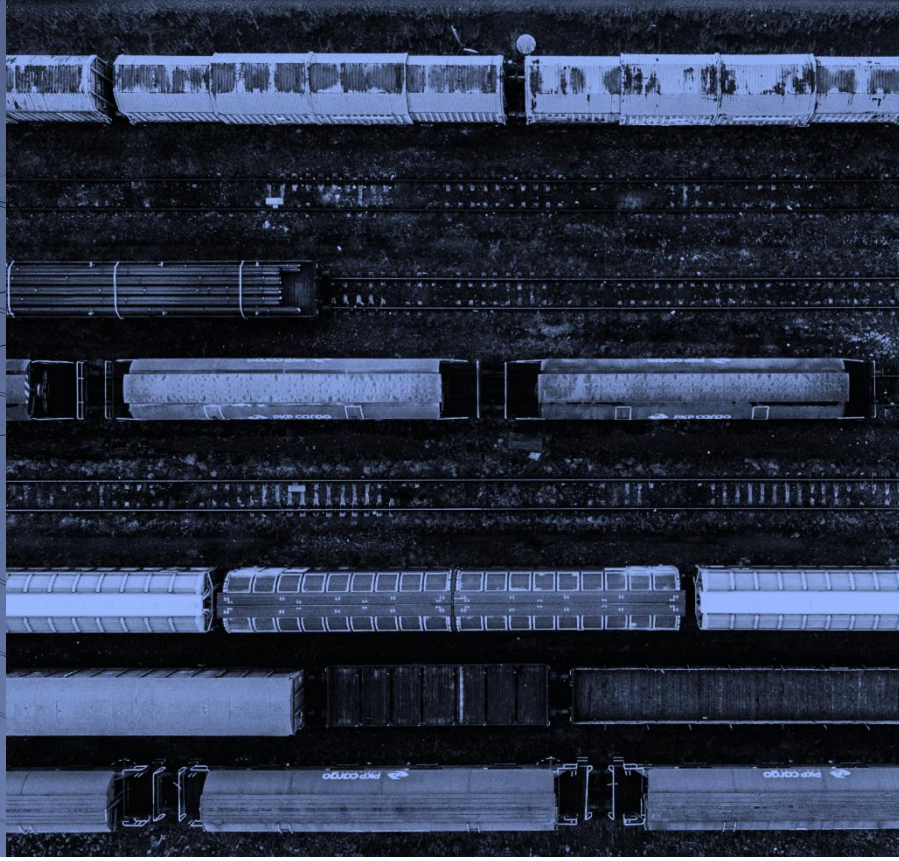

Context Clues to Collaborative Capacity

Organizational Preconditions Guiding Horizontal Collaboration Among Dutch Infrastructure Administrations

TU Delft Delft University of Technology

R.A. Schepers

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Organizational Preconditions Guiding Horizontal Collaboration Among Dutch Infrastructure Administrations

by

R.A. Schepers

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Graduation Committee:	Prof.mr.dr. J.A. de Bruijn	TU Delft
	Dr. M.L.C. de Bruijne	TU Delft
	Dr. M.G.C. Bosch-Rekveldt	TU Delft

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TU Delft Delft University of Technology

Executive Summary

Critical infrastructure systems are interconnected and evolve with society. Global instability and socio-economic challenges like climate change, urbanization, and digitalization create pressure to future-proof these assets while ensuring safe, reliable daily operations. Interorganizational collaboration (IOC) offers an effective way for traditionally hierarchical organizations to achieve multi-actor integration and address horizontal systems and networks together. In the Netherlands, infrastructure plays a significant role in the national economy, and administrations are motivated to collaborate more effectively. However, there is limited understanding of the internal actions required. While knowledge on collaboration is well-developed albeit over a complex landscape, a gap remains as to how the infrastructure administrations can enhance their collaborative capacity to enter into and maintain effective interorganizational collaboration (IOC).

This thesis explores IOC among Dutch infrastructure administrations, focusing on the factors that enhance or inhibit collaborative efforts at the organizational level. This research uses a three-step qualitative approach, including a literature review, semi-structured interviews, and thematic analysis. The literature review provides a theoretical framework by integrating approaches to collaborative capacity across organizational domains, highlighting conditions of leadership commitment, collaborative goal-setting, stakeholder analysis, and structural flexibility. Empirical findings identified a consistent tension between organizational goals and shared collaborative objectives. While practitioners recognize the value of setting collaborative goals, commitment to internal mandates often takes precedence. Progress in collaboration is made when relationship-building and shared goals are prioritized, especially over financial considerations during initial stages. Leadership is found to be a relevant factor in driving or hindering collaboration. Successful IOC often begins with motivated, boundary-spanning individuals who initiate efforts without direct top-down mandates. However, sustained success requires leadership to shift from ad-hoc approvals to a proactive, consistent commitment to collaboration as a strategic priority. Collaborative learning emerges as a critical but underutilized enabler of IOC. Informal networks and proactive relationship-building play key roles in bridging organizational silos. Institutionalizing collaborative learning opportunities could help build a stronger foundation for long-term collaboration.

The thematic analysis of empirical data highlights patterns of shifting roles, redefining rules, and pushing organizational boundaries to achieve successful collaboration. These patterns underscore the importance of structural flexibility and institutional adaptation. The insights provided are not prescriptive but serve as a reflective framework for practitioners to assess and adapt to their own unique contexts. While the complexity of IOC may be daunting, the observed patterns in this research provide a foundation for reflection, growth, and further exploration. By understanding the organizational dynamics that have affected past collaborations, infrastructure administrations can better assess their capacity for IOC and tailor their strategies to address their unique challenges, ultimately safeguarding society's critical infrastructure systems.

Definitions

Collaborative Capacity: The ability for an organization to enter into and sustain collaborative relationships (Hocevar et al., 2011a, p. 1).

Critical Infrastructure: Any systems or asset which is essential for the maintenance of vital societal functions" (The European Commission, 2022)

Infrastructure Administration: Refers to the parent organization responsible for the planning, maintenance and operation of a critical infrastructure network. This included terms such as "Infrastructure Asset Owner" and "Infrastructure Managing Organization".

Interorganizational Collaboration (IOC): Refers to collaboration between autonomous organizations of a problem domain engage in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain (Wood & Gray, 1991).

Interorganizational: Refers to interactions, collaborations, or relationships between two or more separate and independent organizations. These interactions typically involve resource sharing, joint efforts, or coordinated activities to achieve mutually beneficial goals (Gray, 1985; Hibbert et al., 2010).

Intraorganizational: Refers to processes, collaborations, or relationships occurring within a single organization. It involves departments, teams, or individuals working together internally to achieve organizational goals (Van de Ven, 1976).

Relational Behaviour: The desired actions involved in management exchange that promote the development of a collaborative relationship. These actions or attitudes can be shown by individuals or groups and focus on building trust, mutual respect, cooperation, and understanding to strengthen connections (Zheng et al., 2018).

Vertical Collaboration: A partnership between organizations at different levels within the supply chain in pursuit of common goals. Often including elements of hierarchy and client-supplier relations (Martin et al., 2018).

Horizontal Collaboration: Partnership between organizations that operate and the same level of the market (Verstrepen et al., 2009).

List of Figures

List of Tables

Contents

1 Introduction

This MSc thesis examines how infrastructure administrations can foster interorganizational collaboration to ensure that critical infrastructure remains fit for purpose. Critical infrastructure consists of systems and assets, which are considered crucial for supporting key societal functions (The European Commission, 2022). These systems transport food and goods, deliver energy to homes and businesses, and connect people. As society evolves, these systems also change, creating an increasingly complex network of networks that is essential for national governments. Adding to this complexity, socio-economic challenges like urbanization, digitalization, and climate change are creating new demands and obstacles. Asset managers and infrastructure administrations should design, build, and maintain these systems to ensure resilience for the future while minimizing disruptions to daily operations. Moreover, the interconnected nature of infrastructure networks requires collaborative efforts, as no single organization can address these issues independently due to the shared interdependencies among stakeholders. Where physical interfaces exist between different infrastructure systems—such as a train station located underneath an airport, a bridge crossing over a port waterway, or a coastal flood barrier located next to a high-voltage power station—there is often a corresponding organizational interface between the responsible administrations.

However, infrastructure systems do not only present challenges; they also offer opportunities to improve the environment and quality of life for future generations. Effective management of these systems involves integrating processes and collective decision-making to maintain harmony within the overall infrastructure network (Yanga et al., 2018). As such, a growing body of academic and practical literature emphasizes the need for governance structures that move beyond traditional bureaucratic, hierarchical models (Thomson et al., 2009). Infrastructure administrations are encouraged to develop systems and personnel that can effectively integrate horizontal systems with the traditional hierarchical systems (Weber et al., 2007). Interorganizational collaboration is often regarded as a way to achieving multi-actor integration with an emphasis on the transfer of knowledge, sharing of resources, increase in efficiency and achievement of mutuals objectives through a united vision made possible by shared responsibility (Madden, 2017; Maurer, 2010).

1.1 Relevance of the Study

New threats, opportunities and responsibilities are being presented in light of global instability and economic transformation. Collaboration can play a significant role in helping governments achieve shared interests as outlined in the UN's Sustainable Development Goals (SDG) (Kwibisa & Majzoub, 2018). This research is particularly applicable in the pursuit of SDG 17, which calls for collaborative partnerships as means to strengthening the implementation of all SDG's. There is also added value in SDG 7 in ensuring access to affordable, reliable, sustainable energy for all, as well as SDG 11 in the creation of sustainable and resilient cities (The United Nations, 2018) both of which are heavily dependent on our approach to how we will design, operate and maintain our infrastructure in the future.

Additionally, this topic contributes to a vast collection of scholarship on collaboration. Academia continues to investigate the phenomena that is collaboration, often producing recommendations on how teams or organizations interact. Despite this vast literature, much remains unanswered. These teamwork activities occur once partners are already engaged. To facilitate effective collaboration, organizations benefit from understanding factors that reinforce collaborative practices, as well as the motivations, interests, and commitment of individuals and groups to long-term implementation dynamics (Bresnen & Marshall, 2000).

In the Netherlands, according to the Central Bureau of Statistics, infrastructure has contributed 13 percent of added value to the national economy (Weijnen, 2019) and the remaining 87 percent is arguably dependent upon services provided via that infrastructure. In the Netherlands, infrastructure administrations have already pledged to collaborate on domestic infrastructure. Several major organizations including Rijkswaterstaat and ProRail signed the 2020 market vision document citing key commitments to their approach of collaborating in how to work with or engage contractors (Marktvisie, 2020). Key pledges include:

- Moving from structures of hierarchy to collaborative environments throughout the construction industry.
- Realizing and connecting assignments instead of simply building individual projects.
- Instead of working from self-interest, think, work, act and learn through the construction industry chain.
- Acting on the basis of strength and steering on attitude and behaviour in lieu of acting on the basis of power and steering on contract.
- Excel in works that started from realistic preconditions early on.

To cite additional examples, ProRail and Schiphol are collaborating on the Multimodal Hub Schiphol (Bruins, 2020), the interface where plane meets rail and, in the future, perhaps hyperloop. An improved station will increase capacity to accommodate the forecasted increase in passenger traffic, improve the layout and promote multimodal transportation. Furthermore, in “Themastudie elektriciteit 2.0,” (Carter & Splinter, 2021) the Municipality of Amsterdam, Liander & TenneT are collaborating on a joint development framework through to 2035 to create a shared long-term perspective for the expansion of a future-proof electricity network for Amsterdam and the immediate surroundings. This includes agreements on the spatial conditions and conditions under which substations and connections can be incorporated into an existing area

The aforementioned infrastructure administrations are some of the largest in The Netherlands. They possess the responsibility to manage the existing critical infrastructure and the authority to make changes. Concurrent with the distinct cases of collaborative projects seen in the industry, these organizations have decided to join forces in establishing Next Generation Infrastructures (NGInfra). Herein each has committed to create and share knowledge, data, expertise, scientific research, visions and working methods with the goal of identifying solutions for the infrastructure of the future (NGinfra, 2022). Together with Dutch Research Council, NWO, NGInfra is funding interdisciplinary research into the development of a so-called “multi-infrastructure system” which transcends the boundaries of infrastructural silos and facilitates broad decision making. This forms the crucial starting point for the “system of systems” approach where individual infrastructure systems, the total infrastructure system and interdependencies are made clear (NG Infra, 2020).

Collaboration and the sharing of knowledge go hand-in-hand. Without good cooperation between the organizations, the sharing of data and other resources becoming impossible. So how can the infrastructure managers of NGInfra ensure positive mutual cooperation? Factors such as openness, trust, communication and respect are often considered beneficial conditions. But how that works in practice and specifically between different organizations is unclear (Van Der Riet, 2020).

1.2 Interorganizational Collaboration (IOC)

This research will consistently use the term “Interorganizational collaboration” which is abbreviated as ‘IOC’. IOC refers to “the process where autonomous organizations of a problem domain engage in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain” (Wood & Gray, 1991, p.146). This definition emphasizes the voluntary and collective nature of collaboration among independent organizations addressing common concerns. IOC can take various forms, such as partnerships, alliances, joint ventures, or informal networks, and often involves combining expertise, knowledge, or physical assets to achieve outcomes that individual organizations cannot accomplish as effectively on their. It often involves formal or informal agreements which define the cooperation and provide a mutual understanding of roles and responsibilities to facilitate joint efforts and ensure that all participants benefit from the collaboration. Examples can include partnerships between non-profits, joint ventures between companies, or alliances between government agencies and private firms.

In this research IOC will focus on the public context where activities of collaborating agencies hold the expectation that public value is further increased by their working together rather than independently. There is typically a high level of interdependency between the organizations involved and the relationship is long-term in nature. Central to these partnerships is a determination to forego litigation and opt for more informal, joint, conflict resolution (Bresnen & Marshall, 2000c). The cocreation of values enables the organizations to overcome lack of competences and resource scarcity (Dietrich et al., 2010).

The Upside

Multiple advantages highlight the potential benefit for collaboration between organizations responsible for critical infrastructure. Collaborative relationships facilitate the sharing of existing knowledge, acquisition of new knowledge and the development of innovative, synergistic solutions (Hardy et al., 2003). This can yield productivity improvements and cost savings (Verstrepen et al., 2009). Additionally, collaboration aims to address issues of fragmentation (Bresnen & Marshall, 2002), a fundamental yet problematic approach in engineering and construction which results in “silos” of information that are difficult to access and share. Fragmentation breaks down the larger complexities of large projects into smaller, more manageable problems; a potentially challenging approach in interconnected, interdependent contexts where decoupling elements may not be possible. By addressing fragmentation, a functioning collaboration keeps stakeholders informed and connected.

Challenges

IOC does not come without its own risks and challenges. Opportunism, imbalance of organizational structure or the centralization of procedures can all threaten the success of collaborative relationships, making them prone to failure and preventing effective collaboration from being reached. Additionally, the natural characteristics of infrastructure project-based business; *discontinuity, uniqueness,* and *complexity* can limit regular interaction and building upon interorganizational relationships over time. These are presented in the D-U-C framework (Mandjak & Zoltan, 1998):

> D - Discontinuity of demand results from the limited nature of complex energy or transportation infrastructure projects. Designed lifespans of 50 to 100 years complicates the emergence of long-term relations between project actors as upon project completion, most actors go their separate ways leaving long term operation to a smaller, organizationally-focused team, with less of a need to collaborate. Needing to cooperate over the boundaries of organizations puts emphasis on trust development and the management of opportunism. However, the discontinuity of projects presents a chicken-egg type dilemma where the development of trust is needed to collaborate but the periodic demand for collaborative projects does not

allow the time needed to build trust. In the absence of trust from past collaboration new collaborative forms do not blossom.

U - Uniqueness of project transactions inhibits organizational learning, thus preventing efficiency resulting from collaboration.

C - Complex networks of actors come naturally with differing objectives and incentives. The variation in goals and social structure in projects creates a need for a knowledge-integrator role that ensures that the array of knowledge and resources possessed by the collaborating actors will be integrated to achieve a common goal. This is challenging considering the non-hierarchical nature of collaborative networks. Inter-firm projects lack traditional hierarchical structure between collaborating actors presenting implications for coordination and governance.

Bakker & de Kleijn (2018) argue that interorganizational ventures challenge existing notions that have been developed mostly on the basis of intraorganizational projects. As organizations learn and grow as businesses, they develop internal specialized departments that can successfully carry out homogenous processes in support of the organization's mission and its context. Individuals with specialized experience and skills are placed in each of these units with the intention that they excel at the requirements specific to their departments task. This creates organizational boundaries both internally between these specialized departments and externally from other organizations (Tushman & Scanlan, 1981). Organizational boundaries are also associated with a communication boundary (Tushman & Scanlan, 1981). While efficiency is increased within specialized units, their focused specialties inhibit the flow of information between the department and external areas.

Still, IOC and the associated challenges may not directly hinder intraorganizational operations and an infrastructure administrations routine operation of their own network. Despite interorganizational efforts, IOC between other networks may be viewed as a 'nice-to-have' instead of a 'must-have' strategy. This latent nature in combination with the ambiguity of what collaboration is and how to achieve it makes it difficult for infrastructure administrations to develop clear organizational processes in pursuit of interorganizational relationships.

1.3 Problem Statement

From the previous section, it appears that IOC presents both challenges and opportunities and is occurring in practice between motivated infrastructure administrations. How can individual organizations prepare to address both the opportunities and challenges of IOC? Prerequisites at the intraorganizational level that can effect IOC prior to engaging another party and starting collaborative processes are not well understood. What steps can individual organizations take to be ready to collaborate? This "readiness" is known as interorganizational collaborative capacity, and can be defined as "the capability of organizations to enter into, develop and sustain inter-organizational systems in pursuit of collective outcomes" (Hocevar et al., 2011, p. 1). Collaborative capacity can improve the chances of a successful interorganizational relationship and the achievement of goals. However, a knowledge gap exists that this research aims to address by contributing to theory and in practice.

Firstly, there is a gap in empirical evidence specific to horizontal collaboration between infrastructure administrations. While IOC is occurring in practice, case projects are on-going and scientific observations are not widely published. In engineering, infrastructure and construction context, there is substantial literature and several case studies that focus on vertical collaboration, between client and contractor (Abramowicz et al., 2018; Bresnen & Marshall, 2000; Saukko et al., 2020). These cases typically involve contractual cooperation for a single project rather than a long-term collaborative relationship. When the project ends, so does the collaboration. Alternatively, literature on horizontal collaboration can be more

commonly found in the context of supply chain logistics, shipping and air transport where actors align their services within a same network rather than complement one another (Martin et al., 2018; Pomponi et al., 2015; Verstrepen et al., 2009). In these cases, organizations establish an alliance or partnership, with what would otherwise be a competitor, to secure a larger market share and coordinate resource usage. These relationships tend to focus on the longer term; however, they exist between like-minded organizations that essentially deliver an identical service. Few in-depth studies and publications in the context of infrastructure focus on horizontal collaboration between interdependent, complementary organizations responsible for the infrastructure assets, or on cases where organizations with varying scope or different market segments collaborate to create value due to interdependency.

Secondly, while much theoretical literature exists on the broad topic of collaboration, there is no clear link between the intraorganizational prerequisites and how they support an organization's ability to collaborate and achieve key factors in an interorganizational relationship. The concept of collaborative capacity for infrastructure administrations is not widely present in the literature[1]. While literature exists on the prerequisites of collaboration, the results of these studies predominantly focus on the collaborative process and interorganizational level, i.e., what organizations do together.

This approach indicates that the perspective on intraorganizational preconditions and the collaborative capacity of the organization alone is underexplored. Therefore, the problem is defined as:

"There is a lack of knowledge pertaining to the organizational preconditions to long-term, collaborative relationships between infrastructure administrations."

