Accelerating the Energy Transition through Inter-Organizational Learning

The Role of Intermediaries in Knowledge Exchange

CME5200: CME Master Thesis

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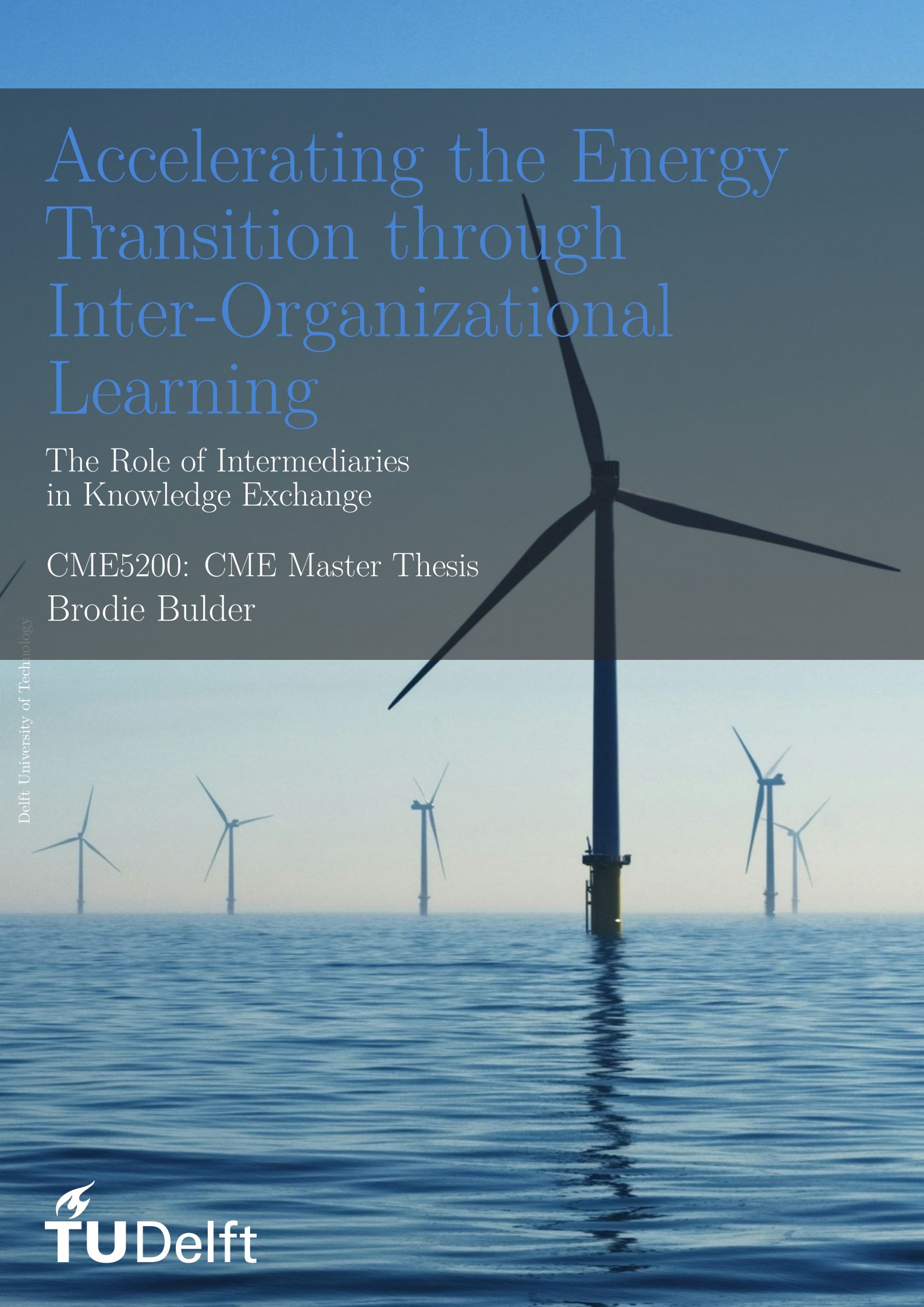
Delft University of Technology



TU Delft

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by

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Cover: Rampion Offshore Wind Farm, United Kingdom (Doherty, 2019)

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Abstract

The energy transition requires rapid deployment of complex infrastructure, yet many projects - such as carbon capture hubs and HVDC interconnectors - face persistent cost overruns, delays, and learning bottlenecks. While organizations recognize the need to learn from past efforts, they often lack the internal structures or cross-project mechanisms to do so effectively. This thesis investigates how specialised intermediaries can improve inter-organizational learning and accelerate energy transition delivery. It addresses the question: How can the energy sector make use of intermediaries to improve inter-organizational learning and accelerate the energy transition? The study adopts an exploratory, qualitative multiple-case design, examining three energy projects where Turner & Townsend acted as intermediary. Data were collected through fifteen semi-structured interviews with both client and consultant representatives and analysed thematically to identify learning mechanisms, barriers, and outcomes. Findings show that intermediaries were engaged to close capability gaps, deliver structured benchmarking, and adapt proven delivery models to novel technical contexts. Through a mix of codified frameworks (e.g., the Cube methodology), anonymised data platforms, and embedded expertise, the intermediary helped project teams standardise fragmented inputs, challenge assumptions, and institutionalise improved routines. This accelerated learning from one project to the next and strengthened long-term client capabilities. The thesis introduces a "Build–Partner–Burst" model to explain how intermediary involvement can adapt over time to meet evolving project needs. The study contributes to intermediary and organizational learning theory by showing how intermediaries act as configurable capability platforms that compress learning cycles, substitute for slow trust formation, and make sector-wide knowledge sharing more viable. Practical recommendations include earlier intermediary engagement, investment in digital data infrastructure, and more deliberate context-tailoring of delivery tools. While limited to three cases within one firm, the findings suggest that intermediaries can play a catalytic role in scaling learning across projects and organizations in the global energy transition.

Preface

Presenting this master's thesis marks the final step in completing my MSc degree in Construction Management and Engineering at Delft University of Technology. The research was conducted in collaboration with Turner & Townsend and examines how intermediaries can accelerate inter-organizational learning in energy transition projects.

The topic arose from an interest in the energy sector, particularly the challenges and opportunities of the energy transition. With an academic background in infrastructure and project management, I was drawn to the practical dynamics of delivery in complex energy projects. During my thesis work at Turner & Townsend, I became involved in initiatives focused on data-sharing, benchmarking, and project delivery across multiple clients and regions. Observing the company's role in facilitating learning between organizations highlighted the intermediary's unique position in accelerating sector-wide improvement. These experiences, along with discussions with my supervisors, shaped the research direction and case selection for this thesis.

I would like to thank Ina and Carl for their guidance and support during the internship and thesis process. Their feedback, access to materials, and willingness to connect me with relevant stakeholders were essential in completing this work. I am equally grateful to all interview participants for their time, insights, and openness in discussing their project experiences.

From the university side, I thank Ad for chairing the committee and overseeing the assessment process. I especially appreciated the thoughtful feedback and regular conversations with Erik-Jan, as well as the fruitful discussions with Magchiel that helped guide the thesis toward a successful completion.

Lastly, I would like to acknowledge the support of friends and family over the past months. Their encouragement helped me stay focused and motivated during the writing of this thesis.

Brodie Bulder
Delft, September 2025

Executive Summary

The energy transition is unfolding at unprecedented speed, yet the megaprojects required to deliver it - carbon capture hubs, HVDC interconnectors, hydrogen production clusters, and more - continue to overrun on cost, time, and risk. Technical novelty, fragmented supply chains, and shifting policy incentives mean no single organization possesses all of the expertise needed to navigate design choices, contracting models, or regulatory hurdles. While firms acknowledge that learning - both within and between organizations - is critical, day-to-day practice still suffers from siloed knowledge systems, short-term resourcing, and ad-hoc collaboration. The result is a "stop-start" learning pattern: lessons gathered on one project are rarely codified fast enough, or shared widely enough, to benefit the next wave of assets coming down the pipeline.

Given this context, the thesis asks how specialised intermediaries can be mobilised to speed up collective learning and, in turn, accelerate the energy transition. Its central research question is: How can the energy sector make use of intermediaries to improve inter-organizational learning and accelerate the energy transition? To analyse this, the study investigates (i) how organizational learning, knowledge management, and inter-organizational learning interact in project settings; (ii) how intermediaries are currently theorised and deployed; and (iii) what mechanisms, barriers, and impacts characterise their work. Five sub-questions structure the study, ranging from the drivers that lead owners to engage an intermediary to the durability of the capabilities transferred. Together, these questions frame a systematic exploration of intermediaries as potential "learning catalysts" capable of turning isolated project experiences into sector-wide progress.

Three interconnected concepts frame the thesis. Organizational learning explains how a firm notices problems, experiments, and embeds improved routines. Models such as single-/double-/triple-loop learning and the 4I framework show that insights travel from individuals to firm-wide standards only when they are codified in processes that survive staff turnover - a critical requirement in fast-moving energy projects where schedules, risk logs, and contracting strategies adapt in real time.

Complementing this, knowledge management concerns the socio-technical systems - people, processes, and technology - that capture and share those lessons. Without the right incentives or workflows, even sophisticated repositories remain under-used. Tools like Turner & Townsend's Cube methodology and ISO-aligned cost codes therefore matter not just for administration but because they make learning portable, letting a carbon-capture team reuse experience drawn from rail or petrochemical megaprojects. Finally, inter-organizational learning widens the lens to multi-actor project networks that span owners, suppliers, and regulators. Here, knowledge flows hinge on trust, complementary capabilities, and intermediaries that translate jargon, anonymise data, and balance power. Evidence from automotive clusters, municipal benchmarking, and clean-tech supply chains shows such brokers can compress innovation cycles by integrating otherwise siloed actors - exactly the role needed to turn isolated project insights into sector-wide progress during the energy transition.

Methodologically, the study adopts an exploratory, qualitative multiple-case design centred on three energy transition projects in which Turner & Townsend acted as the information intermediary. After a targeted literature review established the analytical lens, 15 semi-structured interviews were conducted with project directors, controls specialists, and client representatives, capturing both the supply- and demand-side experience of intermediary-enabled learning. Cases were chosen purposively to maximise variation in technology focus and contractual set-up, while the dual-sided sampling ensured triangulation of views on the same collaboration. Interview data were transcribed and subjected to a systematic thematic analysis, with codes developed inductively during the coding process. Rather than applying a predefined framework, themes emerged organically from the data, allowing for a grounded understanding of how intermediary-enabled learning unfolded in practice. Iterative code categorisation in Atlas.ti resulted in recurring mechanisms, barriers, and outcomes, which were then compared across cases to identify transferable patterns. Reflexive memos, participant transcript checks, and strict anonymisation

procedures safeguarded research ethics and helped keep the author's insider position - in an internship with Turner & Townsend - from unduly colouring the interpretation.

Interviews across three energy transition engagements reveal a consistent narrative: client organizations turn to an intermediary when specialised capability, independent insight, or accelerated growth cannot be generated fast enough in-house. On Net Zero Teesside and Celtic Interconnector that need centred on project-controls expertise and proven governance templates; in the Performance Forum it was independent benchmarking to reassure investors. The intermediary responded with a set of practices - purpose-built teams, codified delivery frameworks such as the Cube, and anonymised data platforms - that together accelerated learning curves and anchored strategic choices in comparative analysis rather than intuition.

These initiatives were met with challenges rooted in organizational dynamics and contextual complexity. First-of-a-kind scopes offered limited historical data; contracting silos, human resource shortages, and confidentiality rules suppressed knowledge flow; and shifting regulatory demands forced parallel workstreams. Progress resumed only when Turner & Townsend layered three enablers onto the challenge set: (i) data tools that anonymised and standardised fragmented cost and schedule inputs, (ii) trust-building routines - from shadow-pairing to equal-vote governance - that supported open data exchange, and (iii) adaptable delivery methods that allowed proven controls out of mature sectors and tailored them through scenario workshops and targeted SME input.

The result is demonstrable learning impact. Clients adopted new risk-scenario disciplines, scheduled baselines faster, and embedded cost-coding libraries and benchmarking logics in their own playbooks. Where long-term project pipelines existed, shadow-paired deputies continued to apply and refine these routines; where pipelines were absent, industry platforms like the Performance Forum preserved lessons for the next wave of hydrogen, CCS, or other low-carbon assets. Across all cases the same capability-centric cycle emerges: diagnose gaps early, mobilise configurable expertise, convert data into insight, and institutionalise the routines so that future projects start further up the learning curve. This progression is illustrated in the intermediary capability model (figure 2), while the corresponding learning mechanisms, enablers, and outcomes are summarised in the synthesis matrix (figure 1).

To translate these findings into action, the thesis offers six practical recommendations. First, project owners should involve intermediaries before scopes and contracts are fixed, allowing time for benchmarking, scenario planning, and collaborative learning to shape project foundations. Second, strengthening the data infrastructure is essential: intermediaries and industry bodies should invest in central cloud-based platforms that automate data cleaning and analysis, integrate with ISO taxonomies, and allow for real-time performance comparisons. Third, sector actors should expand benchmarking platforms like the Performance Forum beyond oil and gas to include new energy players - hydrogen, CCS, sustainable fuels - by designing tailored participation incentives that balance confidentiality with insight-sharing. Fourth, intermediaries can serve as neutral facilitators of policy feedback, channelling anonymised cross-project evidence into structured dialogues with regulators to improve permitting, standards, and investment timelines. Finally, while intermediaries already apply an "80% proven, 20% tailored" approach to delivery methods, this contextualisation can be made more systematic. Introducing feedback loops that track how tools perform across technical or regulatory contexts would allow intermediaries to refine and modularise their templates, helping future teams build on prior adaptations rather than starting from scratch. Together, these actions support a more systematic approach to capability development across energy transition programmes.

The study enriches learning theory by positioning the intermediary as a configurable capability platform rather than a static broker. The Build–Partner–Burst model shows that the depth and duration of engagement are design variables that shape how fast knowledge moves from one project to the next. Structural neutrality emerges as a functional substitute for slow-growing bilateral trust, enabling firms to pool sensitive cost and schedule data into continuous, anonymised benchmarks that confront optimism bias in real time. In doing so, the intermediary compresses the 4I learning cycle—intuiting, interpreting, integrating, institutionalising—into a joint client–consultant process, with codified tools such as the Cube and ISO cost codes providing an "80% proven / 20% tailored" foundation for rapid contextual adaptation.

Several boundaries affect these insights and point toward future research directions. Evidence is drawn

from three cases inside a single consultancy, relies primarily on interview data, and captures only a moment in each project's life; broader multi-intermediary, longitudinal studies are needed to test causal strength and durability. Future work should also (i) measure learning impacts through time-series cost, schedule, and capability metrics, (ii) investigate the social dynamics of shadow-pairing and middle-management knowledge flow, (iii) experiment with AI-enabled data pipelines that lower the cost of sharing, and (iv) compare how different regulatory regimes modulate the demand for neutral learning platforms. Addressing these questions will move the field from promising case evidence toward a generalisable theory of intermediaries as systemic learning catalysts in the global energy transition.

Engagement Drivers *Why do clients engage*	**Facilitating Mechanisms** *What does the intermediary do*	**Energy Challenges** *What are the barriers*	**Key Enablers** *How are barriers overcome*	**Learning Impact** *What is the effect*
Resourcing Gaps *Augmenting capability and capacity*	• Flexible capability model (see following figure). • Deployment of subject matter experts and shadow-pair roles. • Turnkey controls and contracting expertise.	• First-of-a-kind technologies stretch internal skills. • Tight timelines and local labour shortages. • Organisational memory weakened by attrition.	• Flexible resourcing enables rapid (de)mobilisation. • Shadow-pairing converts external support into internal capability. • Trusted-advisor status facilitates early risk identification.	• Critical control functions operational within weeks. • Client teams achieve operational autonomy. • Stronger governance frameworks for future projects.
Assurance & Insight *Providing data-driven confidence*	• Supplies anonymised cost and schedule benchmarks. • Conducts scenario-based risk and assurance reviews. • Maps proven methods (e.g., Cube) to novel technologies.	• Lack of historical data for new-energy assets. • Confidentiality constraints limit transparency. • Complex governance slows data exchange.	• Anonymisation and standardised coding protect confidentiality. • Analogous benchmarks bridge data gaps until actuals mature.	• Faster, evidence-based final investment decisions. • Higher investor confidence in forecasts. • Stage-gate reviews grounded in empirical evidence.
Growth Development *Accelerating learning and innovation*	• Facilitates study groups for joint research and reflection. • Synthesises shared data into joint guidance. • Runs early challenge workshops to reframe assumptions.	• Organizational inertia and entrenched norms resist alternative approaches. • Protective information cultures restrict learning. • Policy volatility heightens risk aversion.	• Neutral facilitation reduces defensiveness and builds trust. • Equal-vote forum ensure balanced participation. • Regularly refreshed themes sustain learning relevance.	• Quicker adoption of innovative delivery strategies. • Continuous learning loops supporting funding cases. • Process improvements institutionalised in knowledge bases.

Figure 1: Cross-case synthesis of drivers, mechanisms, challenges, enablers, and learning impact.

Capability Dimension	**Build**	**Partner**	**Burst**
Ambition for internal know-how	High *Wants to own the tools & talent*	Medium *Wants a core that can run without full external help*	Low *Seeks externally delivered expertise*
Intermediary role	Architect & coach	Co-pilot, then mentor	Full operator
Engagement curve	Short, intense setup → early exit	Gradual taper (shadow → check-in)	Fixed term → hand-back or roll-off
Typical scope	Design governance, templates, WBS; train & backstop	As 'Build' plus interim functional leads (e.g., PMO, cost)	End-to-end controls, benchmarking, assurance
Organizational maturity	High *Established systems, strong internal capability base*	Medium *Some functions in place, capability gaps remain*	Low or situational *Limited relevant experience, depends on external delivery*
Good fit when…	• Stable workforce • Long asset pipeline	• Capacity gap is big now but will shrink	• First-of-a-kind technology • Cost-of-delay large • Organizational restructure likely
Learning impact	High retention inside client	Medium retention (depends on taper discipline)	Low retention (episodic learning burst)

Long-term development ⟷ Short-term outsourcing

Figure 2: Capability model showing three engagement types - Build, Partner and Burst - arrayed along a long-term development to short-term outsourcing axis.

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1

Introduction

The rapid transformation of the global energy sector demands a resilient and adaptive infrastructure capable of supporting economic growth, ensuring energy security, and advancing decarbonization efforts. An efficient and sustainable energy system is essential for modern society from economic, social, and environmental perspectives. Reliable energy infrastructure supports economic development, enhances societal well-being, and plays a crucial role in mitigating climate change (Farghali et al., 2023; IEA, 2021). Over the past decades, the energy sector has undergone significant transformations, driven by increasing global energy demand, policy shifts toward decarbonization, and advancements in renewable technologies (IRENA, 2020; Kousar et al., 2024; Kuzemko et al., 2024). These transitions require large-scale energy infrastructure projects that integrate new technologies while meeting evolving regulatory requirements. According to the Net Zero Roadmap from the International Energy Agency (IEA), global energy investments are expected to exceed $4.5 trillion annually by 2030 to meet sustainability goals and energy security requirements (IEA, 2023). However, delivering these projects efficiently remains a challenge due to increasing complexity, technological disruptions, regulatory uncertainties, and geopolitical influences (Geels et al., 2017; Helm, 2017). The evolving legal and policy landscape further complicates infrastructure development, as the energy transition requires adaptive regulatory frameworks to facilitate investment and innovation (Hailes & Viñuales, 2024). Furthermore, the integration of renewable energy sources necessitates significant modifications to existing grids and storage solutions, underscoring the importance of infrastructure adaptation in ensuring a stable and efficient energy supply (Schnidrig et al., 2023).

1.1. Problem Statement

Energy organizations today operate under rapidly changing conditions, characterized by technological shifts, evolving policies, and rising sustainability pressures. Despite increasing recognition that learning - encompassing both the creation of new knowledge and the retention of existing expertise - is central to competitive advantage, many firms remain challenged by fragmented or poorly aligned learning structures. For instance, even where technological solutions exist for knowledge capture, organizational norms often block their effective deployment, resulting in underutilized systems and a reluctance to share knowledge across functional boundaries (Gouveia et al., 2023).

Further compounding the problem is the sporadic engagement in inter-organizational learning. While the growing complexity of clean energy transitions makes it impractical for any single entity to possess all relevant capabilities, energy firms rarely harness external insights in a cohesive, sustained manner (Sabidussi & Wasser, 2024). Barriers like departmental silos, limited trust, and a short-term focus on immediate operational demands undercut efforts to collaborate with universities, technology developers, and even industry peers (Bossink, 2020; Magyari et al., 2022). This is particularly problematic in innovation-heavy contexts, such as photovoltaic, wind, or power-to-gas technologies, where knowledge flow is critical for both timely implementation and long-term competitiveness (Malhotra et al., 2019).

Taken together, these deficits hinder the systemic knowledge integration required for the sector to

respond to pressing environmental and economic challenges. While scarce best practices do exist - exemplified by some global oil companies and electric utilities that have effectively codified and disseminated technical know-how (Edwards, 2008) - they remain exceptions rather than the rule. As a result, progress in adopting innovative, low-carbon solutions too often stalls, exposing firms to risks and leaving significant opportunities for collective problem-solving unexploited. Under these circumstances, questions remain about how energy organizations can better structure learning routines, build collaborative frameworks, and cultivate cultural support for continuous improvement.

1.2. Research Gap

Despite a growing body of literature that highlights how organizations acquire and utilize knowledge internally (Fiol & Lyles, 1985; Liu, 2021; Senge, 1990), and a parallel line of research underscoring the importance of multi-actor collaboration in the energy sector (Bossink, 2020; Sabidussi & Wasser, 2024), several gaps remain evident. First, most studies addressing inter-organizational learning focus on discrete collaborations - such as alliances or demonstration projects - without systematically examining how learning mechanisms can be integrated across diverse, often siloed, energy actors (Sohi & Matthews, 2019; Van Wijk et al., 2008). In other words, current work tends to emphasize single instances of inter-firm exchange rather than the continuous, multi-level frameworks needed to sustain collaborative innovation in an environment as complex and dynamic as the energy domain.

Second, although knowledge management has been well-studied in mainly oil and gas, and power generation (Edwards, 2008; Gouveia et al., 2023), insights are largely confined to internal knowledge management practices. While these analyses acknowledge the strategic value of codifying and sharing knowledge, they do not go far enough in exploring how KM systems might extend beyond organizational boundaries to support collective learning among technology providers, policy-makers, and utility companies (Magyari et al., 2022). The literature suggests that cross-sectoral knowledge exchange is crucial for addressing long-term challenges, such as distributed innovation and regulatory uncertainty (Liu, 2021), but offers limited guidance on designing knowledge systems that effectively leverage external expertise and diffuse best practices in real time.

Third, and most importantly, a growing number of studies - across various domains ranging from automotive production networks to biotechnology alliances - suggest the crucial role of intermediaries in bridging organizational boundaries and reducing knowledge asymmetries (Apostolou et al., 2003; Boekestijn, 2002; Fagundes & Gasparetto, 2023). Yet, few have only touched on this topic within complex energy-sector contexts (Malhotra et al., 2019; Ossenbrink, 2017). This gap is particularly noticeable given the unique challenges posed by the energy sector's technological diversity, its cross-sector dependencies, and the speed at which new policy frameworks and sustainability targets are emerging (Bossink, 2020; Sabidussi & Wasser, 2024).

Taken together, these gaps highlight the necessity for more holistic models that (i) integrate organizational learning, knowledge management, and inter-organizational learning into a cohesive framework; (ii) specify how knowledge systems can be purposefully designed to promote sustained collaboration among heterogeneous actors; and (iii) identify the specific role and operational structures of intermediaries that broker information, build trust, and bridge sectors. Addressing these areas is essential for unlocking the collective innovation potential required to meet evolving energy demands and to advance the sustainability agenda in increasingly interdependent energy systems.

In figure 1.1, the research gap is illustrated through the overlapping domains of organizational learning in the energy sector, knowledge management in the energy sector, and intermediary roles in inter-organizational learning. While each circle has received separate attention in the literature, the figure highlights the underexplored space where these three perspectives intersect, underscoring the need for an integrative framework that addresses knowledge exchange among diverse energy-sector actors and systematically embeds intermediary practices.

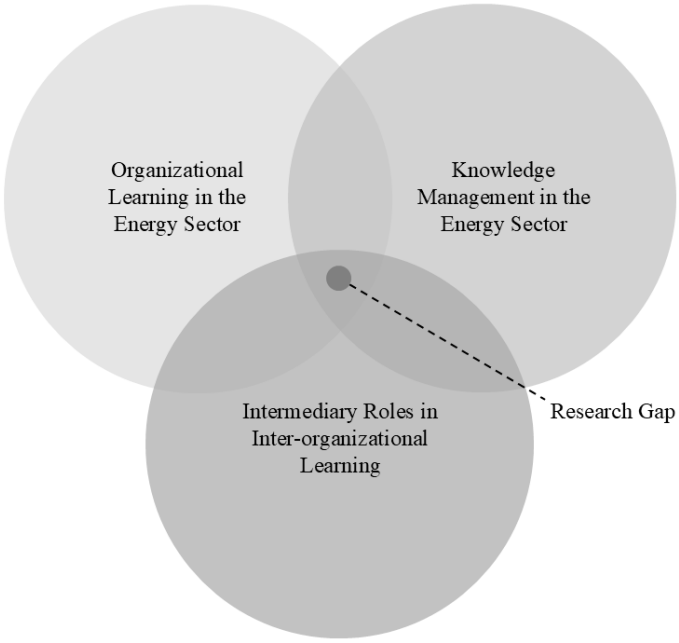

Figure 1.1: Visualisation of the research gap in project-based learning.

1.3. Research Question

Building on the research gap identified, this study aims to investigate the following research question:

How can the energy sector make use of intermediaries to improve inter-organizational learning and accelerate the energy transition?

To support the main research question, the following sub-questions have been formulated:

1. What distinctions do existing studies draw between organizational learning, knowledge management, and inter-organizational learning, and how are these viewed in the energy sector?
   This sub-question clarifies the conceptual underpinnings and outlines how each framework - organizational learning, knowledge management, and inter-organizational learning - applies to energy-related collaborations, thereby establishing the theoretical context.
2. How have intermediaries been defined and theorized in the inter-organizational learning literature?
   This sub-question establishes the theoretical grounding for intermediaries, examining core concepts, roles, and mechanisms through which they facilitate knowledge transfer across organizational boundaries.
3. How and why do energy sector organizations engage with intermediaries, and what mechanisms do intermediaries apply to facilitate inter-organizational learning?
   This question investigates the underlying drivers for engaging intermediaries—such as capacity gaps, access to expertise, or learning ambitions, and examines the concrete practices intermediaries employ to enable cross-organizational knowledge exchange and capability development.
4. What are the key challenges and enablers affecting knowledge exchange and learning in the energy transition context, and how do intermediaries navigate these?
   This question explores how characteristics of energy transition projects shape inter-organizational learning, and how intermediaries respond to these dynamics.
5. What is the impact of intermediary-facilitated learning for client organizations, and to what extent is this learning sustained beyond the intermediary's involvement?
   This question focuses on the practical impact, performance, and outcomes of inter-organizational

learning - examining not only the knowledge exchanged, but also the extent to which it builds the capacity to learn.

1.4. Research Design

This study follows a qualitative case study approach to examine how intermediaries in the energy sector facilitate inter-organizational learning. The research design links the study's research questions to the data sources required for analysis (see figure 1.2 below for an overview). Further details on data collection and qualitative data analysis are provided in chapter 3.

To provide a brief overview of the methodology, the study begins with a literature review to establish the state of the art on inter-organizational learning in the energy context. This review explores knowledge transfer mechanisms, organizational learning, intermediary roles, and sector-specific challenges in energy collaborations. Insights from the literature inform the empirical research by shaping the design and focus of the interview questions. Empirical data is collected through semi-structured interviews with actors involved in energy projects, including representatives from an intermediary organization, as well as energy firms. These interviews capture practical experiences related to knowledge exchange, the role and functioning of intermediaries, and factors that support or hinder inter-organizational learning. The collected data is analysed using a thematic coding approach to identify recurring patterns, barriers, and enabling conditions. The findings contribute to the development of a strategy for embedding intermediary practices and improving knowledge integration in the energy sector, offering practical strategies to enhance collaboration and learning across organizational boundaries.

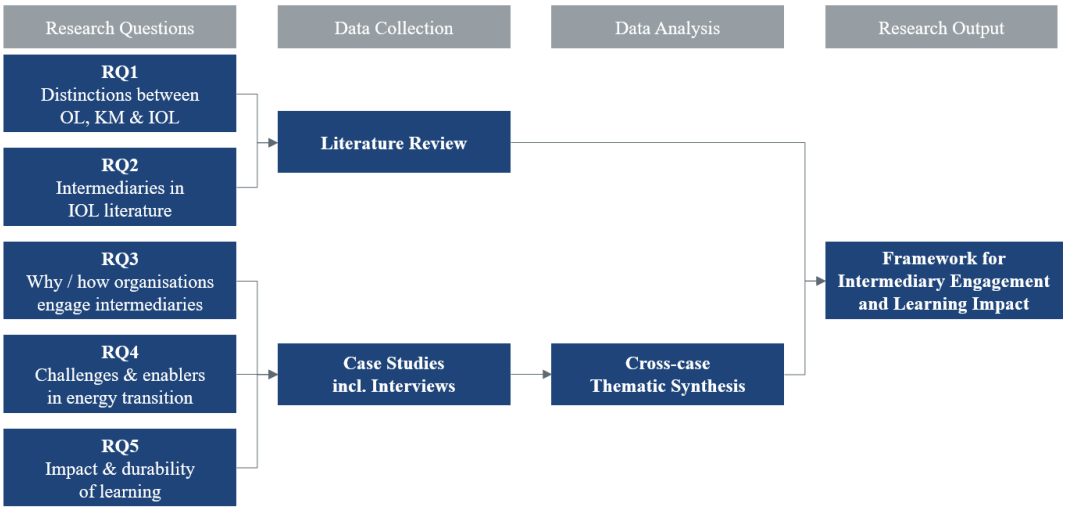

Figure 1.2: Research design linking the five research questions to their corresponding data sources, the qualitative cross-case analysis, and the resulting framework for intermediary engagement and learning impact.

1.5. Broader Impact

1.5.1. Practical Relevance

As the energy sector undergoes a rapid transition to meet sustainability goals, enabling effective collaboration and knowledge exchange among diverse actors is increasingly essential. Large-scale infrastructure projects - such as renewable energy installations, grid modernization, and energy storage systems - require coordinated expertise, significant investment, and timely execution. However, without effective inter-organizational learning, energy-sector organizations risk repeating mistakes, duplicating efforts, and failing to adapt to fast-changing complex regulatory and technological conditions. By improving the mechanisms through which knowledge is transferred across organizational boundaries, organizations can enhance their ability to respond to evolving challenges and drive innovation more effectively.

This research provides practical insights into how energy-sector organizations can better utilize intermediaries to structure and support knowledge-sharing across sectors. Findings from interviews with

actors engaged in energy projects will help identify the conditions, practices, and factors that have either enabled or hindered learning. These insights can inform the design of targeted knowledge-sharing strategies that reduce fragmentation, build trust, and support continuous improvement; ultimately improving project delivery and innovation capacity in an industry characterized by complexity and interdependence.