1.4 Research Objective

This research aims to obtain a deeper understanding of how IOC can be encouraged and enhanced. Based on the problem definition and identified knowledge gap, this research focuses on measures that organizations can take internally to facilitate collaboration and support partnering organizations externally. Accordingly, this research focuses on distinguishing preconditions of collaboration at the organizational level that may influence collaborative capacity. Therefore:

"The objective of this research is to contribute to the collaborative capacity of infrastructure administrations by providing knowledge on the preconditions for interorganizational collaboration and the requirements for collaboration at the internal, intraorganizational level."

Achieving this objective addresses the internal aim of providing knowledge to help fill the gap identified in practice and theory. This aims to assist decision makers and managers of infrastructure administrations in preparing their organizations to collaborate. By aiming to support an environment conducive to collaboration, this research seeks to contribute to the external goal of facilitating interorganizational collaboration between organizations responsible for interconnected infrastructure systems.

[1] A literature search conducted in the Web of Science Core Collection on "collaborative capacity" or "collaboration readiness" yielded 197 results. When refined with "infrastructure," results are narrowed to seven. These journal articles focused on Healthcare (x4), Tourism (x1), Climate Change (x1), and a single case of gas transmission infrastructure in Mexico where Collaborative Capacity is mentioned as a necessary implementation but not a focus of the research.

1.5 Research Question

Based on the research objective the following research question and sub questions are formulated:

How can Dutch infrastructure administrations enhance their capacity for horizontal, interorganizational collaboration (IOC)?

SQ1. What are the theoretical intraorganizational preconditions to IOC?

SQ2. What challenges and success factors are managers practitioners within infrastructure administrations encountering regarding horizontal IOC?

SQ3. How can empirical patterns invite managers to assess collaborative capacity within their own specific context?

Scope

Given the broad nature of collaboration, the scope is defined with the following boundaries:

Dutch Infrastructure
The study is conducted in the Netherlands in cooperation with Delft University of Technology and in connection with the collaborative platform Next Generation Infrastructure (NGinfra) comprised of six major Dutch infrastructure administrations. Of the six, the research explores two member organizations, the main port authority and the railway infrastructure administration.

[Intra]Organizational Preconditions
This research focuses on the intraorganizational domain, which includes the actions and decisions an organization can take internally to facilitate potential collaboration with other entities. Within this domain, organizations have control and authority over the implementation of measures that may enhance their capacity to collaborate. The research examines the conditions, strategies, and initiatives that an organization can develop independently—without the involvement of external parties. In contrast, the interorganizational domain involves multiple parties working together, where collaborative conditions depend on shared actions, joint decisions, and alignment between organizations. Once organizations engage in collaboration, they may relinquish some autonomy to align with collective goals.

Horizontal, Interorganizational collaboration
The research focuses on facilitating horizontal collaboration between infrastructure administrations, complementary organizations that share interdependencies but are ultimately responsible for different infrastructural domains. In horizontal interorganizational collaboration, the collaboration occurs between organizations that operate at a similar level of the market. It is important to distinguish this from the common structure of vertical collaboration, which is more hierarchical and often seen between client and supplier or employer and contractor (Bresnen & Marshall, 2000; Saukko et al., 2020).

Collaborative Relationship
The research targets organizational preconditions to collaboration relationships. Specific collaborative frameworks or forms such as joint ventures, public-private-partnerships (PPPs), or other specific contracts are not included.

1.6 Structure of the Report

Chapter 1: Introduction - This chapter introduces the study, highlighting its relevance and the broader context of IOC. It explains the upside and challenges of IOC, outlines the research problem, objectives, and questions, and defines the scope of the study within the Dutch infrastructure context. This chapter also provides a detailed overview of the report structure.

Chapter 2: Methodology – This chapter outlines the methodology used in this research and the different approaches are explained. The three research follows 3 steps to answer 3 sub questions in support of the main research question.

Chapter 3: (SQ1) State of the Art - This chapter presents the literature review and establishes the theoretical framework for the study. It covers existing research on preconditions for IOC, collaborative capacity, and process design models, This logically addresses the foundational concepts of IOC, setting up an understanding of the necessary conditions within organizations that facilitate collaboration. It aims to build a theoretical framework, serving as a reference point for the empirical research.

Chapter 4: Empirical Data -This chapter presents the empirical data, including insights from an exploratory workshop and semi-structured interviews. The characteristics of the sample population are outlined, followed by a detailed discussion of key themes guided by the theoretical framework.

Chapter 5: (SQ2) Empirical Successes and Challenges - This chapter summarizes the main identifies the successes and challenges identified in the empirical context, focusing on the balance between organizational and collaborative goals, leadership tensions, institutional constraints, and the role of collaborative learning.

Chapter 6: (SQ3) Thematic Patterns - In this chapter, the thematic patterns observed in the empirical data are analysed. Key patterns such as changing positional rules, reframing goals, pushing boundaries, and the role of individuals in leading IOC initiatives are identified and discussed in relation to improving collaborative capacity. It opens up space for reflection rather than prescriptive action. It invites managers to think about how the findings relate to their own settings.

Chapter 7: Discussion - The discussion chapter interprets the empirical findings in light of the theoretical framework, exploring the factors that enable or hinder successful IOC. It emphasizes the importance of balancing organizational goals, leadership's role, structural flexibility, and collaborative learning. It also outlines the limitations of the research and provides a reflection on the broader implications.

Chapter 8: Conclusion - The conclusion synthesizes the findings, summarizing how Dutch infrastructure administrations can enhance their collaborative capacity by assessing their specific context. It highlights the tensions, opportunities, and critical insights gained from the research to guide future collaborative strategies.

Chapter 9: Recommendations - The final chapter provides recommendations for both practice and future research. For practitioners, it invites managers to assess collaborative capacity within their own contexts, focusing on strategic priorities, multidisciplinary engagement, and empowering boundary-spanning individuals. For researchers, it offers avenues to further explore topics such as leadership’s role, structural flexibility, and metrics for assessing collaborative success.

2 Methodology

This chapter provides an overview of the process and procedure used in the gathering of data. A qualitative research approach was selected to align with the original research objectives. This chapter will outline the rationale for qualitative and inductive research and how it was utilized to select participants and case studies.

2.1 Research Type

This research is qualitative in nature. Qualitative research focuses on naturally occurring or ordinary events and is particularly productive in natural settings (Saldana et al., 2014). This allows for adaptation as more information becomes available. The more researchers have a developed understanding of data collection the surer they can become of the adequacy of the data itself (Saldana et al., 2014; Weiss, 1994). Qualitative research, with careful design, can be used to test can be used to test theories in new contexts. In this project, the theories about collaboration and in particular the prerequisites that make collaboration successful are tested in this under-researched context of interconnected infrastructure. This research is also explorative, exploratory research methods are suitable for researching phenomena where there are no single or clearly defined outcomes (Yin, 2018). Literature surrounding the theories of prerequisites to successful collaboration remain somewhat unpublished in this context. Qualitative research methods are useful for understanding phenomena in a new and unexplored context (Corbin & Strauss, 2014; Saldana et al., 2014). This report synthesizes existing theory and the newly explored empirical evidence from the Dutch infrastructure sector. This research seeks to explore the preconditions to IOC at the organizational level, providing recommendations for infrastructure administrations.

2.2 Research Phases

This section outlines the strategy implemented to conduct qualitative research and answer the research question. The research approach selected to help answer the main research question is schematically summarized (see Figure 1) and is broken down into three (3) key steps comprised of a literature study through desk research focusing on SQ1, explorative interviews with practitioners and finally a thematic analysis. The project first uses an inductive process to review existing theory and models and identify how the theoretical models would potentially fit in an infrastructure organizational context. An inductive process is also followed in the analysis of empirical data to arrive at patterns which are displayed in an empirical model.

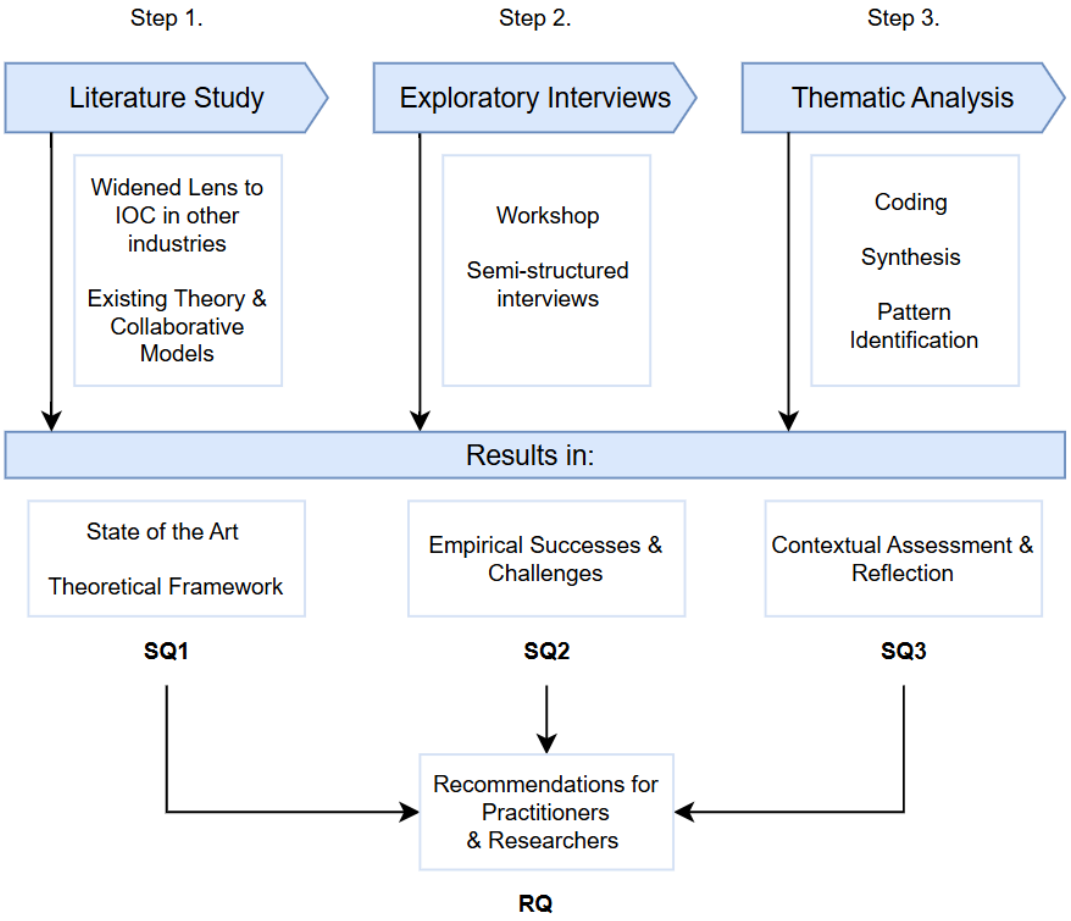

Figure 1: The Research Framework

2.3 Literature Study

Through desk research, literature on the preconditions to IOC are explored to answer research sub-question SQ1 and establish a state-of-the-art. Given the knowledge gap identified in the problem statement, the literature scope is widened to include research from other disciplines as well as more traditional vertical collaborative contexts that may still provide insight into the organizational factors that impact IOC. This serves as a point of reference for the focus on infrastructure administrations. From the literatures, overarching elements are identified and organized into a theoretical framework. Literature is obtained from scholarly sources, the vast majority are peer-reviewed journal articles obtained from academic collections and research databases including the TU Delf library, Scopus and Web of Science Core collection. The articles range from theoretical methodologies to case studies to literature reviews. Published books and book chapters are also used. Some media sources, such as magazine publications are considered appropriate, specifically the NG Infra magazine which offers insight into the state of domestic infrastructure, the topic at hand, making it a valuable source.

Firstly, keywords are identified to carry out the literature search. The terms are derived from the research questions and preliminary literature scan during analysis of the research gap. After widening the scope to include research into IOC withing in other contexts, a wider range of theory on the management of collaboration is returned. From the range of varying scientific approaches, two research types emerge that align with the [intra]organizational focus of the research objective and are loosely grouped into preconditions (3.1) and process (3.2).

The identified keywords from each literature group yield a two-prong approach to the literature study. The terms identified are: *preconditions, interorganizational, collaborative, capacity*. Using the keywords, synonyms are then identified. By including keyword synonyms, various word search combinations are accounted for that could yield and relevant results. Keyword synonyms are obtained using Merriam-Webster (Merriam-Webster, 2022). In addition to the synonyms obtained in the thesaurus, comparative keywords found during the preliminary literature search are also identified and included. The starting terms are listed on the left column of Table 1: Keyword Synonym Selection for Literature Search where the right column represents the synonyms found that are similar to the root keyword.

Table 1: Keyword Synonym Selection for Literature Search

No.	Root Keyword(s)	Synonyms Selected
1	Inter-organizational	Inter-agency, Inter-firm, Multi-actor, Horizontal, Cross-[collab.], Multi-actor, Inter-sectoral
2	Capacity	Readiness, Capability, Competence
3	Collaboration	Cooperation, Coordination
4	Preconditions	Antecedents, prerequisites, factors
5	Infrastructure	N/A, project, construction

While *infrastructure* is an identified keyword given the research question and application field, this term was omitted from the literature search due to the scarce results and identified research gap. The goal of the search is to understand how organizations can facilitate collaboration without the narrowed limitations of specifying a sector or industry.

2.4 Empirical Study

Once the state-of-the-art is established, attention is turned to understanding the state of Dutch Infrastructure through empirical study (4 & 5), which is subsequently interpreted through a thematic analysis (6). Empirical data is collected via a series of semi-structured interviews with industry professionals. Interviews are a form to collect data which allow the researcher to capture people's experiences and their understanding of the topic in their context. (Saldana et al., 2014) suggest dividing qualitative analysis into two cycles if using interviews as a method to collect data. 1) Where data is swept from the first round of exploratory interviews and then, 2) the second round of in-depth interviews can probe interesting and substantial themes that were obtained in the first round of interviews. This two cycle approach is implemented with a short workshop conducted with multiple practitioners from different organizations followed by one-on-one interviews.

Considering the research gaps of the intraorganizational perspective in relation to horizontal collaboration, the research is qualified as explorative. Zooming in on the preconditions to facilitate collaborative relations, the research aims to compare state-of-the art knowledge from theory with empirical data based on practice from collaborating infrastructure administrations in The Netherlands.

Empirical studies can provide insight and understanding on a topic based on first-hand information. Considering the knowledge gap and the rather understudied topic of the pre-requisites to IOC. The interview methodology offers an opportunity to make distinct connections between what organizations can do themselves and how they can influence a collaboration. Therefore, this approach is classified as qualitative research.

<u>Exploratory Workshop</u>

Firstly, an online exploratory workshop (4.1) is held to establish what organizational factors practitioners associate with IOC in Dutch infrastructure. This session is held with a group from Next Generation Infrastructure where a series of questions were asked. During the

discussion, several key points emerged regarding the motives, supporting idea and barriers to effective collaboration.

Semi-structured Exploratory Interviews

Qualitative research prioritizes depth over breadth, aiming to understand underlying motivations, perceptions, and experiences in a detailed manner. Given the complexity of the topic, a smaller sample size enables a more intensive examination of each participant's insights. This approach allows for a deeper dive into the data, capturing rich, contextualized information that may not emerge in studies with larger, more generalized samples. This explanation emphasizes that the choice of a smaller sample size aligns with the goals of qualitative research and the need to explore the topic in depth. The interviews lasted approximately 1 – 1.5 hours and were held mostly in English, however for some, the native language of Dutch was used to enable more fluid and open communication. The interview protocol (Appendix C - 10.3) provides some structure when necessary, but all interviews remain generally free-flowing and explorative.

2.4.1 Focus Organizations

A sample of two Dutch infrastructure administrations is selected for the interviews. They are comprised of the countries' largest port authority responsible for the largest seaport in Europe and the governmental organization responsible for the national railway network. Within each network, interdependencies and interfaces exist between one or multiple other infrastructure networks. Each of the organizations are in control of a network that could be classifies as 'critical infrastructure'. Additionally, each organization are members of NGinfra and show an interest in improved collaboration for the future of domestic infrastructure and commitment to exploring how it can be achieved. In this report they are referred to as 'Railway Administration' and 'Port Authority' respectively.

Railway Administration

The first focus organization is the Dutch Railway Administration. It operates as a government organization on behalf of the ministry of Infrastructure and Water Management and aims to ensure the safe and efficient operation of the Dutch railway network (Rijksoverheid, 2024). They are responsible for the maintenance and extension of the national railway network infrastructure, which according to the Dutch Government (Rijksoverheid, 2024) includes:

- Constructing, managing and maintaining railway infrastructure: This includes tunnels, level crossings, overhead lines, signs, points, and railway facilities such as stations.
- Allocating network capacity: they determine how much capacity is available on the railway network and allocate it to different train operators.
- Controlling rail traffic: they operates the railway traffic control center and coordinates disaster response.

Port Authority

The Port Authority is a public company responsible for the management, operation, and development of a major port within the Netherlands and the largest port in Europe. It houses major international companies that handle a vast and diverse volume of cargo, many of which are transferred to connecting infrastructure networks via road or rail. It serves as a Dutch and European hub for global trade and logistics. According to the Port Authority (Havenbedrijf, 2024), their core tasks include:

- Management and Operation: The Port oversees the daily operations of the port and it's clients, including shipping, cargo handling, and infrastructure maintenance.
- Safe Shipping: Ensuring the smooth and secure handling of all shipping activities.

- Sustainable Development & Future-Resilience: The Port Authority focuses on environmentally friendly practices and initiatives preparing the port for future challenges and opportunities.

2.4.2 Characteristics of the Interviewees

In this study, a relatively small group of interviewees was intentionally selected to allow for a deep and nuanced exploration of the complex subject matter. The interviewees consist of two practitioners from the Port Authority, two from the Railway Administration and a fifth independent collaborative expert. The selected interviewees were chosen based on their ability to provide diverse yet relevant perspectives, contributing to a comprehensive understanding of the research question. They possess insight both internally, to understand how their organization manages itself, as well as externally to understand how it collaborates and interacts with other stakeholders. While the titles and responsibilities vary between each correspondent, all possess IOC experience and can offer insight into the decision making processes. Finally a, fifth correspondent is classified as an independent collaborative expert. They have extensively studied IOC with the Dutch infrastructure industry and they are familiar with both the Rail and Port focus organizations of this report. While not actively employed by either infrastructure administration, the independent collaborative expert offers a source of impartial insight. All interviewees are listed in Table 2 followed by a short profile of each.

Table 2: Practitioners Interviewed

Interviewee	Role	Organization
1	Asset Manager	Port Authority
2	Contract Manager	Port Authority
3	Innovation Program Manager	Railway Administration
4	Regional Manager	Railway Administration
5	Collaborative Expert	Independent

Port Authority Asset Manager

The Port Authority Asset Manager, has over twenty-five years of experience in asset management and maintenance at the Port Authority. They shared insights on the Port Authority's approach to collaborating with other organizations, particularly in infrastructure projects and innovation efforts. The Asset Manager has also served as the Port's representative and first contact for NG Infra for five to six years, playing a key role in fostering IOC knowledge exploration outside of the project setting.

Port Authority Contract Manager

The Port Authority Contract Manager, has extensive experience in civil engineering and contract management, and has worked across multiple sectors including contractors, engineering companies, and client organizations over the span of 23 years. They began their career as a contractor, moved into project management at engineering companies, and since 2010 has worked as a contract and project manager on the client, asset-owner, side. In this time a they have has significant involvement in executing projects for the Port of Rotterdam, where interorganizational collaboration has remained a value in the execution of their contracts.