1.5.2. Academic Relevance

This study addresses key gaps in the literature on organizational learning and knowledge management within the energy sector. While prior research highlights how organizations acquire and utilize knowledge internally (Fiol & Lyles, 1985; Liu, 2021; Senge, 1990), and underscores the importance of multi-actor collaboration in energy transitions (Bossink, 2020; Sabidussi & Wasser, 2024), limited attention has been given to how learning can be systematically sustained across diverse, often siloed, energy-sector actors (Sohi & Matthews, 2019; Van Wijk et al., 2008). Furthermore, although intermediaries are recognized for their role in reducing knowledge asymmetries across sectors such as manufacturing, banking, and biotech (Apostolou et al., 2003; Boekestijn, 2002; Fagundes & Gasparetto, 2023), their function within the energy domain remains underexplored (Malhotra et al., 2019; Ossenbrink, 2017). By integrating these perspectives, this research contributes to a more comprehensive understanding of how intermediaries can support cross-sectoral knowledge exchange and collaborative learning in the dynamic, multi-actor energy context.

1.5.3. Potential Outcomes and Contributions

This study aims to contribute a framework and actionable insights detailing how energy sector organizations can strategically utilize intermediaries to enhance inter-organizational learning, thereby contributing to the acceleration of the energy transition. By synthesizing insights from the literature and interviews, the research will highlight key enabling conditions, success factors, and practical strategies for leveraging intermediaries to bridge knowledge gaps and promote long-term learning. Particular attention will be given to identifying what makes knowledge exchange successful in multi-actor collaborations and which variables need to be addressed to sustain it.

Additionally, the study will identify key barriers to inter-organizational learning, such as misaligned incentives, low trust, or structural fragmentation, and propose ways to mitigate them. By focusing on real-world practices and experiences, the research bridges theoretical insights with practical application, offering value both to academics studying organizational learning and to practitioners aiming to enhance collaboration and knowledge flow in the energy sector. Ultimately, the study supports broader efforts to increase organizational resilience and adaptive capacity in response to the ongoing demands of the energy transition.

1.6. Thesis Structure

This thesis is structured into several chapters following this introduction, each contributing to answering the main research question. Chapter 2 reviews relevant literature on organizational learning, knowledge management, and inter-organizational learning, with a particular focus on intermediary roles in knowledge exchange. It also examines sector-specific challenges in the energy domain and identifies gaps in existing frameworks that limit cross-sectoral collaboration. Chapter 3 outlines the research design, detailing the qualitative case study approach adopted to explore how intermediaries facilitate learning across organizational boundaries in energy-sector collaborations. It explains the data collection process, which involves semi-structured interviews with stakeholders engaged in multi-actor energy projects, and describes the thematic analysis method used for data interpretation. Chapter 4 introduces the empirical setting, providing context on the selected project-based organization and its involvement in the energy transition. It presents relevant background information to situate the interview findings within the organizational and sectoral landscape. Chapter 5 describes the data collection and analysis process in detail, including the development of interview protocols, coding strategy, and identification of key patterns. It focuses on how actors perceive the role of intermediaries and what factors enable or hinder inter-organizational learning. Chapter 6 presents the main findings from the interviews, highlighting recurring themes such as trust-building, boundary-spanning practices, and barriers to knowledge sharing across organizations. Chapter 7 relates these findings to existing theoretical perspectives, synthesizing insights into a conceptual framework for operationalizing intermediaries in the energy sector. It dis-

cusses how this framework addresses current research gaps and supports improved knowledge integration among diverse actors. Finally, Chapter 8 concludes the thesis by summarizing key insights, answering the main research question, and outlining practical recommendations for enhancing inter-organizational learning in the energy sector. It also reflects on limitations and suggests directions for future research.

2

Literature Review

In order to understand how organizations learn together and exchange knowledge across boundaries, it is essential to first grasp the foundational concepts of organizational learning and knowledge management. This chapter begins by clarifying how these areas complement one another: organizational learning highlights the ways in which firms acquire and adapt knowledge internally, while knowledge management deals with systematically codifying, sharing, and utilizing that knowledge. Taken together, these perspectives set the stage for examining inter-organizational learning, which extends beyond single organizations to explore how multiple actors collaborate in complex environments. By reviewing both classic and recent research, the chapter demonstrates why concepts such as boundary-spanning, trust-based networks, and intermediary roles are essential for managing the technological, regulatory, and stakeholder demands of the energy sector. The analysis ultimately underscores the importance of intermediaries in bridging organizational boundaries and shaping collective learning processes; an aspect that holds particular promise for addressing the urgent challenges of the energy transition.

2.1. Defining Concepts

Before exploring how learning occurs across organizational boundaries and the roles intermediaries play in this process, it is necessary to first define the foundational concepts underpinning this study. This section introduces and distinguishes between three key constructs: organizational learning, knowledge management, and inter-organizational learning. While these terms are often interrelated, they reflect different levels of analysis and mechanisms through which knowledge is acquired, shared, and applied. Organizational learning focuses on how knowledge is developed and embedded within firms, whereas knowledge managment addresses how this knowledge is systematized and utilized. Inter-organizational learning extends this perspective by examining how organizations learn from and with one another. Clarifying these distinctions lays the foundation for understanding how intermediaries facilitate learning in multi-actor environments.

2.1.1. Organizational Learning

Organizational learning is broadly defined as "the process of improving actions through better knowledge and understanding" (Fiol & Lyles, 1985, p. 803), and it encompasses a spectrum of learning intensities; from small, incremental enhancements to large-scale, transformative breakthroughs (Bayus, 2013; von Hippel, 2005). Initially conceptualized in part by Cyert and March (1963), organizational learning has become increasingly prominent following works such as Senge (1990), reflecting a shift in many industries from merely replicating existing routines toward embracing more adaptive and innovative practices (Liu, 2021; Söderlund & Tell, 2009). This broader perspective on learning includes both the day-to-day operational adjustments and the fundamental rethinking of processes, allowing firms to respond effectively to changing environments and new opportunities (Dodgson, 1993; Grant, 1996).

In aligning with this expanded view, organizational learning literature rests on four main assumptions: it is experiential, behavioral, social, and organized (Huber, 1991; Liu, 2021; Slater & Narver, 1995). This implies that learning unfolds through direct experience and behavior modification, is reinforced

through social interactions, and is sustained by structured processes that guide how organizations acquire, interpret, and apply knowledge. Consistent with Fiol and Lyles (1985), knowledge within organizations is not solely the aggregate of individual insights but also becomes embedded in routines, norms, and cultures, leading to what Hedberg (1981) and Mariotti (2012) term "organizational memory". Such embedded knowledge allows collective learning to persist beyond any single employee's employment period and encourages alignment across the firm. Nonetheless, as Liu (2021) emphasizes, the extent of learning can vary greatly, from single-loop or "adaptive" adjustments (Sohi & Matthews, 2019) to double-loop interventions that tackle deeper root causes (Argyris, 1976), and even triple-loop learning aimed at enhancing the organization's overall capacity to learn.

Building upon these distinctions, researchers have highlighted that single-loop learning focuses on correcting specific errors without questioning existing assumptions, whereas double-loop learning reexamines underlying beliefs and institutionalized patterns (Liu, 2021; Snell & Chak, 1998). Triple-loop learning goes further by reflecting on how the organization learns in the first place, ultimately refining its learning mechanisms. While such nuanced learning can drive transformative change, it is also hindered by factors like project-based structures and temporary teams, which can limit the transfer of knowledge across an entire organization (Lindkvist et al., 1998; Prencipe & Tell, 2001; Williams, 2008). Nevertheless, the three fundamental stages of organizational learning - knowledge acquisition, dissemination, and shared interpretation (Slater & Narver, 1995) - remain crucial for any organization seeking to utilize its collective experience for long-term competitive advantage.

To further conceptualize organizational learning, research has also introduced frameworks that address where learning occurs and how it progresses across multiple levels. Easterby-Smith et al. (2000) argue that organizational learning occurs at multiple levels — individual, group, and organizational. Elaborating on that notion, Crossan et al. (1999) propose a "4I framework" that conceptualizes learning as unfolding through four interlinked processes - intuiting, interpreting, integrating, and institutionalizing - which operate at the individual, group, and organizational levels. At the individual level, learning involves recognizing new patterns and meanings; at the group level, the focus shifts to reconciling and organizing these insights; and at the organizational level, routines and practices are ultimately formalized to embed collective knowledge. While Easterby-Smith et al. (2000) emphasize the distribution of learning tasks among individuals, groups, and the broader firm, the 4I framework further underscores the interplay between exploration (seeking out new information) and exploitation (leveraging existing knowledge for immediate gains). Taken together, these perspectives illustrate that learning is not confined to a single domain but is rather the result of continuous interactions among people, groups, and organizational structures.

2.1.2. Knowledge Management

Knowledge management (KM) has deep historical roots, even if early organizations did not explicitly label their practices as KM (Edwards, 2008). According to Edwards (2008), the term itself was popularized in the 1980s by Karl Wiig, and later gained traction in the 1990s following influential works by Nonaka and Takeuchi (1995) and Davenport and Prusak (1998). While Edwards notes that these authors significantly contributed to shaping the discipline, its also pointed out that KM builds on older traditions such as expert/knowledge-based systems, business process analysis, and organizational learning. In other words, KM's formal recognition emerged relatively recently, but the underlying concept of managing organizational knowledge has long been practiced in multiple domains.

According to Edwards (2014), KM systems can be conceptualized through a socio-technical lens, where People, Processes, and Technology form the core components. It highlights how each element both influences and is supported by the others: people help design and operate processes and technology, processes define organizational roles and knowledge needs, and technology offers new possibilities for innovation and efficiency (Edwards, 2014). Although there are multiple perspectives on KM - ranging from information technology-centric (Alavi & Leidner, 2001) to organizational or human resources–focused as cited in Liu (2021) - all agree that effective knowledge management is based on the same core components.

In a widely accepted view, knowledge comprises both explicit and tacit dimensions, where explicit knowledge can be readily codified and disseminated, and tacit knowledge remains deeply embedded in personal cognition and social interaction (Nonaka & Takeuchi, 1995; Polanyi, 1959). Building upon

these foundations, Liu (2021) draws on Cross (1997) to describe KM as a discipline that specifically promotes an environment where knowledge is created, captured, shared, transferred, and effectively utilized. This perspective recognizes that effective KM practices extend beyond technological solutions, emphasizing the cultural and organizational systems necessary to facilitate collective learning. Furthermore, KM is increasingly seen as a key source of competitive advantage (Carneiro, 2000), as it harnesses the collective expertise of employees, streamlines the flow of insights, and reinforces continuous improvement across the firm. Taken collectively, these perspectives illustrate that KM extends beyond any single tool or framework; it is an evolving discipline that harnesses and integrates diverse forms of knowledge to drive better decision-making and business performance.

2.1.3. Inter-organizational Learning

Inter-organizational learning generally refers to the exchange and co-creation of knowledge across organizational boundaries, with the goal of enhancing each participating firm's capabilities and performance (Sohi & Matthews, 2019). It extends beyond organizational boundaries, involving processes through which separate organizations exchange, receive, and are influenced by the knowledge and experiences of others (Van Wijk et al., 2008). By drawing on complementary or supplementary forms of knowledge from one another, organizations can jointly develop new insights, enhance innovation, and respond more effectively to environmental changes (Buckley et al., 2009; Van Wijk et al., 2008). Specifically, complementary knowledge refers to know-how that aligns with or reinforces a partner firm's existing competencies, thereby strengthening its core capabilities. In contrast, supplementary knowledge involves expertise or information that is distinct from a firm's current knowledge base, expanding its repertoire and enabling the development of new capabilities or market opportunities. This process involves not just the transfer of information but also the mutual adaptation of routines and practices, leading to new or refined ways of operating (Easterby-Smith et al., 2000; Mariotti, 2012). As a result, inter-organizational learning requires ongoing dialogue and negotiation among partners, whether they can collaborate horizontally (e.g., alliances or joint ventures) or vertically (e.g., franchises or supply-chain relationships) (Sohi & Matthews, 2019).

In practice, inter-organizational learning depends on several key factors. First, the characteristics of the knowledge itself - its specificity, tacitness, and complexity - can determine how readily it can be shared (Reed & Defillippi, 1990). Second, the internal attributes of each organization, such as absorptive capacity, firm size, or experience, shape how effectively they can learn from external partners (Easterby-Smith et al., 2000; Van Wijk et al., 2008). Finally, relational elements—trust, social ties, power asymmetry, and structural arrangements—play a decisive role in facilitating or constraining knowledge flow (Sohi & Matthews, 2019). When these factors align, inter-organizational learning can yield both short-term improvements (e.g., shared problem-solving) and long-term benefits (e.g., the creation of new products or capabilities) that surpass what individual organizations might achieve on their own.

2.2. Applying the Concepts to the Energy Context

Having clarified the distinctions between organizational learning, knowledge management, and inter-organizational learning, this section applies those concepts to the energy sector. The energy field is uniquely suited for such analysis due to its complex actor configurations, technological uncertainties, and cross-sector dependencies. By examining how energy organizations develop learning routines, manage knowledge assets, and collaborate across boundaries, we gain insight into how these theoretical concepts take shape in practice. While the focus here remains on energy-specific studies, it is worth noting that empirical work in this domain is still relatively limited and often centered on particular technologies or organizational settings.

2.2.1. Organizational Learning in Practice

Organizational learning has been widely acknowledged as a critical capability for firms operating in complex and uncertain environments. In the energy sector, where firms face rapid technological change, evolving policy landscapes, and increasing sustainability pressures, the ability to learn effectively becomes essential for maintaining competitiveness and enabling strategic adaptation. Recent empirical studies have begun to explore how energy firms develop and embed learning routines in response to these challenges, uncovering both common patterns and context-specific dynamics.

Learning in Complex Energy Environments
Organizational learning in the energy sector unfolds within a context marked by technical complexity, evolving regulatory landscapes, and diverse stakeholder involvement. Demonstration projects for sustainable energy technologies, such as photovoltaic systems, require actors to operate within uncertain and innovation-heavy environments. Bossink (2020) highlights that these conditions demand structured, organization-wide learning strategies aimed at improving technological functionality, operational efficiency, and market readiness. Simultaneously, Sabidussi and Wasser (2024) emphasize the importance of internal readiness for navigating energy transitions, noting that firms must possess both *capacity* - in terms of resources, routines, and managerial processes - and *agility*, defined as the ability to rapidly adapt to emerging technological and policy shifts.

Strategic Learning Mechanisms and Outcomes
Firms in the energy sector implement a range of deliberate learning mechanisms to handle dynamic and interdependent challenges. Bossink (2020) identifies six major learning strategies, including capturing intellectual property, scaling prototypes, and developing production and distribution networks. These are supported by trust-based collaboration, sustained investment, and learning networks across academia, industry, and government. Likewise, Sabidussi and Wasser (2024) show that successful firms use benchmarking tools and readiness taxonomies to continuously evaluate their internal performance and compare it with peers, facilitating reflexive learning and strategic alignment.

Enablers and Barriers to Learning Orientation
Despite the strategic importance of learning, energy firms face persistent barriers. Organizational inertia, departmental silos, and regulatory uncertainty often hinder the development of learning-oriented cultures (Sabidussi & Wasser, 2024). In contrast, enabling conditions include access to dynamic capabilities, alignment of values through ESG strategies, and strong stakeholder engagement. Agility—both internal and external—emerges as a decisive capability, allowing organizations to experiment with new technologies and business models in the face of uncertainty. In demonstration projects, collaboration with end-users, market actors, and regulators is key to shaping products and services in ways that reflect practical needs and foster broader system adoption (Bossink, 2020).

Learning Across Networks and Policy Interfaces
Organizational learning is not confined within firm boundaries but extends into wider socio-technical and institutional networks. Bossink (2020) illustrates how learning-by-interacting and learning-by-using strategies in demonstration projects engage a range of actors, including urban planners, NGOs, insurers, and consultants, in a co-evolutionary process of system development. Similarly, Sabidussi and Wasser (2024) advocate for multilevel learning—across firms, sectors, and geographies—to overcome carbon lock-ins and enable transformative change. Their approach explicitly bridges organizational theory and strategic management to operationalize learning through diagnostics, benchmarking, and intervention tools.

2.2.2. Managing Knowledge in Energy Organizations
KM plays an important role in helping energy organizations deal with operational complexity, enhance innovation, and retain critical expertise. Across the energy sector, organizations face increasing pressure to align their KM practices with strategic goals, particularly as they adapt to renewable energy transitions, long project lifecycles, and aging workforces. In this subsection, key barriers to effective knowledge management are explored, enabling practices for knowledge transfer and innovation, and the strategic design of KM systems. These insights are drawn from comparative case studies, empirical analyses, and literature reviews, which together highlight both recurring challenges and best practices in the energy context.

Barriers to Knowledge Management
One of the most persistent challenges in energy sector organizations is overcoming organizational and cultural barriers to KM. Gouveia et al. (2023) investigate a relatively young Brazilian company operating in natural gas thermoelectric generation - specifically one that is positioned to manage the largest thermoelectric park in Latin America. Their study identifies several internal KM barriers, including limited engagement from top management, lack of motivation among employees, the absence of formal

knowledge retention plans, and a culture of internal distrust. Even when technological infrastructure exists, it is often underutilized due to resistance from employees, especially in environments where knowledge is viewed as an individual rather than collective asset. These conditions hinder efforts to retain and leverage knowledge within critical energy generation operations (Gouveia et al., 2023).

These challenges align with findings by Edwards (2008), who reviews KM practices across multiple segments of the energy sector, including oil and gas exploration, power generation, nuclear energy, and electricity utilities. Edwards notes a notable contrast between industry leaders such as BP and Shell - known for their well-integrated KM systems - and other organizations still unfamiliar with structured KM initiatives. Drawing especially from the oil and gas sector, Edwards stresses the importance of balancing three core KM elements - people, processes, and technology - and cautions against over-reliance on technological tools without parallel investments in cultural and managerial alignment (Edwards, 2008).

Enablers of Knowledge Retention and Sharing

In response to these challenges, several authors point to enablers that can support knowledge transfer and retention. Gouveia et al. (2023) emphasize the importance of creating a knowledge-sharing culture through recognition and incentive mechanisms. They also highlight the need for structured knowledge retention plans, particularly in the face of generational turnover and the risk of losing tacit expertise. Interviewees in their case study pointed out that knowledge handovers and job rotations were often informally implemented, but not institutionalized (Gouveia et al., 2023). Complementing these findings, Edwards (2008) underscores the importance of cultural and managerial alignment to support KM initiatives. Such investments include, for example, the development of knowledge-sharing cultures through communities of practice (CoPs), transparent leadership communication, tailored reward systems for collaborative behavior, and structured onboarding and mentoring programs to ensure the continuity of critical knowledge across project teams and generations.

Magyari et al. (2022) argue that dynamic knowledge-sharing capabilities can be developed through smart knowledge management systems (SKMS). Their comparative study between a traditional large energy company involved in electricity and gas distribution and a cleantech startup developing power-to-gas (P2G) technologies reveals that SKMS can be utilized to integrate internal and external knowledge flows in several ways. These systems support the structured capture of internal insights from operational teams, facilitate collaborative platforms for external R&D partnerships, and incorporate external content monitoring to stay up to date with technological developments and regulatory shifts. This integrated knowledge landscape enables both firms to align short-term operational needs with long-term innovation goals.

On the contrary, Magyari et al. (2022) explain that both organizations face barriers rooted in path dependency and strategic ambivalence. For the incumbent firm, existing processes and legacy systems prioritize stability and incremental improvement, making it difficult to shift toward radical innovation. For the startup, despite its explorative mission, its dependence on existing R&D routines and established networks can also create inertia. This reflects an ambivalence between exploration (e.g., experimenting with breakthrough clean energy technologies like P2G or carbon capture) and exploitation (e.g., streamlining existing technical processes or commercializing a mature product). This tension complicates KM system design, as each firm must find a balance between enabling innovation and maintaining operational continuity (Magyari et al., 2022).

Strategic Design of KM Systems

Strategic alignment is critical to the success of KM initiatives. Edwards (2008) presents a lifecycle-based model that incorporates knowledge creation, refinement, storage, transfer, and use. He highlights how different organizations must tailor KM practices to their operational needs, whether through codification strategies (e.g., databases and repositories) or personalization strategies (e.g., communities of practice). For example, in large oil and gas firms, codification is often favored to retain technical knowledge, while cleantech startups may rely more heavily on informal knowledge flows and team-based learning.

Magyari et al. (2022) support this idea by linking SKMS effectiveness to strategic ambidexterity, which is the balance between managing current operations and exploring new technological opportunities. This balance allows organizations to absorb, process, and act on knowledge across multiple time frames, a

capability that becomes increasingly important in energy systems undergoing sustainability transitions (Magyari et al., 2022).

Edwards (2008) further advocates for knowledge audits as a foundational step in identifying gaps and tailoring KM initiatives. Without this initial diagnosis, organizations risk applying one-size-fits-all solutions that fail to reflect their contextual needs.

2.2.3. Learning Across Organizational Boundaries

Inter-organizational learning is increasingly recognized as an essential process in the energy sector, enabling firms to navigate the complexity of energy transitions by drawing upon knowledge held by external actors. These learning dynamics occur through formal and informal mechanisms, including project co-development, strategic alliances, cross-sector collaboration, innovation networks, and information intermediaries. What unifies these varied modes is a shared recognition that no single organization possesses all the capabilities or knowledge required to manage the rapidly evolving technological and policy landscapes in the energy domain.

Cross-Sector Learning and the Role of Intermediaries and Policy

A prevalent form of inter-organizational learning involves the transfer of knowledge across sectoral boundaries. Malhotra et al. (2019) highlight how the development and diffusion of clean energy technologies—specifically wind power, solar photovoltaics (PV), and lithium-ion batteries—require integrating knowledge from sectors such as chemicals, materials, and manufacturing. These interdependencies present coordination challenges due to technological complexity and knowledge specificity. To mitigate these issues, the study underscores the importance of public research institutions as intermediaries and of policy interventions that create structured collaborative environments.

Intermediaries, such as public research institutes, universities, and hybrid organizations, play a crucial role in facilitating inter-organizational learning by acting as bridges between otherwise disconnected actors. They do so by translating knowledge across disciplinary boundaries, brokering collaborations, and reducing information asymmetries. For example, in the case of lithium-ion battery development, institutions like Argonne National Laboratory not only conducted foundational research but also helped transfer this knowledge to both established firms and new entrants, accelerating technological uptake. Similarly, institutions like Fraunhofer Society in Germany contributed to solar PV advancements by mediating between academic research and industrial application. By occupying a position of relative neutrality and credibility, these intermediaries are able to convene stakeholders, standardize knowledge, and enable cross-sector integration.

Moreover, policy interventions that strategically support such integrative learning are important too. Malhotra et al. (2019) argue that "sectoral integration does not occur automatically and needs to be enabled through purposive coordination efforts" (Malhotra et al., 2019, p. 78). The article emphasizes that targeted policy mixes - such as funding for joint R&D programs, innovation subsidies, and platform-based initiatives - are essential for aligning incentives and sustaining collaboration across sectors. These interventions can enhance the visibility of knowledge needs, incentivize participation by private actors, and strengthen the institutional roles of intermediaries. As a result, both policy and intermediaries jointly shape the conditions under which inter-organizational learning becomes possible, scalable, and durable in complex clean energy transitions.

Trust, Motivation, and Reciprocity in Project Co-Development

Another domain where inter-organizational learning plays out is in the co-development of renewable energy projects. Mandry and Koubaa (2021) investigate knowledge transfer between offtakers and developers in Morocco, revealing that while relationships are primarily structured around formal contracts, meaningful knowledge exchange still takes place. Learning is stimulated by reciprocal motivations: both firms recognize the value of mutual learning and willingly share knowledge when they perceive tangible benefits in return. Trust-building mechanisms, such as shared project goals and frequent site interactions, are essential to overcoming the inherent tension between protecting proprietary knowledge and engaging in collaborative learning. Importantly, the study finds that the offtaker is evolving from a passive electricity purchaser into a more proactive co-developer, using its growing absorptive capacity to internalize knowledge gained from partners. Knowledge sharing occurs through digital platforms, such

as shared data rooms, and on-the-ground learning during project execution, emphasizing the importance of both technological and experiential channels for effective knowledge exchange.

Organizational Boundaries and Structural Openness
The openness of organizational boundaries has a significant impact on a firm's ability to engage in inter-organizational learning. Nisar et al. (2016) identify four typologies of openness in energy firms: non-existent, embryonic, burgeoning, and embedded. These typologies range from rigid hierarchical structures that limit external engagement to network-based structures where open innovation is a routine strategic activity. According to the study, most traditional energy firms fall within the "embryonic" category, indicating an awareness of open innovation without fully embedding it into their organizational routines. Structural openness is not only a function of internal readiness (e.g., leadership, culture, tools) but also of external factors such as regulatory environments and societal expectations. Companies situated in rigid institutional contexts often struggle to move beyond experimental forms of openness. However, those able to strategically invest in boundary-spanning capabilities - including corporate venture capital, co-creation platforms, and collaborative governance structures - are better positioned to accelerate learning across organizational lines (Nisar et al., 2016).

Enabling Learning through Policy and Collaboration Networks
Finally, Ossenbrink (2017) draws attention to how inter-organizational learning in the distributed energy resources (DERs) sector is shaped by policy frameworks and institutional collaboration. Barriers such as strict regulation and technological path dependencies can inhibit cross-firm knowledge transfer. Yet, the authors find that policy instruments which incentivize joint R&D, establish shared technological platforms, and promote collaborative innovation networks significantly enhance inter-organizational learning. Standardization and knowledge codification efforts also help bridge the gap between firms with differing competencies and risk perceptions. In this sense, policy does not only set the conditions for market operation but actively shapes the knowledge infrastructure within which firms learn from one another.

2.2.4. Synthesis

Synthesizing the reviewed literature on organizational learning, knowledge management, and inter-organizational learning specific to the energy sector reveals both meaningful advances and critical shortcomings in how firms approach learning in the context of systemic energy transitions. On one hand, energy organizations experiment with specific mechanisms like structured learning in demonstration projects (Bossink, 2020), internal benchmarking and readiness assessments (Sabidussi & Wasser, 2024), Smart KM Systems (Magyari et al., 2022), and leveraging intermediaries or policy support for cross-sector collaboration (Malhotra et al., 2019; Ossenbrink, 2017). These efforts aim to improve adaptability and innovation. On the other hand, the literature consistently highlights that the effectiveness of such initiatives is frequently undermined by deep-rooted challenges, including cultural resistance to knowledge sharing (Edwards, 2008; Gouveia et al., 2023), organizational inertia and path dependencies hindering change (Magyari et al., 2022; Sabidussi & Wasser, 2024), and often limited structural openness (Nisar et al., 2016), particularly within a fragmented sector facing complex, uncertain transition pathways.

Organizational learning initiatives remain mostly internalized, with firms relying on internal benchmarking, agile capabilities, and reflective project structures to guide strategic adaptation. However, as shown by Sabidussi and Wasser (2024) and Bossink (2020), such practices frequently fall short in contexts marked by complex stakeholder landscapes and technological uncertainty. Similarly, while KM practices have developed in certain domains - particularly among established firms in oil and gas - many firms continue to struggle with knowledge retention, cultural resistance, and an overreliance on technology without aligning managerial and cultural systems (Edwards, 2008; Gouveia et al., 2023). Even innovative approaches such as smart KM systems (SKMS) are constrained by strategic ambivalence and path dependencies that limit their ability to facilitate transformative change (Magyari et al., 2022).

Taken together, the reviewed literature suggests that current approaches are insufficient for addressing the scale and complexity of the ongoing energy transition. The challenges energy organizations face - long timeframes, distributed innovation, regulatory ambiguity, and the need for cross-sectoral knowledge

integration - cannot be tackled in isolation. No single organization holds all the relevant expertise, nor can it internalize the breadth of knowledge needed to navigate shifting technological, policy, and market conditions. This highlights the increasing relevance of inter-organizational learning as a strategic necessity rather than a supplementary practice.

Indeed, inter-organizational learning emerges as the most promising, yet still underutilized, pathway for system-level knowledge integration. Studies such as Malhotra et al. (2019) and Ossenbrink (2017) underscore the critical role of intermediaries and policy in bridging sectoral divides and enabling knowledge flows across firm and industry boundaries. It has the potential to not only facilitates technical exchange but also helps to align incentives, reduces informational asymmetries, and standardizes learning processes across diverse actors. These intermediaries may offer a scalable solution to one of the core tensions in the energy transition: how to connect fragmented organizational capabilities into a coherent, adaptive system of innovation and learning.

Consequently, exploring how these intermediaries operate, how they influence learning outcomes, and how they might be strategically embedded in energy transition governance presents the direction for further research.

2.3. Intermediary Roles in Inter-Organizational Learning

Inter-organizational learning increasingly relies on actors and structures that bridge organizational boundaries and enable the transfer, coordination, and application of knowledge. Across sectors and contexts, various forms of intermediaries, ranging from individuals to institutions, play an important role in shaping how learning unfolds between organizations. This section draws together theoretical and empirical insights on the different types of intermediary roles, their underlying mechanisms, and the structural and relational conditions under which they facilitate or hinder learning. By examining both formal and informal intermediaries, it highlights the diversity of ways through which inter-organizational learning can be enabled, sustained, or constrained.

2.3.1. Conceptualizing Intermediary Roles

Sohi and Matthews (2019) have outlined that future research within the realm of inter-organizational learning should further explore the roles of information intermediaries. These actors, often referred to interchangeably as information intermediaries, knowledge brokers, or boundary spanners, play a critical function in facilitating learning across organizational boundaries. While these terms are sometimes used synonymously, subtle distinctions exist. Knowledge brokers are typically positioned to manage and coordinate the flow of information and expertise across actors in a networked environment. For example, Apostolou et al. (2003) describe the broker as someone who initiates and maintains a learning network, responsible for identifying synergies, promoting cooperation, and facilitating network activities. This role includes acting as an architect, lead operator, and caretaker, ensuring participation quality and knowledge exchange continuity. Similarly, in a public sector context, an intermediary is defined as "an organization that acts between parties, but is not involved in the same primary processes as these parties" (Boekestijn, 2002, p. 6), and is capable of building trust, resolving disputes, and matching knowledge supply with demand. As the article further emphasizes, intermediaries play a crucial role in addressing trust and commitment issues between organizations. They also perform informational functions, such as connecting parties, distributing practical knowledge (know-how), and identifying where expertise is located (know-where) (Boekestijn, 2002). In contrast, boundary spanners operate at the interface of two organizations and are responsible for day-to-day relational management. As noted by Fagundes and Gasparetto (2023), literature defines boundary spanners "as organizational members who operate within organizational boundaries [...] and are subject to internal and external influences" and who "process information provided by the partner organization and represent their organization's interests in the relationship" (Fagundes & Gasparetto, 2023, p. 388). These individuals are essential for enabling knowledge transfer by developing interpersonal trust and navigating contextual dynamics that shape inter-organizational learning (Fagundes & Gasparetto, 2023). Taken together, these roles emphasize that effective learning across organizational boundaries depends not only on formal structures and systems but also on the presence of dedicated actors who actively facilitate, translate, and sustain knowledge exchanges.

2.3.2. Learning Through Structured Intermediation

Structured intermediation refers to deliberately organized mechanisms for facilitating learning across organizational boundaries, often involving formal roles and digital platforms. Apostolou et al. (2003) illustrate this in the Austrian automotive sector through the AC Styria cluster; a formally structured network comprising SMEs, large manufacturers, and research institutions. In this setting, the intermediary organization serves three codified roles: architect (designing the network and selecting participants), lead operator (coordinating knowledge flows), and caretaker (monitoring participation quality). The broker facilitates both tacit and explicit knowledge exchange through structured interventions such as seminars, training, and factory visits. A dedicated IT system, "Knowlaboration", supports personalized content access, knowledge retention, and asynchronous collaboration, helping institutionalize learning beyond individual participants.

A similar approach is observed in the Dutch public sector, where Boekestijn (2002) explores benchmarking initiatives between municipalities and public agencies. In this context, intermediaries such as consultants, branch organizations, and public knowledge institutes facilitate inter-organizational learning by brokering trust, translating knowledge, and guiding shared performance comparisons. For example, consultants often act as neutral facilitators who collect and interpret performance data, clarify performance indicators, and guide discussions about best practices; bridging gaps between competing organizations, ensuring that shared information is understandable, and translating raw benchmarking results into concrete improvement steps (Boekestijn, 2002). These actors offer structured templates, protocols, and facilitation techniques that help municipal organizations learn from one another despite bureaucratic and cultural barriers. Unlike the automotive case, intermediaries in this public sector setting are more dispersed but remain central in orchestrating the learning process.

2.3.3. The Individual as Boundary Spanner

On a more more detailed level across various organizational contexts, boundary spanners - individuals who operate at the interface between organizations - play a crucial role in enabling inter-organizational learning through informal, trust-based relationships. These actors include engineers, project managers, school principals, and sales representatives, who facilitate both tacit and explicit knowledge flows between firms, often beyond formal structures.

In Brazil, Borelli et al. (2021) explore small business cooperation networks across sectors such as education, retail pharmaceuticals, and furniture manufacturing. They show that learning emerges from both structured activities (e.g., training) and informal interactions like problem-solving discussions. Here, boundary spanners are important in balancing exploration and exploitation dynamics. The authors stress that interpersonal trust and low staff turnover among these actors are essential for sustaining learning, while opportunism and power asymmetries pose significant risks to knowledge exchange.

A literature review by Fagundes and Gasparetto (2023) further highlights that inter-organizational cooperation is deeply embedded in interpersonal relationships, particularly in B2B buyer–supplier settings. Boundary spanners, regardless of their hierarchical level, serve as mediators, relational facilitators, and conflict managers. Their effectiveness is contingent on their relational competencies and the trust they build with counterparts. Moreover, the study points to the need for more multi-level analyses to understand how interpersonal trust at the individual level translates into organizational performance.

Empirical work in India by Doshi and Pradyumana (2011) reinforces these insights in the context of alliances, joint ventures, and supply agreements. The authors identify boundary spanners as key agents in translating external knowledge into internal practices through both experiential and vicarious learning; where experiential learning involves gaining knowledge through direct, hands-on collaboration, while vicarious learning occurs by observing and emulating the practices of more experienced or successful partner firms. Their informal interactions help manage the transfer of tacit knowledge, which cannot be codified and is acquired only through close interpersonal collaboration.

Lastly, Janowicz-Panjaitan and Noorderhaven (2008) study Dutch biotechnology alliances to analyze how formal structures and informal social relationships jointly shape inter-organizational learning. They emphasize that boundary spanners are central to this dynamic exchange, serving as channels for learning across organizational boundaries, particularly in environments rich in complex, context-specific knowledge.

2.3.4. Trust, Power, and Motivation in Interorganizational Learning

Inter-organizational learning is often portrayed as a cooperative endeavor, but empirical evidence shows that it is deeply shaped by trust dynamics, power asymmetries, and the incentives of involved actors. In strategic alliances, Janowicz-Panjaitan and Noorderhaven (2009) argue that the learning of tacit knowledge is shaped by a dual logic of trust and calculation. Based on examples from technology-intensive sectors like biotechnology and semiconductors, the authors show that operating-level boundary spanners (e.g., engineers, team leads) rely on interpersonal trust to engage in close collaboration and knowledge exchange. In contrast, corporate-level boundary spanners (e.g., executives) are primarily guided by strategic cost-benefit calculations, aiming to protect their firm's core competencies. This duality implies that learning effectiveness depends on the alignment of motivations across hierarchical levels: while frontline workers depend on trust to share tacit knowledge, executives structure the conditions for learning through governance systems shaped by calculated risk assessments.

In the Dutch construction sector, Janowicz (2004) similarly shows how long-term relationships between clients (e.g., housing associations) and contractors rely heavily on mutual trust to sustain inter-organizational learning. Trust at both the interpersonal and organizational level promotes open dialogue, experimentation, and feedback processes, even within temporary project collaborations. These findings suggest that trust functions not merely as a supplement to formal control but as a precondition for effective learning under uncertainty.

Yet, intermediaries who facilitate learning are not always neutral actors. Sleptsov et al. (2013) analyze investment banks as information intermediaries in U.S. mergers and acquisitions. Their study highlights how the willingness of intermediaries to share relevant knowledge is influenced by their relational incentives. Repeated and non-exclusive relationships with acquirers enhance banks' ability and motivation to provide tailored, high-quality information. However, exclusive ties reduce competitive pressure and can erode intermediaries' effort and responsiveness. In this setting, investment banks, though positioned as brokers of complex knowledge, are driven by self-interest and strategic positioning rather than purely by a desire to support client learning. This underscores a broader point: effective inter-organizational learning depends not only on the presence of intermediaries but also on how their motivations and power are managed through relational configurations.

Taken together, these studies illustrate that trust and power are not opposing forces in inter-organizational learning. Instead, they operate at different levels and through different actors, from engineers and project leads to executives and external consultants. Learning is most effective when trust-based interactions at the operational level are supported - not undermined - by governance structures and incentive systems at the strategic level.

2.3.5. Knowledge Characteristics and the Role of Tacit Learning

Understanding how knowledge is transferred across organizational boundaries requires careful attention to the characteristics of knowledge, particularly its tacitness, and the mechanisms that enable its transfer. Tacit knowledge, which is deeply embedded in individual experience and difficult to articulate, presents a greater challenge for inter-organizational learning compared to explicit knowledge, which can be codified and shared more easily. Several studies illustrate how intermediaries such as boundary spanners, expatriate brokers, and embedded team members play a important role in facilitating tacit learning across organizational interfaces.

Salk and Simonin (2012) provide a meta-theoretical framework for understanding collaborative learning in various inter-organizational contexts, including international joint ventures, biotechnology, semiconductors, and geographically dispersed teams. Their research highlights the multi-level nature of learning - spanning individuals, groups, organizations, and inter-organizational systems - and emphasizes the importance of social processes such as trust, identity, and motivation. The authors point to expatriates and alliance team members as key boundary spanners and knowledge brokers. These individuals are not only instrumental in identifying and absorbing external knowledge but also in navigating complex social dynamics to enable its internalization and practical use. Particularly in multinational contexts, expatriate staff play an essential role in sensing, translating, and embedding tacit knowledge within their home organizations through direct interpersonal engagement and embedded task learning.

Similarly, Doshi and Pradyumana (2011) explore inter-organizational learning in the Indian business

context, analyzing a variety of alliances including joint ventures and supply chain agreements. They distinguish between experiential learning, which arises from direct collaboration, and vicarious learning, which stems from observing a partner's adaptive behavior. The study underscores the importance of boundary spanners such as engineers, managers, and technical specialists who operate at the interface of collaborating organizations. These intermediaries help translate tacit knowledge into actionable insights by facilitating interpersonal interaction, building trust, and aligning internal practices with external observations. Their informal yet strategic role is especially crucial in contexts where formal structures do not adequately support knowledge exchange.

Janowicz-Panjaitan and Noorderhaven (2009) add further nuance by analyzing how boundary spanners facilitate the transfer of tacit knowledge in international alliances, particularly within high-technology sectors like semiconductors and biotechnology. They argue that motivations for learning differ across hierarchical levels: while corporate-level actors are driven by strategic, calculative motives, operational-level actors, those embedded in daily joint activities, are influenced by trust and interpersonal engagement. These operating-level boundary spanners are essential for the effective transfer of tacit knowledge, which relies heavily on close collaboration, contextual understanding, and mutual identification. The authors show that trust and calculation function in parallel, shaped by the roles and contexts of boundary spanners.

Across these studies, a consistent pattern emerges: tacit knowledge cannot be easily transferred through documents or databases but requires personal, situated learning mechanisms. Whether through expatriates embedded in joint ventures, technical staff bridging organizational boundaries, or operational actors deeply involved in collaborative tasks, the successful transmission of tacit knowledge hinges on interpersonal trust, proximity, and mutual engagement. Intermediaries thus serve as the linchpins in transforming elusive, experience-based knowledge into collective organizational capability, especially in sectors characterized by complexity and innovation such as biotechnology, manufacturing, and semiconductors.

2.3.6. Interorganizational Learning and Performance Outcomes

Inter-organizational learning has been consistently associated with improved organizational outcomes, particularly when it is supported by intermediaries and embedded in trust-based collaborative structures. Drawing on empirical and conceptual contributions from Rajala (2018) and Borelli et al. (2021), this sub-section highlights the mechanisms by which intermediary-supported learning processes affects performance, and how sectoral and structural contexts shape these outcomes.

Rajala (2018) presents a meta-analytic study rooted in supply chain management, analyzing 21 independent quantitative studies involving 4,618 firms engaged in buyer–supplier relationships. In this industrial context, inter-organizational learning is conceptualized as a process of joint information sharing, sense-making, and knowledge integration between firms. The analysis identifies significant positive effects of inter-organizational learning on four dimensions of performance: relationship, operational, innovation, and market performance. Notably, the strongest effect is observed in relationship performance, suggesting that collaborative learning strengthens mutual understanding and trust. Rajala (2018) further highlights that relational mechanisms such as shared memory (linked to the "relationship learning" perspective) are more robust predictors of performance than broader constructs like absorptive capacity. These findings emphasize the importance of social structures and joint meaning-making in achieving learning outcomes, reinforcing the relevance of intermediaries or boundary-spanning roles in facilitating interaction across firm boundaries.

Complementing on this, Borelli et al. (2021) further highlight how sector-specific dynamics - ranging from educational services to pharmaceutical retail and furniture supply - shape the roles and practices of boundary spanners in small business networks. These individuals, often situated in operational roles such as engineers or managers, act as conduits for both tacit and explicit knowledge. Rather than simply relaying information, they help embed external insights into internal processes, enabling firms to adjust practices in response to shared network learning. The study underscores that effective learning outcomes are less about formal metrics and more about relational durability, cultural alignment, and the capacity to bridge gaps between heterogeneous organizational routines. Crucially, the presence of stable interpersonal relationships serves as a buffer against structural imbalances or opportunistic behaviors, which could otherwise fragment the learning environment and compromise network cohesion.

2.3.7. Implications for the Energy Sector

The accumulated insights from this review of intermediary roles in inter-organizational learning offer several implications for sectors characterized by complexity, fragmentation, and dynamic transformation; which is particularly evident in the energy sector. Energy transitions involve a multitude of actors across public, private, and civil society domains, all of whom operate with different interests, knowledge bases, and institutional logic. In such environments, the ability to coordinate, transfer, and integrate knowledge across organizational boundaries is not just advantageous, but essential for navigating technological, regulatory, and societal change.

One recurring insight across the reviewed studies is that inter-organizational learning does not emerge spontaneously, nor can it be sustained solely through formal governance. Instead, learning is facilitated through relational infrastructure; comprising trust-based interpersonal relationships, boundary-spanning roles, and structured mechanisms for collaboration. Whether through dedicated brokers in Austrian automotive clusters (Apostolou et al., 2003), consultants in Dutch municipal benchmarking initiatives (Boekestijn, 2002), or embedded actors in Brazilian small business networks (Borelli et al., 2021), intermediaries help translate, manage, and embed knowledge flows. These actors enable both tacit and explicit knowledge exchange, often by navigating asymmetries in power, interest, and capability.

Crucially, the energy sector's reliance on project-based work, shifting alliances, and emerging technologies means that no single organization holds all the expertise necessary to address the challenges ahead. As Sleptsov et al. (2013) demonstrate in the financial sector, intermediaries are not always neutral: their ability and willingness to contribute depend on relational configurations and incentives. This underscores the importance of designing not just institutional frameworks, but also intermediary architectures that foster transparency, accountability, and shared purpose. In this context, the notion of an information intermediary - one that connects actors, builds trust, and translates knowledge across domains - becomes not merely useful, but crucial for driving coordinated action and systemic learning in complex, multi-actor energy transitions.

2.4. Concluding Remarks on the Literature Review

The above review reveals that organizational learning, knowledge management, and inter-organizational learning, while distinct in their theoretical underpinnings, are deeply interrelated. Organizational learning focuses on how firms acquire, embed, and adapt knowledge internally, whereas knowledge management aims to systematize and leverage that knowledge. Extending beyond individual boundaries, inter-organizational learning highlights the collaborative processes necessary for firms to innovate and respond to environmental complexity.

Within the energy sector, these concepts converge around the challenge of dealing with multifaceted technologies, extensive regulatory requirements, and diverse stakeholder demands. Although many energy organizations have devised strategies for knowledge retention and operational adaptation, the persistent need to integrate specialized expertise from diverse actors underscores the importance of intermediary roles. In adjacent sectors, existing empirical work points to the significance of trust-based relationships, governance structures, and supportive policies for enabling effective knowledge flows across organizations.

To integrate these interconnected concepts, figure 2.1 presents a conceptual model of intermediated knowledge flows. This framework illustrates how an intermediary could facilitate learning across projects in two primary ways: by transferring person-specific expertise to new projects with similar technological, contractual, and contextual characteristics, and by transferring project-based insights that have been codified from previous engagements. Through these channels, the intermediary enables systematic knowledge flows from one project to the next, supporting a cumulative learning process across the sector. This process connects the structured capture of knowledge (knowledge management), its internal adoption within organisations (organisational learning), and its exchange across organisational boundaries (inter-organisational learning).

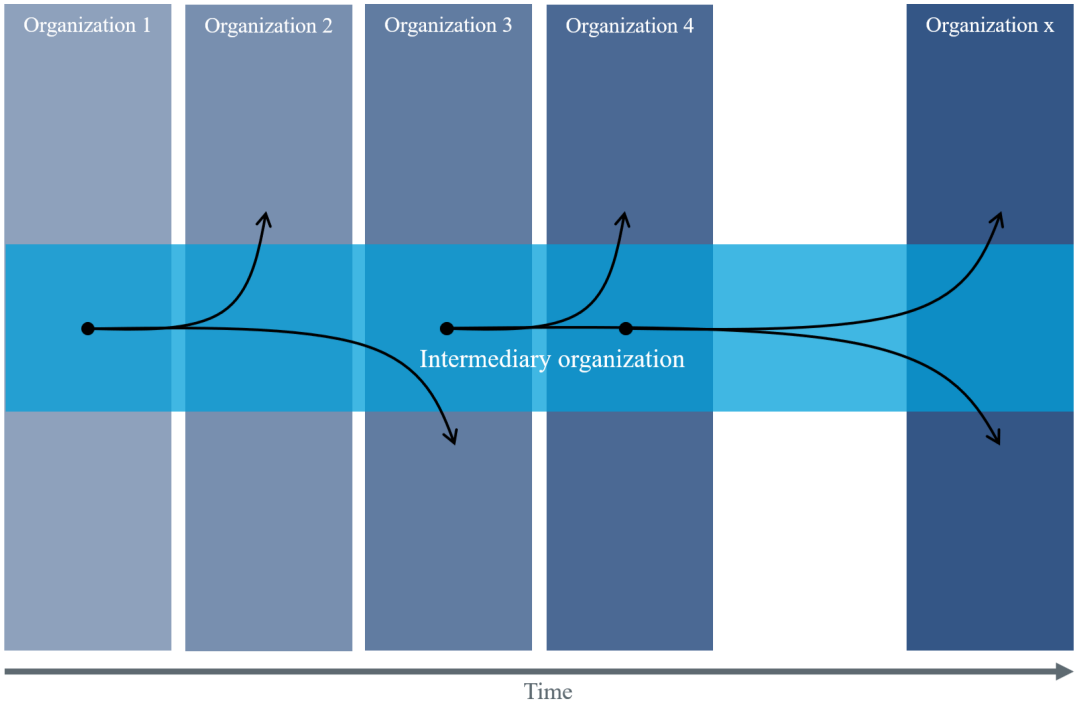

Figure 2.1: Conceptual framework of knowledge flows across organizations through an intermediary.

A noticeable gap in the literature lies in the specific function and impact of information intermediaries within the energy sector. Current studies acknowledge that intermediaries - variously described as brokers, boundary spanners, or bridging organizations - can mitigate coordination challenges, reduce information asymmetries, and enhance collective learning. Yet, research explicitly examining how these intermediaries operate within the energy transition landscape remains limited, and no studies have explored how to systematically embed intermediary practices in this context. Given the urgent demands of energy-system transformation, the role of an information intermediary emerges as a particularly promising direction for future research, offering potential to strengthen cross-sectoral collaboration and accelerate learning-based innovation.

3

Research Methodology

This chapter specifies the research design and rationale used to investigate how information intermediaries facilitate and enhance inter-organizational learning in the energy sector. It sets out the overall approach (qualitative, multiple-case study), the logic of case selection and sampling, the data-collection instrument by design (semi-structured interviews), the analytic strategy (thematic analysis with cross-case comparison), and the ethics and quality principles. Descriptive profiles of the organization and cases are provided in chapter 4; concrete data collection procedures and the analysis as executed are reported in chapter 5.

3.1. Research Approach

The study adopted a qualitative research approach to explore how inter-organizational learning is facilitated through the use of intermediaries in the energy sector. A multiple-case study design was selected because it allows in-depth inquiry of a phenomenon within its real-world context and supports theoretical replication through cross-case logic (Yin, 2009).

Two data sources underpin the design: (i) a review of academic and practice literature to ground the conceptual framing, and (ii) semi-structured interviews with practitioners engaged in energy-sector collaborations. The interviews were intended to surface the roles of intermediaries, enablers and barriers to inter-organizational learning, and mechanisms of knowledge transfer. By integrating theoretical perspectives with empirical findings, this study is designed to generate insights that can inform practical recommendations for strengthening collaborative learning in complex, multi-actor energy environments.

3.2. Methods Overview

To address the research question, the study combined a comprehensive literature review with semi-structured interviews. This pairing balances theoretical grounding with practice-based insight and is consistent with qualitative designs aimed at generating analytically generalizable explanations.

3.2.1. Literature Review Rationale

The literature review established the theoretical foundations for investigating inter-organizational learning in the energy sector. Its objectives were to: (1) synthesize frameworks on organizational and inter-organizational learning and knowledge management; (2) examine the role of intermediaries in cross-boundary knowledge transfer; and (3) contextualize sector-specific conditions (e.g., regulatory uncertainty, technological complexity, actor diversity) that shape learning dynamics. The synthesized insights informed the interview structure.

3.2.2. Case Selection Process and Criteria

A qualitative, multiple-case study design was adopted. Case selection followed a purposive and iterative process, guided by the theoretical framework, the overarching research question, and practical considerations of access. Cases were chosen where intermediary involvement was not only visible but

also likely to yield observable insights into learning processes unfolding within or across organizations. These cases - comprising recent or ongoing projects, programmes, or initiatives - provide the empirical context for the semi-structured interviews detailed in the following section.

The starting point for identifying potential cases was an internal mapping of Turner & Townsend's involvement in energy-sector projects, given the firm's positioning as an advisor across a broad portfolio of energy infrastructure programmes. In the early stages, this mapping was complemented by a series of exploratory conversations with colleagues across different teams and roles. These informal discussions had a dual purpose: to introduce the research focus internally, and to uncover promising candidate cases through practitioner insights and referrals. Colleagues were asked whether they were aware of projects, programmes, or initiatives in which inter-organizational collaboration, learning, or knowledge transfer played a notable role—particularly in relation to energy transition goals.

The resulting longlist of candidate cases was then screened against four criteria:

1. Presence of organizational actors with differing experience bases;
2. Relevance to energy-transition priorities (e.g., decarbonization, infrastructure innovation, renewable integration);
3. Visibility and materiality of intermediary involvement;
4. Feasibility of obtaining access to data and knowledgeable informants.

Through this filtering process, three cases were selected that collectively span a range of technology types and maturity levels, organizational configurations, and intermediary functions. Each case offers a distinct perspective for studying inter-organizational learning in practice, while also enabling cross-case comparison to identify recurring patterns and context-specific variations. Detailed organizational and case profiles appear in chapter 4; the realized sample and data collection parameters are reported in chapter 5.

3.2.3. Semi-Structured Interview Design

Semi-structured interviews were selected to balance systematic coverage of core constructs with the flexibility needed to probe emerging themes and capture nuanced perspectives (Carruthers, 1990). The guide was derived from the research question, the conceptual framework, and the literature. It was organized around the following constructs:

- Current practices and mechanisms for knowledge sharing and collaboration in the case context;
- The perceived role, value, and use of the intermediary in enabling cross-boundary learning;
- Barriers and enablers of effective inter-organizational knowledge exchange;
- Concrete instances of knowledge capture, transfer, and (re)use across temporal and organizational boundaries;
- Perceived effects of intermediary-facilitated learning on project delivery and energy-transition objectives.

The full guide is provided in appendix A; adaptations made during fieldwork are documented in chapter 5.

Sampling Strategy

A purposive sampling strategy was employed to obtain a dual perspective within each case: the intermediary organization and the client-side actors. This approach aligns with the guidance of Knott et al. (2022), emphasizing participant selection based on their capacity to provide rich, experience-based insights into these complex processes. Sampling was guided by two principles:

1. Coverage across the knowledge-lifecycle tiers: participants were sought at multiple organizational levels - directors, project managers/senior consultants, and consultants/analysts on the intermediary side, together with roles on the client side - to reflect how learning is initiated, operationalised, and embedded in practice.

2. Direct involvement in knowledge sharing or decision making: only individuals occupying roles with hands-on responsibility for, or first-hand exposure to, inter-organizational learning mechanisms were invited. This ensured experiential rather than peripheral accounts.

Concretely, the realised sample spanned three role clusters that together provide the perspectives needed to examine intermediary-facilitated learning, its enablers and challenges, and the capabilities transferred:

- Strategic roles such as senior project directors and account leads, who shape engagement scope and learning objectives.
- Operational specialists such as benchmarking analysts and project-controls managers, who design and run the routines through which knowledge is captured and reused.
- Client counterparts such as forum members and functional leads, who experience the intermediary's practices from the asset-owner side.

The target sample size was not fixed in advance; interviewing continued to theoretical saturation - defined as the point at which no substantively new themes emerged - assessed separately for intermediary and client groups within each case (Saunders et al., 2018).

3.3. Data Analysis Design

Interview data were analysed using reflexive thematic analysis, chosen for its suitability in identifying patterned meanings relevant to the research objectives and for accommodating both theory-informed and emergent insights (Braun & Clarke, 2006). The approach combined deductive coding (from the research question and literature) with inductive coding (from the data), allowing iterative refinement of themes.

3.3.1. Thematic Analysis Procedure

The analytic procedure followed a structured but flexible sequence:

1. Familiarization: review of transcripts and analytic memoing to surface initial insights;
2. Initial coding: development of a code system informed by the conceptual framing while remaining open to emergent categories; coding and organization supported by Atlas.ti;
3. Theme development and review: clustering codes into candidate themes, iterative checking for coherence and distinctiveness against data excerpts and the research question;
4. Interpretation and linkage to theory: elaboration of theme relationships and integration with intermediary and organizational learning literatures.

Software support (Atlas.ti) was used for code management and auditability; actual coding outputs and the final category structure are reported in chapter 5.

3.3.2. Cross-Case Analysis

Following within-case analysis, a cross-case comparison was planned to seek theoretical replication and to distinguish convergent mechanisms from context-contingent patterns (Eisenhardt, 1989; Miles et al., 2014; Yin, 2009). Descriptive case positioning is presented in chapter 4; inferential cross-case findings follow from the thematic results (see chapter 5 and subsequent chapters).

3.4. Research Ethics and Quality

Given the involvement of human participants, the study adhered to standard ethical principles: informed consent, the right to withdraw, confidentiality via anonymization of personal identifiers, and secure data storage. Credibility and trustworthiness were supported through (i) dual-perspective sampling across actor roles, and (ii) an auditable coding workflow. The concrete operationalization of consent, anonymization, and transcription choices is documented in chapter 5.

3.4.1. Researcher Positionality (Planned Mitigations)

The research was conducted while embedded within the host organization, which facilitated access but introduced potential for confirmatory bias and role duality. Mitigations built into the design included the use of a standardized interview protocol, explicit separation of research and operational interactions, reflexive memoing throughout data collection and analysis, peer debriefs on emerging interpretations, and maintaining an audit trail. Reflexivity in practice and its effects on analysis are discussed in chapter 5.

4

Case Study

This chapter provides an in-depth overview of Turner & Townsend, the organization at the centre of this study, with a specific focus on its Energy & Natural Resources (ENR) practice. The operational aspect of the firm will be highlighted, including the services offered to clients in the energy sector. Finally, the specific context of the selected cases will be described in detail to clarify their relevance to the research objectives.

4.1. Organizational Context

Turner & Townsend is a global consultancy specializing in programme and project management, offering services across real estate, infrastructure, and energy & natural resources. With over 22,000 specialists in more than 60 countries, Turner & Townsend combines local expertise with global insights to manage complex projects (Turner & Townsend, 2025c). Within the energy sector, Turner & Townsend supports clients across various domains, including renewable energy (such as wind, solar, hydropower), nuclear, oil and gas, and decarbonization initiatives (Turner & Townsend, 2025b).

As mentioned, this research focuses on Turner & Townsend's ENR practice, which operates in parallel across multiple countries worldwide. The ENR practice offers a range of services to clients, including Project Controls & Performance, Cost & Commercial Management, Procurement & Supply Chain, and Programme Advisory. However, the scope of services offered by each national office varies based on market demand and the maturity of the local operation. While some offices provide the full range of services, others concentrate on specific areas.

4.2. Case Context

This section provides detailed contextual information for each of the three selected cases: the Performance Forum initiative, the Celtic Interconnector programme, and the Net Zero Teesside Power project. Building upon the methodology outlined in the previous chapter, each project's scope, objectives, stakeholder composition, and specific relevance to inter-organizational learning within the energy transition will be described. These descriptions clarify the rationale for case selection and demonstrate how each project supports the exploration of intermediary roles in energy-sector collaborations.

4.2.1. Performance Forum

Scope and Objectives

The original Performance Forum, launched in 1994 as a Joint Industry Partnership (JIP), was established to support collaboration and benchmarking among companies in the offshore upstream energy sector, based on the recognition that improved project outcomes could be achieved through shared learning and access to reliable performance data. Over three decades, the Offshore Performance Forum has built a database of actual cost, schedule, and technical data from around 1,000 offshore capital projects, enabling its members to benchmark performance against real industry outcomes (Performance Forum, 2025). The initiative has helped member organizations set more realistic project targets, iden-

tify lessons learned, and ultimately improve delivery performance - hence the name. Building on this long-standing foundation, the Onshore Performance Forum is a recently established JIP designed to apply similar principles to onshore energy infrastructure, where comparable benchmarking and peer learning practices are less mature.

As the energy sector undergoes a significant transformation towards low-carbon and renewable solutions, it became clear that an equivalent platform for onshore energy projects was missing. In response, the Onshore Performance Forum was launched as a separate, parallel initiative, applying the same proven methodology to onshore energy and processing facilities. While the offshore forum continues to serve its traditional focus areas, the onshore forum is specifically designed to address the performance benchmarking needs of both conventional onshore infrastructure (such as LNG plants, terminals, and gas processing facilities) and emerging new energy developments, including hydrogen, carbon capture and storage (CCS), and sustainable fuels.

The short-term objective of the Onshore Performance Forum is to collect and analyse performance data from executed or planned onshore projects, utilising project actuals wherever possible and particularly for conventional energy projects, and high-quality estimates for project types where actuals are not available particularly new energies projects. These insights are used to inform benchmarking for all onshore energy projects but should be particularly useful for new energies projects where there is less familiarity, leveraging similarities in plant characteristics across conventional and novel technologies. In the longer term, the forum aims to expand its scope to comprehensively cover all onshore facility types.

Through a structured approach to data collection, anonymized peer comparison, and collaborative learning, the Performance Forum equips members with an evidence base to support early-stage screening, stage-gate assurance, and project close-out reviews. This in turn promotes more informed decision-making by offering insights based on real-world performance.

Stakeholder Landscape
The Performance Forum operates as a Joint Industry Partnership managed and operated by Turner & Townsend who serve as the independent third-party manager, responsible for collecting, maintaining, and analysing confidential project performance data submitted by members. This independent role is crucial for ensuring data confidentiality and adherence to competition regulations. Membership is open to companies actively involved in the development of onshore energy and processing facilities. While the Offshore Performance Forum currently consists of 25 members, the Onshore Performance Forum includes participation from ten companies since its recent launch. Willingness to collaborate is an essential pre-requisite of membership of Performance Forum. Members are required to submit project cost, schedule, and technical data, including estimates for new energy projects where actuals are not yet available. The forum is member-led, with the scope and priorities guided by the membership through a Members' Committee. Performance Forum is one of the largest industry collaboration initiatives of its type and the energy sector is unusually mature in its openness to the sharing of cost and schedule performance information for overall industry benefit.

Relevance to Inter-organizational Learning in the Energy Transition
The Performance Forum serves as a significant platform for inter-organizational learning, particularly within the evolving landscape of the energy transition. Building upon the 30-year foundation of the Offshore Performance Forum, the onshore initiative adapts a proven collaborative benchmarking approach to new contexts. It addresses a critical gap in benchmarking for onshore energy projects, especially those related to new energies like hydrogen and CCS, where sufficient completed project data is scarce. The forum explicitly aims to inform the benchmarking of new energy projects by leveraging data from conventional onshore facilities, recognizing that many plant characteristics are similar across different energy types.

Based on the information on the website of the Performance Forum (2025), inter-organizational learning within the Performance Forum is realized through several mechanisms. Firstly, data sharing and benchmarking represent a core component. Members contribute actual project cost and schedule performance data, which is subsequently anonymized and aggregated by Turner & Townsend to generate comparative metrics. This process enables participant companies to rigorously assess the competitiveness of their project costs or schedules against peer performance, assure the accuracy of their estimates, and systematically identify lessons learned from completed projects.

Secondly, the forum actively promotes improvement through diverse collaborative activities. These include workshops, focused study groups, webinars, and detailed case studies, all designed to facilitate the structured sharing of experience and collective insights among members. This direct interaction fosters a deeper understanding of best practices and common challenges.

Thirdly, a crucial aspect of the forum's contribution to learning involves knowledge transfer across sectors, especially given that real outturn data is often limited for new energy projects. By extending proven benchmarking principles from conventional oil & gas projects to the emerging new energy developments, the forum facilitates the transfer of insights and practical approaches. This cross-sectoral application is particularly relevant as the energy industry undergoes significant transition, which necessitates cost guidance and accelerated learning curves for new technologies such as hydrogen and carbon capture.

4.2.2. Celtic Interconnector

Scope and Objectives

The Celtic Interconnector is a planned subsea high-voltage direct current (HVDC) link designed to facilitate the exchange of electricity between Ireland and France. This critical infrastructure project aims to enhance energy security, promote the integration of renewable energy by enabling the export of excess energy, and ultimately reduce electricity costs for consumers across Ireland, France, and the wider European Union. Once operational, the interconnector is designed to transmit 700 megawatts of electricity, sufficient to supply approximately 450,000 homes (Turner & Townsend, 2025a). This initiative is a key component in progressing towards a fully integrated European energy market, aligning with the EU's climate objectives for affordable, secure, and sustainable energy. The project commenced in 2020, achieved final investment approval in late 2022, and is projected to be energised in 2027, with major construction activities concluding by the end of 2025. Turner & Townsend has been engaged since 2020 to provide comprehensive programme and project management, as well as procurement capabilities, including commercial management and tender evaluation (Turner & Townsend, 2025a).