Railway Innovation Program Manager

The Railway Innovation Manager has a history in the Research & Development (R&D) domain. They possess an industrial design and innovation management background. Throughout their career, they have collaborated with industry partners, contractors, and more recently, with knowledge institutions such as research consultancies, domestic universities and Next Generation Infrastructures (NGinfra). They play a significant role in fostering collaborations aimed at driving innovation in rail infrastructure, particularly in

logistics and mobility. Over the years, their focus has shifted from ad hoc partnerships to more strategic, long-term collaborations. According to the Innovation Program Manager, this transition helped the Railway Administration improve punctuality and reliability of the rail network, which previously faced significant challenges and has therefore remained an organizational top priority. Currently, they are involved in initiatives to explore climate impacts and track stability. The Railway Innovation Manager has also been actively involved in European collaborations, working other European railway organizations and the Dutch Ministry of Infrastructure and Water Management, focusing on R&D initiatives such as the Shift 2 Rail program. Their work emphasizes building strategic alliances, enhancing the railway administration's capabilities to manage challenges related to increased rail traffic, outdated technology, and the need for new solutions in a dynamic infrastructure environment.

Railway Regional Manager
The Railway Regional Manager has extensive experience in managing infrastructure projects and fostering interorganizational collaboration. They have worked closely with asset owners such as the Ministry of Infrastructure and Water Management as well as the high voltage network service operator. They have overseen several projects with a focus on improving collaboration where railway assets are share an interdependency with other infrastructure networks or environmental stakeholders. The Regional Manager has been a large advocate in pushing for the adoption of project management models within the railway administration, such as the two-phase tender model, to enhance collaborative efforts. Their role involves coordinating between stakeholders, managing complex contractual decision-making processes, and promoting a shift towards more collaborative cultures and policies within their organization in both horizontal and vertical collaborative contexts.

Independent Collaborative Expert
The Independent Collaborative Expert is a researcher with significant experience examining the challenges and opportunities of interorganizational collaboration in the context of aging infrastructure. His work focuses on leveraging interdependencies between networks to identify and realize investment opportunities. The Independent Expert has worked with Dutch universities and conducted institutional analysis by immersing themselves in the day-to-day activities of the infrastructure organizations of focus, observing the practical challenges of infrastructure management and collaboration.

2.5 Thematic Analysis

A thematic analysis is used to identify, understand and synthesize themes that emerge within the empirical data. Upon completion of the interviews, transcriptions are made. Through data preparation, transcription organizes the data into readable and manageable text. Here, the researcher is also immersed in the subject matter content. Atlas Ti qualitative data analysis software is used to organize and code efficiently. Once interview transcripts are complete and cleaned, they are uploaded to the coding software.

During transcription the data quickly reflected the level of complexity found in the literature on IOC. Underlying significance of the data begins to already emerge in a challenging interrelated fashion. A predominantly deductive coding approach is implemented using pre-defined codes which stem from the theoretical framework obtained during the literature review. From the theory, the main topics for of coding are assigned:

Purpose & Strategy - the organization's recognition of interdependence and motivation to collaborate.

Structure - how internal roles and processes may effect multi-actor collaboration.

Lateral mechanisms – hard factors such as collaborative systems, tools and technologies; as well as soft factors such as social connection or reputation.

Incentives & rewards – how actors could be attracted to collaborate and rewarded for participation

People – Individual collaborative capacity.

2.5.1 Developing the Empirical Model

Thematic analysis is a qualitative method for identifying, analyzing, and reporting patterns and themes within data. It provides a systematic framework to organize and describe data sets in detail. For this project, thematic analysis was instrumental in understanding the underlying patterns and nuances in the data, allowing for the subsequent development of an empirical model. Thematic analysis was conducted using a combination of procedural and creative approaches. A systematic coding process was applied based on the domains and factors outlined in the Inter-Organizational Collaborative Framework (Hocevar et al., 2011). This structured approach ensured manageable codes, facilitating a goal-oriented analysis that tied to the organizational objectives of the research questions.

To begin, familiarity with the data was achieved through repeated readings and detailed note-taking, focusing on indicative quotations from respondents. Initial codes were systematically generated to capture meaningful segments of the data, particularly within the organizational domains. These codes were then organized into potential themes, which were reviewed and refined for consistency with the research questions and data's underlying essence. Each theme was named and supported by illustrative evidence. In addition to procedural analysis, creative analysis allowed for flexibility in interpreting nuanced meanings and patterns beneath surface-level observations. This dual approach provided a comprehensive understanding of the data.

Themes identified during the analysis were synthesized into theoretical constructs. Relationships between these constructs were hypothesized based on observed patterns and existing literature. A conceptual framework was developed to represent these relationships, forming the foundation of the empirical model. For example, the code 'goals' was categorized under the organizational domain of 'purpose & strategy.' Thematic analysis revealed that 'organizational goals' could hinder inter-organizational collaboration (IOC), whereas 'collaborative goals' were present in successful case examples. Further analysis highlighted that achieving collaborative goals often required organizational flexibility and a willingness to reframe individual goals to align with IOC objectives. Conversely, institutional barriers and rigid organizational goals were found to impede collaboration. By identifying these dynamics, the analysis enabled the development of a model that highlights the interplay between organizational goals, collaborative goals and IOC efforts.

3 State of the Art

Collaboration offers a wealth of literature in an array of contexts. Through scoping and demarcation, this literature study aims to identify the intraorganizational preconditions to IOC to answer research sub-question SQ1. Following the keyword driven literature search, two types of research are discovered and loosely grouped in 'Preconditions to IOC' and 'Processes design for IOC'. While the 'Preconditions to IOC' are explicitly questioned in SQ1, over the course of the literature study, theory on 'Process design for IOC' emerges as a second source of literature that tends to pay more attention to the intraorganizational level.

Preconditions – In 'preconditions to IOC', the group of research seeks to identify factors needed for IOC. This group of literature includes descriptive theory on the *conditions* that make collaboration possible and that motivate actors. There is also considerable overlap with theory on factors that influence the *capacity* of organizations to foster and grow IOC. While both inter- and intra-organizational factors are identified in this group, intraorganizational factors are also mentioned with procedural contexts that align with the 'Process Design for IOC' theory.

Processes – In 'Process design for IOC', the group of research delivers step-by-step guidance to organizations planning for IOC. This literature is *process oriented* and prescriptive. The process steps occur within, or share some similarity with, the intraorganizational conditions found in the 'preconditions to IOC' literature.

This loose grouping of research approaches to IOC is supported by a comparable grouping made by Hibbert et al., (2010) in a comprehensive literature review. Research on the management of collaboration categorized under two types of problem conceptualization (Figure 2) where; a) the research is used to conceptualize the nature of collaboration as a management challenge, or b) the research prescribes responses to the management challenge of collaboration. Furthermore, Category III contains success and failure factors while Category V contains guidelines and process steps.

Type of research problem conceptualization	*Categories where the research is usually used to help* ***conceptualize the nature of collaboration****, as a management challenge*	*Categories where the research is usually used to describe (or prescribe)* ***responses to the management challenge*** *of collaboration*
Practice oriented, relatively micro scale	Category III – success and failure factors *Category VII – themes*	Category IV – competencies behaviours and tasks Category V – guidelines and process steps Category VI – tools and facilitation *Category VII – handles for reflective practice*
Process oriented, usually of intermediate scale	Category I – life cycles, phases and stages	Category V – guidelines and process steps Category VI – tools and facilitation
Structurally oriented, relatively macro scale	Category II – analytic conceptualizations, such as typologies, models and diagnostics	Category IV – competencies behaviours and tasks Category V – guidelines and process steps

Figure 2: Relationships between insight and problem conceptualization (Hibbert et al., 2010a)

While loose categorization is possible, Hibbert et al., (2010, p.6) acknowledge the grouping to be imprecise as “most of the approaches can be viewed to some degree from both perspectives…It is not, therefore, surprising that categories of response straddle two or three levels of conceptualization.” The theoretical overlap described is also present in this report. The classification in this literature review and the accompanied theoretical framework (Figure 8) offer a means of understanding how the theoretical literature can assist in answering SQ1 by reviewing different approaches to IOC from an organizational perspective, rather than a precise characterization of work by multiple authors.

3.1 Preconditions to IOC

In general, the scholarship shares common aims in seeking to identify the “the conditions that make collaboration possible and motivate actors to participate” (Wood & Gray, 1991, p. 13) or “the essential elements that develop and strengthen organizational collaboration” (Raišienė, 2012, p. 66). However, boundaries, definitions and criteria of what constitutes these critical conditions are inconsistent with one another. There is rarely a distinction made between external, intra-organizational and inter-organizational preconditions and publications tend to focus either on one or the other or a combination. A coherent overview of these preconditions is thus lacking.

Adding further complexity is the relationship between the (pre)conditions and time. Terminology such as ‘preconditions,’ ‘prerequisites’ and ‘antecedents’ can imply that such conditions are required prior to a collaboration while words such as ‘factors’ and ‘aspects’ do not imply a place in time. Collaboration is an organic process which develops and evolves, there is no start-stop function. This cut and dry sequence is somewhat misleading in the simple model of Wood and Gray (1991). There is no hard line. For this reason, preconditions and the associated synonyms may refer to conditions present in a single parent organization planning a future collaboration as well conditions present within a multi-actor collaborating organization.

Despite the state of coherence within the literature, some classification is still possible. Research on the conditions of collaboration, and how they influence collaborating organizations are conducted at different scales and can be classified into groups of influence as shown in Figure 3. Macro-scale factors stem from external or institutional structures and systems (Hibbert et al., 2010; Raišienė, 2012). Factors which fall in this category, such as environmental, political and social aspects (Kwibisa & Majzoub, 2018; Mattessich & Monsey, 1992) are largely beyond the control of managers responsible for a single organization. On the other hand, micro-scale factors depend on the relationship between collaborative partners (i.e. trust, communication, joint decision making) and are the focus of considerable research hoping to guide management practices on the daily challenges that arise during collaborative processes (Maurer, 2010; Vangen & Huxham, 2003; Zheng et al., 2018). The theoretical underpinnings of micro-scale factors are practice-oriented, rooted in psychology and sociology, often analysing behaviours and perceptions of collaborative participants. Conversely, the macro-scale research is oriented toward social network, political science and institutional theory (Hibbert et al., 2010).

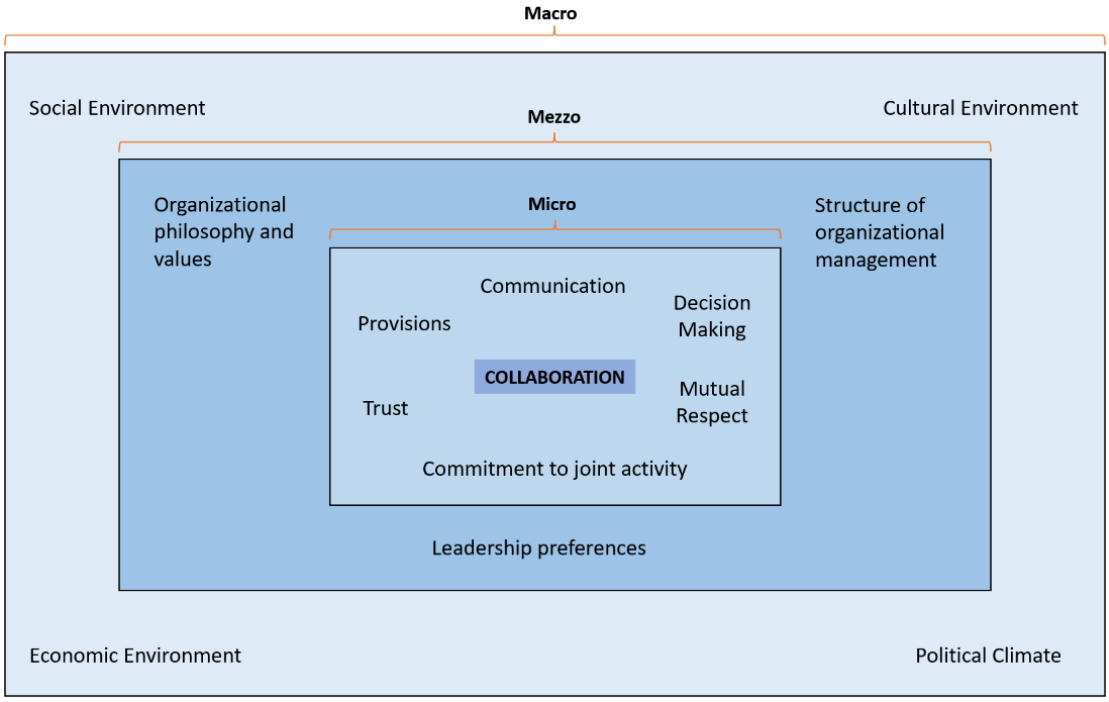

Figure 3: Determinants of collaboration ***(Raišienė, 2012)***

Mezzo-factors exist at an intermediate scale and include organizational philosophy, core values, structure and leadership preferences (Raišienė, 2012). The intermediate factors are influenced by the macro-scale factors but play an influential role in collaborative performance at the micro-scale. For an organization to take control and instil preconditions ripe for collaboration, this intermediate stage becomes interesting as it presents the opportunity to execute their own strategy and internal processes. With a focus on the Mezzo level factors, organizations maybe have more control in orientating themselves toward IOC. In their seminal study, Wood & Gray (1991) cited preconditions are centered around are stakeholders' motivations or structural conditions that give rise to collaboration:

1) Recognized Interdependence: Organizations see that they are interdependent and that solving the issues they face requires collaboration. This awareness drives them to engage with others who share common interests.

2) Shared Problem or Opportunity: There is a shared sense of a problem that needs to be addressed or an opportunity that where benefit can be achieved through collaboration. This creates a sense of urgency or purpose that drives the need for cooperative efforts.

3) Existence of Legitimate Leaders or Conveners: Effective collaboration often requires a leader or a convening organization that can bring together diverse parties. This entity should have the legitimacy and authority to initiate and facilitate discussions, build trust, and guide the process.

4) Favorable Political, Social, and Institutional Contexts: The broader environment should support collaborative efforts, meaning that political, social, and institutional factors are conducive to working together. This may involve having supportive policies, shared norms, or a history of prior successful collaborations.

Factors of the macro-scale are out of any single organization's control while the micro-scale depends on interorganizational relations. The wide scope and interdependency of all

determinants at varying scales show that demarcation is needed when considering interorganizational collaboration and its participants.

Conditions for Interorganizational Collaborative Capacity
Literature on collaborative capacity examines organizational factors that can influence an organization's readiness and capability for IOC. In this context, the organization is the unit of analysis, rather than the collaboration. Specifically looking at what makes an organization ready and able to collaborate offers insight at the intraorganizational level. Member capacity could be as a key precondition relevant to the intraorganizational stage that supports horizontal interorganizational collaboration. However, the term and associated theory is used differently:

1) "Collaborative capacity refers to the conditions needed for coalitions to promote effective collaboration…" (Foster-fishman et al., 2001, p. 242).
2) "Collaborative capacity is the ability of organizations to enter into, develop, and sustain inter-organizational systems in pursuit of collective outcomes" (Hocevar et al., 2011b, p. 1).
3) "Collaborative capacity…developing the systems and personnel able to integrate collaboratives, or horizontal systems, with the traditional vertical, specialized, and functional systems" (Weber et al., 2007, p. 197).

In some cases the connection to the [pre]conditions (section 3.1) is seen where 'capacity' refers to the conditions needed for coalitions to promote collaboration. The word 'coalitions' implies that the facilitation takes place at the multi-organizational level (Foster-fishman et al., 2001). On the other hand, predominant applications focus on the *capability* of the member organization itself in making the transition toward inter-organizational systems (Hocevar et al., 2011; Weber et al., 2007). Despite defining collaborative capacity as conditions needed for coalitions, (Foster-fishman et al., 2001) go on to suggest that it is also needed at four critical levels i) within members, or member capacity ii) within relationships, or relational capacity iii) within organizational structure, organizational capacity and iv) within programs they sponsor, or programmatic capacity. Therefore, it can be understood that collaborative capacity exists at both intra- and inter-organizational levels and across different dimensions of vertical collaboration, horizontal relationships and 'partnerships' (Weber et al., 2007).

Similar to the preconditions, the factors of member collaborative capacity are identified and classified in various approaches. Classification into organizational domains (Hocevar et al., 2011) assists in understanding where critical elements fit into an organization but lacks clear distinctions between existential factors, strategic processes and the inter-/intra-organizational levels. On the other hand, extensive lists of critical elements of member capacity (Foster-fishman et al., 2001) emphasize the core skills, knowledge, attitudes and motivations, (Appendix 10.2.4.). These critical elements are extensively described and cover in-depth what makes a "member" a sociable, productive, collaborator. However, the elements are individually geared, and the organizational perspective is lost. The Inter-Organizational Collaborative Capacity (ICC) Model presented by Hocevar et al. (2011) is presented in Figure 4: The Five Organizational Domains and 13 Factors of ICC (Hocevar et al., 2011). The five organizational domains and 13 factors of the ICC model offer a framework that serves as a potential tool for researchers and managers aiming to analyze specifically where or how preconditions to IOC fit within a organization. In addition to the framework of preconditions, the contributions of Hocevar et al. (2011) are catered toward large public organizations including government and infrastructure administrations.

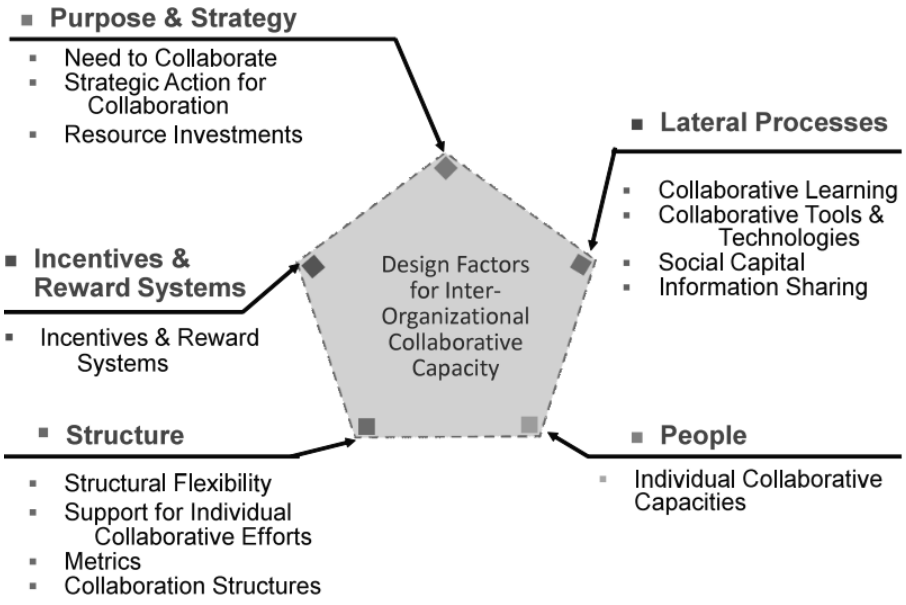

Figure 4: The Five Organizational Domains and 13 Factors of ICC (Hocevar et al., 2011)

As part of this framework, (Hocevar et al., 2011) distinguish between the intraorganizational versus the interorganizational. This distinction is of high importance to the research goals. Figure 5: Organizations in a Common Problem Space (Hocevar et al., 2011) shows the collaborative context with participating organizations and an inter-organizational entity, interdependent through a shared problem. The preconditions for collaborative capacity are present within each organizations, outside of the shared entity. Notably, once two or more organizations engage to form what is a shown as an “Interagency Organization,” the domains and factors influence a collaborative capacity in the newly formed organization as well.

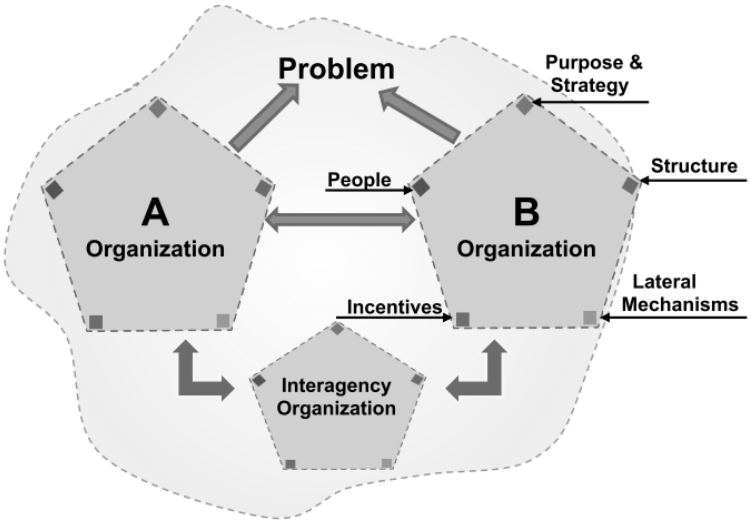

Figure 5: Organizations in a Common Problem Space (Hocevar et al., 2011)

3.2 Process Design for IOC

In the previous section the literature presents preconditions that support IOC and conditions that support an organizations capacity for IOC. Literature presenting these preconditions can be descriptive delivering the 'what' but tends to lack the 'how' in facilitating IOC. Collaboration is a dynamic process (Thomson et al., 2009) and therefore warrants a procedural approach in addressing '*how'* the preconditions to IOC may be fostered within an organization. Alternative to the critical factors, frameworks can be found which offer a stage-wise approach in implementing and managing horizontal IOC. This section examines the scholarship on approaching IOC through a this more procedural lens.

IOC presents the three characteristics seen in complex process design; there are multiple actors involved that share interdependency; the actors negotiate in a complex manner; and the negotiation process extends over time (Bruijn et al., 2010). IOC requires organizational change around a complex issue. Through process design, organizations analyse both themselves and their potential collaborative partner to inform change with their own organization that sets the stage for engaging in positive negotiation. Verstrepen et al., (2009) offer a stage-wise approach in the context of transport and logistics service providers that participate in horizontal collaboration. While, the type of organizations in focus differ from critical infrastructure, the early process steps are consistent with other models where the identification of motives and objectives informs the development of a collaborative strategy prior to partner engagement (Ref. Figure 6: A stage-wise approach towards horizontal cooperation (Verstrepen et. al., 2009).

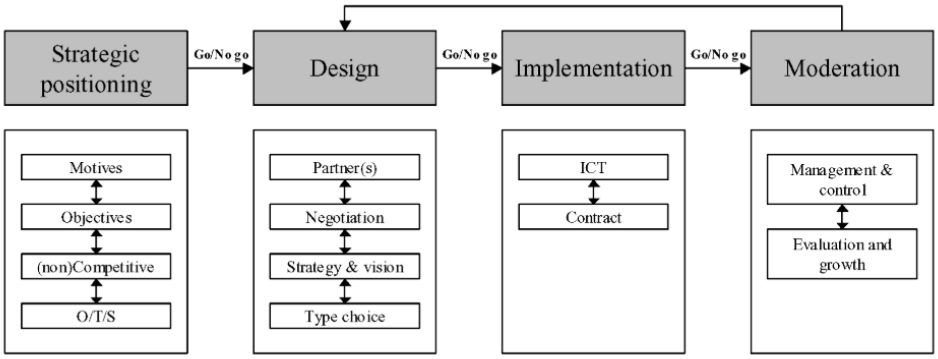

Figure 6: A stage-wise approach towards horizontal cooperation (Verstrepen et. al., 2009)

Similar models are also found on complex negotiation, process management and stakeholder engagement (Bruijn et al., 2010; Fisher et al., 1982). In addition to the identification of organizational factors of collaborative capacity, Foster-Fishman (2001) outlines strategic actions members can take to build capacity. Of the process models reviewed, The Strategic Environmental Management (SEM) model (Wesselink & Paul, 2013) offers a detailed and applicable guide to manage interests and relationships in complex projects within a Dutch critical infrastructure context. Wesselink & Paul, (2013b) offer a 9-step process to facilitate strategic and structured collaboration and identify solutions acceptable to all parties involved. SEM focuses on identifying, understanding, and engaging stakeholders in projects where diverse interests are at play, such as infrastructure, spatial planning, or major societal issues. Its goal is to build support and prevent or minimize conflicts. While the total process involves both organizational and interorganizational action, focus of the literature review is placed on the aspects of the SEM model that occur at the organizational level, prior to engagement of multiple parties. As shown in Figure 7: The SEM Model (Wesselink & Paul, 2013) accounts for the intraorganizational aspects in the two quadrants of the model on the "Internal" or "Preparatory" side of the model. First preparation which is followed by the analytical and strategic phases. Each phase consists of two steps for a total sequence of four steps. The preparation phase includes 1) the formulation of

goals, what is to be achieved through the collaboration and 2) the inventory of issues and stakeholders. The analytical phases follow with 3) the identification and analysis of standpoints and interests and finally, 4) determining a strategy per stakeholder. Each step is further detailed in the following sections.

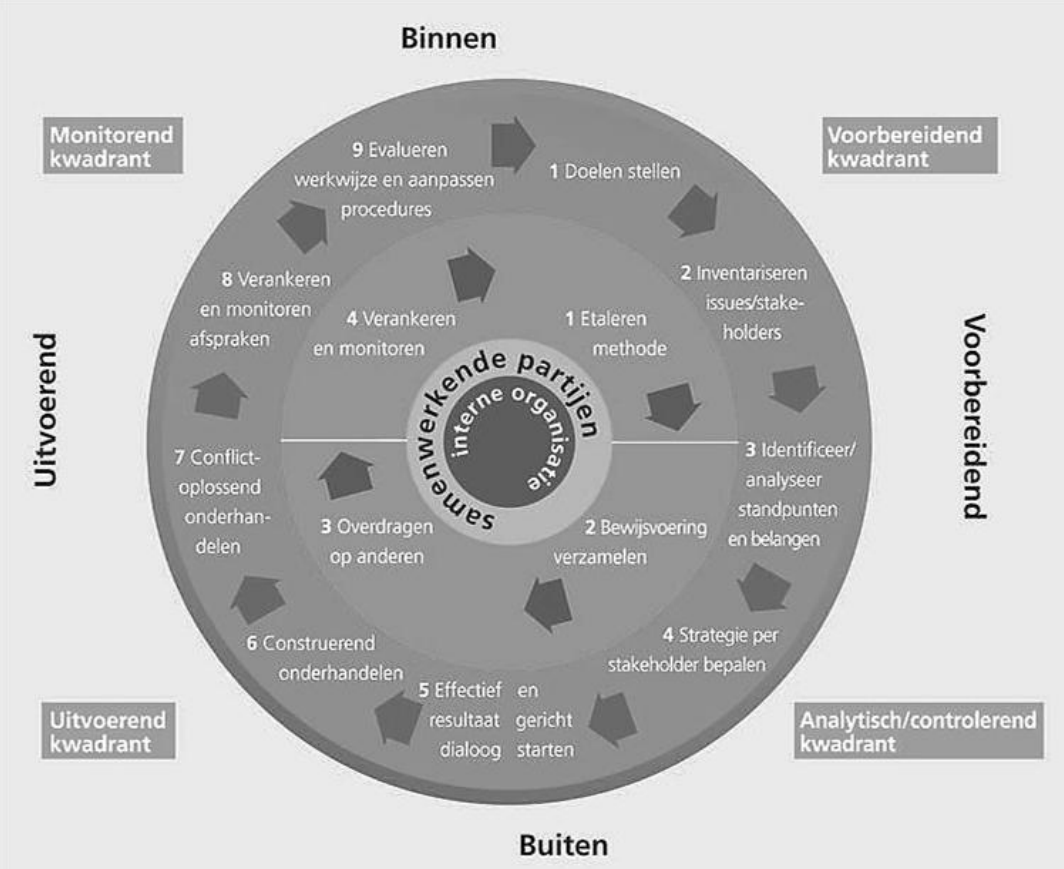

Figure 7: The SEM Model (Wesselink & Paul, 2013)

As the organization identifies the benefits to be had from a collaboration, personnel are encouraged to engage in collaborative behaviour. This is further supported by *resource dependence theory (RDT)* which is often mentioned in the context of collaboration (Hibbert et al., 2010). According to RDT, the resources of external stakeholders can influence the internal behaviour of a single organization. Thus, by understanding the interdependence, internal assets and potential benefit of external resources, an organization can acknowledge that external resources may be needed to achieve organizational goals where IOC may help to bridge the gap.

Preparation

Strategic action, or strategic positioning is cited as one of many critical factors of collaborative capacity (ref. 0). However, what constitutes ‘strategic action’ is not simply a starting point, rather a process of gradually increasing awareness that results in intent and purpose to proceed with collaboration (Verstrepen et al., 2009). Most organizations operate according to a mission in pursuit of organizational goals. The felt need to collaborate is supported by an organization’s benefit perception and recognition that benefits may be available through IOC. An organization is more likely to participate in IOC if they positively perceive the potential outcomes as beneficial.

Setting goals also comes with the formulation of ambition, assembly of a team, and determining a direction in which the organization wants to take the collaboration (Wesselink

& Paul, 2013). Without a clear ambition and goals, the organization cannot be steered. Different members within an organization may already have different ambitions and approaches to a project. Therefore, it is suggested that ambitions be determined together with both project directors with a short-term focus on the project and also asset managers that represent the long-term interests of the asset. This in turn leads to a fluid, flexible ambition which may lead to increased complexity but also more opportunity for wins.

3 dimensions define the starting point of the collaboration:

- Motives – an understanding of what can be expected as a result of the collaboration, and the so-called 'felt need' for the collaboration.
- Objectives – how one can benefit, that is how the object of collaboration fits into larger ambitions to accomplish certain goals
- Intensity – an understanding of how the collaboration actually helps fulfil strategic, tactical or operational goals

When setting goals for collaboration it is commonly misunderstood that these concern the goals of the project in which infrastructure operators collaborate, for example the improvement in availability of an asset, resulting in a new or upgraded road or a different distribution of transport over rail, road and water, the so-called modal split. In this sense, the goal of the project is different from that of the approach to collaboration. The importance of a clear goal when interdependencies are present is twofold. On the one hand the organization's internal team obtains a sharp focus to increase the chance of success. Externally, potential partners see a clearly formulated goal

Preparation Quadrant – Step 1: Setting Goals
The first step in the first quadrant, officially called setting goals, emphasizes the importance of defining clear goals, aligning the ambitions of various stakeholders, and assembling a capable team to implement the plan. According to Wesselink & Paul (2013, p. 75-79), the process begins with setting goals by formulating a clear ambition that reflects the interests of all stakeholders and what the collaboration aims to achieve. These goals should be SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) to ensure they guide the environmental management process effectively. Additionally, it is recommended to understand and address potential conflicts between personal and organizational goals.

In terms of team building, the focus is on assembling a team equipped with the necessary knowledge, skills, and competencies. Building trust and fostering effective communication within the team is recommended, along with creating a supportive work environment that facilitates collaboration and knowledge sharing. Finally, clear roles and responsibilities within the team structure, implement efficient work processes (such as distinguishing front-office from back-office tasks), and ensure proper administrative support and secure information management. Together, these elements lay the groundwork for a successful collaborative effort.

Preparation Quadrant – Step 2: Stakeholder & Issue Inventory
The second step explains identifying and analyzing the issues and stakeholders in the collaborative environment. It emphasizes the importance of gathering and organizing existing knowledge, conducting thorough research, and creating detailed dossiers. According to Wesselink & Paul (2013, p. 82-88) the process of identifying issues and stakeholders involves several key steps. For identifying issues, brainstorming and research are essential to uncover potential concerns. Detailed issue dossiers should be created for each issue, documenting its history, severity, and potential impacts. For stakeholder identification, stakeholder mapping helps to pinpoint key stakeholders and assess their level of interest and influence. Detailed stakeholder dossiers are also recommended, which include information about their interests, power, emotional state, and stance on the issues.

Analysis & Strategic Development
Cooperation is most advantageous when partners bring supplementary strengths to the table. A SWOT analysis (Strength, Weakness, Opportunity, Threat) of an organizations own core activities and competencies can offer insight into one's own collaborative capacity and what the organization can contribute. A SWOT assessment of potential partners can also encompass *hard* factors (i.e. business case, quantifiable resources) and *soft* factors (i.e. trust and cultural fit) which can weigh on collaborative compatibility. Cultural alignment can be influential in long-term, intensive partnerships where a "chemistry" or connection is needed to speak the same language. Steps taken to evaluate and consider the compatibility between partners is important as partnerships are not only built on economic and strategic compatibility but also on emotional and cultural alignment (Verstrepen et al., 2009).

Analytical Quadrant Step 3: Identifying and Analysing Stakeholder Interests
According to Wesselink & Paul (2013, p. 91-94),The third step emphasizes the need for analyzing the interests, motivations, and concerns identified in in the preparation steps. During this phase, organizations interests and profiles can provide indicators as to their influence and positions. By analyzing the relationships between stakeholders, teams gain valuable insight into areas of alignment, potential conflicts, and how various issues impact potential partners. The goal is to build a strong foundation for collaboration by recognizing common interests and identifying areas of tension early on. Additionally, considering the emotional aspects of stakeholders and assessing the best strategy for communication can enable building trust and achieving mutual gains. Emotional analysis includes understanding stakeholders' history with the project, their past experiences, and any potential sources of conflict. Another important aspect of Step 3 is conducting relationship analysis to determine common goals or exhibit similar concerns. This analysis helps in clustering stakeholders to streamline communication and strategize collective approaches. It also enables the identification of stakeholders who may require more attention due to their high influence or potential to obstruct project progress.

Analytical Quadrant Step 4: Strategic Development
In Step 4, (Wesselink & Paul, 2013, p. 94-101) gathered information is used to formulate strategies for each stakeholder. The goal is to determine how to best engage each party in the decision-making process based on their priorities, influence, and level of interest. Strategies can range from informing less-influential stakeholders to empowering those who play a critical role in project success.

This step also includes assigning appropriate participation levels for each stakeholder, ranging from simply informing them to actively involving them in the project. A successful strategy is designed to create conditions for optimal cooperation and positive involvement of all stakeholders, maximizing the value of their contributions. To achieve this, it's important to understand what motivates each stakeholder, their concerns, and their expectations from the project. Training in change management and understanding different influence styles are emphasized as key components to enhance stakeholder engagement. This training helps team members recognize different stakeholder motivations and adapt their communication approaches accordingly.

3.3 Summary of the Literature - SQ1

Through the literature study, two theoretical perspectives provide insight into the intraorganizational preconditions to IOC. These two perspectives are integrated into a theoretical model which aims to help answer SQ1.

The theory presents conditions that “make collaboration possible and motivate actors to participate” (Wood & Gray, 1991 p.13). Terminology varies as “conditions”, “factors”, “variables” and “domains” are all presented. This contributes to a wide range of factors where categorization can be helpful to distinguish between intra- and inter-organizational and external conditions in accordance with the scope of this report. Three categories are presented by Raišienė (2012) where the mezzo level is particularly significant, as it represents a domain where organizations can proactively improve their capacity for collaboration.

Literature on the conditions for organizational collaborative capacity overlaps with literature on the preconditions to IOC, focusing on an organization’s ability to establish, develop, and sustain IOC. The concept of collaborative capacity is presented using insights from Foster-Fishman (2001) and Hocevar et al. (2011). The ability of an organization to effectively engage in and sustain IOC can be classified into five domains:

- Purpose and Strategy: Aligning organizational mission and goals with collaboration efforts, supported by leadership commitment.
- Structure: Creating structures that support collaboration, including liaison roles, inter-agency teams, and adaptable processes to facilitate coordination.
- Lateral Mechanisms: Promoting horizontal interactions through social capital, collaborative tools, and effective information sharing across formal and informal channels.
- Incentives: Motivating participation through rewards, and reducing barriers to encourage engagement.
- People: Focusing on individual skills, knowledge, and attitudes that foster effective collaboration, including conflict resolution, communication, trust, and recognizing diverse perspectives.

The theory present process models that can guide organizations through the first steps in approaching IOC. (Verstrepen et al., 2009; Wesselink & Paul, 2013). These models introduce a sequential element that is not well covered in literature on the preconditions. Through the procedural approach, the literature suggests several preparatory steps in developing a collaborative strategy prior to negotiations with any external party. Taking time to evaluate, understand and analyze the goals and interests of a potential partner is suggested. In addition to an outward-looking stakeholder analysis, organizations are encouraged to conducting self-assessments into their own strengths and weaknesses which may clarify complementary or supplementary capabilities. These steps emphasize the importance of aligning organizational strategies with collaborative efforts. According to Wesselink & Paul (2013), the success of the strategic environmental management approach is dependent upon it’s timely implementation. When embedded within the organizational strategy, the principles are integrated as collaborative goals within the organization’s structure, management and culture. In this sense it can become more than simply a tool to be used only when collaboration is being considered.

3.4 Theoretical Model

The theoretical framework presented in Figure 8 synthesizes insights from the literature review which can may aid in understanding empirical observations. It conceptualizes the transition from recognizing the need for collaboration to building collaborative capacity.

The horizontal rows of the framework of the framework draws upon the process-oriented approaches proposed by Verstrepen et al. (2009) and Wesselink & Paul (2013) and the main steps in preparation for IOC. The vertical columns of the framework draw on the literature of the Preconditions to IOC and collaborative capacity of Wood and Gray (1991), Foster-Fishman (2001), and Hocevar et al. (2011), as previously listed.

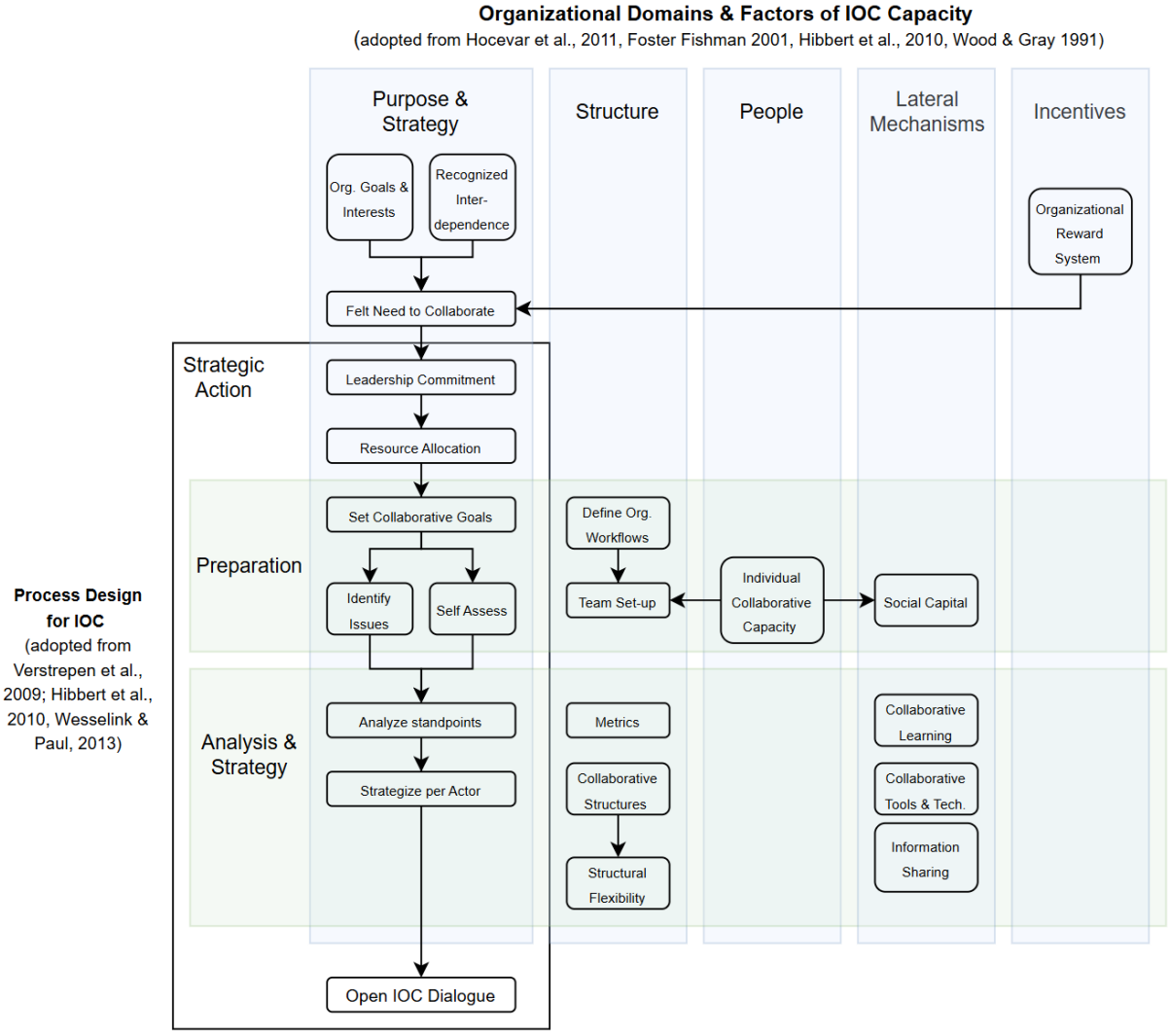

Figure 8: Theoretical Framework

The overlap seen in the model emphasizes the importance of strategic alignment, where organizations integrate collaborative principles into their structures, management, and culture. For example, Wesselink & Paul (2013) highlight that the success of the SEM approach depends on its integration into organizational strategies, ensuring that collaboration becomes a sustained capability rather than an ad hoc tool.