Stakeholder Landscape

The primary client and key stakeholders in the Celtic Interconnector programme are EirGrid, Ireland's Transmission System Operator (TSO), and Réseau de Transport d'Electricité (RTE), its French counterpart. EirGrid, a state-owned body, plays a central role in both operating the Irish transmission system onshore and is expanding its scope to include ownership, operation, and development of offshore transmission assets, a new area of expertise for the organization. Turner & Townsend serves as a critical intermediary, leading the overall programme for the Celtic Interconnector with their personnel forming the core management team and directing key development phases. Beyond the immediate project partners, the Irish State and the European Union are significant overarching stakeholders, providing support and substantial grants for the project, recognizing it as a Project of Common Interest. This public sector-led approach, with its distinct motivations compared to private organizations (e.g., focus on public opinion and carbon footprint over profit margins), shapes the dynamics of knowledge exchange and collaboration within the project.

Relevance to Inter-organizational Learning in the Energy Transition

The Celtic Interconnector programme presents a promising opportunity to study inter-organizational learning in the context of the energy transition. Early indications suggest that Turner & Townsend, being the intermediary firm for this engagement, has played a significant role in facilitating knowledge exchange and capability development between actors with differing experience bases.

As previously mentioned, EirGrid, as the national transmission system operator with historically onshore-focused expertise, is engaging with new technical, organizational, and regulatory challenges in delivering a complex offshore interconnector. Initial reflections from stakeholder discussions imply that Turner & Townsend's involvement goes beyond conventional consultancy. Their contributions may include strategic guidance, embedded support, and informal knowledge-sharing practices that help address capability gaps and accelerate learning within EirGrid's project teams.

While the full scope and effectiveness of these mechanisms remain to be explored, the case offers a valuable context for examining how intermediaries can enable capacity-building across organizational boundaries in response to the evolving demands of the energy transition.

4.2.3. Net Zero Teesside

Scope and Objectives

Net Zero Teesside Power is a pioneering project in the UK, designed to be the world's first commercial-scale gas-fired power station equipped with carbon capture technology. This initiative aims to produce up to 860 megawatts of low-carbon electricity, capable of powering approximately 1.3 million homes annually, contributing significantly to the UK's net-zero greenhouse gas emissions target by 2050. The project is strategically positioned as a hub within a decarbonized industrial cluster on Teesside, leveraging shared carbon dioxide (CO2) transportation and storage infrastructure developed by the Northern Endurance Partnership (NEP). Beyond its primary electricity generation, Net Zero Teesside is intended to complement renewable energy sources by providing flexible, dispatchable low-carbon power generation, thereby backing up intermittent renewables. The project will utilize Carbon Capture Utilisation and Storage (CCUS) technology to capture and store up to two million tonnes of CO2 per year in a North Sea saline aquifer. Turner& Townsend's involvement commenced in 2021, supporting the development of the project's procurement and contract strategy, identifying the UK supply chain for carbon capture technology, and developing Front End Engineering Design (FEED) tender documentation for the power station and associated CO2 compression and export facilities. The project aims to generate substantial economic benefits, including nearly £3.5 billion in Gross Value Added over its lifecycle and supporting thousands of jobs during both construction and operation.

Stakeholder Landscape

The Net Zero Teesside project features a complex stakeholder landscape, with BP leading the development of the power and carbon capture project. As the primary client, BP has guided the procurement and project delivery strategy. A crucial component of this landscape is the Northern Endurance Partnership (NEP), a collaboration between BP, National Grid, Equinor, Shell, and Total, which is responsible for developing and operating the shared CO2 transportation and storage infrastructure. This partnership will serve multiple industrial decarbonization projects in the East Coast Cluster, of which Net Zero Teesside is a central element. Turner & Townsend plays a key role as a strategic partner to BP, specifically supporting the development of the project's procurement and contracting strategy. The project also involves two successfully appointed engineering contractors, a result of a dual competition approach. Given the nature of UK energy transition projects, there is notable government involvement, often implying a competitive environment among projects for public funding and support.

Relevance to Inter-organizational Learning in the Energy Transition

The Net Zero Teesside Power project provides a useful context for examining inter-organizational learning within the energy transition, especially the intermediary role played by Turner & Townsend. Preliminary insights suggest that even experienced actors like BP may face context-specific learning challenges - such as adapting to UK-specific construction practices, unfamiliar contracting mechanisms, and the demands of delivering a first-of-a-kind carbon capture power station.

Turner & Townsend's involvement may reflect an effort to help navigate these challenges, drawing on their wider experience across (UK) infrastructure and industrial projects. Their advisory role could include areas like supply chain engagement, contract structuring, and project management support—functions that potentially enable smoother knowledge transfer in a highly regulated and competitive environment.

Given the novelty of the project and the constraints on direct inter-organizational knowledge sharing in such a market, the case may highlight on how intermediaries facilitate learning that would otherwise be difficult to access. As such, it provides a useful perspective through which to examine the informal and structural ways in which capability-building occurs between organizations engaged in the delivery of first-of-a-kind low-carbon infrastructure.

4.2.4. Cross-Case Reflections

Figure 4.1 and table 4.1 jointly summarise how the three cases - Performance Forum, Celtic Interconnector, and Net Zero Teesside - occupy different positions along six analytical dimensions, yet all rely on the intermediary role of Turner & Townsend to enable inter-organizational learning. The scores presented are indicative and subject to interpretation; they are not grounded in additional quantitative evidence but are instead derived from qualitative patterns observed in the case analysis.

Performance Forum scores highest on dependency on the intermediary and maintains strong organizational maturity, reflecting a highly structured, data-driven platform where Turner & Townsend facilitates benchmarking and peer exchange across multiple operators. Celtic Interconnector, by contrast, faces significant stakeholder and regulatory complexity - involving two national grids, EU oversight, and marine consents - which elevates coordination risks and helps explain its top score for novelty of delivery approach. Net Zero Teesside likewise ranks highest on stakeholder and regulatory complexity, due not only to the involvement of multiple regulators but also to its joint venture delivery structure and the presence of a dense project cluster within the Teesside industrial region. It also stands out for both technological novelty and contribution to the energy transition, combining first-of-a-kind CCUS and hydrogen systems with cluster-wide decarbonisation ambitions.

Taken together, the radar charts visualise a spectrum from institutionalised, cross-sector learning (Performance Forum) to highly project-specific, technology-led novelty (Net Zero Teesside), with Celtic Interconnector occupying a middle ground where governance innovation outweighs technical newness. Across all three settings, Turner & Townsend's intermediary role moves beyond the provision of technical or commercial expertise; it embeds structural learning mechanisms - ranging from benchmark data management to real-time programme coordination - tailored to each project's maturity and complexity profile.

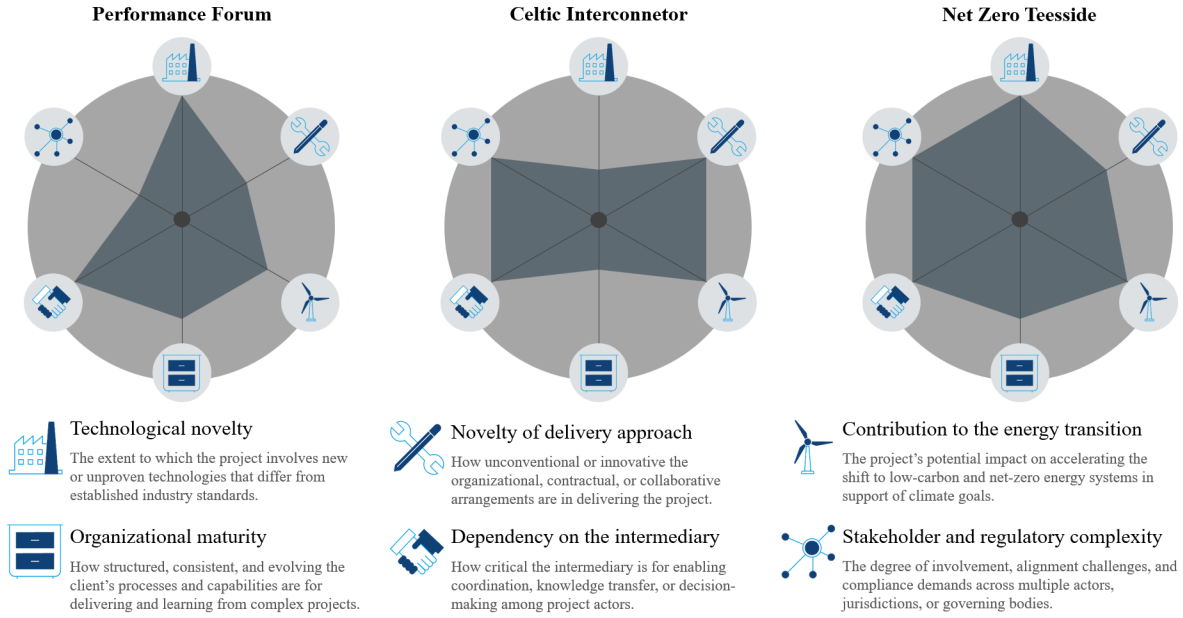

Figure 4.1: Comparative radar charts visualizing six dimensions across three case studies.

Variable	Performance Forum	Celtic Interconnector	Net Zero Teesside
Technological novelty	5 – Data-driven benchmarking platform in the new energy domain.	2 – HVDC cable and converter technology are mature and well-proven.	5 – First-of-a-kind CCUS with multiple new process units.
Novelty of delivery approach	3 – Well-established peer-learning forum, but with limited exposure to new energy technologies.	5 – EirGrid lacks delivery experience with this type of complex infrastructure.	4 – BP's limited of UK onshore construction experience and limited familiarity with the local supply chain.
Contribution to the energy transition	4 – Improves delivery efficiency through cross-industry learning, with indirect impact on decarbonization.	5 – Enables large-scale renewable balancing between two grids.	5 – Captures and stores CO_2 from an entire industrial region.
Organizational maturity	4 – Member companies have formal PMOs and robust lessons-learned cycles.	2 – Limited prior megaproject experience within a single project team.	4 – Consortium includes several mature majors, with new cluster governance.
Dependency on the intermediary	5 – Forum would not operate without Turner & Townsend's facilitation and analysis.	5 – Turner & Townsend contributes extensive programme management expertise and augments the client's PMO capacity through embedded resources.	5 – Turner & Townsend brings in critical UK construction, contracting, and supply chain expertise.
Stakeholder & regulatory complexity	2 – Established joint industry partnership.	5 – Two national grids, EU regulators, and marine consents create high complexity.	5 – Complex mix of joint venture partners and local, national, and sector authorities.

Table 4.1: Case comparison based on six evaluation criteria (scores 1–5).

5

Data Collection and Analysis

Following the design specified in chapter 3 and the case profiles in chapter 4, this chapter reports how data were collected and analysed. It documents the data collection procedures (participants, protocol, logistics, transcription), the analysis as executed (coding outputs and cross-case comparison), and brief notes on methodological integrity.

5.1. Data Collection

5.1.1. Data Collection Procedures

Primary data comprised semi-structured interviews with professionals involved in the three cases described in chapter 4: the Performance Forum, the Celtic Interconnector Programme, and the Net Zero Teesside Power Project. In total, 15 participants were interviewed across Turner & Townsend and client organizations.

To aid transparency, table 5.1 summarizes the realized sample. Counts by role are provided to reflect the dual-perspective design in section 3.2.3.

Table 5.1: Interview sample overview by case.

Case	**# interviews**	**Turner & Townsend / Client**	**Typical roles represented**
Performance Forum	5	3 / 2	Forum coordinator, benchmarking lead; operator benchmarking sponsor
Celtic Interconnector	5	4 / 1	Project director, construction manager; TSO senior manager
Net Zero Teesside	5	5 / 0	Account lead, commercial controls manager, project controls manager
Total	15	12 / 3	–

As shown in the table above, the number of client interviewees was substantially lower than that of Turner & Townsend participants. Consequently, the client voice is less extensively represented in the dataset, though still present across two of the three cases.

The interview guide (see appendix A) operationalized the constructs defined in section 3.2.3. As data collection progressed, minor adaptations were made to probe emerging issues introduced by earlier participants: the potential gap between client needs and intermediary contributions, and the hypothetical impact of the intermediary's absence from the engagement process.

5.1.2. Engagement and Context

Interviews were conducted in June 2025, online via Microsoft Teams. Sessions lasted 40–60 minutes (mean ≈ 45 minutes). The researcher acted as the sole interviewer and used a semi-structured approach to support follow-up probing and clarification.

All participants provided informed consent; confidentiality and secure storage followed the procedures in section 3.4. Recordings were made with permission for transcription and analysis.

5.1.3. Recording and Transcription

Audio recordings were transcribed using Microsoft Teams' automated function and then reviewed and edited by the researcher. A non-verbatim approach was applied to enhance readability while preserving intended meaning; filler words, repetitions, and minor hesitations were removed without altering substantive content. Personal identifiers were anonymized. Organization names (e.g., Turner & Townsend, client organizations, and relevant locations) were retained where analytically necessary.

5.1.4. Reflexivity in Practice

This study was conducted while the researcher was embedded at Turner & Townsend as a thesis intern. That position created unusual access to people, documents and tacit practices, but it also introduced filters that can shape what was seen, asked and recorded. This note complements the procedural mitigations in section 3.4.1 by making those filters explicit so readers can judge transferability.

First, the three cases were framed as instructive examples rather than failures. This was partly a result of the early stages of the research, when the researcher held exploratory conversations with colleagues across different Turner & Townsend teams. These informal meetings served to introduce the study internally and to identify promising candidate cases through referrals and practitioner insights. As a result, the cases selected reflected projects where inter-organizational collaboration, learning, or knowledge transfer was visible rather than situations that would typically be viewed as poor practice. Consequently, the material under-represents conflict dynamics that might surface in less successful programmes. Second, the evidence comes mainly from the UK and Ireland under NEC-style governance. Findings that rely on these contracting and regulatory norms may travel poorly to other regimes. Third, the interview set is skewed toward the intermediary (12 Turner & Townsend staff and three client counterparts), so the client perspectives are present but thinner, and possible critiques were not accessed. Finally, most interviews occurred during active or recently completed work, which raises the chance of optimism and recall effects and tilts the data toward set-up and mobilisation rather than long-run operations after handover.

These conditions make positive narratives more available than critical ones, emphasise the intermediary's own framing around capability, governance and benchmarking, and may overstate the extent to which the findings apply beyond the UK and Irish context.

5.2. Data Analysis

5.2.1. Analytic Procedure

The thematic analysis design described in sections 3.3 and 3.3.1 was implemented. Coding combined deductive categories derived from the conceptual framing with inductive codes emerging from the transcripts. Coding and code management were conducted in Atlas.ti; an auditable trail (codebook versions, query outputs) was maintained.

The coding aggregated into seven analytical categories aligned with the sub-research questions:

1. Engagement Drivers - reasons for engaging an intermediary and expected value;
2. Facilitating Mechanisms - practices, artefacts, and routines enabling knowledge flow;
3. Internal Knowledge Management - capture, (re)use, and circulation inside the intermediary;
4. Challenges - barriers to cross-boundary learning and collaboration;
5. Enablers - conditions supporting effective learning (e.g., trust, governance, incentives);
6. Gap in Expectations - misalignments between client needs and intermediary contributions;

7. Learning Impact - perceived effects on delivery performance and transition objectives.

Within each category, interpretive themes were iteratively refined and checked against contrasting excerpts to capture both convergences and divergences across participants.

5.2.2. Single-Coder Approach and Checks

Given the dataset size and the researcher's immersion, a single-coder approach was adopted. To enhance trustworthiness, peer discussions were held to surface alternative readings, and periodic code–data checks were conducted to prevent code inconsistencies. When differing interpretations emerged, the underlying excerpts were revisited.

5.2.3. Cross-Case Comparison

Following within-case analysis, a cross-case comparison was conducted consistent with section 3.3.2. The seven categories were contrasted across the three cases, using the descriptive positioning in chapter 4 (radar charts and table) as contextual reference points rather than as interpretive results. The comparison identified: (i) mechanisms that converged across cases, (ii) context-contingent patterns explained by differences in stakeholder/regulatory complexity or organizational maturity, and (iii) propositions suitable for theoretical replication.

5.3. Methodological Integrity

Methodological integrity was supported by: (i) consistent data collection procedures and a documented interview log; (ii) an auditable Atlas.ti project (codebooks); (iii) single-coder reflexivity with peer debriefs; and (iv) dual-perspective sampling realized across intermediary and client roles (see table 5.1). Despite a modest sample and a comparatively smaller number of client interviewees, recurring patterns across cases and roles indicated sufficient coverage for the study's exploratory aims.

6

Findings

This chapter presents the empirical findings of the study, derived from qualitative analysis of interview data collected across three case studies. The findings are organised to mirror the three research questions that frame the study (see figure 6.1 below). Sections 6.1 and 6.2 address Research Question 3 by first identifying the Engagement Drivers that prompt clients to involve Turner & Townsend and then detailing the Facilitating Mechanisms through which the intermediary creates value. Sections 6.3 and 6.4 respond to Research Question 4, outlining the principal Challenges in the Energy Transition and the Key Enablers that help overcome them. Research Question 5 is treated in section 6.5, which analyses the longer-term Learning Impact of these engagements. Finally, section 6.6 presents a cross-case synthesis that integrates the preceding themes into a consolidated view of how Turner & Townsend supports inter-organizational learning across diverse energy-transition contexts. Each section presents the findings in a logical sequence, from initial client engagement to lasting impact, supported by detailed evidence from the case studies.

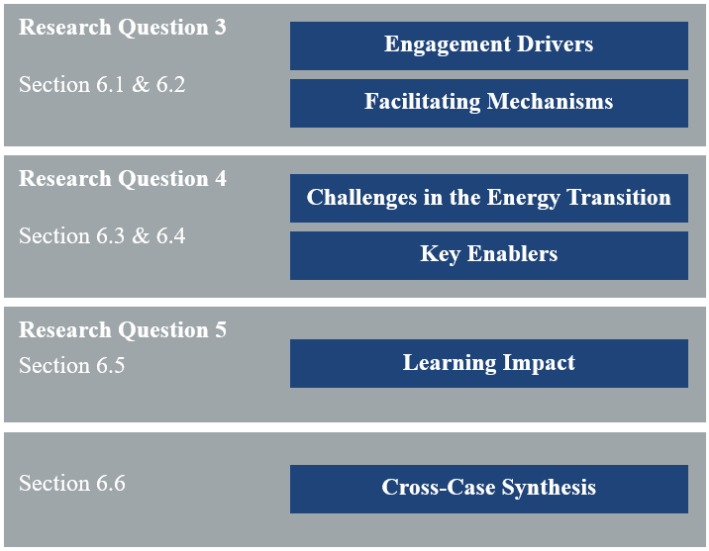

Figure 6.1: Overview of the Findings chapter structure, showing the alignment of Research Questions with thematic sections.

6.1. Engagement Drivers

Engagement drivers explain the reasons why client organizations decide to work with Turner & Townsend in the first place. As a result of the analysis, three main themes were identified: Resourcing Gaps, Insight & Growth, and Relationship Capital, as shown in the figure 6.2 below. This section will focus on

the first two themes. Although Relationship Capital was found to influence client decisions in selecting intermediaries for high-stakes energy transition projects, it primarily relates to established networks and a strong reputation built through past performance, brand recognition, and strategic account management. While this is an important driver, it is not the primary content-related reason why client organizations decide to work with Turner & Townsend.

Figure 6.2: Structure of Engagement Drivers themes and sub-themes.

6.1.1. Theme 1: Resourcing Gaps

Resourcing Gaps examines why client organizations in large-scale energy-transition projects brought Turner & Townsend into their teams. Across cases, the driver was less about head-count relief than about obtaining specialised knowledge and a workforce model that could expand or dissolve with project risk and scope.

Net Zero Teesside illustrated the first dimension—capability augmentation—most explicitly. One interviewee stressed, "I'd say it's 100% about capability—not capacity. … They already have existing agencies they can use to get commercial resources." (NZT-I2) Carbon-capture technology, a collaborative cost-reimbursable contract, and an immature onshore supply chain lay outside the client's organizational memory. Turner & Townsend therefore entered as a boundary spanner who translated offshore lump-sum norms into onshore alliance practice, supplied current U.K. market intelligence, and mentored the client's commercial staff. At the same time, the engagement remained deliberately elastic. As another interviewee explained:

> "We help clients in three ways… 'we'll help you build capability'… we'll help them build their own team, and then we'll step back. We've got the 'capability partner' where… we will be in-seat to deliver… that might scale off as the company builds their own capability gradually. And then we've got the BP model, which is just a burst of capability that is outsourced to us and we provide it." (NZT-I4)

This spectrum - from temporary embedded advisers to a fully integrated commercial - controls team—allowed the level of external involvement to contract once internal systems matured, converting knowledge asymmetry into a platform for future self-sufficiency.

A complementary pattern emerged on the Celtic Interconnector. Faced with a €1.5 billion contract and recent staff attrition, EirGrid lacked the senior programme experience needed to negotiate, govern, and deliver a first-of-kind interconnector. "We didn't have enough experience and we needed to mobilise effectively external support… I worked with Turner & Townsend… to build up quite a strong team… that's been in place and effectively delivering the Celtic Interconnector." (CI-I5) Here, augmentation served a dual purpose: experienced external leads accelerated near-term execution while mentoring internal personnel, embedding governance processes for future offshore wind projects. Flexibility was equally critical. A senior manager observed that projects of this scale occur "once every 10 years," so "why would you build an internal framework … for complex contract dispute resolutions? You wouldn't" (CI-I1). Turner & Townsend therefore supplied a turnkey team that could be scaled up during construction and demobilised at handover, sparing EirGrid the cost of permanent staffing yet leaving behind transferable know-how.

Taken together, Resourcing Gaps manifested along two intersecting axes: (1) knowledge depth, where external specialists filled capability voids faster than internal hiring could achieve, and (2) commitment length, where flexible engagement terms let clients calibrate support to evolving risk profiles. By treating intermediaries as adjustable levers rather than static suppliers, both projects converted latent

vulnerabilities into structured collaboration and positioned themselves to reduce external dependence over time.

6.1.2. Theme 2: Insight & Growth

Insight & Growth captures the dual value that Turner & Townsend offered across the three cases: independent insight that projects represented credible value and structured growth opportunities for clients to extend their own capabilities.

Insight emerged primarily through cost and risk assurance as Performance Forum members face investment gate reviews which demanded proof of competitiveness. Member organizations therefore made use of Turner & Townsend's Performance Forum with a thirty-year benchmark history:

> "It is spending billions of dollars. And in order to satisfy your investors, you must show them that you've looked at all the possible ways… of saving money, you've measured yourselves against competition just to give them a level of comfort. … So that's where Performance Forum comes in." (PF-I1)

This enabled investors and auditors to quantitatively assess their estimates against industry peers. The credibility of this assurance stems from the utilisation of industry-wide benchmarks rather than internal datasets, reinforcing the interpretation that benchmarking served as a form of financial due diligence.

Growth represented the second dimension: intermediaries do not only provide insight and assure value but actively broadened it by stimulating learning and innovation. At Net Zero Teesside, Turner & Townsend positioned their early involvement as an opportunity to critically assess BP's established project approaches. By highlighting the "very different risk profile" associated with delivering a first-of-a-kind carbon-capture facility for BP, Turner & Townsend created scope for considering alternative and better fitting contracting and delivery strategies.

> "One of the most important things is we are able to have those conversations early enough to get the client to understand that what they're proposing to execute with this project is not their business as usual. … It's a very different risk profile, and that they would do well to get some help here." (NZT-I2)

This proactive engagement enabled the client to transition from reaffirming existing practices towards identifying and addressing new learning requirements.

Where Net Zero Teesside benefited from project-specific reflection, the Performance Forum provided a more formalised learning platform for collective learning. Member organizations contributed cost and schedule data and commissioned research on emerging topics such as hydrogen and LNG. Interviewees emphasised that the value of the forum extended beyond the provision of raw benchmarking data to the collective interpretation sessions, during which operators shared experiences, critically examined established practices, and jointly developed guidance to support funding applications. In contrast to the one-off advisory role observed at Net Zero Teesside, the Performance Forum institutionalised learning within a continuously evolving shared knowledge base, demonstrating the catalytic potential of a structured, multi-organization platform for industry-wide learning.

> "It has made me reflect on the importance of an intermediary… in connecting organizations and identifying opportunities for shared learning. … Our primary purpose is to make sure the partners learn and share their data and information; that is not the primary purpose of the member organization. So I think that intermediary role is essential." (PF-I2)

This reflection highlights a critical contrast: while individual firms are incentivised to protect proprietary insights, an independent intermediary can facilitate openness without commercial bias. Across both Net Zero Teesside and Performance Forum, Turner & Townsend leveraged neutrality to coordinate dialogue that competitors or joint-venture partners would have struggled to initiate themselves. Where BP used the catalyst to stress-test a single project, Performance Forum members exploited it to shape future energy portfolios, demonstrating scalability from project-specific to industry-wide learning.

6.2. Facilitating Mechanisms

Facilitating mechanisms analyse how Turner & Townsend enabled inter-organizational learning across the three case studies. The coding produced four main themes, as seen in figure 6.3 below: People & Capacity, Knowledge & Insight, Structure & Control, and Relationship & Alignment. This chapter develops only the first two. People & Capacity and Knowledge & Insight capture the intermediary's distinctive contributions: deploying specialised staff, codified methods, and benchmark data to shorten client learning curves and improve decision quality. By contrast, Structure & Control (contract playbooks, assurance reviews) and Relationship & Alignment (stakeholder workshops, voting rules) describe well-established governance and engagement routines that serve as contextual enablers rather than primary learning mechanisms. Because their detailed workings overlap with material already covered, they are acknowledged here but not explored further in this section.

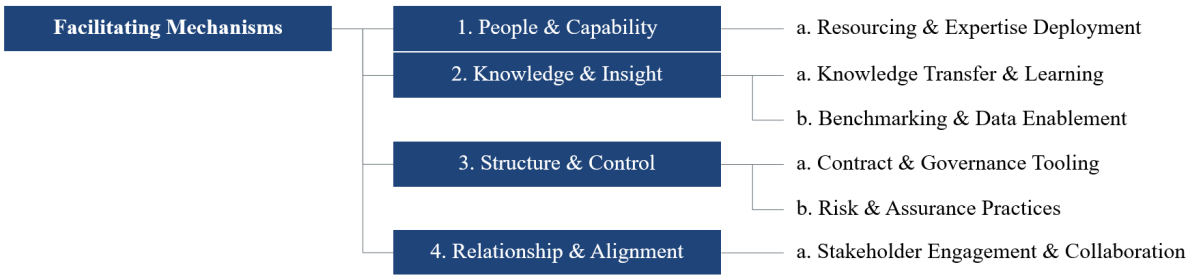

Figure 6.3: Structure of Facilitating Mechanisms themes and sub-themes.

6.2.1. Theme 1: People & Capacity

This theme focuses on Resourcing & Expertise Deployment, which is the deliberate mobilisation of personnel whose prior experience, sector knowledge, and organizational fit accelerate project delivery while allowing the client to avoid long-term staffing commitments.

At Net Zero Teesside, Turner & Townsend drew upon its internal network to redeploy staff who already understood the client's working practices:

> "It is a bit of a unique contract arrangement… because of everything we've done at Turner & Townsend elsewhere, we've been able to utilise people within the organization who have worked with BP before — to know how to best sell to BP in a way that will prevent those problems occurring again. So we know the challenges BP have had in the past… 'We won't let that happen again'." (NZT-I3)

Prior experience with BP allowed project-control specialists to anticipate known pain points in cost-reimbursable contracting and to tailor reporting protocols without a lengthy onboarding process. This example illustrates how matching experiential backgrounds to client processes transforms resourcing into a form of risk mitigation rather than a simple increase in manpower.

A comparable logic guided staffing on the Celtic Interconnector, where the consultant's selection process emphasised sector-specific fit:

> "This is probably the largest project that they've taken on with EirGrid… Some of us were a new team, but they selected the right team. They don't just send anyone to the client; they do profile them, do make sure they've got the right experience, do make sure they're the right fit. … They've definitely got value for money. They've got people that have bought into the project." (CI-I4)

Here, profiling ensured that secondees possessed interconnector or subsea-cable experience and could operate effectively within a Franco-Irish joint-venture context. The ability to rotate such specialists on fourteen-day notice enabled EirGrid to secure niche competence without incurring long-term payroll liabilities.

6.2.2. Theme 2: Knowledge & Insight

Knowledge & Insight explores how Turner & Townsend support clients in building understanding and making informed decisions. This theme captures both the transfer of experience across projects and the provision of evidence that underpins strategic choices. Together, these mechanisms help organizations navigate complex projects with greater confidence and clarity.

Knowledge transfer reflects Turner & Townsend's function as an intermediary in which prior experience is redistributed across other projects and organizations, thereby accelerating client learning curves and de-risking delivery. At Net Zero Teesside, the consultants embedded a standardised controls methodology - the Cube - to translate lessons from other sectors into a contract environment unfamiliar to BP:

> "Turner & Townsend also put together their own process called the Cube. The Cube gives you the ability to perform projects in a consistent way. So we've taken all the knowledge from all the projects we've worked on, created the Cube, and what that's done for us on Net Zero Teesside is—we've been able to take the Cube and some of the standard processes from the Cube and put that into an operating model for BP. … We've been able to leverage all that learning and process we've created—and apply it to BP—and it has transferred very well." (NZT-I3)

This codification enabled rapid set-up of reporting and cost-management processes while serving as a tangible learning structure for the client's team. As one participant from Net Zero Teesside reflected, "80/20 is about right. We've taken the Cube, and the vast majority of it as a process works perfectly." (NZT-I4), indicating that while context-specific tailoring is necessary, a strong foundation in proven delivery methodologies remains central. This balance is illustrated in figure 6.4, which emphasises the 80% reliance on proven delivery foundations such as the Cube, alongside a 20% focus on context-specific adaptation through targeted SME input, scenario-based workshops including well-founded assumptions, and transparent decision-making processes. Similar reach-back mechanisms supported the Celtic Interconnector, where Turner & Townsend imported programme-set-up expertise from aviation and rail mega projects to guide EirGrid through its first subsea interconnector, illustrating the portability of "solutions on the shelf" across domains.

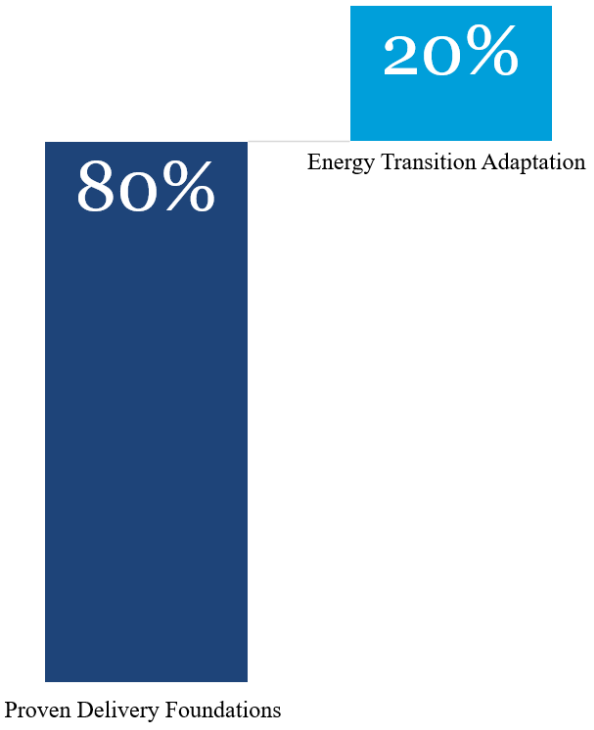

Figure 6.4: Illustration of the research's thematic structure, emphasizing an 80% foundation in proven delivery methodologies and a 20% focus on context-specific adaptation.