The starting point of the framework is a combination of Organizational Goals and Recognized Interdependence which exist in the purpose and strategy domain. This means that an organization sets its own goals while acknowledging its existence within a broader

network. Recognizing interdependence highlights the necessity of collaboration with other organizations to achieve broader objectives. From organizational goals and recognized interdependence arises the Felt Need to Collaborate. This component represents the realization that collaboration is necessary for achieving organizational objectives effectively. The felt need can stem from a perceived benefit of collaboration or from addressing a shared problem. Organizations view collaboration as a means to achieve their goals when they recognize that independent action is insufficient.

Strategic Action

With a felt need to collaborate, organizations take strategic actions to maximize arrive develop and strategy to specific to the context and stakeholder. Strategic Action presents the focused overlap and between organizational preconditions within the ‘purpose and strategy’ domain and the Process design steps. At this stage, organizations possess the most intraorganizational control where the set up influences IOC. Strategic action begins with committed organizational leadership and the availability of resources that facilitate further thorough strategic preparation and analysis steps. During these steps, the strategy considers where the organizational domains fit and contribute to an eventual IOC.

Answering SQ1

In addressing SQ1, using the theoretical model integrating organizational conditions for IOC capacity and process design for IOC, the intraorganizational preconditions to IOC are identified as follows:

- Leadership commitment to IOC that allocates resources for strategic development.
- A context-specific collaborative strategy that includes:
    - Collaborative goals that cater to a mutual ambition of stakeholders.
    - An understanding of parent organization and the collaborative partner with respect to standpoints on issues along with strengths, weaknesses, opportunities and threats both sides bring to the table
    - Metrics that evaluate performance and assess outcomes.
- An organizationally flexible structure that employs lateral mechanisms and coordinates interorganizational processes with internally defined organizational workflows.
- A team of collaboratively capable individuals committed to the collaborative strategy.

4 Empirical Data

The empirical data is composed of the explorative workshop with NG Infra and the explorative interviews. The data collected contributes to the understanding and identification of the contextual success and challenges experienced by practitioners and the the answering of SQ2.

4.1 Explorative Workshop

A workshop is organized as part of a recurring NGinfra meeting. As an additional agenda item, the representatives from each of the member organizations anonymously took part in a collective informal Q&A on IOC following reoccurring discussions on coordinated network resilience in response to the COVID-19 pandemic. The representatives are collectively asked five questioned on the motivations, challenges and expectations relative to IOC between their organizations.

Organizational Goals & Interests - In response to the first question on the barriers to IOC, 3 of 4 participants speak on the importance of the alignment of goals and interests. They highlight that conflicting goals can hinder IOC, specifically when one organizations achieves their goal while the other does not. The asset manager of the Port Authority adds that success can be found in finding common goals. Conversely, when asked about their expectations of IOC, participants responded from an organizational perspective including as “achieving your own goal” and “generally, money”, displaying perhaps some contradiction that reaching a mutual or collaborative goal is not as high of a priority as long as IOC delivers results in the interest of the single organization. However, in almost the same sentence, one participant states that you cannot achieve your own result if you don’t achieve a joint result. The flip-flopping of answers on both organizational goals and mutual goals contributes to a sentiment that achieving personal and collective results are interconnected but clarity and consensus was lacking.

IOC Varies with Context – When asked how they envision future IOC between their organizations. Three participants answer that it will vary with context; per project, per environment, or per region. One respondent adds that the form of collaborations may be different whether incidental or structural. In an answer on important requirements for IOC, one participant also cites changing environmental laws affecting stakeholder relationships and that getting involved within a specific context in key.

People - One participant mentioned people as a potential barrier. Stating that true collaboration happens at the individual level, and that IOC is simply a sum of collaboration between individuals.

Clarity in strategy on vertical IOC – There is a degree of clarity shown in how the respondents understand vertical collaboration with contractors. It is stated that continued evolution has shaped forms of collaboration which infrastructure administrations take with subcontractors. There have also been tools developed to optimize vertical IOC. The asset owners have clear expectations of the contractors, acknowledge interdependence and stakeholder understanding. This clarity is not seen in the answers on horizontal IOC.

The meeting transcript of the workshop can be found in Appendix A (10.1).

4.2 Purpose & Strategy

4.2.1 Felt Need

When an infrastructure administration recognizes the interdependencies shared with another infrastructure and acknowledges that IOC is needed to accomplish their goals, it is referred to as a ‘felt need’ to collaborate. A felt need can be derived from a perceived benefit or

opportunity, but it can also stem from a common problem or perceived threat. The felt need to collaborate is mentioned often by the practitioners and contextually linked to other key factors or actions that facilitate IOC. It goes hand in hand with the recognition of interdependence needed for practitioners to understand how other network assets are important to their own organizational goals and how institutional barriers (4.3.1) affect one's role within the networks of networks (4.3.2). This recognition affects the way of thinking of decision makers to more long-term outlooks and drives infrastructure administrations to explore loosely structured collaborative agreements (4.3.2). In cited case examples, respondents described the actions that follow the felt need to collaborate vary and are of more significance than the felt need itself which could indicate that 'felt need' is an existential precondition that does not demand attention. Still it is important to understand its role and relationship with the other supporting or limiting factors.

The collaborative expert cites an example where one of several national Dutch energy networks recognized their independencies with other energy networks. Following their felt need, in an effort to better understand the interdependencies, the organization decided to invest in an innovative and explorative collaborative platform. Ultimately the Netherlands Authority for Consumers and Markets (ACM) deemed it an inefficient use of organizational resources.[2] While the NMA has positive intentions in aiming to protect economic competition for the Netherlands, the case example shows the felt need to be present in the early hatching of IOC while accompanied by other preconditions of resources and support from stakeholders.

4.2.1.1 The Theemswegtracé Case

In a more successful case example, the exploration of IOC on the Theemswegtracé project continued as the Port Authority justified the allocation of resources (4.2.4) and involved more disciplines (4.3.2). The Theemswegtracé is a €300-million project addressing capacity and efficiency issues associated with the Calandbrug near Rozenburg in the Port of Rotterdam. The Calandbrug, a steel vertical-lift bridge serving rail, road, and shipping traffic, is a vital link in the Betuwe Route to the European hinterland and a gateway to the Brittanniëhaven for ocean shipping. By rerouting rail traffic via the Theemswegtracé as shown in Figure 9: Rerouted railway via the Theemswegtracé, the project aligns with the Port's goals of improving sustainability and efficiency in transport while concurrently addressing predicted growth in rail freight and shipping traffic. This solution eliminated a critical bottleneck, ensuring smoother operations across transport modes (Rotterdam, 2021).

[2] Excerpt 1:8 interview Independent Collaborative Expert

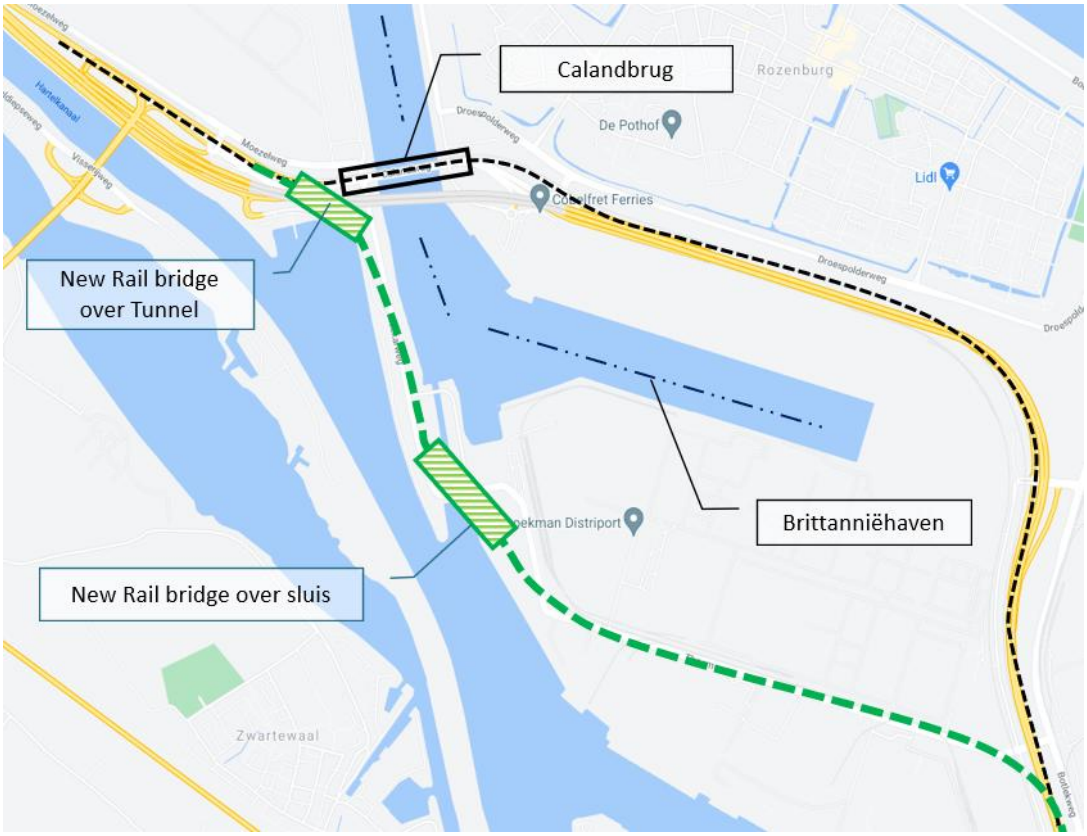

Figure 9: Rerouted railway via the Theemswegtracé

As the Calandbrug caused noise disturbances within the port area and limited waterway access in addition to other issues. The Port Authority felt the need to take the lead and involve the Railway Administration to solve relieve the bottleneck.[3]

The Port Authority's felt need is observed as stemming from a more active approach in pursuit of their own organizational goals. The felt need by the Railway Administration is observed as more passive but still cooperative having agreed to support The Port's lead on a project concerning their own asset. The Railway practitioners spoke on the need to collaborate for efficient procurement strategies when it comes to engaging the shared pool of contractors and suppliers between all asset owners[4], representing a more interorganizational outlook. While causes of the felt need are nuanced and varied, practitioners from both sides speak on the importance of a sense of urgency the drives early coordination.

> *"I see that more often than not, we just manage to solve the problem together. And I do think that resolution is reached due to the need to be able to do it quickly and that everyone feels a common problem"*[5]

The presence of uncertainty is also cited as default scenario where the existence of high project complexity meant the decision to collaborate was made. Also contributing to the felt need to collaborate, is a sense of urgency.

> *"We had two highly complex situations where we didn't know the answer yet. So we decided we have to do this in collaboration with a contractor, of*

[3] Excerpt 5:12 interview Port Authority Asset Manager
[4] Excerpt 6:8 interview Railway Administration Innovation Program Manager
[5] Excerpt 6:9 interview Railway Administration Innovation Program Manager

course, but also with engineering firms, [the railway carrier] and [airport administration]."[6]

Societal Vision

Practitioners from both the Port Authority and Railway Administration link a societal awareness as precedent to the creation of a collaborative strategy – that the organization must place less emphasis on self-interests and more thought on stakeholder values. In one cited example, the Railway Administration discovers an interface issue stemming from the close proximity of the railway network and the high voltage grid power lines. The Railway organizations discovered the issue, recognized the interdependence and reached out to the high voltage grid operator. However, the regional manager for the railway expresses frustration that their counterparts did not share the societal vision that supports the felt need to collaborate.

"We [Raiway Admin.] start to make the connection because we see that we have to work together somehow. It took us a very long time to get this problem [EMC Values] noticed by the ministry and once it was acknowledged, it was assigned to make an assessment how big the problem was. We needed to ensure that the magnetic fields from power lines from the [High Voltage Transmission Service Operator] will not interfere with the signaling system of [Railway Admin]. So if the TSO powers up the lines from 10,000 volts to 40,000 volts, the magnetic field grows and interferes with our signaling system, compromising safety. We had a problem to manage it and it was hard to get our colleagues from the high voltage grid operator in a listening mode, to shift their focus away from their own organizational interests and to start thinking in the interests of the public. It took us a year or two, but that was key"[7]

The felt need was absent from one organization and present with the other. But why was the felt need absent? The possession or perception of power affects relational behaviour and influences how respondents expressed the felt need. Infrastructure asset owners are essentially monopolists. In traditional, hierarchical relationships, the asset owner possesses 'realization' power; authority backed up by domestic law which makes it easy to have an eye for the strictly most financially attractive pathway. The railway infrastructure manager is backed up by the Railways Act which provides general rules about the construction, management and accessibility of railways. Asset managers can perceive the backing of laws as absolute power which can be wielded opportunistically to force transactional behaviour and create a win-lose outcome via vertical collaboration.

"…we are so powerful and we have the law behind us, so we can do exactly what we want to do and you have to listen."[8]

This power play becomes more problematic in a horizontal setting when a complementary asset owner is also backed by their own, equally powerful domestic laws and policies. The lack of hierarchy, or the existence of two equally important responsibilities creates a "power between powers" impasse where traditional transactional behaviour fails to settle disagreements or solve issues. When describing how the Railway Regional Manager resolved the tension with the colleagues at the High Voltage Grid Operator, he ultimately instilled a felt need to collaborate by discussing the values and interests behind the issues at play and so created a shift in relational behavior.

"You have to explain that this [transactional] mechanism is not good for the collaboration and once you acknowledge that, you can start saying, 'OK, we have

[6] Direct Excerpt 7:7 interview with Railway Regional Manager
[7] Direct Excerpt 7:5 interview with Railway Regional Manager
[8] Direct Excerpt 7:1 interview with Railway Regional Manager

issues here to manage. Let's identify what issues we have, if we identify them, then we can talk about it and make a deal about it."[9]

He states that it can still be a challenge but that the industry is improving. The biggest win being that he sees asset owners acknowledging the need to collaborate driving an effort to create more collaborative agreements (4.3.2).

Goals

Organizational goals are a key driver for asset owners, but how this translates to an attitude towards collaboration and the pursuit of mutual goals is observed differently between different organizations. The Port Authority possesses a clear perspective towards its own goals which in turn orientates its position towards collaboration. Their goal to be the best port in Europe with the highest service level drives an ambition to pursue and execute continuous improvements at pace.[10] The Port Authority is also committed to becoming a leader in the energy transition and making the Port industrial cluster an example. They are searching proactively for partners who can help them achieve this such as via ministries or the Second Chamber of Parliament with an approach that "we believe it is good and why don't you listen."[11] They believe in their own goals and encourage others to jump on board.

This drive also means involving whomever necessary for them to achieve their goals. To have an optimal functioning harbour means smoothly operating freight trains and trunks in an out of the container terminal on reliable road and rail infrastructure. The Port Authority takes it upon themselves to ensure the network interconnections are functioning and fit for purpose so their own goals are met. The Asset Manager from the Port acknowledges that the organizational attitude might even be construed by others as arrogant: rolling up the sleeves and getting it done. "Not talking, but doing…Make it happen". This organizational culture can lead to collaboration, but only if needed and only to achieve their own goal:

"We do not prepare ourselves for a better cooperation, if there's not a specific project or specific goal to reach or a specific problem that we have to solve. So when there is an opportunity, a risk, or a project, we search the partners we need to involve proactively."[12]

The Port Authority deemed the Theemswegtracé a risk willing to take in the midst of the Financial crisis in order to meet their own organizational goals of ensuring reliable, continuously available connections to the newly expanded Maasvlakte. [13] They took the lead in initiating the process to engage the Railway administration and allocate resources. But when the goals are examined at the outset, the leadership directed a team to 'explore' news possibilities and involved multiple disciplines. These directions are in line with setting goals for a collaboration with an eye on process, rather than an eye on a project that delivers on organizational goals only. This success factor is not yet the norm, but shows the potential when collaborative goals are set.

There is a less assertive, but still collaborative approach observed by the Railway Administration on a railway tunnel project which demanded close collaboration with the airport. The Regional Manager describes the setting of goals and objectives for the collaboration upfront with all parties He acknowledged that the expression of collaborative goals and objectives is difficult early on, but yields a better relationship between collaborative parties over time. The relationship is important in times of adversity to lean back on. Distinct, organizational goals still exist between multiple parties, so it is important to look deeper and see how parties can make the step from organizational goals to mutual

[9] Direct Excerpt 7:26 interview Railway Regional Manager
[10] Direct excerpt 2:4 interview Port Authority Contract Manager
[11] Direct excerpt 5:7 interview Port Authority Asset Manager
[12] Direct excerpt 5:4 interview Port Authority Asset Manager
[13] Excerpt 1:13 interview independent collaborative expert

goals. Asset owners must consider in advance what they want to achieve when designing the project itself, the project organization through to procurement strategies.

> *"Up front we created the context. The objects and goals we want to achieve. We discussed that with all the rail contractors, NS and with Schiphol. And that was hard because NS didn't trust us at that time and Schiphol didn't want to connect at all. They just thought "well, we are above the ground and they are underground so I don't care." But later on I was happy that we did that because we had some serious incidents about dust in the in the station after renewal. And we could have had a lot of issues if we didn't have such a good relationship. But we had to build on that."*[14]

The formation of this 'context' was described firstly as phase zero dialogue rounds between both asset owning and executing contractor stakeholders. Each dialogue round was assessed by a consultancy firm according to goals that prioritized building trust. A consultancy tool was employed for observing various behaviors and each round recommendations were issue on how to do better. During the rounds stakeholders followed a working plan loosely based on the tunnel project.[15] The Regional Manager added that price was nothing more than tariffs and the hourly rates in these early phases. He feels that collaboration was ripe during the phase one Bouwteam resulting from the trust placed as a priority placed on trust early on in phase zero:

> *"We worked on trust. It was a topic. We did it in the introduction. We did it in the project startup. We did it in the follow ups. It was a an event that was very important on the agenda…We created a context where people feel safe"* [16]

4.2.2 Leadership Commitment

The outlook and decision making of organizational leaders is critical in determining whether a 'felt need' to collaborate translates action. The leaders can especially be the key facilitators or main roadblocks. In an example, a railway admin representative cited that at first it was proving difficult to get one asset owning organisation to come to the table. Interestingly, the respondent first described the process by saying 'they' when he discussed the lack of willingness of another infrastructure owner to communicate, but then correcting himself and specified 'the person' indicating that an important individual can be a single road block for an organisation to collaborate. This individual turned out to be a key executive director proving to be uninvolved and unmotivated.

> *"it was a little bit hard to get them, well, get the person on the table, but in the end it did happen*[17]*…we had another project with Schiphol, MKS multimodal knoop Schiphol. The directors of Schiphol, NS, ProRail and the Ministry were talking to each other because of what was a very political project. We used that management board to create some collaborations inside and then we helped them with some collaboration on the operating level."*

Incentivization and social capital between higher level leaders ultimately allowed the collaboration at the operating level to proceed. When trying to understand what affects leadership commitments to collaboration, it is observed that there are tensions at play

[14] Direct Excerpt 7:8 interview with Railway Regional Manager
[15] Excerpt 7:9 interview with Railway Regional Manager
[16] Direct Excerpt 7:10, 7:30 interview with Railway Regional Manager
[17] Direct Excerpt 7:13 interview with Railway Regional Manager

affecting operational goals which are weighed especially when considering pivotal decisions with long-lasting impacts over permanent infrastructure. The long term thinking presents a challenge for leaders that are appointed with a duty to address short term issues. The Port Authority asset manager explains that managers possess a contract for four years with a chance of a second term extending to eight years. Their horizon is not next generation, it is short-term. Conversely, the organizations responsible for the railway, roadway and water management infrastructure report to the ministries which tie them closer to the national government and better suited for long term outlooks.[18] The Port Authority possesses a fickle relationship with their shareholders, comprised approximately 30 percent municipality of Rotterdam and 70 percent Ministry of Finance. This is essentially 100 percent public government. However, compared to other infrastructure administrations it operates as more as a company, but with public shareholders. There is a tension between whether the government should pull board of directors more closely in line with a national policy that public offices can steer? Or should the board itself be left to operate more as a free business. [19] The long term outlook on infrastructure of the future is difficult to translate directly into immediate action. However if decision makers possess this outlook then they are more likely to engage one another and take proper action when the time comes.

> *"When we think next gen, when we think long term, when we think bringing together it also means that we have to fundamentally reconsider the inherent value biases in our long term predictions. And I think this aspect of next gen will be tough to translate to exact doings. It's more a way of thinking. And with that way of thinking, if you can get that into the minds of the decision makers, then it's also something that is bringing them together.[20]*

When asked about how the Port Authority can shift toward a more long-term, societal vision and engage more with interagency explorative teams, the asset manager ties this to the involvement of the COO. He explains the challenge of being involved with the collaborative learning groups that produce knowledge and strengthen relationships but produce limited to no tangible financial results or new infrastructure assets. The COO questions why other regional infrastructure organizations are also not participating almost as proof to doubt the Port's own commitment:

> *"It's hard to say directly to my COO at this moment, but we need to put on more 'maatschappelijke bril" (societal (glasses) vision) to look at the world around us. We as the Port Authority cannot solve the problem tomorrow alone. So we have to do it together. I have quite a lot of discussions with our new COO who is also on the board of NG Infra, and he is starting to see it and he is starting to understand what I'm telling him. But he still has that urge to see results. And when I talk to him about the societal impact and the partners we have within NG Infra. And then he says, "well, yeah, Alliander is a partner of NG Infra but is not the energy provider within our region. That should be Stedin. Why don't we have Stedin within NG Infra? Why don't we have Tennet within NG Infra?" So that's a thing we need within NG Infra to take the next steps. Involve other partners."[21]*

The Port Authority took the lead in the Theemswegtracé case. The success of opening new boundaries for collaboration started with the Port Director where leadership directed a team to explore possibilities for the case and with directions to involve the railway administration.[22]

[18] Excerpt 5:17 interview with Port Authority Asset Manager
[19] Excerpt 1:15 interview with independent collaborative expert
[20] Excerpt 1:26 interview with independent collaborative expert
[21] Direct Excerpt 5:18 interview with Port Authority Asset Manager
[22] Excerpt 1:18 interview with independent collaborative expert

Notably was the direction to ‘explore’ what was only a conceptual idea at that stage and involve the other side.[23] With the leadership commitment, resources followed. When the Port Authority contract manager speaks of the importance of transparency, resources and mutual goals for collaboration. He traces the key precondition down to the justification of a project influenced by its leaders:

> *“the justification for a project is, of course, decided on a high level. Even before the first phase of a project, before you can even speak of a project, there is somebody who wants something. That is the first seed that is planted.”*[24]

The project manager simply sought the ‘exploration’ of an issue and the ‘involvement’ of others. The leader in this case did not demand a self-serving organizational solution, but rather showed an openness to thinking outside of the box, planting a collaborative seed. When organizational leaders show a commitment to IOC, practitioners speak on the importance that leaders follow this commitment with sufficient mandate to employees involved in the IOC. If governance is designed properly, the trust from the mother organizations at the management level is required for the operational level to execute the governance according to design. In cases of a mismatch in organizational structures and cultures when teams come together, the collaborating employees need this trust and mandate from the mother organization to be flexible when compromise is needed. [25]

Both railway practitioners describe how processes hinge on executive authorization of new ideas. The Botlek is an industrial area and harbor complex located within the Port, known for being strategically positioned on the banks of two rivers with a connection to the railway network making it a critical hub for shipping, logistics, and industrial activities. The Railway innovation manager describes the introduction of data sharing and smart sensors to solve capacity problems as opposed to the introduction of new infrastructure [additional rail track]. Employees saw new possibilities in technology, then discussed it with management. Once management approved, the innovation team explored the idea further and engaged the Port Authority who agreed to explore the issue together in a think tank environment.[26] Early in the development phase of new organizational endeavors, it is feasible and beneficial to bring the forerunners together out of enthusiasm.[27] If on both sides, employees at the operational level speak the same language and value collaborative goals, progress can be made. The railway innovation manager cites a thriving collaboration between the innovation departments at the railway administration and that of the main carrier. However, organizational management prioritizes system reliability over innovation, despite enthusiasm on both sides within innovation focused departments.

> *“In a very early phase you can often just explore a technology by bringing the enthusiasts together. See how far you get. Gradually it becomes more and more difficult, you just have to build on that those people involve the others, so that you get higher up in the organization…look at what is possible in each phase to involve everyone. You should not stay too long with only the technically enthusiastic people, because there is a chance that others will think “what are you doing? You have no commitment outside of that group to go further.”*[28]

This represents a bottom-up approach in gathering early collaborative support between a core group ultimately increasing involvement and gathering wider support to present a

[23] Excerpt 5:13 interview with Port Authority Asset Manager
[24] Excerpt 2:7 interview with Port Authority Contract Manager
[25] Excerpt 2:16 interview with Port Authority Contract Manager
[26] Excerpt 6:15 interview with Railway Innovation Manager
[27] Excerpt 6:17 interview with Railway Innovation Manager
[28] Direct Excerpt 6:18 interview with Railway Innovation Manager

stronger case to leadership. She stresses starting small scale. Instead of seeking collaborators to immediately commit to automatic trains on the track, she seeks partners who wanted to participate in a trial. As phases advance there reaches a point were more serious agreements must be made to secure leadership commitment on both sides. The management approval represents the key transition from a felt need to collaborate into action. In maintenance and renewal of railways beneath the major national airport, the railway regional manager describes how obtaining approval from the committee to make interorganizational trust a central goal during the project planning and procurement phase boosted his team's ability to carry out a process with collaborative goals prioritizing trust:

> *"…We went to our directors said, "OK, we have this issue here and we want to try a new pilot model based on trust. It's like 87 million euros, so it's a big pilot. Do we have permission?" And they said 'YES' which was an important because we used that EXCO [executive committee] approval to reinforce the trust model through the process, like "Our EXCO approved this pilot, so we are doing it. We don't have a choice." That was the urgency we needed. I guess that's the key."*[29]

At the start, the railway practitioner did indeed have a choice, but executive approval equipped him with support to keep doubts and opposition to a minimum when implementing the trust based model. It could be argued that a dose of hierarchical enforcement was used to initiate a process that prioritized collaborative goals.

4.2.3 Partner Analysis

There is importance in considering the inherent values and institutional roles of potential partners in infrastructure decision-making. Focusing solely on overcoming barriers to collaborate at any cost might neglect the essential values that each organization holds. Instead, the goal should be to respect and balance these values, whether they are financial, institutional, or operational. The Railway Administration, as a non-profit entity, will never generate income and always incur costs for which they are reliant on the ministry, this creates tension in decision-making processes. Port Authority took leadership in the Theemswegtracé, ensuring that relevant parties were involved and contributed financial resources to continue the process.[30] What is unclear is whether the Port Authority heavily funding a rail asset is representative of their consideration of the Railway's inherent values, or rather their own will to overcome the financial barrier to achieving their own goals. The Port Authority Asset Manager describes how their team actively works to make Rotterdam the most appealing choice, when a potential client is deciding between European locations like Antwerp or Rotterdam. They carefully craft the best proposition for the client using a structured funnel management process, similar to how they would approach an innovative idea. The focus is on early-stage planning to tailor an offer that meets the client's needs, ultimately securing their partnership.[31] It represents careful strategic preparation before engaging another organization. When asked if this is also done prior to engaging other asset owners, he confirmed that it is. Tying into the Theemswegtracé, the asset manager explained how the Port assumed an atypical role to facilitate decision-making.

> *"If [Railway Admin.] for instance says, "well, we don't have money at this moment to solve your problem," then we at PoR say "well, then we're going to solve it with your help and we're going to get some subsidiary funds for this project. And by the way, we need your support with the Ministry to get some other funding and we'll manage it all for you."…A kind-of project team already exists in the 'minus-two' phase, so it's not a*

[29] Excerpt 7:17 interview with railway regional manager
[30] Excerpt 1:17 interview independent collaborative expert
[31] Excerpt 5:22 interview Port Authority Asset Manager.

project yet, but there is still a project team discussing together what the options are and how we should manage it."[32]

The strategy shows the Port's team possess, to a degree, an understanding of these institutional roles and values that are tied to the decision making of the Railway administration. This enabled their navigating of complex inter-organizational responsibilities, and a degree of structural flexibility to assume the atypical role.

The deeper level of partner understanding is not observed as being widespread throughout the infrastructure administration. The collaborative expert explains the challenges faced by practitioners who often have expertise limited to their own domain but struggle to work across networks. In explorative collaborative groups, practitioners struggle to align their visions of the future of Dutch infrastructure. They lack a shared language, database, and common ground. This absence of mutual understanding and vision made collaboration difficult. The conclusion is that successful collaboration requires a shared knowledge or visions which is reliant on understanding one's counterpart. Within the project space of the Theemswegtracé, a common problem forced two organizations to explore solutions that served both parties. However, independent from a project, practitioners may not be strategizing about the long term interests of other organizations.

Both the Port Authority contract manager and the Railway Region manager expresses the needed for practitioners to get involved in specific events such as dialogue rounds[33] or behavioural compass exercises[34] employees can learn about the inherent values the drives each organization, however these statements are in context of already established projects and occurring at the organizations. It is apparent that dedicated stakeholder analysis prior to engagement occurs less frequently at the organizational level.

4.2.4 Resource Allocation

Efficient and Responsible Resource Investment

In discussing aging infrastructure and the likelihood of reaching IOC between asset owners, the collaborative expert explains the owners' positions rule, that each independently monitors the technical state of their given asset, how much lifetime remains, and perhaps other issues that may be present. They calculate the timing of their asset maintenance and renewal and how that timing may fall with an interdependent asset. Collaboration is only initiated if the timing is right for both parties. People who are involved determine the feasibility of the collaboration to ensure that government resources and public tax money is allocated in an effective manner. If in any case a cross-collaboration can be seen as inefficient use of public resources, it is not initiated. The organizations have a mandate by the government to spend public funds responsibly.[35]

However, the line of responsibility and efficiency is not clearly defined. In the successful case of IOC between asset owners, The Port Authority's decision to invest in the Theemswegtracé is still internally contested in hindsight on whether such a large sum in the midst of the 2019/2020 financial crisis was worth it (€80 million expenditure from a total of €740 million total for the financial year). Ultimately it was a risk that the Port decided to take. Having been more or less 'pushed' to invest in the project, the ability to invest and act quickly contributes to a feeling of unfairness as the National government is commonly a source of funding for the core infrastructure in The Netherlands. However, the playing field became uneven when one party was left providing a majority of the funds for the project as the Port Authority in this case was. On the other hand, the Port feels a need to proceed with

[32] Direct Excerpt 5:13 interview Port Authority Asset Manager.
[33] Excerpt 7:8 interview with Railway Regional Manager
[34] Excerpt 2:10 interview Port Authority Contract Manager
[35] Excerpt 1:7 interview independent collaborative expert

the investment to bypass what could be seen as the ‘stroperig’ or slow moving public decision-making processes around infrastructure planning and replacement.[36]

Furthermore, different infrastructure owners have different positions and capabilities in reserving resources for cross-infrastructural collaboration. In contrast to the example of the Port Authority, consider the owner of the Dutch railways. On public investment, the collaborative expert emphasizes that with rail infrastructure, all revenue generating business aspects belong to the carrier, who essentially makes money by operating the rail transport. The rail infrastructure itself does not make money, furthermore the development and maintenance of this infrastructure will only ever cost money.[37] They are also much more closely tied to the National Government, where all funding is public. This contributes to the values and decision-making processes of the organization and creates different tensions during operations. Project Managers for the Port express feelings of frustration that their colleagues from the railway administration are delaying the realization process or being uncooperative. On the surface one organization is interpreted as a good collaborator and the other poor. While in fact there is a fundamental difference in values that drive their rules and processes. A difference that collaborating partners must identify and understand is tied to collaborative capacity.

Widening the Scope

The Port Authority shows an wider eye of public value across their network. Where often a single investment plays a larger role or impacts other assets within the network. This widened scope, when considering resource investment has shown often to be a facilitator of collaborative endeavours when weighing the costs and benefits. When the Calandbrug (4.2.1.1) availability began to drop off due to required maintenance and complaints from the surrounding neighbourhood became frequent, the Port saw an 80 million euro investment in the Theemswegtracé rerouting as justified as an important link with the recently expanded multi-billion euro Tweede Maasvlakte. The crucial port investment value was limited by a malfunctioning rail bridge. So the Port of Rotterdam widened the scope, scaled-up, involved more people than just asset managers to realize the development.[38]

The Port Authority does not exclusively have a financial justification to execute projects; they are not always business case drivers. While a distinct investment on it’s own may appear inefficient, perhaps it creates value elsewhere.

> *“they [The Port Authority] execute several projects despite knowing that it will be a relatively poor business case. The reason is that they want to have the best harbour of Europe with the highest service level.”*[39]

Heavy & Early Resource Allocation

In successful cases, conditions for interorganizational collaboration are fostered by heavy and early resource investment:

> *“…before you get to a mutual goal, you need to have some other conditions. And what went especially right in the processes of the Calandbrug and Theemswegtracé is that they [the infrastructure operators] were very heavily invested in that front-end phase. It was not just about getting asset managers at the table. It was not simply working with the boundaries that were there, but actually opening up new ones.”* [40]

[36] Excerpt 1:13 interview independent collaborative expert
[37] Excerpt 1:16 interview independent collaborative expert
[38] Excerpt 1:9 interview independent collaborative expert
[39] Direct excerpt 2:4 interview Port Authority Contract Manager
[40] Direct excerpt 1:21 interview with Collaborative Expert

In other words by investingearly and heavily in terms of people and detailed planning, the infrastructure operators created novel opportunities to collaborate unlocking the mutual goal. They gained alternate views on problem solving and found a new solution instead of traditional asset repair and renewal. The Contract Manager for the Port Authority stressed a lot of effort and resources must be allocated early on in the beginning of a project in order to find a mutual benefit. Resources and effort must be spent on specifically identifying the justification of the project, it's benefit and why it's wanted. This motivation are the first steps into creating a common ground. In the high-paced, stressful nature of projects sometimes the fundamental aspects of why one is actually engaged in the collaboration in the first place can be lost under adversarial conditions. Being able to understand that common ground and original mutual drivers create a support to fall back on is crucial to getting back to success.[41] This notion is supported by the Innovation Manager of the Railway Administration who explains that when it comes to investment decisions, she is starting to see that they [Railway Administration] is already allocating resources in teams that binds important stakeholders together early on, prior to any decision on making phases. She states that this is really a concern about how to get as many people involved to let them discover "What's in it for us? What do we agree on?"[42] She explains that holding these discussions together helps to build and maintain partnerships.

> *"Constantly try to keep that progress so that you go to the next step. More and more together. We also try to get everyone who is important in the end to already be involved in the exploration phase. That way they feel with what role am I going to play in this later on. But sometimes we also have to take a step back. Did we forget someone? Or is someone not happy?"*[43]

The Asset Manager for the Port provides some insight into the key early processes at the start of the Theemswegtracé collaboration, where the Port did not allow budget resources of one side to be an obstacle to early investment and exploration into an interorganizational collaboration.

> *"the [Port Authority] project manager in the 'minus-two' phase, where it is still a conceptual idea, connected with the Railway administration and set up a project team to discuss the possibilities. And if the rail team for instance says, "well, we don't have money at this moment to solve your problem," then we at the Port say "well, then we're going to solve it with your help and we're going to get some subsidiary funds for this project. And by the way, we need your support with the Ministry of Infrastructure relations to get some other funding and we'll manage it all for you." A kind of the project team already exists in the 'minus-two' phase, so it's not a project yet, but there is still project team discussing together what the options are and how we should manage it."*[44]

Alternatively, in an unsuccessful case in the Rotterdam harbour area, collaboration between infrastructure owners was not achieved at the Suurhoffbrug where rail and road meet to traverse a waterway. As the roadway was due for maintenance, the administration responsible for the highway, RWS, applied to the ministry of Infrastructure and Water Works for funding. The ministry inquired if there was coordination with the railway administration to see if both assets could be renovated simultaneously. However, when it came to the funding, the Director of Public and Transit and Rail deemed the project to be the responsibility of the

[41] Excerpt 2:6 interview Port Authority Contract Manager
[42] Excerpt 6:16 interview Railway Administration Innovation Program Manager
[43] Excerpt 6:19 interview Railway Administration Innovation Program Manager
[44] Direct Excerpt 5:13 interview Port Authority Asset Manager

roadway administration RWS since it was 'their problem.' RWS however, felt that they were not responsible for the rail asset and therefore said there would be no collaboration:[45]

> *"So even though it's the same ministry, the financial logic of these different departments excluded potential interorganizational collaboration."*

In other words, the way financial resources are allocated and the way procedures and institutions with regard to infrastructure planning and resource allocation are 'shaped' severely influence the preconditions for interorganizational collaborations. Operating within the traditional boundaries may risk smothering any collaborative spark.

A regional manager for the Railway Administration views budget and cash flow discussions as a limiting factor, stating that discussions on which asset owner might need to pay for a collaborative project could be a difficult discussion, which thus ends up 'defeating' any option to even explore collaboration beforehand. They have seen success when both asset owners go to the financier together in a coordinated application for financing. This outlook differs from that of the Port Authority, where less emphasis on cash flow is placed in the early stages and an alternative goal might be prioritized.

> *"Deciding how we want to collaborate is not easy, especially when it comes to budget. The railroad gets its budget from the Ministry of Infrastructure. But the train manager, gets budget from the Ministry of Finance but sometimes also from the infrastructure Ministry. So we have discussions about who's paying for what and who's responsible for what. Who is the organization who goes to their budget holder to ask for permission or for more additional funding? These are difficult question. The case for financing is stronger when we go both to our budget holders to explain the situation, what we both want instead of fighting."*[46]

Infrastructure asset owners possess monopolistic-like power and influence over their respective networks. Therefore their own strategy and decision making regarding where and with whom to allocate their relatively vast resources make or break the opportunities for IOC. If they elect to commit to collaboration, not many organizations can stop that. On the other hand, if they opt not to fund collaboration, there are no competing entities to fill the void and the organizationally-focused status quo continues.