An intermediary transfers not only codified knowledge but also acts as a process facilitator within the Performance Forum: "So we're not there to decide what direction; we're there to help them decide on the direction." (PF-I2) In this role, knowledge exchange takes place at an industry-wide scale:

> "Then there is the side of Performance Forum … a bit more direct collaboration between the members to share best practices, to share case studies of where they've tried something new, to present initiatives that they think are making a difference to them, or even just to relatively informally contact one another about a subject … within the Performance Forum context, they've sort of got this agreed platform where they can discuss topics a bit more freely. … They've all agreed to collaborate in the area of project controls and project delivery efficiency." (PF-I3)

Here, Turner & Townsend facilitated study groups that aggregated lessons on fast-tracking, alliancing, and multiple-feed strategies, providing operators with externally validated reference cases that would be difficult to access individually.

Across the three cases, therefore, knowledge flowed through both codified methodologies (e.g., the Cube) and peer interaction, demonstrating that structured knowledge transfer - whether inward to a single client or outward across a joint industry partnership - constitutes a critical mechanism for improving project performance.

The second aspect on insight involves benchmarking and data enablement, which refers to the systematic use of anonymised cost, schedule, and performance data to support project decisions with externally validated evidence. This reduces estimation bias and increases investor confidence. At Net Zero Teesside, Turner & Townsend leveraged its internal database to position first-of-a-kind costs within an industry frame of reference:

> "We anonymised benchmark projects and presented how Net Zero Teesside numbers compared … Option A based on reference project A, Option B based on project B, and so on—anonymised by industry and project value to ensure alignment." (NZT-I1)

By mapping estimates against multiple reference cases, the team translated cross-sector intelligence into a calibrated options analysis that accounted for carbon-capture novelty yet guarded against contractor price inflation. This suggests that structured benchmarks, even when drawn from adjacent sectors, provided a defensible anchor for target-cost negotiations.

The Performance Forum extended the same logic to a consortium scale, standardising data definitions so operators could compare capital efficiency without revealing commercial secrets:

> "What our members are looking for is a reasonably transparent view of what everybody else spends or how long everybody else takes. And this collaborative approach gives them that without the… sort of fiddling with the numbers to make them fit… All we do is escalate them, group them together, and as far as possible, draw a chart and say, 'That's what it looks like, take it away'." (PF-I3)

Here, Turner & Townsend's role as an independent data manager safeguarded anonymity while enforcing ISO-aligned structures, enabling twenty-five companies to base funding decisions on peer evidence rather than consultancy heuristics.

Across the three case studies, benchmarking and data enablement functioned as a technical and governance mechanism: it translated lessons from mature domains, unified disparate data into a common language, and embedded those insights in live reporting tools - thereby turning past performance into an actionable compass for future energy-transition projects.

6.3. Challenges in the Energy Transition

This section examines the challenges faced by the intermediary within the energy transition case studies. Analysis of the cases identified four main themes in which Turner & Townsend encountered barriers: Information & Knowledge, Organization & People, External Environment, and a structural dimension of Project & Delivery Structure. The first three themes, which are analysed in the following subsections, respectively show how limited datasets and first-of-a-kind complexity, decreasing capability bases and

fragile collaboration, and volatile regulatory conditions each constrained the intermediary's ability to drive learning-led performance. The fourth theme, Project & Delivery Structure is recognised but is not expanded here; their practical implications were highly case-specific and did not generate comparable patterns across all three studies. See figure 6.5 below for the theme structure.

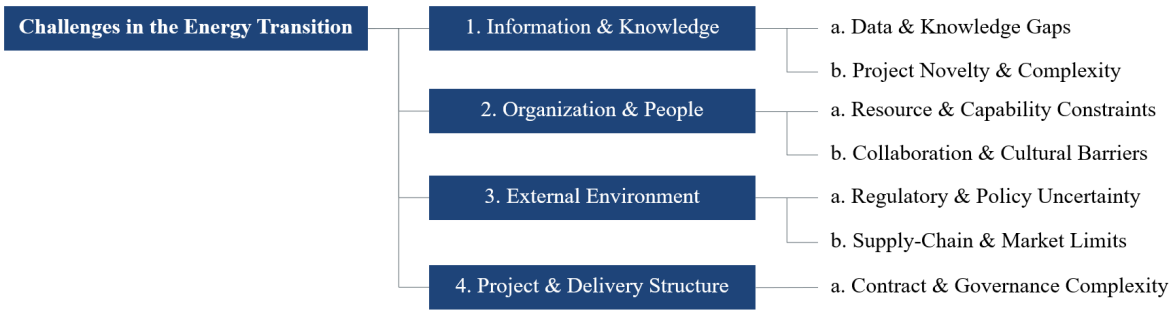

Figure 6.5: Structure of Challenges in the Energy Transition themes and sub-themes.

6.3.1. Theme 1: Information & Knowledge

Data & knowledge gaps as well as project novelty & complexity emerged as consistent barriers across the cases, revealing that in the absence of reliable historical information, ambitions for evidence-based decision-making and learning-driven cost control could not be fully realised. The theme captures systemic shortages in quantity, quality and continuity of project data that constrained benchmarking, forecasting and inter-organizational learning - gaps that were compounded whenever projects were technically novel or organizationally complex.

Net Zero Teesside interviewees repeatedly underlined the absence of reference cases:

> "That's a very key point. Lack of historical data. Nobody's really done this before. It's new to the UK, especially on this scale. So there's a lot of learning as well across the industry." (NZT-I3)

This lack affected both cost estimating and schedule planning due to the project's first-of-a-kind character and "immature design" (NZT-I1). Because Turner & Townsend could not base its advice in robust carbon-capture benchmarks, the team relied on analogues and expert judgement, increasing perceived risk for the client. In the Performance Forum case the problem became structural; even when members agreed to share, obtaining complete datasets proved challenging:

> "The second challenge and the most common one is where we all agree on what data we want to collect and you just have incomplete data, it's not going to help you. Or you do get incomplete data that has a lot of variables that may inform why the project work was as high as it is or higher than the others. And that information doesn't get shared with the PF, right? So that's one of those are the challenges." (PF-I1)

The intermediary's facilitation skills were therefore diverted from analysis to data-chasing, thereby slowing cycle times.

The Celtic Interconnector illustrated the physical dimension of complexity. A 575-kilometre subsea cable running through congested, multi-jurisdictional waters and terminating in Brittany's granite coastline required multiple zonal teams (Ireland, France, UK). The project's structure therefore expanded into distinct onshore-offshore work packages, each with unique supply chains and regulatory regimes, confirming that uncommon geographies increase coordination interfaces and stretch delivery timelines.

These findings indicate that in energy-transition megaprojects, knowledge bottlenecks often stem not only from an unwillingness to share but from the immaturity of the database and limited data-governance practices. Without systematic data capture, consistent coding standards and active feedback loops, intermediaries are restricted to working with provisional rules of thumb rather than insights grounded in robust statistical data.

6.3.2. Theme 2: Organization & People

Organization & People captures the human side of energy-transition delivery - both the scarcity of competent resources and the frictions that arise when multiple organizations must collaborate under competitive pressure. This main theme is built up of resource & capability constraints and collaboration & cultural barriers, that together describe how reduced availability of expertise, high internalisation costs, and protective information cultures limited the effectiveness of all three case studies.

Net Zero Teesside interviewees warned that basic capacity was at risk from the outset: "A company like BP - if they hadn't brought us in - might have just gone full steam ahead, perhaps under-resourced, especially given the current pressure from low oil prices." (NZT-I2) This suggested that, without intermediary support, the client would have pursued a capital-intensive carbon-capture scheme with an insufficient controls function. A similar pattern emerged at Celtic Interconnector, where Turner & Townsend had to import offshore-cable specialists because "the biggest challenge that's going to come up in Ireland is the offshore knowledge and experience" (CI-I4). Both projects therefore depended on external augmentation rather than costly internal build-up. Yet augmentation had limits: interviewees in all three cases worried about sustainability once the consultants departed, particularly given industry-wide attrition.

The problem was amplified by what one Net Zero Teesside manager called an unprecedented erosion of organizational memory:

> "Capability in general is lower than it used to be … they're reducing their capability to reduce costs … what they're losing is that knowledge base that used to sit within the organization, and the organizational learning and knowledge base is lower than it's ever been." (NZT-I4)

This observation resonated with Performance Forum respondents, who described "a 20 to 30% reduction in the number of people in these organizations" that "diminished" the ability to engage in benchmarking activities, pushing "organizational learning and sharing" into a "secondary role or a tertiary role" rather than the primary focus it should have been (PF-I2).

Even when expertise could be mobilised, collaboration mechanisms frequently stalled on cultural barriers. A Net Zero Teesside commercial lead summarised the dilemma:

> "Everybody wants the benefit of everybody else's information but doesn't want to share their own … from a BP perspective, they would never be willing to put their own data related to Net Zero Teesside into a similar environment." (NZT-I4)

Strict confidentiality clauses, "segregation principles" within joint ventures and fears of losing competitive edge produced one-way knowledge expectations that Turner & Townsend could only partially offset through anonymised benchmarking. Performance Forum faced analogous resistance: members hesitated to contribute new energy data out of concern that it might "reveal how they're organised" (PF-I1), while Celtic Interconnector interviewees described an "insular TSO culture" that limited reach-back to peer networks.

Collectively, these findings demonstrated that human resources and collaborative behaviours were as critical as technological factors in shaping project challenges. Where staffing was limited and trust between parties remained fragile, intermediaries were compelled to devote substantial effort to convening the appropriate stakeholders and managing the boundaries of permissible data sharing. In such conditions, even routine coordination became demanding, constraining the capacity to progress energy-transition projects effectively.

6.3.3. Theme 3: External Environment

The influence of the external environment on the cases posed a significant barrier, specifically with regards to regulatory & policy uncertainty. This shaped what information could be shared, how contracts were structured and even which projects could proceed. This challenge referred to the shifting, sometimes contradictory, legal and policy conditions that limited collaboration and forced each case-study client to implement strict procedural boundaries.

On Net Zero Teesside, Turner & Townsend repeatedly confronted competition law and segregation rules that separated technology partners on the same site:

> "I'm working on a hydrogen production facility with the exact same issues. … You can't just share information - it becomes a matter of anti-competition and collusion. You're not allowed to. So there are real systemic issues hamstringing this kind of sharing." (NZT-I2)

The requirement to uphold "segregation principles" compelled the intermediary to establish parallel workstreams and anonymise benchmarking data. This increased costs and extended timelines while limiting opportunities for shared learning. Similar compliance challenges emerged in the Celtic Interconnector, where differences between Irish marine legislation and mainland construction regulations necessitated additional safety workshops for offshore contractors, adding further procedural complexity to the project environment.

Policy volatility further complicated collaborative initiatives within the Performance Forum:

> "BP will be an example … but if you look outside of Europe, whether it be the US … policy changes and strategy changes … have created volatility in the level of engagement and the want and engagement in this type of forum." (PF-I2)

As government incentives shift — such as the United States to "reduce the Inflation Reduction Act" — member companies alternated between active participation and withdrawal, preventing benchmarking initiatives from reaching the critical scale needed for robust analysis. Additionally, vendor confidentiality agreements on emerging technologies, including large-scale electrolysers, further limited transparency, withholding essential cost data even when formal participation had been secured.

Across the three cases, Turner & Townsend was required to invest significant effort in clarifying jurisdictional overlaps, establishing information-sharing protocols, and providing assurances to partners regarding regulatory compliance. In effect, uncertain and fragmented regulatory frameworks constrained not only the contractual flexibility of these projects but also the extent to which Turner & Townsend could facilitate inter-organizational learning.

6.4. Key Enablers

Energy transition projects advanced when Turner & Townsend was able to move beyond addressing isolated challenges and activate a coherent set of internal enablers. This section organises these enablers into three themes, of which the structure is visualised in figure 6.6 below. Data & Technology examines how the intermediary developed information systems that transformed commercially sensitive project data into a shared analytical resource. People & Collaboration concerns the trust-building and capability development practices that enabled the mobilisation of expertise and supply chains across diverse stakeholders. Delivery Methods explores how established governance and project control practices from mature sectors were adapted to the specific requirements of transition projects. A fourth area, External Environment, was also observed but is not analysed further here, as regulatory and policy shifts in favour of low-carbon investment and system decarbonisation originate externally and operate independently of intermediary actions, and are therefore not considered enablers within the scope of this study.

Figure 6.6: Structure of Enablers in the Energy Transition themes and sub-themes.

6.4.1. Theme 1: Data & Technology

The first enabler identified was Data & Technology, reflecting Turner & Townsend's efforts to develop a data and knowledge infrastructure capable of supporting complex energy transition projects. This

infrastructure balanced the need for confidentiality with the demand for timely and scalable information. It included anonymisation protocols and flexible data submission processes, allowing proprietary project information to be transformed into a shared analytical resource for learning and decision-making across projects.

On Net Zero Teesside the intermediary overcame strict segregation rules by routing raw figures through an in-house anonymisation engine before using them in cross-project benchmarks:

> "I think we give our clients some comfort so they know that we have got access to their information because we've done certain parts of the project for them, but they also have the comfort that we have really well-defined confidentiality agreements around that, and that as a trusted service provider that won't be abused. But what that does allow us to do is still use that information in an allowable way … we just need to make sure that it's anonymized and in line with the confidentiality requirements that we've got. … I think that we are one of the only companies that can have access to that information. " (NZT-I4)

The quotation illustrated how legal constraints were not removed but instead managed through Turner & Townsend's role as a "trusted service provider", which enabled selective data gathering while protecting the competitive interests of project partners. This approach resulted in the creation of a usable, albeit anonymised, cost database that supported scenario analysis for both the power plant and carbon capture components of the project.

The Performance Forum extended the model by lowering the barrier to contribution. Recognising that few new-energy projects had reached completion, the forum accepted high-quality estimates and captured lessons immediately after commissioning:

> "Hence the collection parameters are new … we've changed the collection parameters to include projects that have not been executed yet … estimates for projects that are coming up in the next three years will fall part of the benchmarking … as those projects execute, the data will get replaced with the actuals and the quality will therefore improve." (PF-I1)

This adaptive method helped the network mitigate the "data drought" typical of novel technologies while still challenging optimism bias among members. Complementary measures such as template simplification, phased submission and explicit "rules of engagement" further expanded the dataset, demonstrating that incentives and governance had reinforcing effect.

Together, these practices transformed fragmented project data into enabling shared and meaningful learnings, supporting evidence-based decisions even in contexts where technologies were new.

6.4.2. Theme 2: People & Collaboration

People & Collaboration emerged as the second enabler: Turner & Townsend advanced energy-transition projects not only by supplying data and tools but by creating trust and by expanding the human and supply-chain capabilities required to execute unfamiliar scopes. The theme is defined here as the intermediary's ability to build credible relationships while simultaneously mobilising the skills, training and procurement that were absent in client organizations.

Trust-based collaboration was most visible on Net Zero Teesside, where Turner & Townsend operated between joint venture partners that were otherwise restricted by segregation rules. One manager explained:

> "And then on the other side, when it comes to taking that knowledge and sharing it with someone else, again, I think it's a trust thing … we are independent advisors, we don't have an agenda other than trying to support that project … we've got this part to play as the bridge between client to client, and doing that as a trusted advisor to both and without being conflicted against the interests of either, that really works for us." (NZT-I4)

The quotation showed how perceived neutrality legitimised cross-project knowledge flows that would have been impossible in an operator-to-operator setting. A comparable dynamic underpinned the Performance Forum: equal voting rules and collective norms ensured that "everybody has the same votes" and that larger oil majors could not dominate smaller members (PF-I2). This governance structure

translated strategic commitment - "everybody has to participate" (PF-I1) - into practical data sharing, reinforcing the intermediary's role as an honest broker.

Capability and supply development complemented trust. On the Celtic Interconnector Turner & Townsend addressed an offshore skills shortage by insisting on competency assessments and lobbying for new training pathways:

> "We need a new program of training to suit the offshore … The legal requirements aren't [yet] employing … we need to make sure they're getting the right training … because you can see that you could have certain untrained people entering the industry who are not familiar with the risks." (CI-I4)

This focus on training and competency frameworks ensured that supply chain readiness could keep pace with the project's technical demands, especially in a context where offshore energy work was new to many contractors in the area. Similarly, in the Performance Forum, Turner & Townsend's facilitation of broader membership - including technology providers and non-oil participants - enabled collective skill development and diversified perspectives within the benchmarking platform. Together, these practices demonstrated that capability and supply development were not secondary activities but integral enablers of energy-transition projects, ensuring that skilled personnel and prepared suppliers were available to execute complex scopes safely and effectively.

6.4.3. Theme 3: Delivery Methods

Delivery Methods refers to how Turner & Townsend structured, governed, and continually adjusted delivery approaches so that energy-transition projects remained controllable despite immature design, supply chains and volatile scopes. It rests on two linked capabilities: installing transparent governance and risk controls that give clients visibility over baselines and contingencies, and deploying adaptive project strategies that translate proven methods from mature sectors to emergent low-carbon assets.

The adaptive logic was most explicit on Net Zero Teesside. One consultant argued that the assignment was "about having the tools, processes, procedures, and organizational structure to manage it all" and that "very little of what we do in construction consultancy is truly bespoke to one industry" (NZT-I2). By framing carbon-capture works as another complex process-plant build - albeit with a novel core unit - the team could apply familiar NEC target-price contracts, schedule risk reviews and integrated change control while deferring bespoke treatment to the genuinely first-of-a-kind elements.

This sector-agnostic way of looking at it unlocked cross-project benchmarking even when only fragments of precedent data existed:

> "There are a lot of parallels … while you might not have cost data related to a hundred carbon capture projects … you do know that to build a process facility of a certain size and scale generally costs a certain amount … you can always get a reference case, but then adjust that to account for the bespoke nature of what you're doing." (NZT-I4)

The quotation illustrates how Turner & Townsend blended generic cost–time ratios with targeted adjustments for untested capture technology, thereby offering BP a defensible baseline without waiting for a fully populated carbon-capture dataset.

The Performance Forum placed this principle at the centre of its new energy benchmarking efforts. Members accepted that "an onshore processing plant of any kind provides useful information for any other kind of onshore processing plant … fundamentally, a plant is a plant" (PF-I3). By aligning work-breakdown structures to ISO 19008 and insisting on granular cost coding, the intermediary converted conventional conventional energy facility data into a single comparative platform - an example of scope diversification that mitigated the data sparsity facing emerging energy technologies.

Transparent governance underpinned these adaptive strategies by linking cross-sector methods to clear decision frameworks. On Celtic Interconnector, Turner & Townsend required executives to identify "what are the core benefits … and when you slowly build that up … it holds you to what the benefits are" (CI-I3). This meant that choices around technology, timelines and routing were regularly checked against the project's agreed purpose, reducing scope drift. On Net Zero Teesside, this discipline combined with contextual risk scans that assessed whether contractor baselines considered site-specific factors such

as wind patterns and wet ground conditions. By using structured reviews to test whether imported delivery methods aligned with the realities of each location, Turner & Townsend ensured that their sector-agnostic approaches remained grounded in the unique physical and regulatory contexts of each project.

In summary, Turner & Townsend's delivery methods advanced energy-transition projects not by creating entirely new approaches but by carefully adapting proven project controls and performance practices from other sectors. By embedding these methods within clear governance structures, the intermediary ensured that clients could pursue the high pressure timelines associated with energy-transition goals while maintaining the discipline of established project management frameworks. This combination of adaptive strategy and transparent oversight enabled projects to move forward efficiently.

6.5. Learning Impact

Learning Impact examines how Turner & Townsend's project-level engagements contributed to lasting organizational learning within client organizations and, by extension, the broader energy-transition. This section is structured around three themes — Capability Development, Insight & Decision Quality, and Delivery Methods (see figure 6.5 below) — each representing a specific pathway through which technical expertise, analytical practices, and process discipline were internalised by clients (see figure 6.7 for an overview of these themes).

Figure 6.7: Structure of Learning Impact themes and sub-themes.

6.5.1. Theme 1: Capability Development

Capability Development describes how Turner & Townsend systematically transformed its own expertise into enduring client capabilities, thereby strengthening the wider energy-transition ecosystem. This theme comprised two interconnected processes: deliberate capability transfer, in which staff, tools and methods moved from the intermediary to the client organization; and strategic sustainability, in which these gains were embedded within operating models, talent pipelines and future project delivery plans.

On Net Zero Teesside the consultancy's goal was explicitly to make itself redundant over time:

> "So yes, we upskilled the client to think differently, increased their learning capacity, and they brought us in on this project because of that. The VP literally said, 'Whatever you did on that project, I want you to do it on Net Zero Teesside'." (NZT-I4)

This request, grounded in earlier success, suggested a transfer loop in which each assignment generated a more self-reliant owner. Interviewees confirmed the loop's endpoint: "I've seen clients we've worked with become self-sufficient and not need us later. In those cases, we've done our job" (NZT-I2). Capability building was therefore not incidental; it was a central component of the intermediary's added value.

The Celtic Interconnector provided a structured mechanism for that transfer. Turner & Townsend paired every key consultant with an in-house counterpart:

> "We would upskill their team. … If we've got a project director, there's a deputy project director from EirGrid … the deputy following the everyday work of Turner & Townsend is learning, is growing, is developing." (CI-I3)

Shadowing enabled the transfer of practical know-how in real time while responsibility for project delivery would ultimately return to the transmission operator on the longer term. The model also

prompted proactive mapping of "what educational skills might be missing" (CI-I3), combining day-to-day delivery with long term workforce planning.

Strategic sustainability depended on the existence of a robust project pipeline to ensure that newly developed capabilities could be retained and applied. Within the Performance Forum, Turner & Townsend's benchmarking initiatives were perceived as mechanisms for industry-wide learning: "Are you helping the industry overall with the transition? I do think that is happening" (PF-I1).

Similarly, interviewees on the Celtic Interconnector highlighted that a continuous programme of offshore projects was necessary to maintain delivery capability, observing that:

> "Right, we need 20 people in the PMO", starting out they might have two, and outsiders would be 18, but as time goes by, it changes like that, and eventually the client will have their own. … They can take seven to 10 years to actually fill everything, but ultimately that's where they're heading." (CI-I2)

Turner & Townsend's role thus extended beyond individual projects to shaping portfolios and supporting the adoption of sector standards, such as ISO 19008, to ensure that capabilities remained current and transferable across future energy-transition initiatives.

In summary, Turner & Townsend enabled capability development in two complementary ways: horizontally, by transferring expertise in project controls, contracting, and risk management into client organizations; and vertically, by aligning these capabilities with future project pipelines and broader industry frameworks. This combined focus on immediate operational competence and long-term applicability established it as a structural enabler within the energy transition.

6.5.2. Theme 2: Insight & Decision Quality

Insight & Decision Quality examines how Turner & Townsend transformed fragmented project data into timely, evidence-based decisions. This theme consisted of two interrelated components: decision & risk quality, referring to the systematic analysis of project risks and options; and benchmarking & learning loops, which provided the comparative evidence needed to validate or adjust investment and delivery strategies.

On the Net Zero Teesside project, risk workshops structured around contract clauses shifted discussions from abstract debates to the analysis of quantifiable scenarios.

> "The primary outcome of all this is just making better decisions earlier. And what I mean by that is we're always able to share this information and we're always able to give the insights that come with it, and through those insights, we're able to guide our clients towards the right decision." (NZT-I4)

The observation suggested that structured analysis occasionally led to project cancellation rather than progression; however, the prevention of resource misallocation still represented a successful outcome. Complementary "risk-based scenario training" sessions further reinforced this discipline by simulating weather delays and ground-condition disruptions prior to construction, fostering what another participant described as a "realistic and constructive discussion of the risks" (NZT-I1). Collectively, these practices reduced the time between the emergence of new evidence and the corresponding managerial response.

The Performance Forum demonstrated how cross-operator benchmarking institutionalised learning loops that advanced client decision-making capabilities. Members supplied cost and schedule data that Turner & Townsend anonymised and returned as industry medians, quartiles and outlier flags:

> "Benchmarking … gives people a challenge to their biases because it says, 'You think you're going to achieve it in nine months, but everyone else took twelve'." (PF-I3)

This process enabled client teams to confront optimism bias early and align their expectations with industry evidence, strengthening the quality of internal discussions at key stage-gates. The benchmarking outputs encouraged reflective questions, such as "Are we purchasing in the wrong place? Can we now start buying from Europe instead of Asia?" (PF-I1), illustrating how clients used comparative insights to adjust procurement strategies and investment decisions. By embedding external reference points into

internal governance, the Performance Forum converted data-sharing into a structured mechanism for improving client learning and decision quality across the energy-transition portfolio.

Comparable dynamics surfaced on the Celtic Interconnector, where Turner & Townsend's schedule and contract expertise accelerated a multibillion-euro final investment decision that "otherwise … would have taken a lot longer" (CI-I5). This acceleration was not just a matter of speed but of quality: the intermediary's structured guidance ensured that EirGrid's investment choices were grounded in robust programme logic, clear commercial terms and tested delivery frameworks. As a result, decisions were taken with greater confidence and clarity, strengthening the client's ability to govern risks while maintaining momentum on a nationally significant energy-transition programme.

Collectively, these findings indicated that high-quality insight did not simply emerge from the availability of data but was actively developed through systematic benchmarking and scenario-based risk discussions. By embedding structured learning loops and disciplined use of comparative evidence, Turner & Townsend enabled client organizations to make informed decisions about whether to proceed, adapt, or halt projects. This approach reduced the strategic and financial uncertainties typically associated with first-of-a-kind energy transition initiatives, strengthening clients' ability to manage risk while advancing project objectives.

6.5.3. Theme 3: Delivery Methods

Delivery Methods were critical because effective process discipline and realistic cost management ultimately determined whether energy transition projects progressed from concept to implementation. Defined here as the systematic enhancement of management systems and the demonstrable control of schedule and cost outcomes, this theme combined process and system improvement with cost and delivery performance into a coherent, mutually reinforcing capability.

Process improvement was particularly evident on Net Zero Teesside, where Turner & Townsend systematically evaluated each proposed tool prior to its adoption:

> "They've asked us to look at their documentation as well — their reporting processes … we would change this section, we would do it like this for this reason, we would use this kind of metric or this KPI rather than this one." (NZT-I3)

By embedding revised KPIs and baseline-engineering models, the intermediary aligned contractor reporting with NEC target-price governance and reduced the noise that typically obscured early warnings. A comparable mechanism operated in the Performance Forum: work-breakdown templates for carbon-capture and hydrogen plants, agreed "as a group of six organizations," were "taken and used … to go to market for pricing against an agreed structure" (PF-I2). Here, shared templates translated novel technologies into familiar procurement packages, accelerating tender cycles and standardising future data capture.

Structured learning rapidly translated into tangible economic outcomes. Performance Forum analyses on alternative contracting approaches - as a result of the shared learnings during annual workshops - were provided to operators, who then "use[d] that as an input into making the decision as to which way they would contract in the marketplace" (PF-I2). This closed feedback loop - from comparative study to immediate commercial application - demonstrated how structured, codified insights could accelerate decision-making while reducing the need for additional bespoke consultancy expenditures.

The benefits of cost control became most evident when rigorous contract administration was combined with systematic performance monitoring:

> "If we get to the end of the project and it's been delivered within that estimate, we've done a good job … we've reduced change as best we can, we've prevented extensions of time requests." (NZT-I3)

Interviewees on the Celtic Interconnector highlighted the value of this disciplined approach, noting that Turner & Townsend's management frameworks enabled land-cable and converter-station packages to remain "on programme, reasonably on cost", a level of control considered unattainable "without the expertise to check it". Across the project portfolio, clients reported accelerated baselining, earlier identification of risks, and - on Net Zero Teesside - time savings significant enough to eliminate the need

for an additional design iteration.

Taken together, Turner & Townsend enhanced delivery performance by first establishing robust management processes and then systematically monitoring their financial impacts. This approach created a positive feedback loop in which strengthened systems generated more reliable data, enabling tighter project control. The demonstrable cost savings achieved through these methods, in turn, reinforced client confidence in the upgraded processes, further embedding them within ongoing and future project delivery.

6.6. Cross-Case Synthesis

The cross-case synthesis of the findings presented above connects the patterns across the three case studies into a clear, overarching framework. Figure 6.8 distils the evidence from the three case studies into a single pathway that runs horizontally across five analytical lenses: why clients engage, what the intermediary does, which contextual barriers arise, how those barriers are mitigated, and what learning impact ultimately is. Reading the figure from left to right therefore highlights a recurrent, capability-centred logic:

1. Clients engage Turner & Townsend to address capability, insight, or growth needs that could otherwise hinder the delivery of complex energy-transition projects.
2. The intermediary responds by deploying a combination of specialised personnel, structured processes, and data-driven tools to accelerate inter-organizational learning.
3. These interventions face recurring challenges, including limited precedents, fragmented governance structures, and cautious organizational cultures, which reflect the uncertainties of first-of-a-kind technologies and evolving policy landscapes.
4. Turner & Townsend mitigates these challenges through targeted enablers that safeguard confidentiality, facilitate balanced collaboration among stakeholders, and transform temporary external support into sustainable internal capabilities.
5. These efforts lead to tangible learning outcomes, including faster evidence-based decision-making, strengthened internal systems, and the development of codified knowledge that can be applied to future energy-transition initiatives.

A notable pattern in figure 6.8 is how it moves from why clients engage on the left to what learning is achieved on the right. It begins with immediate needs for capability, insight, and growth, then shows how Turner & Townsend intervenes and navigates challenges, and finally highlights the longer-term benefits of these engagements. This flow demonstrates that Turner & Townsend's role extends beyond supplying resources or data; it systematically enables clients to build capability, make evidence-based decisions, and strengthen internal systems. In doing so, the intermediary not only supports project delivery but also fosters organizational learning that advances the energy transition.

Engagement Drivers *Why do clients engage*	Facilitating Mechanisms *What does the intermediary do*	Energy Challenges *What are the barriers*	Key Enablers *How are barriers overcome*	Learning Impact *What is the effect*
Resourcing Gaps *Augmenting capability and capacity*	• Flexible capability model (see following figure). • Deployment of subject matter experts and shadow-pair roles. • Turnkey controls and contracting expertise.	• First-of-a-kind technologies stretch internal skills. • Tight timelines and local labour shortages. • Organisational memory weakened by attrition.	• Flexible resourcing enables rapid (de)mobilisation. • Shadow-pairing converts external support into internal capability. • Trusted-advisor status facilitates early risk identification.	• Critical control functions operational within weeks. • Client teams achieve operational autonomy. • Stronger governance frameworks for future projects.
Assurance & Insight *Providing data-driven confidence*	• Supplies anonymised cost and schedule benchmarks. • Conducts scenario-based risk and assurance reviews. • Maps proven methods (e.g., Cube) to novel technologies.	• Lack of historical data for new-energy assets. • Confidentiality constraints limit transparency. • Complex governance slows data exchange.	• Anonymisation and standardised coding protect confidentiality. • Analogous benchmarks bridge data gaps until actuals mature.	• Faster, evidence-based final investment decisions. • Higher investor confidence in forecasts. • Stage-gate reviews grounded in empirical evidence.
Growth Development *Accelerating learning and innovation*	• Facilitates study groups for joint research and reflection. • Synthesises shared data into joint guidance. • Runs early challenge workshops to reframe assumptions.	• Organizational inertia and entrenched norms resist alternative approaches. • Protective information cultures restrict learning. • Policy volatility heightens risk aversion.	• Neutral facilitation reduces defensiveness and builds trust. • Equal-vote forum ensure balanced participation. • Regularly refreshed themes sustain learning relevance.	• Quicker adoption of innovative delivery strategies. • Continuous learning loops supporting funding cases. • Process improvements institutionalised in knowledge bases.

Figure 6.8: Cross-case synthesis of drivers, mechanisms, challenges, enablers, and learning impact.

6.6.1. A Capability-Centric Perspective on Intermediary Engagement

The centrality of capability becomes clearer when the synthesis matrix is read together with the Capability Model in figure 6.9. Whereas figure 6.8 traces a generic learning pathway, figure 6.9 positions that pathway on a continuum that ranges from Build (architect and coach) through Partner (co-pilot and mentor) to Burst (full operator). This continuum is shaped by several interacting dimensions that jointly determine the nature of the intermediary engagement:

- Ambition for internal know-how – the extent to which the client seeks to build and own its tools and talent (Build) versus accepting externally delivered expertise as an efficient solution (Burst).
- Intermediary role – the positioning of Turner & Townsend as architect and coach (Build), co-pilot and mentor (Partner), or full operator (Burst).
- Engagement curve – the temporal profile of involvement, from short and intense mobilisation with early exit (Build), through gradual tapering (Partner), to fixed-term outsourcing with limited retention (Burst).
- Typical scope – the span of activities covered, from governance templates and training (Build), to interim functional leadership (Partner), to full end-to-end controls, benchmarking and assurance (Burst).
- Client maturity – the capability base of the client organisation, which can be understood both as overall organisational maturity (the general strength of systems, governance and workforce) and as situational maturity (the client's experience with the specific technology, geography or project type). Build aligns with high maturity, Partner with medium maturity and Burst with low or situational maturity, where even otherwise mature organizations may lack experience in first-of-a-kind contexts.
- Good fit conditions – the external circumstances under which each model is most suitable, such as a stable workforce and long asset pipeline (Build), a temporary capacity gap that will shrink (Partner), or high uncertainty, first-of-a-kind projects and large cost-of-delay pressures (Burst).
- Learning impact – the retention of knowledge within the client, ranging from high and embedded (Build), to medium and taper-dependent (Partner), to episodic bursts with low retention (Burst).

The three case studies demonstrate how Turner & Townsend's role in developing client capability varies across different project contexts. Net Zero Teesside represents a clear Burst engagement: BP outsourced a self-contained package of commercial controls expertise to cover a critical early phase, with no expectation that Turner & Townsend would remain once the carbon-capture facility reached maturity. Celtic Interconnector began in a Build mode - Turner & Townsend was asked to architect the programme controls function and coach EirGrid's deputies - and has since migrated toward Partner as internal capability has grown and the intermediary now co-pilots delivery rather than leading it. By contrast,

the Performance Forum sits outside the Build–Partner–Burst framework: here Turner & Townsend acts as an independent knowledge facilitator for a joint industry partnership, a role that is adjacent to, but distinct from, its core project management advisory services and therefore not reducible to any single archetype.

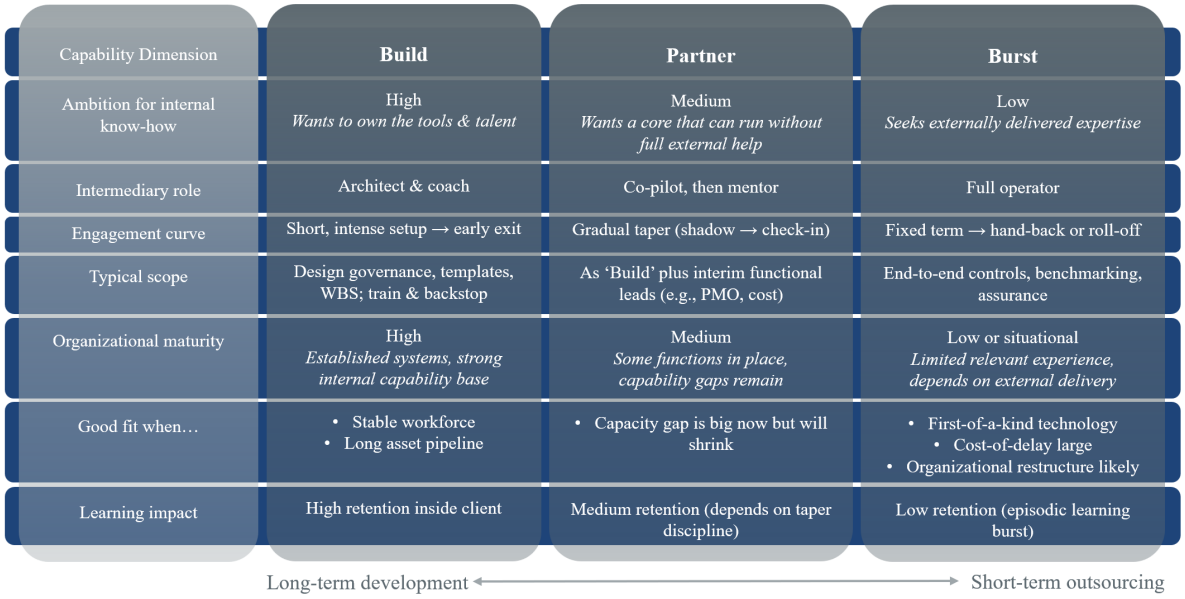

Figure 6.9: Capability model showing three engagement types - Build, Partner and Burst - arrayed along a long-term development to short-term outsourcing axis.

6.6.2. Connecting the Two Frameworks

Taken together, the two figures present a layered explanation of the intermediary role. The synthesis matrix (what happens) captures the recurrent sequence of actions and outcomes across very different projects. The capability model (why it takes the form it does) explains the variation in depth and duration of those actions: the further a client sits toward Build, the more the engagement emphasises architecting systems and coaching deputies; the further toward Burst, the more it emphasises turnkey delivery and episodic knowledge transfer. Crucially, all archetypes still follow the same left-to-right logic of figure 6.8; they differ only in speed, intensity, and retention of learning.

6.6.3. Implications for Inter-Organizational Learning

Four cross-case insights emerge:

1. Capability as the guiding thread – Whether the driver is resourcing, insight, or growth, capability is the common denominator: the ability to execute first-of-a-kind work with confidence and to retain enough know-how to improve the next asset in the pipeline.
2. Intermediary neutrality as an enabler of data sharing – Trust in Turner & Townsend's independent position unlocks data flows that neither operators nor contractors can achieve alone, converting fragmented evidence into sector-wide benchmarks.
3. Sustained value creation as a marker of success – The most durable learning occurs when the intermediary equips clients with the tools and processes needed to continue improving delivery performance beyond the initial engagement.
4. Continuous intermediary renewal – For this continuous improvement cycle to remain sustainable, Turner & Townsend must itself stay at the forefront of sector developments, continually expanding its knowledge base and refining its methods so that each new assignment both draws upon and enriches its evolving expertise.

These findings position Turner & Townsend not merely as a supplier of professional services but as a systemic learning catalyst whose interventions align with varying levels of client capability development.

The two figures therefore serve as complementary maps: one traces the sequence of learning, while the other locates each engagement on a strategic landscape of capability development.

6.6.4. Practical Self-Assessment Tool for Prospective Clients

To translate the academic findings into an actionable resource for industry, a self-assessment tool is provided in appendix B. The tool distils the Engagement Drivers analysis into five mutually-exclusive "buckets'' (A-E). Each bucket emerged inductively from the case-code patterns described above - specifically the interplay of (i) urgency/compliance pressure, (ii) pipeline horizon, (iii) capability-building ambition, and (iv) the need for neutral benchmarks. By asking organizations to tick a short checklist the tool lets any energy sector actor rapidly locate itself on the Build–Partner–Burst landscape and trace the relevant knowledge-flows in this chapter. This diagnostic guide is necessary because it bridges research and practice: clients can self-diagnose in under two minutes and then jump straight to the sections of the thesis that explain what Turner & Townsend (or any intermediary) should do for their specific context.

Client category	**Dominant situation the category represents**
A – Benchmark & assurance	Seeking neutral peer benchmarks; delivery support is secondary.
B – Compliance-driven first-of-a-kind sprint	Facing a hard regulatory deadline on first-of-a-kind scope; speed and assurance outweigh capability building.
C – One-off outsourcer	Single flagship project with no intent to retain capability; "deliver and hand over".
D – Pipeline capability builder	Multi-project pipeline with clear ambition to internalise tools and talent.
E – Mature gap-filler	Generally mature organization with a discrete technical or geographical knowledge gap that needs targeted support.

Table 6.1: Five diagnostic buckets used in the Self-Assessment Tool (see appendix B).

Actors identify the first bucket in which they agree with at least two statements (appendix B); this keeps the categories mutually exclusive while capturing the full spectrum of engagement needs uncovered in the three case studies.

6.6.5. Knowledge-Flow Map

The diagnostic buckets in Table 6.1 are only the first half of the translation to practice logic. Once an actor knows which bucket best describes its situation, it still needs to understand how the intermediary converts that need into learning outputs. For that second step a Sankey diagram (Figure 6.10) visualises the knowledge flows identified in the cross-case analysis.

The Sankey diagram emphasises proportionality. Flow thickness reflects the degree of effort or knowledge volume moving from each client category on the left through distinct intermediary action streams in the centre into specific embedded impacts on the right. This allows energy sector actors to see which action streams their category engages most strongly, where the knowledge ultimately embeds, and how their pathway differs from the other four categories. Because all five categories appear in a single view, users can benchmark their own pathway against peers and immediately identify under- or over-invested areas.

To keep the findings chapter concise, Appendix C presents cropped versions of Figure 6.10, each highlighting a single client category (A–E). Practitioners can therefore see their own flow in isolation without the visual noise of the full map.

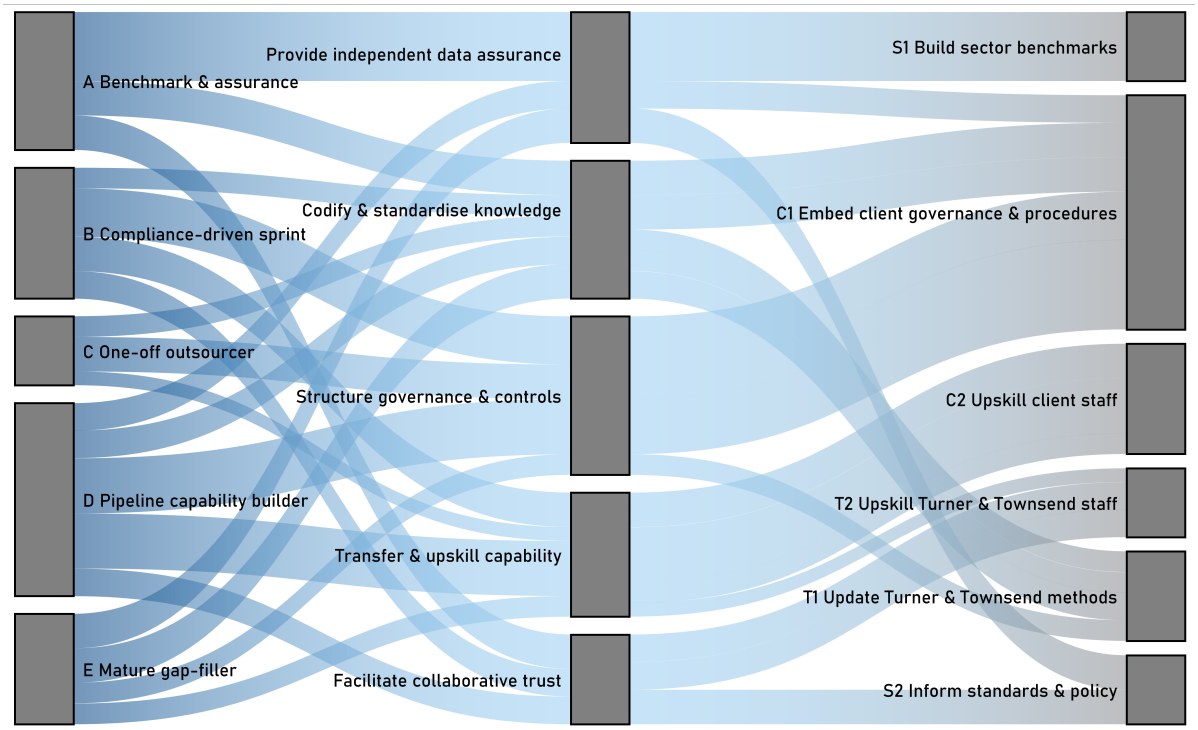

Figure 6.10: Knowledge-flow Sankey: from client categories (left) through intermediary action streams (centre) to embedded learning outputs (right). Flow thickness is qualitative and derives from the relative weightings in the three case studies.

Table 6.2 converts the five intermediary action streams shown in the centre into plain language descriptions, linking each to examples from the cases.

Stream label	Purpose and typical artefacts	Example from cases
Provide independent data assurance	Collect, anonymise, and benchmark cost–schedule data; peer quartile charts; data quality checks	Performance Forum database; contractor reference benchmarks on Net Zero Teesside
Codify and standardise knowledge	Translate lessons into reusable templates and playbooks	Cube methodology modules reused on Net Zero Teesside and Celtic Interconnector
Structure governance and controls	Install standard operating procedures, KPIs, and stage-gate checklists; update Turner & Townsend's own library for future bids	NEC target-price governance pack embedded at Net Zero Teesside
Transfer and upskill capability	Shadow-pairing, on-the-job coaching, competency frameworks	EirGrid deputy roles shadowing Turner & Townsend project leads
Facilitate collaborative trust	Neutral workshops, voting rules, information-sharing agreements	Performance Forum workshops and study groups; JV bridging on Net Zero Teesside

Table 6.2: Intermediary action streams shown in the Sankey centre column.

The right-hand nodes represent sustained impacts rather than one-off deliverables. The Sankey makes visible that some streams terminate almost entirely at the client, whereas others continue into sector benchmarks or back into Turner and Townsend's own method base, supporting the next engagement. As shown in table 6.3, the S-nodes denote sector-level diffusion where lessons are codified into benchmarks

or standards, the C-nodes capture embedding within the client's own systems and procedures, and the T-nodes indicate internal embedding within Turner & Townsend itself, where methods and staff capabilities are updated for future use.

Output label	**Sustained impact**
S1 – Build sector benchmarks	Anonymised cost and schedule medians used by investors, regulators and future projects.
S2 – Inform standards and policy	Lessons channelled into ISO or WBS revisions and policy white papers.
C1 – Embed client governance and procedures	Stage-gate charters, KPI dashboards and change-control logs installed in the client's PMO.
C2 – Upskill client staff	Formal curricula and on-the-job coaching that enable clients to internalise capability.
T1 – Update Turner & Townsend methods	Cube modules, clause libraries and data lakes refreshed for the next assignment.
T2 – Upskill Turner & Townsend staff	Cross-sector rotations and internal masterclasses broaden consultant expertise.

Table 6.3: Embedded learning outputs (right-hand Sankey nodes).

The diagram can be read in three steps. First, locate your bucket via the self-assessment tool in Appendix B. Second, follow the coloured band from that bucket across the centre; thickness indicates relative effort. Third, note the destinations on the right to see where knowledge is likely to embed.

7

Discussion

The purpose of this thesis was to examine how intermediaries - illustrated through Turner & Townsend - catalyse inter-organizational learning and, by extension, accelerate energy-transition projects. The empirical findings reveal a capability-centric logic in which clients engage Turner & Townsend primarily to close knowledge and resourcing gaps; Turner & Townsend then deploys structured people–process–data mechanisms that overcome systemic barriers and leave behind enduring learning capability. This discussion integrates those findings with the literature, showing where the study confirms, contradicts, or extends current theory on intermediaries, knowledge brokers, and learning networks, and points out what the study's theoretical contributions are.

7.1. Integration with Literature

7.1.1. Re-connecting Knowledge and Learning Domains

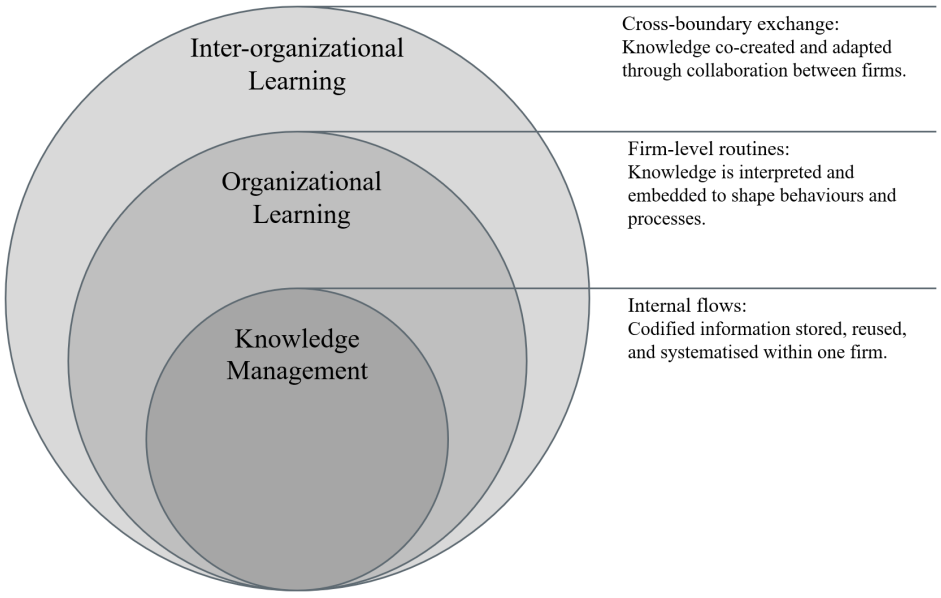

Figure 7.1: How the three learning constructs nest and interact in the study's cases. Knowledge management provides codified inputs; organizational learning converts them into changed routines; inter-organizational learning links otherwise isolated cycles through a neutral broker.

Distinguishing the lenses

Drawing on the review in Chapter 2, knowledge management concerns the capture and codification of data so that it can be reused; organizational learning describes how firms use codified knowledge to

modify their routines, practices, and ways of thinking; inter-organizational learning involves organizations sharing, acquiring, and adapting to each other's knowledge and experiences (figure 7.1). Each lens therefore emphasises a different point of focus - knowledge base, behavioural change, and cross-boundary exchange.

Integration of the lenses within the findings

The case evidence shows the three constructs operating as concentric and mutually reinforcing layers:

- Knowledge management as infrastructure: Turner & Townsend's Cube methodology codified lessons and practices from previous projects into reusable processes and templates, enabling consistent knowledge capture and application across the organization to support current project delivery. This observation refines the initial conceptual framework (figure 2.1), which depicted the intermediary primarily as a channel for transferring knowledge between organizations; in practice, the intermediary also actively consolidates and standardises this knowledge before sharing it onward, functioning as a structured platform rather than a passive channel.

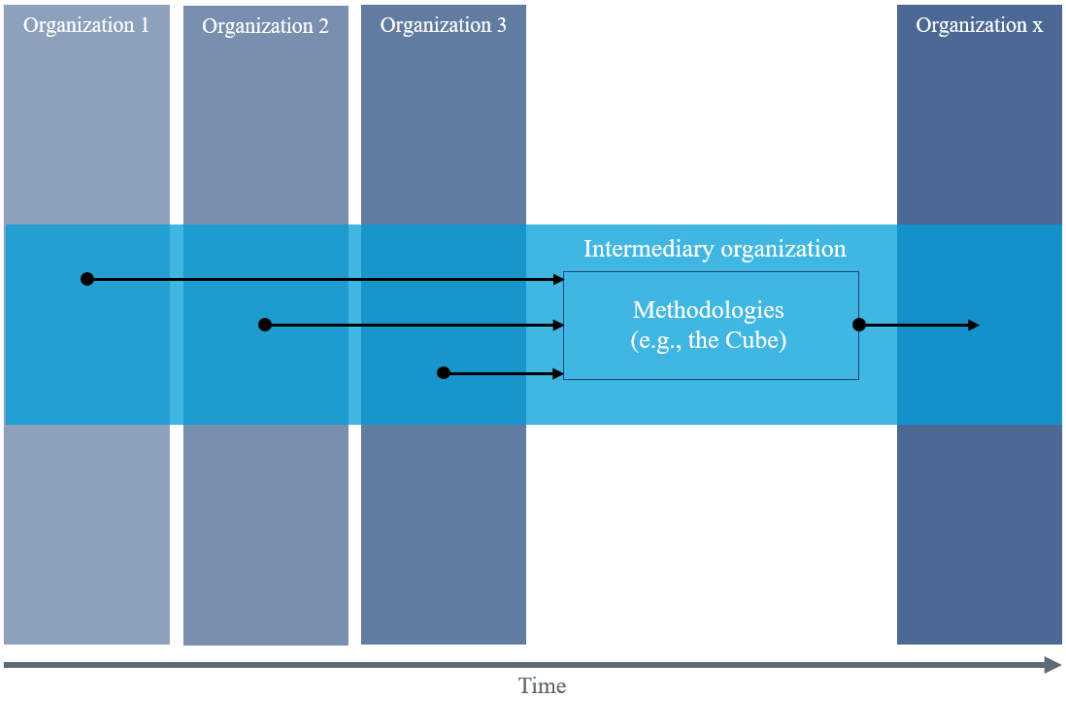

Figure 7.2: Empirical refinement of the conceptual framework, illustrating how the intermediary not only transfers knowledge between organizations but also codifies and standardises it (e.g., through the Cube methodology) before redeployment, enabling structured knowledge flows.

- Organizational learning as behavioural change: At Net Zero Teesside, risk-scenario workshops used these knowledge management tools to prompt participants to reflect critically on their contracting assumptions. This facilitated double-loop learning by challenging established practices and encouraging alternative approaches, illustrating the interpreting and integrating stages of the 4I framework in a live project setting.
- Inter-organizational learning as relational channel: Acting as a neutral knowledge broker, Turner & Townsend facilitated the transfer of insights across organizational boundaries - among BP, EirGrid, and 20+ operators within the Performance Forum. This enabled individual learning processes to scale beyond single firms, supporting the development of shared capabilities across the sector. Compared to the initial conceptual framework of figure 2.1, which depicted the intermediary mainly as a channel for moving knowledge between organizations, the empirical evidence from the Performance Forum refines this view by showing how the intermediary actively collects, anonymises, and benchmarks data before returning structured insights to all participants. Additionally, the intermediary coordinates equal voting, study groups, and annual workshops,

transforming the knowledge flows into an ongoing, collaborative process that strengthens sector-wide inter-organizational learning and collective decision-making.
For Net Zero Teesside and Celtic Interconnector, the inter-organizational transfer mechanism takes a hybrid form that combines the initial conceptual framework (figure 2.1) with the delivery codification framework above (figure 7.2). Lessons from previous engagements move along the knowledge flow sequence of the initial framework (e.g., anonymised cost benchmarks and market intelligence), while the Cube methodology provides the codified templates through which those lessons are immediately embedded in project controls and reporting. In practice, Turner & Townsend deploys the right expertise (human resources) to the right project, underpinned by Cube-based processes, so that knowledge captured on Project A is standardised and rapidly redeployed on Project B - compressing the time between learning and application.

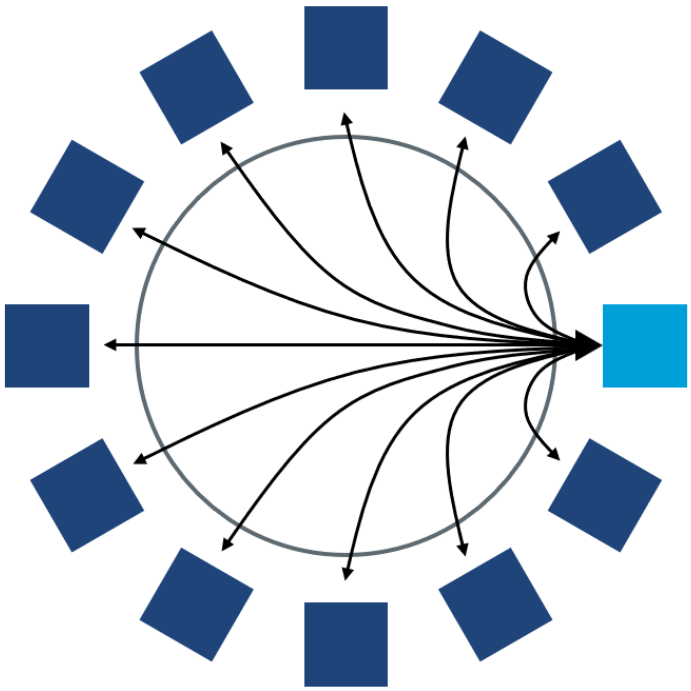

Figure 7.3: Conceptual Performance Forum framework: a round-table model in which the intermediary gathers project data, performs anonymised benchmarking, and redistributes insights while coordinating equal voting and collaborative workshops.

Positioning the intermediary
Because Turner & Townsend operates outside the core processes of client organizations while managing the underlying knowledge systems, it is suggested its able to align these learning layers more rapidly than internal teams typically can. In this way, the firm facilitates an intermediary-accelerated 4I process: intuiting and interpreting occur collaboratively within combined client–consultant teams, while integrating and institutionalising are advanced early through the use of shared tools such as the Cube and other standards such as ISO. This mechanism helps to explain why clients primarily sought capability development rather than simple capacity supplementation when engaging Turner & Townsend.

Implication for the remaining subsections
The five literature-linked subsections that follow examine distinct aspects of this layered dynamic: capability brokerage, structural neutrality, structured benchmarking, adaptive delivery, and compressed learning cycles. Each represents a tangible example of the progression from knowledge management, to organizational learning, to inter-organizational learning described in this section.

7.1.2. Capability-Centric Engagement and Knowledge-Broker Theory

Clients in all three cases enlisted Turner & Townsend for specialised know-how rather than simply capacity augmentation. The level of support then expanded or contracted as project risk changed,

revealing a fundamentally capability-centred motive for engaging the intermediary.

This observation is consistent with the knowledge-broker literature, which views intermediaries as actors that mobilise and recombine distributed expertise (Sohi & Matthews, 2019). It also extends earlier empirical work by Apostolou et al. (2003) by showing that scalability, rather than brokerage alone, has become the dominant engagement driver in large capital projects.

The cases therefore suggest that brokerage theory should pay closer attention to temporal flexibility. An effective intermediary behaves as a 'fluid capability platform', re-configuring its depth and duration of involvement along the Build–Partner–Burst framework introduced in figure 6.9. Recognising this design parameter can help both researchers and practitioners explain why some learning arrangements are short and intense, while others evolve into long-term partnerships.

7.1.3. Trust and Neutrality as Data-Sharing Enablers

Across the case studies, Turner & Townsend's role as a neutral party made it possible for organizations to share cost and schedule data that they would not have shared directly with competitors. This finding highlights the importance of institutional positioning in unlocking data flows critical for inter-organizational learning in complex project environments.

The result aligns with boundary-spanning literature, which emphasises the role of interpersonal trust in facilitating knowledge exchange across organizational boundaries (Fagundes & Gasparetto, 2023). However, the findings also nuance this perspective by showing that individual-level trust, while valuable - as seen in the Celtic Interconnector case where the project director acted as a boundary spanner in the early phases of the engagement - is not always sufficient to enable broader data sharing. In contexts such as the Performance Forum and Net Zero Teesside, where commercial sensitivities were high, the presence of a neutral, institutionalised broker was necessary to structure and sustain data-sharing processes beyond what individual relationships alone could achieve.

This suggests that neutrality can act as a structural substitute for trust, providing a platform for data exchange before bilateral/interpersonal or network-based trust has fully developed. For practice, this implies that energy-transition organizations should consider embedding neutral data facilitators at an early stage to accelerate collective learning, rather than assuming that trust will emerge organically over time.

7.1.4. Data-Enabled Benchmarking and Learning Loops

In both the Performance Forum and Net Zero Teesside, Turner & Townsend used anonymised cost and schedule benchmarks to convert fragmented project figures into a continuous learning loop. By comparing live estimates and close-out data with industry medians, project teams confronted optimism bias early and used the results to support key investment stage-gate decisions.

This mechanism resonates with the energy-sector literature that stresses the value of structured benchmarking. Sabidussi and Wasser (2024) show how internal benchmarking and readiness taxonomies help firms assess their transition capacity, while Bossink (2020) identifies performance comparison as one of six learning strategies in demonstration projects. The present cases extend those insights by illustrating how a neutral intermediary can broker cross-organizational benchmarks, thereby overcoming commercial sensitivities that typically limit data exchange. The approach also operationalises the "knowledge audit" step advocated by Edwards (2008), replacing ad hoc audits with an ongoing, standardised data-sharing routine.

When facilitated by a trusted broker, benchmarking acts as a transferable mechanism of organizational memory: it preserves lessons that might otherwise be lost as staff rotate or projects close, and it offers tailored comparisons that organizations can act on immediately. For knowledge management practice, the implication is that investing in shared reference standards and neutral data coordination may yield greater learning returns than expanding stand-alone repositories.

7.1.5. Adaptive Delivery Methods

Across all three cases, Turner & Townsend applied proven project-control frameworks - most notably the Cube methodology and ISO 19008 cost coding - from mature sectors and tailored them to assets

such as the carbon-capture plant and subsea interconnector. Doing so gave client teams an immediate structure for baselining, risk reviews, and change control.

This pattern resonates with energy-transition studies that stress the need for internal readiness and agile capability development. Sabidussi and Wasser (2024), for example, argue that firms require both capacity (resources, routines) and agility (rapid adaptation) to navigate new technologies, while Bossink (2020) list systematic learning tools among six strategies for demonstration projects. The findings refine that picture by showing how an intermediary can temporarily "lend" structured routines to organizations whose own absorptive capacity is still limited (Van Wijk et al., 2008). On the Celtic Interconnector, this was achieved by embedding shadow counterparts who learned the methods in situ, suggesting that part of a firm's absorptive capacity can be outsourced and then internalised.

In effect, the intermediary acts as a capability bridge, allowing project owners to bypass the slow, iterative development of internal systems - an insight of particular relevance for policymakers seeking to accelerate energy-transition projects that cannot afford multi-year learning curves.

7.1.6. Sustained Learning Impact

Across the cases, capability development was intentional rather than a side effect. For example, Turner & Townsend paired its specialists with client "shadows", embedded new key-performance indicators, and standardised templates so that project routines would remain fully operable once its direct involvement tapered off. This approach ensured that the practices introduced during the engagement could be maintained and replicated on subsequent programmes, strengthening the client's long-term self-sufficiency while demonstrating the consultant's added value.

This pattern adds nuance to the 4I learning framework proposed by Crossan et al. (1999). Rather than progressing strictly from individual intuiting through group integration to organizational institutionalisation, the firms and the intermediary co-created practices from the outset and institutionalised them in parallel with day-to-day delivery. In addition, several risk-scenario workshops showed elements of so-called triple-loop learning (reflection on how the organization learns) highlighted in recent energy-sector studies (Liu, 2021). In these cases, it emerged when the intermediary encouraged clients to question not only what they were doing, but how they were absorbing new knowledge, for example by using scenario workshops to reflect on risk assumptions or by introducing peer reviews to evaluate the effectiveness of new reporting templates.