4.3 Structure

4.3.1 Organizational Structures

Organizational structure determines how information flows within an organization and between multiple organizations. It allows groups to work collectively as a sum of individual functions to carry out tasks. When describing a distinct role or job functions, interviewees offer insight into how that role fits into the greater organizational structure when it comes to collaboration and also provide insight in the variety of structures. At a higher level interviewees also describe how the structure of the organizations facilitate or hinder collaborative processes. However, there is no single best practice for infrastructure administrations to organize themselves in preparation for interorganizational collaboration. These differences in approach are also reflected in the data provided by the respondents.

<u>Institutional Barriers</u>

The independent expert firstly explains the different levels at which collaboration structures exist which he felt was an important distinction to make. Collaboration occurs at the project case level, within an organization (intra-organizationally) or between organizations (inter-

[45] Excerpt 1:24 interview independent collaborative expert
[46] Direct Excerpt 7:2 interview with Railway Regional Manager

organizationally). These different levels naturally create (different) institutional barriers. The expert has observed a more segregated state of organizational structure at the railway administration. They witnessed how decision makers responsible for aging rail infrastructure are not communicating with the departments responsible for developing new infrastructure, seemingly counterproductive from a networking perspective.[47] Not exclusive to the railway administration, the expert states how practitioners from other organizations concede that they work for one infrastructure administration, and within that administration, they work on one specific topic, therefore they cannot offer insight on interorganizational matters.[48] This observed fragmentation in organizational structure is also observed when the Innovation Manager for the railway administration notes that collaboration on innovation R&D for infrastructure improvements takes place in a separate department from collaboration on infrastructure projects and therefore feels less confident in speaking on the subject.

> *"I work in the innovation department and I am the program manager for innovative collaboration, I'm dealing with the partnerships and I try to link our questions to external knowledge, both market and knowledge institutions and science and I do that as part of a small team…[on the other hand] this research is really about infrastructure projects. About really working together on practical projects in preparation of investments. I'm not directly involved in that."*[49]

She again explains this fragmentation as a barrier to collaboration having observed it exploited by individuals or units in pursuit of self-interest, claiming collaboration is not possible or not allowed citing their own institutional rules or processes showing no motivation to explore how these institutional rules could be re-shaped to work for both parties.[50]

The independent expert explains that these institutional preconditions shape the basic way of operating, however once issues stack up on interdependent infrastructure assets, organizational challenges grow beyond the responsibilities of sole asset managers. In the case example of the Theemswegtracé, after recognizing the interdependence with the railway administration, the port authority incorporated more professionals to overcome institutional barriers and initiate a collaborative process[51]. In this case, the Port Authority took the lead through a team of individuals who pushed the boundaries during the tendering process. The Port Director directed the teams to explore new possibilities for the asset renewal and instructed them to involve the railway administration.[52] Heavy and early front-end investment enabled action toward inclusivity, connecting different intraorganizational roles and departments pushing new boundaries[53]. When asked how organizational managers can facilitate mutual goals in future collaborations, the Contract Manager for the Port Authority ties this to the structure of their internal project boards, who oversee the eventual project manager. The project boards are multidisciplinary where the organization has allocated individuals from staffing, supply chain, asset management, finance all of which project management regularly reports to. This serves as a platform for communication and intraorganizational collaboration. The project context is regularly discussed, initial justification and stakeholder relationships are consistently monitored.[54] This is importantly coupled with sufficient trust and mandate from higher level organizational management to

[47] Excerpt 1:10 Interview independent Collaborative Expert
[48] Excerpt 1:20 Interview independent Collaborative Expert
[49] Direct excerpt 6:1 interview Railway Administration Innovation Program Manager
[50] Excerpt 6:1 interview Railway Administration Innovation Program Manager
[51] Excerpt 1:9 interview independent collaborative expert
[52] Excerpt 1:18 interview independent collaborative expert
[53] Excerpt 1:21 interview independent collaborative expert
[54] Excerpt 2:9 interview Port Authority Contract Manager

those actively involved in the collaboration to be able to change the organizational rules and re-design an arena that works for everyone.[55]

The inclusive and role-expanding approach of the Port Authority appears to be key in avoiding information silos and seizing opportunities because it is the first step away from traditional decision making hierarchy, changing the institutional rules from a passive state to an active one which translates to exploring new possibilities, essential to the pursuit of a mutual goal.[56] Supporting this approach in an interview, the Port Authority Asset Manager describes what they call the funnel management process under a funnel board. New ideas and developing opportunities flow through an inclusive management process:

> *"…we're busy with opportunity development and innovation management through the funnel management process. An idea, an innovation, something we hear about or invent; we work it out a bit. Still no funding or project, but if we think it's viable, then it will be a "project-to-be" that we address in our funnel board. If our colleagues in those funnel boards agree with us and say, well, that's something that has potential, work it out a little bit further, think of what impact you can make, think of a possible business case and come back later with a more developed idea. In the end, there will be a decision if we continue and set up a project. This can be started from an idea but can also start from a possible lead commercially."*[57]

The multidisciplinary approach within the Port Authority seemed to be lacking within the railway administration. The regional manager responsible for the airport tunnel collaboration describes roadblocks stemming from his internal colleagues. The railways internal legal department argued that the collaboration was against the law. The asset managers thought the collaboration was too expensive, and pushed for traditional procurement processes that are cheapest and best for their own organization.[58] Even when efforts are made within an organization, the institution barriers posed by traditional transactional approached prevent widespread adoption. In the eyes of the regional manager, he feels that these transactional blockers are driven by power and lack a collaborative vision. He calls for education to teach a new way of thinking from within. When staffing projects, he proactively selects managers that believe in prioritizing collaboration. He still believes that the Railway administration is not aware nor maximizing its own collaborative capacity, but is beginning to see a change in attitude. He encourages his most critical colleagues to join collaborative working groups to share critical reflections. Individuals who have previously not considered or valued IOC, experience collaborative learning and slowly adjust their preconceptions.[59]

> *"we still have a lot of people who don't believe in it [IOC], but some people who didn't believe previously, are starting to believe. They work in the system and slowly their behavior changes to more a collaborative attitude and that's what we need. I had some people who were suspicious and they tried to convince me and our managers otherwise. I said, "…we need your critical reflections - do you want to join the working group?" they said 'yes,' and changed their whole attitude, because they saw what can happen if you change your behavior to value collaboration. The typical project manager sees a very narrow scope, maybe one asset from A to B. But with a collaborative attitude and behavior, you see over all the projects.*

[55] Excerpt 2:16 interview Port Authority Contract Manager
[56] Excerpt 1:29 interview independent collaborative expert
[57] Direct excerpt 5:20 interview with Port Authority Asset Manager
[58] Excerpt 7:19 interview Railway Regional Manager
[59] Excerpt 7:36 interview Railway Regional Manager

You start to see the whole playing field with every stakeholder in it."[60]

The collaborative expert explains that each organization has a basic way of operating that is hard fought - the entire reason institutions exist. They have distributional consequences based on decisions people make. There can be winners and losers. The hard fought way of operating also means that institutions are not easy to change. However, they can and do indeed change somehow. Understanding aspects of institutional design, what actors are able to do to change is extremely important, yet understudied and poorly understood. The Port Authority Contract Manager stresses the importance of not being bound by institutional rules:

"I'm somebody who likes processes and also not to let yourself be ruled by them because then nothing comes together. I think a good process is designed to give you a framework to fall back on to when needed."[61]

The Port Authority's approach in cases like the Theemswegtracé are a great example of institutional design where people were dealing with their microlevel interaction strategies, yet somehow they managed to change the institutional setting. They added positions that changed boundaries and assimilated information. They made aggregation a lot more symmetric which led to a shared solution and newly accessible resources like budgets that wouldn't have been accessible otherwise from an institutional perspective. Focus should be places on how people actually do this. How do actors actually act?[62] This is essential to creating a governance arrangement that works.

Network of Networks

At the interorganizational level, each administration is a member of the 'network of networks' within which their interdependencies lie, however there is no overarching authority actively involved across all industries. At the organizational level individuals have distinct roles and responsibilities. There is a fundamental dilemma where the transition from intra- to inter-organizational approaches depends on some party to do more than what they alone are responsible for. The independent expert presents a hypothetical solution where the national government could potentially play a role in steering the infrastructure administrations into really exploring the potential for IOC.

"And what I find really challenging here is the role of the national government, because what you would want and what would help, is a two-tiered approach where, 1) the national government has a vision for this network of networks and 2) they actually work with that vision. So now if you want to invest in any type of national infrastructure, the national government basically checks whether they think that's OK. But what you'd like to see is that they themselves are also a little bit more proactive. That they also communicate the networks of highest importance and engage with the industry. That is not the passive, reactive checking that we often see."[63]

The presence and role of authority presents a fundamental question to collaborative structure. How can an authority proactively initiate IOC without also introducing a hierarchical element that can hinder the process?

[60] Direct Excerpt 7:37 interview Railway Regional Manager
[61] Direct excerpt 2:12 interview Port Authority Contract Manager
[62] Excerpt 1:27 interview with independent collaborative expert
[63] Direct Excerpt 1:30 Interview with Independent Collaborative Expert

4.3.2 Collaboration Structures

At the inter-organizational level, collaboration agreements exist between multiple administrations which are a productive and a step in the right direction. The administrations themselves also say that these work. However, when projects begin, the commitment to collaboration does not trickle down from the interorganizational ambition to the distinct project teams. A completely different set of people are involved. The asset manager is not the person drafting the collaboration agreements, which again creates an institutional barrier.[64] This agreement drafted by one party, maybe dictates processes that follow their own organizational procedures but may not fit with how a collaborative partner is used to operating. Flexibility is needed to tailor agreements suitable to both parties which helps reach common ground but can also sacrifice specificity.[65] The language in these agreements can be vague general guidelines intended to allow for a more flexible structure. On the positive side, this is important to give practitioners the feeling that there is a basic inclination to collaborate. Where these agreements fall short is that they do not specifically enable the actors to act.[66]

In conjunction with collaborative agreements, the asset owning organizations participate in inter-agency teams pursuing IOC and exploring knowledge development outside of the project setting. These arenas include joint research projects, knowledge groups, dialogues or other collaborative learning events. Still in these voluntary multi-actor settings, experts can find it challenging and the disconnect between collaborative motivation and action is present. Support for the goals and vision of collaborative platforms is high at the start, but after some time, excitement fades considering the absence of tangible results.[67] In more conceptual collaborative knowledge exploration sessions, The asset owners from various infrastructure administrations are very knowledgeable about their own network, but struggle to find common ground and speak a common language between the networks. They do not have a shared database nor shared visions. The independent expert ties this to limited learning. There is no book to read to simply understand another organization. For those willing to collaborate, there must be a continuous process of being involved with one another which forms a basis for collaboration.[68]

Since the basis for IOC is formed by through interactive processes, despite the aforementioned limitations, voluntary participation by the asset owning organizations in interagency groups is beneficial and important for fostering a basis for IOC. Participation in these arenas are where organizational interests and languages are learned which supports working toward common languages and mutual goals. It is notable that in separate observations, interviewees speak on the participation in interagency teams in the context of other key factors such as goals and interests, and stakeholder recognition. Even when a contract brings organizations together, the Port Authority Contract Manager supports separate non-project related sessions where the basis, or context, for collaboration is fostered.

> *“Arrange activities or events where everybody gets pulled out of the daily business and connects on a different level to understand each other's problems. That is very important. We should not be surprised that interests differ, it’s common. Of course, there is a mutual interest maybe for 75 or 80 percent, but there's also 20 percent where the interests are not always aligned. And you should not be surprised about that one. You should be aware of that and put effort into understanding the interest of the other party. Where it goes wrong is when we only live in our own reality and try*

[64] Excerpt 1:11 interview with independent collaborative expert
[65] Excerpt 2:15 interview Port Authority Contract Manager
[66] Excerpt 1:12 interview with independent collaborative expert
[67] Excerpt 5:15 interview with Port Authority Asset Manager
[68] Excerpt 1:19 interview with independent collaborative expert

to only see our own problems. And if you do not put effort in understanding the problems of the other party, then you will go lose sight of the goal."[69]

The Port Authority Asset Manager ties the continuous improvement of infrastructure performance to data sharing that is being done through these collaborative platforms. They are exploring processes related to shared digital information management and security. Issues are also discussed where the administrations suggest how they can improve one another. [70] The Railway administration is receiving knowledge produced by Roadway and Water Management research programmes since they identify closely with one another as public organizations with close ties to the ministry.[71] Their participation delivers knowledge from large research programs they wouldn't otherwise have had resources for. In this context the asset owners are trying to prepare themselves for IOC independent from an immediate problem or risk that forces the organizations to work together contractually. These teams serve as proactive commitment and positive step toward resilient infrastructure for the future, facilitating collaboration and making complex problems easier to handle.

4.4 Interview Summaries

4.4.1 Railway Innovation Manager

The Railway innovation manager emphasizes aligned goals and interests as the most frequently discussed precondition in their interview. They explain an evolving transition within the organization to collaborative strategy, however organizational goals of maintaining punctuality and reliability are paramount. Additionally, they are actively pursuing partnerships that drive innovation and prepare for future infrastructure needs, but the focus is on innovating existing infrastructure as the densely populated Netherlands does not easily accommodate newly expanded railways. The organization appears to be navigating the complexity of involving multiple stakeholders to spur innovative efforts while remaining focused on operational stability and the future increased demand on rail infrastructure. For this reason management is not present during the early stages of Innovative collaboration strategies.

The Railway Administration innovation department supports the Railway administration's collaboration efforts on the implementation of innovation within their existing network. The department connects external partners, including universities and research institutions, with the administration's internal teams. The majority of innovative IOC projects occur between other railway focused organizations that speak the same language. The Innovation Manager participates with NGinfra and describes structured research partnerships with institutions and the Ministry of Infrastructure and Water management. However, they express doubt in speaking on the railway administration's IOC in the context of asset management and the exploration of new infrastructure projects with interdependent administrations suggesting a degree of siloed collaborative capacity.

The use of data sharing and smart sensor technology is cited as a successful case example of innovative solutions in IOC, particularly in cross-sector partnerships such as in the Botlek region – an example of a lateral mechanisms enabling shared resources and technological advancements to address capacity issues at the port without resorting to building new infrastructure.

The Railway Innovation Manager points out that collaboration is often driven by individuals who are enthusiastic about a particular innovation. In the early stages of new innovations, The innovation program brings together individuals from different organizations who share a passion for new railway industry technologies, which helps build momentum and foster early

[69] Excerpt 2:10 interview with Port Authority Asset Manager
[70] Excerpt 5:5 interview with Port Authority Asset Manager
[71] Excerpt 6:5 interview with Railway Administration Innovation Manager

commitment. As projects progress, it becomes important to involve higher-level management to ensure broader organizational support.

4.4.2 Railway Regional Manager

The Regional Manager emphasizes the importance of recognizing shared challenges, which can serve as a stepping stone to align strategic goals. In the Schiphol tunnel project, they led the Railway Administration's initiative to set collaborative goals and involve the airport administration as well as contractors early on to create a collaborative environment.

The Railway's corporate structure allows it more freedom compared to other governmental ministries. This difference in authority can hinder effective collaboration. The Regional Manager emphasized that power dynamics and legal frameworks often create barriers when organizations need to work together. The importance of building informal networks between asset owners through joint projects is also mentioned. Informal relationships can bridge the gaps in formal governance structures and contribute to smoother collaboration over time.

Executive-level commitment to the adoption of a new collaboration model is described as crucial in signalling the organization's commitment to a collaborative approach, thereby encouraging stakeholders to engage more deeply in the project. This was coupled with ccollaborative learning as a lateral mechanism, dialogue rounds helped to align stakeholders on project goals. This model helped facilitate trust-building and joint planning, contributing to a collaborative approach to project execution.

The Regional Manager stresses the importance of individual collaborative capacity in building a collaborative project team. He noted that individuals who are willing to listen and understand different perspectives play a key role in fostering trust. The manager emphasizes the need for empathy and good listening skills in building relationships with stakeholders. They also mention internal challenges related to changing mindsets within the railway organization. Colleagues can sometimes be hesitant to adopt new collaborative models because they perceive them as risky or costly. Many employees are accustomed to traditional, transactional approaches which prioritize 'winning' the deal in pursuit of an organizationally attractive outcome. According to the regional manager, changing these attitudes requires ongoing education and leadership commitment.

Overall, the Region Manager's insights underscore the importance of leadership commitment, trust-building, and a shared sense of urgency in fostering effective interorganizational collaboration. They highlight both the progress the Railway Administration has made and the challenges it continues to face, particularly in overcoming internal resistance and aligning different organizational priorities.

4.4.3 Independent Collaborative Expert

The collaborative expert emphasizes the importance of recognizing the interdependencies between different infrastructure networks, especially as many of these assets are reaching the end of their technical life. They point out that successful collaboration depends on identifying mutual opportunities that serve specific societal needs. They explained that the Port Authority proactively took the lead on infrastructure projects like the Theemswegtracé due to strategic investments in the Tweede Maasvlakte. This illustrates how strategic leadership and urgency can drive collaboration, particularly when public funding is challenging.

They highlight issues in the internal structures of infrastructure organizations like Railway Administration, where there is often a difference between asset management and management departments and new project developments. This lack of coordination is a structural barrier that inhibits effective collaboration. The collaborative expert describes the presence of collaboration agreements between organizations, which are often broad and vague. These agreements provide a general framework for cooperation but lack the specific guidelines needed to facilitate effective joint actions. These collaboration agreements often

include practical clauses to facilitate communication between organizations (e.g., ensuring contact is made when projects overlap). However, these agreements tend to be more symbolic, giving practitioners a sense of a collaborative inclination without necessarily enabling concrete actions.

The collaborative expert points out that institutional incentives often discourage collaboration. For instance, regulatory bodies may deem certain cooperative actions as inefficient, which discourages organizations like from pursuing partnerships. Due to the institutional challenges, the importance of individual actors in fostering collaboration is explained. The expert highlights how understanding the cultural differences between organizations, such as the more commercial mindset of the Port Authority versus the relatively bureaucratic nature of the Railway Administration can support a more effective collaborative strategy. Individuals who can navigate these differences and foster mutual understanding can help guide teams to more productive interaction.

They also point out that a significant barrier to collaboration is the lack of a common language or shared understanding among experts from different organizations. Establishing a shared vision and mutual goals is often the outcome of a collaborative process rather than a starting point. External knowledge groups like NG Infra are suggested as a helpful in building a common language and facilitating the alignment of goals by bringing together representatives from different organizations to share knowledge and perspectives.

The collaborative expert emphasizes the importance of institutional design in overcoming the complexities of decision-making across multiple levels, from national regulations to organizational policy. Collaboration is often hindered by the lack of alignment between different organizational levels and the varying priorities of departments within the same ministry. According to the collaborative expert, the Theemswegtracé saw success by changing institutional rules, such as involving new stakeholders and making decision-making more inclusive and flexible.

4.4.4 Port Authority Asset Manager

The Port Authority Asset Manager emphasizes the importance of a shared sense of urgency and clear strategic goals to drive collaboration. The Port Authority posses a strong focus on achieving tangible results. The organization's culture is driven by a desire to be the best port in Europe, which serves as an intrinsic motivator for employees to engage in collaborative efforts that further this goal. The proactive, results-driven culture, often sees the Port Authority act as a leader in collaborative projects, such as the Theemswegtracé. In this project, the Port took on a leading role in project management to ensure timely progress, despite the fact that it was ultimately a railway asset. This approach reflects a commitment to achieving its strategic objectives, even if it means taking on roles that are not traditionally theirs to take on. The Asset manager repeatedly characterizes the organizational culture as a "make it happen" attitude, which can be both a strength and a barrier in their view. They acknowledge that while this results-driven culture helps the organization achieve its goals, it can also come across as arrogant, potentially creating friction with partners. They describe a need for individuals within the organization to adopt a broader societal perspective to better facilitate collaboration, particularly in long-term, complex projects like those being explored with NG Infra.