Taken together, the cases point to an intermediary-accelerated 4I cycle: intuiting and interpreting occur within client–consultant partnerships; integration is front-loaded through shared tools; and institutionalisation happens concurrently rather than sequentially. For organizations under transition pressure, this compressed pathway offers a practical route to embed new routines without waiting for lengthy, organic diffusion.

As a final step in this section, table 7.1 maps each headline finding against the literature it confirms, refines, or nuances, visually highlighting the study's integrative contribution.

Headline finding	Confirms	Extends or refines	Nuances or challenges
Intermediary as capability platform	Knowledge-broker role in mobilising expertise (Sohi & Matthews, 2019)	Shows Build–Partner–Burst as design variable shaping outcomes	Challenges view of brokers as static connectors
Structural neutrality enables data sharing	Trust-based boundary-spanning literature (Fagundes & Gasparetto, 2023)	Shows neutrality can substitute for slow trust in regulation-heavy contexts	Questions assumption that trust is always needed for data sharing
Structured benchmarking as comparison mechanism	Value of benchmarking for transition readiness (Sabidussi & Wasser, 2024)	Shows continuous anonymised benchmarking linking knowledge management to action	Indicates repositories alone are insufficient without comparison logic
Adaptive delivery as capability bridge	Need for agile readiness in projects (Bossink, 2020)	Shows transfer of Cube and ISO practices across sectors	Challenges view that absorptive capacity must pre-exist internally
Intermediary-accelerated 4I cycle	Sequential 4I framework (Crossan et al., 1999)	Shows compression of stages and inclusion of triple-loop reflection	Challenges view of 4I as strictly sequential

Table 7.1: Mapping headline findings against literature they confirm, extend, or nuance. This table summarises the study's integrative contribution.

7.2. Theoretical Contributions

This study advances the literature on learning and intermediation in five interrelated ways.

First, it introduces the notion of an intermediary as a capability platform. While existing typologies often portray intermediaries as static connectors, the Build–Partner–Burst framework demonstrated in the cases shows that the depth and duration of intermediary engagement can be treated as strategic design variables that shape learning outcomes. Rather than functioning as one-off transfer mechanisms, intermediaries can be understood as configurable platforms for building and transferring capabilities across projects.

Second, the findings reframe neutrality from a purely relational quality into an institutional asset that can substitute for slow trust formation. Whereas boundary-spanning theory typically emphasises the gradual development of interpersonal trust, the study shows how structural neutrality - illustrated by the Performance Forum's voting mechanisms and data-handling protocols in Net Zero Teesside - can enable the sharing of sensitive data in regulation-heavy or competitive environments, thereby facilitating inter-organizational learning where bilateral trust alone may be insufficient.

Third, the study empirically details benchmarking as a structured comparison mechanism. Knowledge management literature often describes the creation of repositories without specifying how data is converted into actionable insights. The anonymised and standardised benchmarking processes observed in the Performance Forum and Net Zero Teesside demonstrate how intermediaries can transform fragmented project data into meaningful comparisons that directly support decision-making. This mechanism bridges codified knowledge management practices with live organizational learning and cross-firm learning processes.

Fourth, it challenges conventional assumptions within absorptive-capacity theory by showing that capability can be temporarily accessed and transferred through structured shadowing and embedded consultancy practices. In the Celtic Interconnector and Net Zero Teesside cases, organizations were able to adopt and internalise high-level project control routines through close collaboration with the intermediary, demonstrating that absorptive capacity is dynamic and co-created rather than a fixed internal attribute.

Finally, the study advances organizational-learning theory by demonstrating an intermediary-accelerated 4I cycle. Whereas the 4I framework is often viewed as a sequential, internally driven process, the findings show that intermediaries can compress the stages of intuiting, interpreting, and integrating within joint client–consultant teams, while institutionalisation is advanced early through shared tools such

as the Cube methodology and ISO-aligned standards. In some instances, this process also facilitated triple-loop learning, enabling organizations to reflect not only on their actions but on their learning processes themselves.

Taken together, these contributions reposition intermediaries from peripheral facilitators to orchestrators of systemic learning capability, providing a lens through which to understand their role in accelerating knowledge transfer and capability development within sectors facing high-pressure energy transition challenges.

7.3. Summary of Discussion

This chapter has integrated the study's findings with the wider learning literature, illustrating how Turner & Townsend operates as a configurable capability platform that blends codified knowledge management, accelerated organizational learning, and inter-organizational knowledge exchange. By leveraging structural neutrality, structured comparison mechanisms, and adaptive delivery routines, the intermediary compresses traditional learning cycles and enables rapid, evidence-based decisions in (first-of-a-kind) energy projects. These insights extend knowledge broker, knowledge management, dynamic capabilities, and organizational learning theories by emphasizing scalability, neutrality as an institutional asset, benchmarking as a structured comparison mechanism, and the intermediary-accelerated 4I cycle. Together, these insights provide the basis for the study's conclusion, in which the research questions are addressed, before moving to the final chapter on limitations and recommendations.

8

Conclusion

This chapter concludes the thesis by bringing together the main findings and directly answering the research questions that guided the study. It synthesises the results from the case analyses and the discussion, showing how they contribute to understanding the role of intermediaries in accelerating learning within energy-transition projects. In doing so, it clarifies the study's contribution to both academic literature and professional practice before moving to the next chapter on limitations, recommendations, and future research directions.

8.1. Recap of Study Aims and Approach

This research set out to investigate how intermediaries can accelerate learning within energy transition projects, with a focus on the structured knowledge flows and facilitation practices that enable organizations to deliver complex or unfamiliar projects more effectively. Using Turner & Townsend as an illustrative case, the study explored how knowledge management, organizational learning, and inter-organizational learning interact to close capability gaps, embed learning within project delivery, and support sector-wide knowledge sharing. In doing so, the research aims to guide scholars and practitioners in understanding how intermediaries can actively contribute to more efficient and timely energy transition initiatives.

This objective is captured in the main research question of this thesis:

> **How can the energy sector make use of intermediaries to improve inter-organizational learning and accelerate the energy transition?**

To address this question, the study employed a multi-case research design, examining three in-depth cases across different energy transition contexts. The study drew on 15 semi-structured interviews as its primary data source, capturing insights from diverse stakeholder perspectives across the examined cases. By analysing the mechanisms through which intermediaries collect, codify, and redeploy knowledge across project environments, the research provides insights into how intermediaries can systematically strengthen cross-project learning and decision-making. This research aims to offer guidance to scholars and practitioners seeking to enhance their understanding of how intermediaries can support sector-wide learning, contributing to more effective and timely delivery of energy-transition initiatives.

8.2. Answers to the Research Questions

To systematically address the main research question, a series of sub-questions were developed and are answered in the following sections. By first addressing these sub-questions individually, the study builds towards a comprehensive synthesis, providing a grounded and integrated answer to the main research question at the end of this chapter.

8.2.1. Research Question 1

What distinctions do existing studies draw between organizational learning, knowledge management, and inter-organizational learning, and how are these viewed in the energy sector?

The literature positions organizational learning, knowledge management, and inter-organizational learning as inter-linked but analytically separable constructs that operate at different contexts and through different mechanisms. Organizational learning focuses on how a single firm acquires, interprets, and embeds knowledge in routines, cultures, and mental models. Classic definitions stress experiential change - progressing from single-loop error correction to double- and triple-loop reflection on underlying assumptions and learning processes themselves. Frameworks such as the 4I model (intuiting, interpreting, integrating, institutionalising) illustrate how learning moves from individuals to groups and, ultimately, to firm-wide practices. In this view the unit of analysis is the organization, and the outcome is behavioural change - revised KPIs, new governance templates, or novel project-control routines that persist beyond the tenure of any single employee.

Knowledge management is concerned less with behavioural change and more with the systematic handling of the knowledge base on which learning draws. The knowledge management literature emphasises socio-technical infrastructures - people, processes, and technology - that capture, codify, store, and disseminate both explicit and tacit knowledge. Effective knowledge management blends codification strategies (e.g., databases, cost-code templates) with personalisation strategies (e.g., communities of practice) to ensure that what is learned can be retrieved and recombined when needed. Thus, knowledge management is not learning per se but an enabling layer that makes reliable data, benchmarks, and collective memory available for future organizational learning cycles.

Inter-organizational learning extends the process across organizational boundaries when no single actor possesses the full breadth of expertise required. Here, the emphasis shifts to relational conditions - trust, power balance, absorptive capacity, and governance mechanisms - under which knowledge is exchanged, adapted, and co-created among partners. Complementary and supplementary knowledge are blended, and routines are jointly adapted rather than unilaterally transferred.

In the energy sector these distinctions acquire heightened importance because projects are technologically complex, capital intensive, and subject to volatile policy frameworks. Studies show that energy firms rely on internal organizational learning to update risk logs and delivery practices, yet they struggle to retain tacit expertise in the face of ageing workforces and project-based team turnover. Knowledge management becomes critical for codifying lessons so that scarce expertise is not lost. Finally, inter-organizational learning is necessary for integrating chemical, electrical, civil, and digital competencies distributed across (conventional) energy companies, utilities, equipment manufacturers, regulators, and research institutes. Empirical work on wind, solar, hydrogen, and interconnector programmes confirms that the ability to span organizational boundaries - often through intermediaries - is what ultimately determines whether learning scales from one asset to the next in time to meet net-zero targets.

8.2.2. Research Question 2

How have intermediaries been defined and theorized in the inter-organizational learning literature?

Across the inter-organizational learning literature, intermediaries are theorised as actors - individuals, teams, or institutions - that bridge structural gaps between otherwise disconnected organizations and thereby enable knowledge flows that would not occur through bilateral ties alone. Three overlapping terms recur frequently in the literature. Knowledge brokers are formal entities that architect, operate, and curate learning networks; they recruit participants, design governance rules, and supply IT platforms that support both tacit and explicit knowledge exchange. Information intermediaries (e.g., public research institutes, consultants) are organizations that stand outside the primary value-creating processes of the parties they serve; their neutrality allows them to reconcile interests, translate vocabularies, and aggregate or anonymise sensitive performance data. Boundary spanners are individual employees - project managers, engineers, expatriates - who sit at the interface of partnering firms; their personal relationships, trust, and contextual understanding facilitate day-to-day transfer of tacit know-how.

Theorisation has evolved from viewing intermediaries as static conduits of information to recognising

them as dynamic capability platforms. In structured networks (e.g., Austrian automotive clusters, Dutch municipal benchmarking initiatives) brokers assume codified roles such as architect, caretaker, and lead operator, deliberately shaping both the content and the quality of learning. At the individual level, boundary spanners enact a dual logic of trust and calculation: they must build interpersonal rapport while satisfying their home organization's strategic interests. More recent research highlights that intermediaries themselves are embedded in power relations and incentive structures; neutrality is therefore an institutional attribute that must be designed and safeguarded - not an inherent quality. In regulation-heavy and competitive settings, structural neutrality (equal voting rights, anonymised data protocols) can substitute for the long time horizons otherwise needed to cultivate bilateral trust.

Collectively, these perspectives portray intermediaries as orchestrators of inter-organizational learning systems. They do not just transmit knowledge; they identify complementarities, standardise data, manage intellectual-property risks, and align divergent timelines. The energy transition literature positions such actors as important for combining fragmented capabilities across supply chains, policy agencies, and technology domains, thus accelerating the diffusion of practices required to meet goals.

8.2.3. Research Question 3

How and why do energy sector organizations engage with intermediaries, and what mechanisms do intermediaries apply to facilitate inter-organizational learning?

Energy-sector clients turn to intermediaries primarily to bridge immediate capability gaps and de-risk unfamiliar project scopes. In the Net Zero Teesside and Celtic Interconnector cases, client organizations lacked mature commercial-controls expertise or subsea–cable experience, yet could not justify permanent head-count expansion for what might be a once-in-a-decade undertaking. Turner & Townsend's "Build–Partner–Burst" spectrum allowed each client to calibrate support - ranging from a short "burst" of turnkey controls staff for BP's carbon-capture facility to a longer "build" engagement that paired EirGrid deputies with seasoned programme directors. Beyond pure resourcing, clients also sought independent insight. Performance Forum members, for example, needed external assurance that multi-billion-dollar budgets were competitive; Turner & Townsend's neutrality and thirty-year benchmark history delivered that credibility.

To supply this value, the intermediary mobilised three reinforcing mechanisms. First, it deployed people and capacity - purposefully selected specialists whose prior exposure to the client's governance model or to comparable megaprojects reduced ramp-up time and transferred tacit know-how through direct, daily collaboration. Second, it introduced codified processes and tools, most visibly the Cube methodology, which standardised reporting, accelerated baselining, and embedded lessons from mature sectors in first-of-kind contexts. Third, it developed data-driven insight via an anonymised benchmarking platform that translated raw cost and schedule data into decision-ready comparisons. Together, these mechanisms converted an initial mandate for extra human resources into a structured process for inter-organizational learning.

8.2.4. Research Question 4

What are the key challenges and enablers affecting knowledge exchange and learning in the energy transition context, and how do intermediaries navigate these?

Three recurrent challenges constrained knowledge flow across the cases. Information & knowledge gaps arose because novel technologies (e.g., a large-scale carbon capture and storage facility) lacked precedents, leaving estimators without reliable reference data. Organization & people constraints originated from industry-wide attrition and siloed cultures: firms were reluctant to share proprietary information and, in many instances, no longer retained deep in-house expertise. Finally, the external environment - characterised by divergent regulatory regimes and strict anti-trust rules—imposed hard boundaries on what could legally be exchanged, forcing parallel workstreams and meticulous segregation of sensitive data.

Turner & Townsend mitigated these obstacles through a triad of enablers. First, data & technology: bespoke anonymisation engines and flexible submission templates allowed incomplete or commercially sensitive datasets to enter a shared analytical pool without breaching confidentiality. Second, people & collaboration: the firm's perceived neutrality, reinforced by equal-voting rules in the Performance

Forum and balanced representation in joint workshops, built the trust needed for candid exchange. Third, adaptive delivery methods: by importing proven governance frameworks from aviation, rail, and petrochemicals - then tailoring them to carbon-capture plants or subsea cables - the intermediary offered clients a familiar control structure that reduced uncertainty and encouraged data transparency. These enablers did not eliminate structural barriers, but they lowered them enough to sustain cross-boundary learning loops under demanding energy transition timelines.

8.2.5. Research Question 5

What is the impact of intermediary-facilitated learning for client organizations, and to what extent is this learning sustained beyond the intermediary's involvement?

Intermediary engagement produced capability gains that exceeded short-term task completion. Clients absorbed structured project-control routines, risk-scenario techniques, and ISO-based coding - all of which persisted in organizational playbooks after the consultant's engagement ends. On Celtic Interconnector, a deliberate shadowing model mentored EirGrid deputies in real time, while on Net Zero Teesside, Turner & Townsend embedded Cube-driven reporting processes that were well received by project staff and helped shape BP's early-phase delivery approach for the carbon-capture facility. At sector level, the Performance Forum institutionalised thirty years of benchmarking logic, ensuring that cost-efficiency insights remained accessible to future members regardless of individual staff turnover.

Sustainability hinges on two conditions. First, codification: tools, dashboards, and standard operating procedures must be embedded in client systems so that knowledge survives personnel changes. Turner & Townsend addressed this by handing over editable Cube libraries and ISO-aligned WBS templates. Second, pipeline relevance: newly acquired skills must find expression in upcoming projects; otherwise, they are lost over time. Where owners foresee a stream of similar assets - offshore wind grids for EirGrid, additional CCS facilities for BP - the transferred capability is continually rehearsed and refined. Conversely, in one-off "burst" assignments the learning risk reverts to the intermediary unless industry platforms, such as the Performance Forum, capture and recycle it. Overall, the evidence indicates that intermediary-facilitated learning endures when it is both codified and repeatedly exercised within a live project portfolio.

8.2.6. Main Research Question

How can the energy sector make use of intermediaries to improve inter-organizational learning and accelerate the energy transition?

The evidence across the three cases shows that intermediaries accelerate inter-organizational learning when they are engaged not merely as temporary consultants but as configurable enablers of capability building. Energy sector organizations first identify the knowledge domains in which they face unfamiliar delivery expertise due to technology risk (e.g., carbon capture) or lack of in-house expertise. Organizations then select an engagement mode along the Build–Partner–Burst framework: Build when the long-term goal is to internalise full project capability, Partner when external and internal teams will co-pilot delivery for an extended period, and Burst when a short, intensive deployment of expertise is sufficient. This strategic fit ensures that the intermediary's people, processes, and data tools are matched to the client's absorptive capacity and future project pipeline, maximising both near-term performance and longer-term knowledge retention.

Once in place, intermediaries improve learning through the following three primary mechanisms:

1. Specialist mobilisation - purposefully selected staff with prior exposure to comparable megaprojects minimise time required to achieve operational effectiveness and transfer tacit know-how through daily collaboration and structured shadowing.
2. Codified delivery systems - proven frameworks such as the Cube, ISO-aligned cost codes, and risk-scenario workshops—embed lessons from mature sectors into first-of-a-kind energy assets, turning ad-hoc insights into reusable organizational routines. These established foundations are further tailored through targeted SME input, scenario-based workshops grounded in well-founded assumptions, and transparent decision-making processes, ensuring that technology parallels are adapted to the specific risks, supply chains, and design contexts of emerging new energy projects.
3. Data-driven benchmarking - anonymised, standardised benchmarking processes convert fragmented

project data into sector-wide reference points, confronting optimism bias and grounding investment decisions in evidence rather than opinion. Crucially, these mechanisms are underpinned by structural neutrality (equal voting rules, strict confidentiality protocols) that substitutes for the slow formation of bilateral trust and unlocks data flows that proprietary relationships often obstruct.

Sustained impact depends on two reinforcing conditions. First, client organizations require a visible project pipeline in which newly acquired routines can be repeatedly exercised; without this continuity, capability erodes, forcing the sector to relearn on each subsequent project. Second, where such a pipeline exists, the organization's ability to absorb and re-apply transferred knowledge becomes critical. This absorption may occur through codified tools and templates - such as transferred Cube templates and ISO-aligned work-breakdown structures - which embed lessons in delivery routines, or through shadow-pairing models that enable tacit knowledge transfer and practical confidence in executing complex scopes. Benchmarking insights also play a role by challenging assumptions and informing procurement, scheduling, and contracting practices in future projects. Where continuous internal deployment is unlikely, for example in one-off subsea cables or pilot hydrogen hubs, industry-level learning platforms such as the Performance Forum can act as a collective memory, ensuring that lessons remain accessible to other actors facing similar challenges.

In summary, the energy sector can best leverage intermediaries by engaging them early as neutral, capability-oriented partners; by aligning the depth and duration of support to each project's risk profile; and by institutionalising the resulting people–process–data configuration inside both organizational playbooks and cross-firm learning networks. When these conditions are met, intermediaries do more than fill temporary resource gaps - they enable systemic learning cycles that shorten delivery timelines, improve decision quality, and cumulatively accelerate progress toward energy transition goals.

9

Recommendations and Limitations

This final chapter translates the thesis's findings into forward-looking guidance while outlining the study's boundaries. It opens with concrete recommendations for project owners, intermediaries, and policy-makers seeking to embed accelerated learning in energy transition delivery. A subsequent considerations section surfaces contextual factors - such as internal knowledge-management practices, expectation gaps, and improvement suggestions voiced by interviewees - that practitioners should keep in view when applying the recommendations. The chapter then identifies research directions that could deepen, test, or broaden the present insights, before discussing methodological and analytical limitations that shape how far the results can be generalised. Together, these elements ensure that the thesis concludes not only with prescriptive advice but also with a clear appreciation of its scope and the questions that remain.

9.1. Practical Recommendations

This section outlines practical recommendations for project owners, intermediaries, policymakers, and industry bodies seeking to strengthen inter-organizational learning within the energy transition. The recommendations translate the study's findings into actionable steps that can enhance capability development, improve data-driven decision-making, and accelerate delivery of complex low-carbon infrastructure.

1. Engage intermediaries prior to scope and contract lock-in.
Project owners should involve intermediaries at the earliest possible stage, before key scope and contracting decisions become fixed. The findings show that intermediaries deliver the most value when engaged to facilitate exploratory workshops, scenario planning, and benchmarking activities prior to finalising contracting strategies. Early involvement prevents the locking in of cost structures and information silos that are difficult and costly to reverse later in the project lifecycle. By reserving targeted initial funding within strategic procurement arrangements for this early-stage learning mobilisation, organizations can create the conditions for smoother delivery, faster learning loops, and lower overall project risk.

2. Leverage digital tools and AI to streamline knowledge infrastructure.
The study highlights that current efforts to collect, anonymise, and share cost and schedule data across projects are often labour-intensive and manual, consuming valuable time and resources that could otherwise advance project delivery. To address this, intermediaries, potentially in collaboration with industry associations, should invest in scalable, cloud-based knowledge infrastructures that integrate AI and machine learning techniques to automate data cleaning, classification, and anomaly detection. By applying advanced models to systematically process and analyse large, cross-project datasets, these infrastructures can accelerate learning cycles, reduce optimism bias in estimates, and enhance the quality of investment decisions. Furthermore, aligning these systems with ISO taxonomies and enabling API-based access would facilitate integration with live dashboards, supporting continuous, project-to-project learning and enabling organizations to transition from ad hoc data exchange to structured, real-time

knowledge sharing.

3. Expand new energies benchmarking to a broader membership base.
For the Performance Forum and similar benchmarking initiatives, there is an opportunity to attract non-oil and gas actors, including hydrogen, CCS, and renewable energy developers, into structured benchmarking programmes. While potential members may be hesitant to share project data due to concerns about confidentiality and intellectual property, intermediaries can design targeted incentivisation systems - such as participation credits, prioritised access to comparative insights, or tailored benchmarking reports - to encourage membership and data contributions. By expanding the membership base beyond conventional operators, the benchmarking platform can build a richer dataset on emerging technologies, allowing the sector to accelerate learning curves and improve the competitiveness of first-of-a-kind low-carbon assets.

4. Leverage intermediaries as evidence-based facilitators for policy feedback.
Policymakers, regulators, and intermediaries should formalise periodic exchanges where aggregated, anonymised project evidence on regulatory and delivery bottlenecks can be shared with policy bodies. Intermediaries are well-positioned to identify patterns across projects, such as marine permitting delays or supplier qualification bottlenecks, and can channel these insights into structured dialogues with regulators. This approach elevates the intermediary's role from project-level facilitator to sector-level knowledge broker, ensuring that lessons from individual projects accelerate approvals, standardisation, and system-level improvements across jurisdictions.

5. Systematise contextual tailoring of proven delivery frameworks.
While intermediaries already apply an "80% proven, 20% tailored" approach - drawing on tools like Cube methodologies - this contextualisation can be made more deliberate. The case findings emphasise the importance of scenario workshops, assumption testing, and decision audits in adapting delivery models to first-of-a-kind project settings. To build on this, intermediaries should establish structured feedback loops that track how tools perform across different technical and regulatory contexts. These insights can then be codified into modular templates or scenario playbooks, helping future teams benefit from past adaptations and strengthening learning continuity across projects.

9.2. Considerations for Implementation

While the previous recommendations outlined actionable steps for project organizations and intermediaries, this section highlights additional considerations that emerged during the study. These considerations do not directly answer the research questions but surfaced during interviews and analysis as relevant factors that may influence the effective implementation of intermediary-facilitated learning within energy transition projects. They capture reflective insights on the intermediary's internal practices, expectations management with clients, and improvement suggestions provided by interviewees themselves. By bringing these forward, the section aims to inform practitioners and researchers of important dynamics that may affect the planning, delivery, and scaling of inter-organizational learning efforts in the energy sector.

9.2.1. Internal Knowledge Management Practices

Turner & Townsend's internal learning system combines a digital backbone with strong social networks. A central people network environment - branded The Hive - stores case studies, staff CVs, and methodology libraries, allowing consultants to "reach back" to subject-matter experts across regions. Governance protocols ring-fence Performance Forum data and client benchmarks, protecting confidentiality while still letting authorised staff draw on anonymised insights. Ongoing upgrades aim to unify fragmented repositories and pilot AI-driven search so users can retrieve, for example, "all carbon-capture lessons" without manual tagging.

The digital layer is reinforced by people-centric exchange. Regular lunch-and-learns, regional cost-centre meetings, and energy-practice forums help consultants identify "who has done this before," while ad-hoc calls and mentoring provide rapid, tacit know-how transfer. Formal education partnerships (e.g., offshore-substation courses) and internal lessons-learned workshops keep teams current and broaden participation beyond a small circle of senior presenters.

Three improvement gaps remain. First, inconsistent metadata and infrequent updates reduce confidence

in repository searches, forcing staff back to informal networks. Second, resource constraints have slowed the capture of new-energy cost data, jeopardising the timeliness of benchmarks promised to clients. Third, feedback from live projects to methodology owners is ad-hoc, limiting the firm's ability to refine tools such as the Cube. Clear data management roles, incentive schemes for timely uploads, and a formal "close-the-loop" process would strengthen Turner & Townsend's knowledge infrastructure and, by extension, its intermediary effectiveness.

9.2.2. Expectation Alignment and Delivery Challenges

Across the three cases, expectation gaps surfaced most visibly in the definition and delivery of scope. At project outset, several clients provided only broad objectives, leaving Turner & Townsend to infer the precise mix of commercial controls, project management, and assurance activities required. Where contracts had already established bespoke processes - such as RTE's document control system on Celtic Interconnector - the consultant's standard toolkits could be only partially applied, creating role ambiguities and resourcing frictions. Early, transparent scoping workshops and explicit mapping of "in-house", "intermediary", and "sub-consultant" responsibilities were therefore critical in converting loosely framed requirements into coherent work packages and preventing duplication or unsupported hand-offs later in delivery.

A second cluster of gaps related to information and communication. Clients expected rapid access to benchmarking data and insight, yet the underlying datasets were still being assembled - especially for emerging asset classes such as hydrogen plants. Where data pipelines lagged, frustration arose over the pace and granularity of outputs, and, in split-scope arrangements, important procurement decisions sometimes proceeded without mutual feedback to the intermediary. These shortfalls underscore the need for jointly agreed data collection schedules, shared dashboards that track progress against those schedules, and structured forums to explain deviations or late inputs in real time.

Not all engagements exhibited misalignment. In several instances, Turner & Townsend's capabilities exceeded client expectations, leading to requests for extended digital-controls support or additional advisory services. Conversely, some owners, such as BP on Net Zero Teesside, consciously limited their interest in long-term knowledge transfer, viewing the intermediary as a temporary capability bridge rather than a learning partner. Taken together, the cases suggest that sustained alignment hinges on three levers: (i) co-created scope definitions that acknowledge contractual constraints, (ii) realistic, jointly monitored data-provision plans, and (iii) an upfront conversation about the depth of learning the client actually wishes to internalise.

9.2.3. Opportunities for Strengthening Intermediary Practice

Across the interviews stakeholders converged on three broad opportunities for Turner & Townsend to strengthen its intermediary role. First, continuous data and digital capability upgrades emerged as a priority for enhancing Turner & Townsend's intermediary effectiveness. Interviewees highlighted that current data processes remain heavily manual, with repetitive spreadsheet work slowing insight generation and limiting benchmarking potential. There is strong interest in adopting automated data collection tools such as LIDAR-enabled site scanning (e.g., QuanTTum) alongside machine-learning models to streamline outlier detection and variance analysis. Such digital transformation would free staff from time consuming tasks while producing richer cost, schedule, and carbon datasets to support faster, data-driven decision-making across projects and within the Performance Forum.

Second, building broader collaborative learning networks was seen as essential for sustained improvement. Participants noted that opening up Performance Forum activities to universities, data scientists, and other advanced analytics sectors could bring in fresh perspectives while accelerating methodological advancements for benchmarking new energy technologies. Targeted partnerships with academia, cross-disciplinary workshops, and collaborative innovation sprints were identified as practical steps to translate lessons from data-mature industries and support the sector's evolving needs in hydrogen, CCS, and ammonia projects.

Finally, there is a strong case for making intermediary value more visible and user-centred while aligning with strategic growth opportunities. Interviewees emphasised the need to maintain up-to-date internal knowledge systems to enable quick expertise matching, while externally demonstrating quantifiable benefits - such as cost savings or reduced delivery times - attributable to benchmarking initiatives.

This would strengthen the Performance Forum's positioning as a trusted intermediary while supporting member retention and expanding engagement beyond conventional oil and gas participants. Flexible membership models and clear demonstration of impact would allow Turner & Townsend to scale its influence while supporting the energy transition's evolving demands.

9.3. Recommendations for Future Research

The current study shows that using intermediaries focused on building client capabilities can accelerate learning in complex energy transition projects. However, the evidence so far comes from only three cases within a single consultancy. Future research should therefore expand the scope to include different types of intermediaries, such as engineering contractors, public research centres, and government-led transition agencies. This would help test whether approaches like the Build–Partner–Burst model work across different organizations or if they depend on commercial business models. Additionally, looking at other energy assets - such as offshore hydrogen hubs or long-duration carbon storage projects - could clarify whether the mechanisms found in this study also apply to projects with different risks, technologies, and regulatory environments.

Another important area for future research is to measure how much and how consistently intermediaries help organizations learn over time. Long-term studies that track cost, schedule, and capability metrics before, during, and after intermediary involvement could provide concrete evidence of the learning benefits suggested by this research. Using mixed methods, such as mapping how knowledge flows between teams and comparing project performance before and after interventions, would help explain how practices like benchmarking and shadow-pairing lead to better delivery outcomes. These insights could support policymakers and investors in deciding when to include intermediary services in public funding for first-of-a-kind energy projects.

Additionally, further research should explore the social dynamics (human and organizational factors) that support or hinder learning within intermediary-supported projects. Detailed studies, including close observations of project environments and social network analysis, could investigate how trust, differences in power, and professional identities affect the effectiveness of learning practices such as shadow-pairing and cross-team knowledge sharing. This is particularly important for middle-management levels, where this study found barriers to knowledge flow. Understanding these human dynamics will be key to turning standardised templates into long-term behavioural change, an area where current research is limited.

There is also a strong case for exploring how AI and advanced digital tools can improve knowledge sharing in the sector. Future studies could design and test machine-learning systems that automatically collect, clean, and analyse project data, addressing the manual data challenges identified in this thesis. Research should pay attention to issues such as data privacy, potential biases in algorithms, and the ability of these systems to work across different organizations, as these factors affect trust and willingness to share data. Testing these tools in real projects, such as within the Performance Forum, would help evaluate their practical benefits and challenges.

Finally, it would be valuable to position intermediaries within the wider policy and governance frameworks of the energy transition. Comparative studies could examine how different regulations, such as fast-track permitting or pricing mechanisms for low-carbon fuels, influence the demand for and impact of intermediaries in supporting learning. Research could also explore how intermediaries can connect not just project owners but also financiers, technology suppliers, and standard-setting bodies to share lessons and speed up progress across the entire sector. By addressing these questions, future research can help build a clearer, generalisable understanding of intermediaries as key drivers of learning and delivery in the global energy transition.

9.4. Limitations

Although the thesis offers new insights into how intermediaries can accelerate learning in energy transition initiatives, limitations narrow the scope of the study's conclusions. First, the empirical base is narrow. All three cases centre on engagements delivered by a single consultancy, Turner & Townsend, and involve only two technology clusters (carbon capture and HVDC interconnectors) plus one cross-industry benchmarking forum. While the cases were selected to maximise variety within that portfolio,

they cannot fully represent the diverse organizational formats, governance cultures, or risk profiles found across the wider energy sector. Readers should therefore treat the Build–Partner–Burst model and the identified learning mechanisms as transferable hypotheses, not as universally proven patterns.

Second, the study is bounded geographically and culturally. All three cases are situated within UK and Irish project environments, whose regulatory frameworks, contractual norms, and professional cultures may differ from those found in other regions. These contextual factors shape how inter-organizational learning unfolds and how intermediaries are perceived. As such, while the mechanisms identified are transferable in principle, their practical application in other geographies may require adaptation to local governance systems, collaboration norms, and sectoral maturity.

Third, the evidence rests largely on qualitative, interview-derived data. The study relies on 15 semi-structured interviews complemented by publicly available project material. Interviewees were senior professionals who self-selected into the study and may have presented their organization or project in a favourable light. Although perspectives from multiple roles and cases were integrated, the potential for hindsight rationalisation and social-desirability bias remains. Future work incorporating client-side archival data, independent project audits, or large-sample surveys could test whether the same mechanisms hold when measured from alternative perspectives.

Fourth, the researcher's positionality requires reflection alongside participant-related bias. This study was conducted in collaboration with Turner & Townsend as part of a graduate internship, during which the researcher was embedded within the organization and financially compensated. While this affiliation provided valuable access to internal stakeholders, documents, and project processes, it may have influenced the framing of questions, prioritisation of findings, and overall critical distance. As described in chapter 5, reflexivity was therefore actively practised: a consistent interview protocol was applied, participants' views were prioritised in interpretation, and ongoing attention was paid to the researcher's dual role. Nevertheless, the potential for unconscious bias remains and should be considered when evaluating the conclusions.

Fifth, the research design offers a static view rather than tracking evolution over the project lifecycle. Data collection captured perceptions at a single point during project execution, limiting insight into how learning benefits evolve over the full project life cycle or after the intermediary exits. Without longitudinal data on cost, schedule, and capability development, it is not possible to determine the extent or strength of causal relationships - for example, precisely how much risk was mitigated or how durable the transferred routines proved over time. Follow-up studies that track quantitative performance indicators before, during, and after intermediary engagement would strengthen claims about effectiveness and persistence.

Finally, methodological choices introduce their own constraints. Thematic coding was undertaken by a single researcher; despite systematic procedures, interpretive bias cannot be ruled out. Due to the study's qualitative design, it did not include cross-referencing with quantitative data such as financial delivery metrics. In addition, the energy transition landscape is evolving quickly: regulatory reforms, cost-curve shifts, and digital innovations may outpace some contextual details captured here. These factors mean the thesis should be read as an exploratory step - clarifying concepts, surfacing mechanisms, and framing researchable questions - rather than as a definitive guide to intermediary practice across all new energy infrastructure settings.

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A

Interview Guide

Interview Structure and Content

Estimated duration: 60 minutes (approx. 45 effective minutes)

This semi-structured interview guide is designed to explore the role of intermediaries—specifically Turner & Townsend—in facilitating inter-organizational learning within the context of energy transition projects. The guide provides topic areas and example questions rather than a fixed script, allowing flexibility based on the interviewee's responses.

Overall research goal: To understand the intermediary role of Turner & Townsend in improving inter-organizational learning across three energy transition case studies: the Onshore Performance Forum, the Celtic Interconnector Programme, and the Net Zero Teesside Power Project. The focus is on mechanisms used, challenges faced, and the value created.

Target interviewees: Professionals involved in the aforementioned case studies from Turner & Townsend, including representatives from client organizations.

Section 0: Introduction and Context (5 minutes)

- Welcome and thank the participant for joining the interview.
- Emphasize neutrality of perspective, specifically if this is a follow-up interview.
- Personal introdcution of the researcher and briefly outline the study's context: inter-organizational learning, intermediary roles, and energy transition.
- Explain the purpose of the interview and its structure:
    1. Client needs and engagement drivers
    2. Mechanisms of the intermediary that facilitated inter-organizational learning
    3. Challenges and enablers in the energy transition context
    4. Value and impact of learning
- Reassure confidentiality, confirming prior written consent (room for questions), and ask for verbal consent to start recording in MS Teams.
- Ask about their role and experience within Turner & Townsend [or the client organization], focusing on their involvement in the specific case study (energy transition project) and interaction with different client organizations [or with Turner & Townsend].

Section 1: Client Needs & Engagement Drivers (7–8 minutes)

- What were the main reasons the client organization decided to engage Turner & Townsend in this project?

- For Performance Forum: Why did your organization choose to participate in this joint industry initiative?
- Was the engagement driven more by a need for execution capacity or for knowledge, expertise, or a desire to learn how to handle new challenges moving forward in the energy transition context?

Section 2: Facilitating Mechanisms for Learning (15 minutes)

- Considering the case study, what specific mechanisms or approaches did Turner & Townsend utilize to enable inter-organizational learning? That is, how did they leverage their intermediary position to allow knowledge exchange across organizational boundaries?
- Can you provide specific examples (e.g., facilitated interactions, expert involvement, codified tools like the Cube)?
- For each, how did it contribute to actual learning or capability development?
- What is happening internally in terms of knowledge management to support this external learning? What works well, and what could be improved?

Section 3: Challenges and Enablers (7–8 minutes)

- What are some of the biggest challenges for this particular case study regarding its context in the energy transition? This includes challenges in capturing/managing knowledge from energy transition projects compared to traditional ones.
- How does Turner & Townsend help overcome these challenges?
- What conditions enable effective inter-organizational learning here?
- How does the pace of change and lack of historical data affect learning? How does T&T help mitigate this?
- Are there any gaps between what clients need and what Turner & Townsend currently offers? For instance, are there any services or expectations that Turner & Townsend has been unable to meet?

Section 4: Value, Impact, and Sustainability (7–8 minutes)

- From your perspective, when Turner & Townsend provides knowledge or facilitates interaction, what does 'learning' actually mean for the client organization in practice? Is it mainly about gaining specific information, adopting best practices, changing routines, or truly developing their own long-term capability to handle energy transition challenges?
- Can you share a concrete example of knowledge facilitated by Turner & Townsend that led to a tangible improvement?
- What is the long-term value of the learning that is facilitated?
- After Turner & Townsend's involvement ends, can the client continue to apply the learning independently? Or is continued support needed?
- What would the impact be if Turner & Townsend had not been involved in the project?

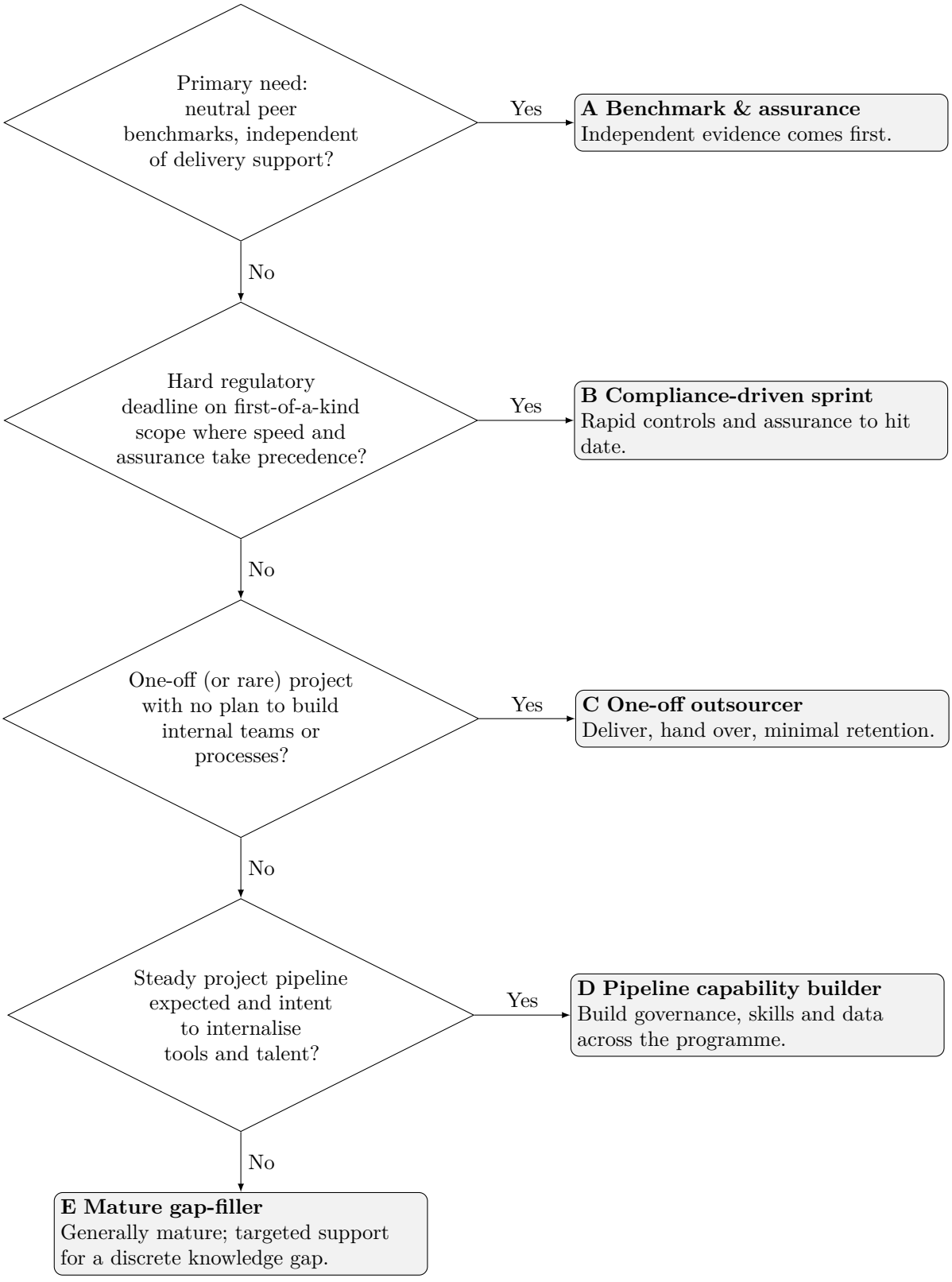
Section 5: Conclusion (5 minutes)

- If you could summarise the most important points from our discussion, what would they be in terms of Turner & Townsend's role in inter-organizational learning?
- Any final questions or points you would like to clarify?
- Thank the interviewee and explain the next steps (analysis, reporting).

B

Guide for Prospective Clients: Self-Assessment Tool

This decision tool helps energy-sector actors quickly identify which of the five client categories (A-E) they fall into within the context of this research. Start at the top question, follow the arrows, and answer Yes/No until you reach a terminal box. The routing is indicative and tailored to the Turner & Townsend intermediary model, so it should be read as guidance rather than prescription; when you sit on a boundary, choose the first terminal you reach. Once you have a category, use it to read the knowledge-flow Sankey in chapter 6 (figure 6.10) and then consult the matching snapshot in appendix C.


Primary need: neutral peer benchmarks, independent of delivery support?
Yes
A Benchmark & assurance
Independent evidence comes first.
No
Hard regulatory deadline on first-of-a-kind scope where speed and assurance take precedence?
Yes
B Compliance-driven sprint
Rapid controls and assurance to hit date.
No
One-off (or rare) project with no plan to build internal teams or processes?
Yes
C One-off outsourcer
Deliver, hand over, minimal retention.
No
Steady project pipeline expected and intent to internalise tools and talent?
Yes
D Pipeline capability builder
Build governance, skills and data across the programme.
No
E Mature gap-filler
Generally mature; targeted support for a discrete knowledge gap.

C

Knowledge-Flow Pathways by Client Category

This appendix provides cropped versions of the knowledge-flow Sankey to help readers focus on the pathway that corresponds to their self-assessment outcome. Each figure highlights one client category (A–E) and fades the others. S-nodes denote sector diffusion, C-nodes denote client embedding, and T-nodes denote Turner & Townsend internal embedding. For full definitions of intermediary streams and outputs see Tables 6.2 and 6.3.

Notes for interpretation

These figures are aids for orientation rather than measurements. Flow widths and directions are indicative, derived from qualitative weighting across the three cases; the exact allocation for a specific client will be elaborated in the category subsections that follow. Read flows left to right: client categories on the left, intermediary action streams in the centre, embedded impacts on the right. The configuration and weighting reflect Turner & Townsend's role and operating model as the intermediary studied in this thesis; the map is therefore tailored to this case and should not be generalised uncritically to other intermediaries or sectors, which may emphasise different streams or operate under different data-sharing boundaries.

Boundary conditions apply to sector benchmarks. S1 flows are shown only where activity occurs through the Performance Forum; advisory projects do not feed data into the Forum, and Forum datasets are not fed back into individual client projects. Where independent evidence is used in advisory work, it is sourced outside the Forum and handled under project-specific confidentiality.

Use the figures to compare emphasis, not to sum totals. The centre streams depict the relative effort across providing independent data assurance, codifying and standardising knowledge, implementing governance and controls, transferring and upskilling capability, and facilitating collaborative trust. A thicker band indicates greater emphasis for that category in the cases analysed. The diagram should not be read as a timeline: some streams can occur alongside each other and reinforce one another, while others may not coexist in practice.

The link to the stream definitions are in Table 6.2 and output descriptions in Table 6.3. The case-based rationale for each category's pattern is discussed in Chapter 6.

C.1. Category A: Benchmark and assurance

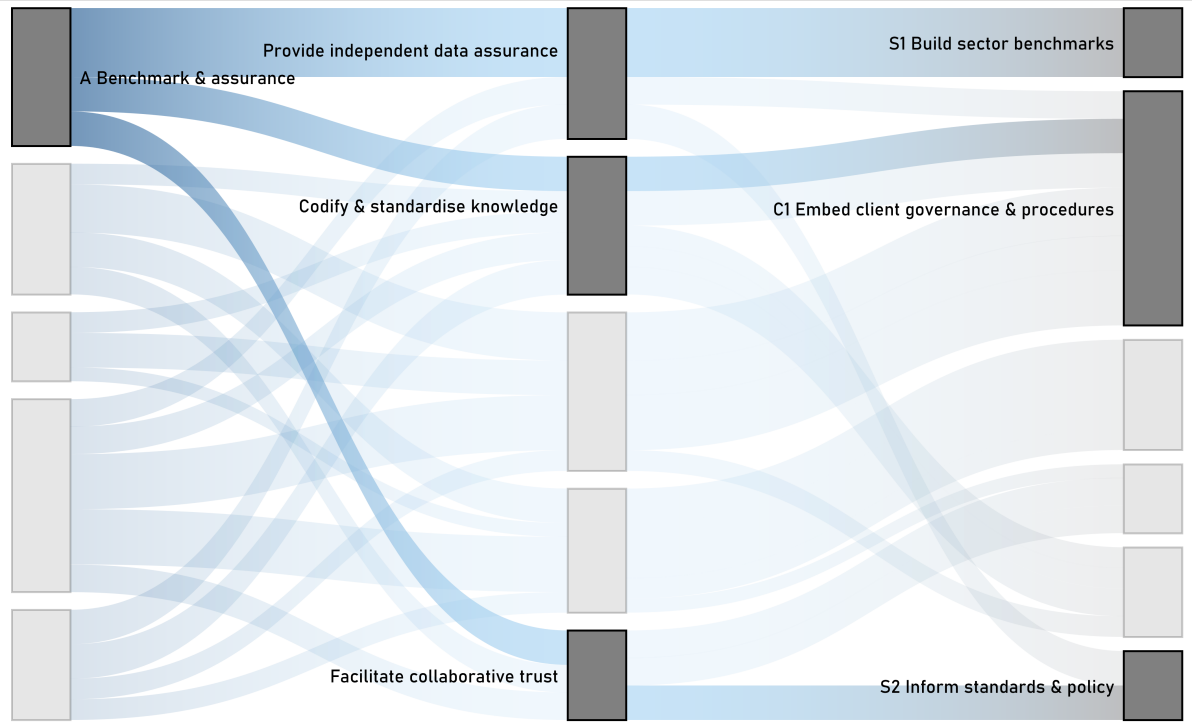


Figure C.1: Cropped Sankey highlighting category A flows.

Flow explanations:

1. A → Provide independent data assurance → S1 Build sector benchmarks. The intermediary supplies neutral, anonymised comparators so benchmark-seeking actors can position their estimates against peers; where the actor participates via the Performance Forum, these validated datasets contribute to sector medians (S1).

2. A → Codify & standardise knowledge → C1 Embed client governance & procedures. Lessons captured in, for example, close-out reports and case studies are translated into standard templates, WBS structures, and reporting formats, then adopted by the client's PMO so that future projects follow consistent procedures and evidence-informed controls (C1).

3. A → Facilitate collaborative trust → S2 Inform standards & policy. Neutral facilitation establishes shared definitions and data-sharing rules across organizations; those agreed conventions are then channelled to standards bodies or policymakers, informing emerging guidance and rules (S2).

C.2. Category B: Compliance-driven sprint

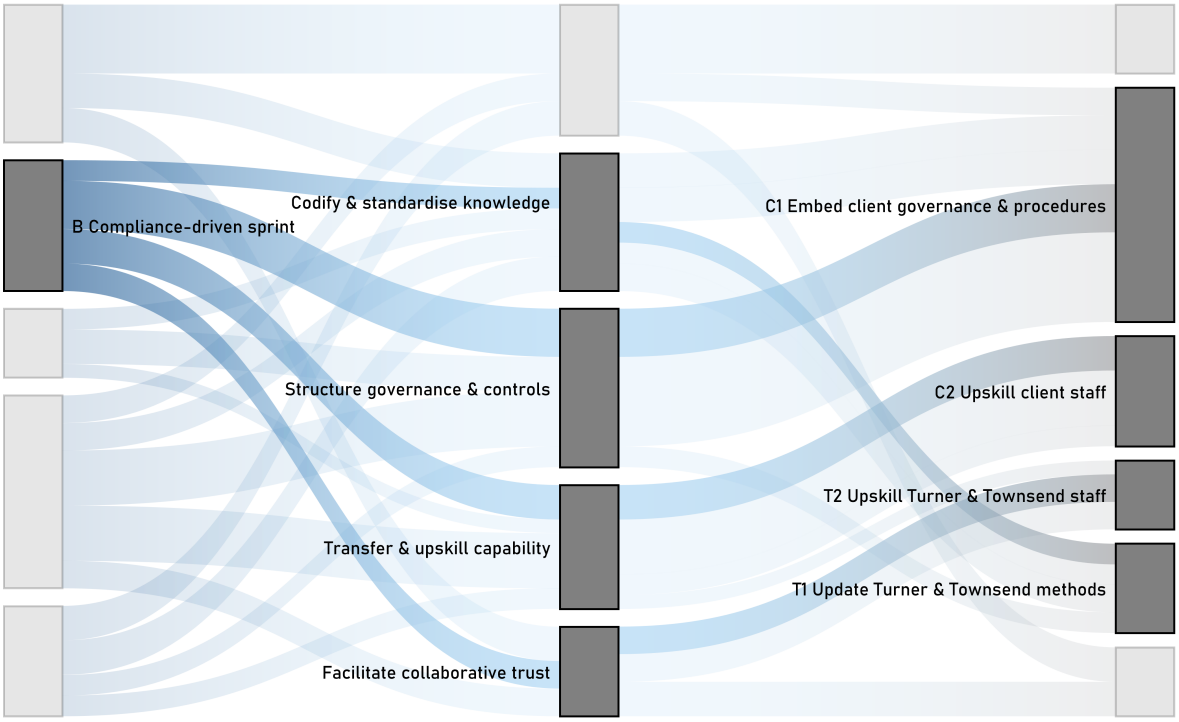


Figure C.2: Cropped Sankey highlighting category B flows.

Flow explanations:

1. B → Codify & standardise knowledge → T1 Update Turner & Townsend methods. Sprint lessons are converted into practical checklists, workshop formats, and clause playbooks which update the intermediary's method library for reuse on similar regulatory sprints (T1).

2. B → Structure governance & controls → C1 Embed client governance & procedures. Under tight regulatory deadlines the intermediary rapidly installs stage-gates, reporting routines, and contract administration so the project can pass assurance; these procedures are adopted by the client PMO and used to run the sprint safely and transparently (C1).

3. B → Transfer & upskill capability → C2 Upskill client staff. Targeted coaching and on-the-job support equip client teams to operate the new controls, run risk reviews, and make evidence-based decisions within the compressed timescale (C2).

4. B → Facilitate collaborative trust → T2 Upskill Turner & Townsend staff. Neutral facilitation across JV partners, contractors, and regulators under segregation and compliance rules builds advanced collaboration skills inside the intermediary, which are retained for future assignments (T2).

C.3. Category C: One-off outsourcer

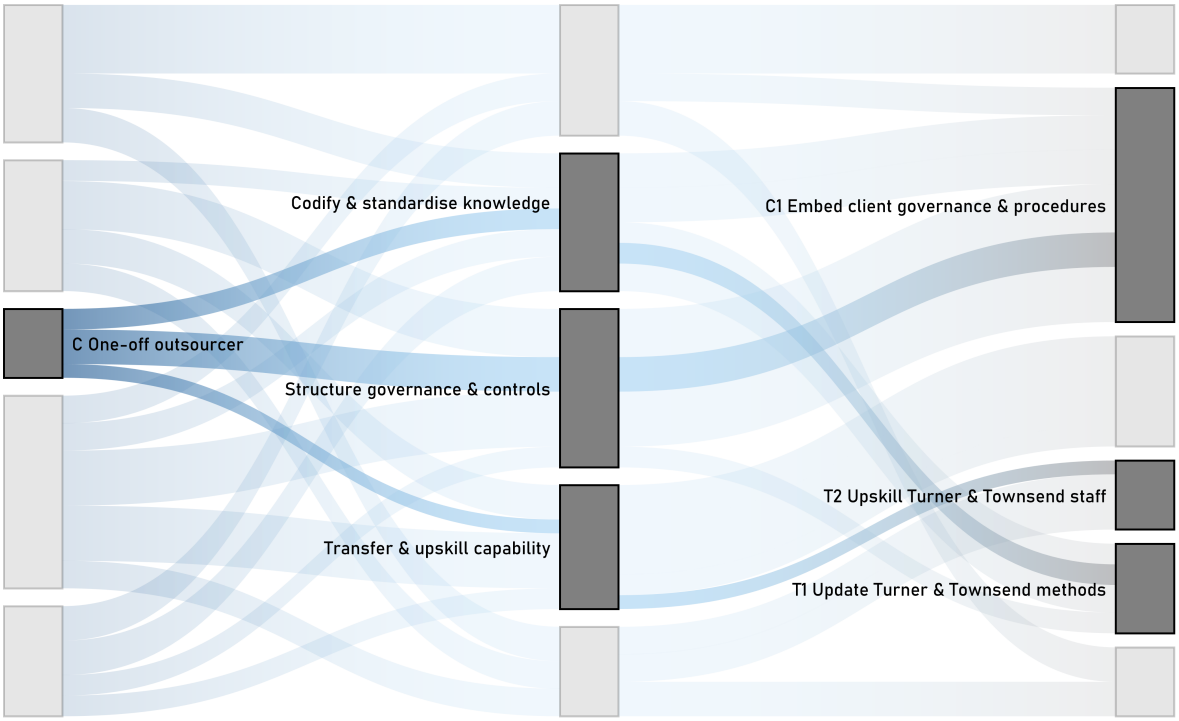


Figure C.3: Cropped Sankey highlighting category C flows.

Flow explanations:

1. C → Codify & standardise knowledge → T1 Update Turner & Townsend methods. Because the client does not plan to retain capability, project lessons are translated into reusable templates, playbooks, etc. that update the intermediary's method library for future use (T1).

2. C → Structure governance & controls → C1 Embed client governance & procedures. For a single flagship project delivered largely through external support, the intermediary prioritises installing fit-for-purpose stage-gates, reporting routines, and change-control so the owner can govern transparently; these procedures are adopted by the client PMO for day-to-day delivery (C1).

3. C → Transfer & upskill capability → T2 Upskill Turner & Townsend staff. Coaching is limited on the client side; most learning occurs inside the intermediary as staff gain experience in the project's context, strengthening facilitation and delivery skills for subsequent assignments (T2).

C.4. Category D: Pipeline capability builder

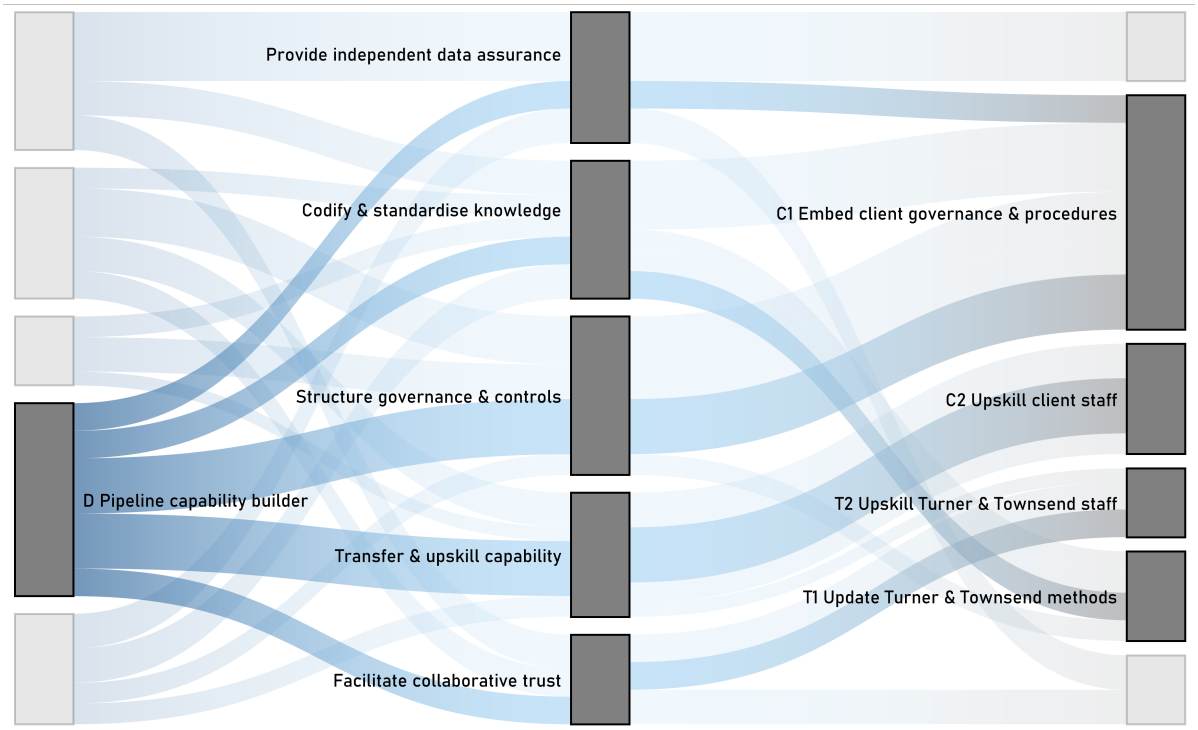


Figure C.4: Cropped Sankey highlighting category D flows.

Flow explanations:

1. D → Provide independent data assurance → C1 Embed client governance & procedures. Independent reference ranges are used to set realistic thresholds, KPIs, and review criteria; these are adopted by the client PMO so future projects in the pipeline apply the same evidence-based controls (C1).

2. D → Codify & standardise knowledge → T1 Update Turner & Townsend methods. Reusable method templates and delivery standards are formalised from pipeline lessons so that methods can be applied and refined on subsequent programmes (T1).

3. D → Structure governance & controls → C1 Embed client governance & procedures. Programme-level stage-gates, reporting routines, and change-control are designed once and rolled out across the pipeline, giving consistent governance and clearer escalation paths (C1).

4. D → Transfer & upskill capability → C2 Upskill client staff. Targeted training, shadowing, and on-the-job coaching build internal teams that can run the controls and sustain delivery quality across multiple upcoming projects (C2).

5. D → Facilitate collaborative trust → T2 Upskill Turner & Townsend staff. Bringing regulators, JV partners, and suppliers together in multi-jurisdiction settings builds the intermediary's facilitation, interface management, and delivery coordination skills, which are carried into later assignments (T2).

C.5. Category E: Mature gap-filler

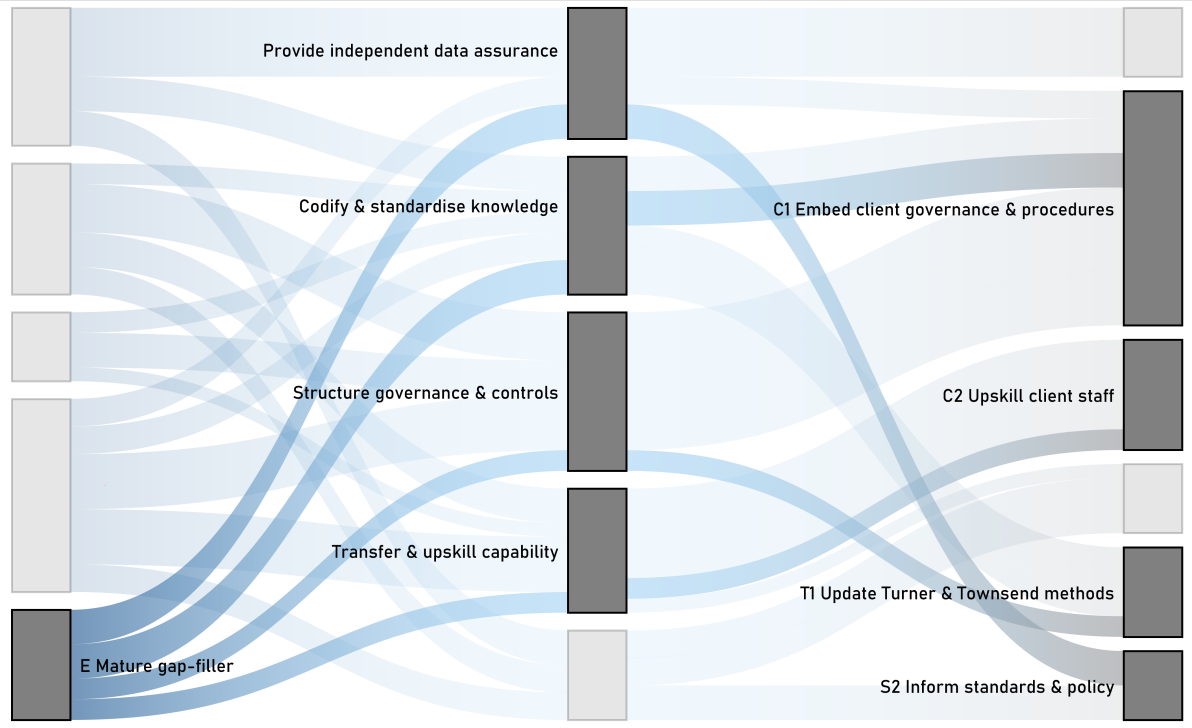


Figure C.5: Cropped Sankey highlighting category E flows.

Flow explanations:

1. E → Provide independent data assurance → S2 Inform standards & policy. Mature gap-fillers seek third-party validation on a narrow technology or geography gap; independent data assurance converts project findings into anonymised evidence for standards consultations (for example ISO/WBS updates or regulator guidance), so the impact extends beyond a single project (S2).

2. E → Codify & standardise knowledge → C1 Embed client governance & procedures. Targeted lessons are translated into updated procedures, WBS structures, and reporting formats and adopted by the client's PMO to close the gap on future works (C1).

3. E → Structure governance & controls → T1 Update Turner & Townsend methods. The intermediary refines its control frameworks and checklists to reflect the niche context, feeding improvements into its internal method base for reuse (T1).

4. E → Transfer & upskill capability → C2 Upskill client staff. Focused training and shadowing equip a small set of client specialists to operate the new controls or technology without a large programme of change (C2).