The Port Authority has a unique governance structure that allows for quicker decision-making compared to more bureaucratic organizations like the Ministry of Infrastructure and Water Management and the Railway Administration. The Asset Manager notes that this independence from direct ministerial reporting allows the Port Authority to be more agile and responsive in its collaborative efforts. However, this also means that their time horizon tends to be shorter, focused on four-year cycles aligned with management contracts.

The Port Authority uses an internal funnel management process for project development and innovation. This process allows the organization to systematically evaluate and develop

ideas before they become formal projects. The Asset Manager also highlights the importance of informal networks and interactions, particularly in the context of NG Infra, where researchers and practitioners work closely together to bridge the gap between research and practical implementation.

4.4.5 The Port Authority Contract Manager

The contract manager for the Port emphasizes that the Port's main motivation for collaboration is to maintain its status as one of the best ports in Europe by achieving the highest service level. This vision requires collaboration with other stakeholders, particularly when dealing with interconnected infrastructure that affects the entire logistic chain, such as train and barge connections. The Port Authority is not solely profit-driven; its goal is to create a high-quality port that serves both clients and society.

The structure within the Port Authority employs PRINCE2 project management methods and structures. The contract manager explains the project board, which includes representatives from different departments, serves as the internal client for the project manager and ensures alignment with the initial project goals. They highlight that the organization benefits from a clear delineation of roles and structured decision-making processes, which help maintain alignment throughout the project lifecycle.

The Contract Manager discusses the use of collaborative learning and informal activities to foster collaboration within teams. They value activities or events that pull team members away from their day-to-day tasks to build trust and understanding among stakeholders. These can support members in maintaining a focus on mutual goals and understanding different interests.

The Contract Manager emphasizes the role of people in successful collaboration. He notes that good collaboration relies on individuals who have the skills to be open, show vulnerability, and build trust. He states that trust can exist even when interests are not completely aligned, and that it is important for team members to be willing to understand each other's challenges. He mentions that having the right people at the table, who understand both the technical and procedural aspects of the project, is essential.

5 Empirical Successes and Challenges

This chapter focuses on interpreting the empirical data obtained within the specific empirical contexts. Thematic analysis identifies success factors and challenges as expressed by the correspondents which contribute to answering SQ2.

5.1 Organizational Goals vs. Collaborative Goals

Across all interviews and the collaborative workshop, the importance of establishing shared goals and a unified vision for collaboration is consistently mentioned as a key to success. Both strategic and project-level managers emphasize that aligning on mutual objectives aids in maintaining focus and avoiding conflicts. This is evidence in case examples like the Theemswegtracé and Schiphol Tunnel projects, where alignment on shared strategic goals was instrumental in progress.

However, this is contrasted by the prevalence of a commitment to organizational goals. What is evident on both sides is that infrastructure operators and their employees are still quite focused on the goals of the organization and seem less focused on the goals and interests of the other infrastructure operator or society in general. The Railway administration's focus on maintaining safety and reliability was highlighted by multiple interviewees. This focus can lead to hesitancy in adopting new innovative technologies or experimental collaboration models, which is sometimes perceived as stagnation by more commercially-oriented partners like the Port Authority. The safety and reliability focus also contribute leadership being less involved in IOC that departs from the status-quo. The organization is focused on introducing innovations to existing rail infrastructure as the solution to future capacity requirements. They see the high density and current land challenges facing the Netherlands and believe that major extensions or additions to the existing rail network are difficult if almost impossible. This is driving a focus within the organization on upgrading or innovating upon existing assets rather than expansion. Therefore, these innovations are predominantly rail-industry focused and less dependent on interconnection with complementary infra systems and organizations. Therefore current innovation collaboration is occurring between actors of the same discipline. Control of their own assets is prioritized so service can run on time. Future goals focus on upgrading their own assets within their own expertise.

The Port seeks to remain Europe's largest maritime hub with a premium level of service. There is recognition of interdependence and a societal vision by some employees but it is not widespread enough throughout the organizational culture to support a consistent and united felt need to collaborate. In the limited cases of success, goals were orientated and prioritized around IOC. In these cases the goals were tied to collaborative aspects such as trust, exploring new ways of thinking, stakeholder engagement and creating a context that encourages collaborative behaviors. Positive progress is made when financial topics are postponed and relations topics are brought to the forefront that support IOC processes such as flexibility and trust. Still, a complex picture is painted as organizations are aware of the importance of the mutual goals for collaboration, which is supported by multiple statements from interviewees, but what is clear from the data is that daily operations are fixated on organizational interests for assets and projects, and less so on relationships and processes.

5.2 Leadership Tensions

Leadership and strategic guidance emerged as both a critical success factor and a barrier, though leaders often struggle to balance short-term organizational goals with the potential long-term benefits of collaboration. The need for a clear strategic purpose, leadership buy-in, and the support of executives were consistently mentioned. However, there are tensions at play that make it challenging for leaders to devote the time, money and personnel to long-term collaborative goals when there are short term issues affecting their organizational goals. High level managers deciding where resources be focused have a mandate to spend

public resources “responsibly” and efficiently. The decision then stems from what the asset owners deem “efficient”. This permits investing in collaboration only when the timing and calculation is right for both parties. Perhaps also why IOC in the form of PPPs are more common when the private sector can cater to the needs of the public organization. In this, the organizations are fed and reinforced by their legal status and role. This influenced the position of infrastructure operators until they experienced more and more that they are increasingly dependent on the other infrastructure operators. Perhaps collaboration is inefficient in the short term but may well be efficient in the long term. Considering that the decision to invest in Theemswegtracé is still internally contested within the Port Authority shows that despite a risk tolerant strategy and successful collaboration, the duty to efficiency and organizational interests casts doubt over whether it was the right move. This ties back into the organizational goals upon which leaders are still focused. What defines whether a decision was correct? Was the Theemswegtracé a conservative economical decision for the Port during the financial crisis, perhaps not. Did it improve an interface between infrastructure networks for long term mutual benefit? Arguably, yes.

5.3 Institutional Rules & Constricting Structure

Large infrastructure administrations are essentially monopolists. The strong aforementioned focus on organizational goals supports closed intraorganizational structure and processes. It is easy for individuals and organizations to stay in their lane and work ‘by the book’ which can easily lead to one organization losing interest in collaborative endeavours and discontinuing any explorative processes. There is a comfort zone of expertise in a single discipline the revolved around known procedures and a common language. It enables employees to keep their head down, focus on their own role within their own disciple. Asset owning organizations participate in horizontal IOC, but it is often seen between organizations that ‘speak the same language’ and have vested interest in similar asset goals. The Port Authority collaborates with other major European harbours on quay wall docking standards. The Railway administration collaborates with European rail agencies to coordinate seamless transition across international borders. The Railway administration is structured in a way where individuals involved in R&D innovations are not consistently in communication infrastructure asset managers overseeing maintenance and renewal. Despite that these innovations must eventually be incorporated into the assets under management. Maintenance and renewal windows present ideal opportunities to incorporate innovations, but with a lack of multidisciplinary approach within, opportunities may be missed. Additionally, while the innovation team is collaborating with the common-type external organizations of the wider rail industry, complementary relationships with other infrastructure organizations currently appear to be less well-structured and embedded in the organization. These can also lie with other departments, such as asset management who may have a closer eye on interfaces with the complementing network. This contributes to a fragmentation within the organization with regard to horizontal collaboration. The focus on organizational goals functions as blinders for the organization when it comes to seeing their position within the wider the network of networks. It makes the institutional boundaries invisible to most practitioners. It is not common practice for people to inquire into the business of another. This can be done by an infrastructure organization themselves or potentially by a third entity such as the public government, although this remains an exploratory solution. Multidisciplinary approaches present a feasible organizational step in breaking through these institutional barriers. Multidisciplinary processes appear more present within Port Authority structure and processes. This was less apparent from the side of the Railway administration, where signs of internal silos between different disciplines hinder employees with collaborative goals. The Port Authority’s widened scope and 'bundling' of resources to 'push' the Railway to collaborate reflects a difference in collaborative attitude tied to investment where the Port says “work with us” and backs it up by directly investing in the railway network as well. The Railway’s need to be ‘pushed’ into a collaboration in the case of the Theemswegtracé does not necessarily mean that they lack a collaborative attitude, rather that the playing field is simply not level.

5.4 Collaborative Learning

The interviewees repeatedly mentioned the importance of building informal networks, boundary-spanning roles, and proactive relationship-building activities. Informal interactions were often emphasized as valuable mechanisms to bridge gaps between formal structures. Collaborative learning has emerged as a binding precondition that can influence all other preconditions. Collaborative learning occurs within collaborative structures or arenas. These structures can be tied to infrastructure project organizations, seen in trust-based dialogue rounds during project planning, or they can exist independent of any specific asset such as voluntary participation in explorative multi-actor research. The key is that practitioners come together with an eye on collaborative goals, rather than organizational goals. These settings appear to foster the basis for IOC where actors are put into an environment that encourages a way of thinking that lends to understanding their counterparts on a deeper level. The practitioners acknowledge that this understanding is the first step toward aligning interests and arriving at mutual goals. Collaborative learning environments make institutional boundaries more visible and able to be pushed.

Based on the description of how some employees in asset organizations still interact, The infrastructure industry is rooted in long-standing and intricate decades-old relations and procedures to guide infrastructure investments. The way things have been done often leaned on the transactional behaviour to produce the most advantageous outcome for the parent organization. The practitioners cite collaborative learning as the solution to addressing this behaviour, but truly aiming to change organizational culture and behaviour is complex. Collaborative learning is not occurring often nor widespread enough. It is not prioritized by the organizations. It is being explored in pilots on the side when the situation allows. Existing collaborative agreements between the asset owners aimed at facilitation the learning may fall short in that they do not specifically enable the actors to act in the short term. So what does enable actors to act? Interagency teams that just “talk a lot” support a basis for collaboration, but they are at odds with an organizational culture like the Port Authority that prioritizes action and impact. Leaders question the commitment of others which makes them apprehensive to commit themselves.

5.5 Successes and Challenges Summarized – SQ2

Based on the data. By addressing these challenges and leveraging the identified success factors, infrastructure organizations can foster more effective collaboration and achieve better outcomes for society.

Successes:

- Collaborative Goals and Vision: A clear and unified vision for collaboration and aligning on mutual objectives helps maintain focus and avoid conflicts.
- Leadership: Strong leadership aware and willing to commit to long-term collaborative.
- Collaborative Learning: Building informal networks, boundary-spanning roles, and engaging in proactive relationship-building activities can foster collaboration and stakeholder understanding.
- Trust and Relationship Building: Trust is a cornerstone of successful collaboration. Building strong relationships between organizations and individuals is key.
- Multidisciplinary Approach: Encouraging collaboration between different disciplines within organizations can break down organizational silos.

Challenges:

- Prioritization of Organizational Goals: A strong focus on organizational goals can hinder collaboration. Prioritizing individual organizational interests over shared goals can lead to missed opportunities.
- Leadership Tension: Leaders expected to manage an organization as efficiently as possible contributing to short-term organizational priorities.
- Institutional Barriers: Traditional organizational structures and processes can create silos and barriers to collaboration, this is associated with a lack of collaborative culture.

6 Thematic Patterns

The empirical data shows that there are particular tensions at play. While success factors are explicitly identified by the practitioners, they appear to be related to the identified challenges. In looking into some of the underlying patterns that occurred in the contextual successes and failures, this section aims to answer SQ3 where these underlying patterns can guide reflection and assessment of collaborative capacity in other contexts.

The Empirical Model in Figure 10 visualizes the empirical thematic patterns. Empirical models aid to simplify complex systems where the underlying mechanics may not be fully understood. This model is limited to the contexts which have been studied in this report and is not all-encompassing. Still, it assists as a visual tool to further discuss the results of the study and compare and contrast the results with existing literature.

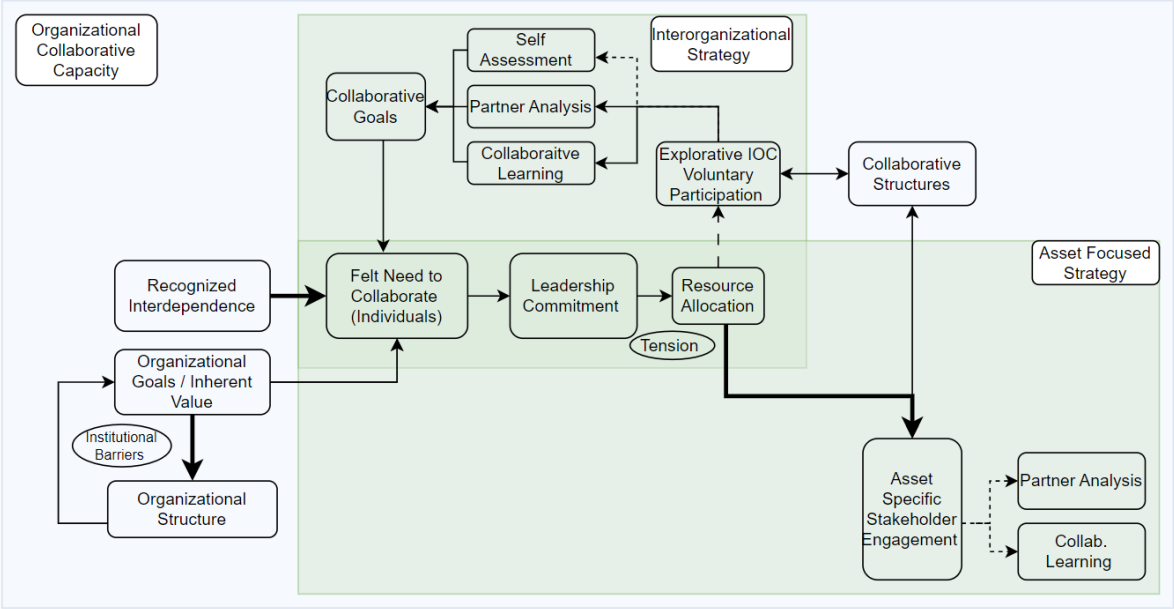

Figure 10: Empirical Model

6.1 Changing Positional Rules

The Leadership tension and varying levels of collaborative culture within the asset administrations paints a picture where the development of collaborative strategic is not an inherently intraorganizational. In successful cases like the Theemswegtracé and Schiphol Tunnel, an asset-focused strategy is observed (as shown in Figure 10 – Asset Focused Strategy). Here, the first process where strategic actions are seen is in successful collaboration within interorganizational project teams. Notably, the strategic action occurs at the collaborative level where organizations then invest time to better understand each other and their respective position to the project and explore solutions. In the Theemswegtracé, multidisciplinary involvement led to an innovative solution, organizational flexibility, and better recognition of the institutional boundaries which were addressed through new roles. On the other hand, the Interorganizational Strategy, represents a second process where strategic action is observed through the participation in explorative, multi-actor, teams committed to collaboration but not tied to assets or projects. These processes represent an important arena where organizational representatives spend time devoted to explore the inherent values and interests that drive them. Practitioners describe the positive impact these groups have on the development of collaborative capacity and place a high level of

importance upon them. However, compared to the interorganizational engagement at the asset specific level, the involvement here is much lower. Still in both processes it appears that actions associated with building organizational collaborative capacity are occurring during collaborative processes.

6.2 Reframing Goals

The Theemswegtracé, Schiphol Tunnel and Suurhoffbrug present the tensions at play between organizational and collaborative goals. In successful cases of the Theemswegtracé and Schiphol Tunnel, the organizations were able to re-frame their goals in a way where collaborative goals were justified and link to but not focused on organizational.

For the Port Authority, the Calandbrug could have been viewed exclusively as expensive, considerably high-risk railway asset in need of repair that might not justify them going above and beyond to assist in repairing. However, when widening the scope to view the interface with the Maasvlakte, the Theemswegtracé begins to appear as asset equally critical to both the Port Authority and Railway administration. This widened scope let the Port set a goal to simply explore the possibilities with the Railway Administration to see what, if anything could be done to improve the noise disturbances and limited waterway availability the aging rail asset was causing in the Port. For the Railway Administration, the explorative approach by the Port was enough to spur them to take the opportunity to investigate their aging asset while taking advantage of the management resources contributed by the Port. The explorative approach steadily turned into a process that arrived at an innovative solution for both organizations.

In the Schiphol Tunnel, the Railway Administration was faced with a complex railway renewal project that would have taken over ten years to complete under normal circumstances. Additionally, the codependent asset airport asset owner lacked motivation to collaborate. With the adoption of a two-phase collaborative model, the Railway administration approach the first dialogue rounds with the goal of establishing trust between both asset owners and contractors. After productive dialogues and trust between actors, comprehensive planning and strategic scheduling delivered on organizational substantive goals with a 3 year schedule and minimized disruption. However the substantive achievements were only realized once collaborative goals were set by actors up front establishing trust and open communication.

Alternatively, the Suurhoffbrug presents a case where goals were not able to be reframed and set collaboratively. As the road portion of a share railway bridge was due for maintenance, the ministry of infrastructure inquired if there was coordination with the railway administration to see if both assets could be renovated simultaneously. However, when it came to the funding, the Director of Public and Transit and Rail deemed the project to be the responsibility of the roadway administration since it was ‘their problem’ and the railway was not due for maintenance so their budget would not be applied. Organizational goals remained focused on resources and responsibilities and collaboration was not achieved.

6.3 Pushing Boundary Rules

Changing the organizational boundary rules might support structural flexibility and organizational agility. In the Theemswegtracé, the steps taken by the port to voluntarily explore possibilities for a railway asset represents a move from a passive state to an active one asset management. This sparked an inclusive and role-expanding process that led to a willingness to adopt a completely new role in leading the management of a railway asset project. The rules were witched from a passive state to an active one. While the Railway Administration is typical associated with bureaucratic and slow moving processes. They demonstrated the agility and structural flexibility in adopting the new model and implementing lateral mechanisms in the Schiphol Tunnel to get other actors on board.

6.4 Awareness of Rules

All respondents advocate for collaborative learning despite working in different rolls. The data suggests that the collaborative learning that occurs in different contexts contributes to supporting a deeper awareness of the institutional rules at play in their specific context. The Port Authority Asset Manager and Railway Innovation manager represent individuals in a strategic management role. They work with a higher level oversight of their respective networks and asset systems and are not dedicated to a single project. They are also both involved in NGinfra serving as representatives of their organizations and experience interorganizational strategy in an explorative setting. They both see a need for adjusting organizational processes and aligning organizational goals across departments and with management. On the other hand, the Port Authority Contract Manager and Railway Regional Manager represent individuals in a project management roles. They are responsible for the execution of specific projects within their infrastructure networks. Their experience in IOC is operational and asset-focused. From a project management perspective they are more focused on implementation details, problem-solving, and ensuring that collaboration works effectively at an operational level. They both see value in collaborative learning environments that teach individuals to understand the differing values between stakeholders and use that to improve day-to-day operations.

6.5 Individuals Lead

The data indicates that organizational leadership is not in fact taking the lead. They are instead operating on a case-by-case basis of evaluation and approval. The role of leadership shows the hierarchy present within these organizations. Before major moves are made on innovation or collaboration, one must first ‘check with the boss’. The spark and motivation behind the successful cases begins with employees who dare to span organizational boundaries to plant collaborative seeds. They explore new possibilities and garner enough support to produce evidence that leadership can then get behind. It takes a different way of thinking for leaders to pay adequate attention to long term collaborative goals when environmental stressors are pushing short term organizational goals. However, there are indications that new insights emerge when leaders spend time to learn about the other organizations with which they are interdependent. Commitment to collaborative learning in settings separate from the day-to-day business supports a societal vision and long-term collective thinking.

The felt need to collaborate by particular individuals leads them to garner support at a small, manageable scale before ultimately higher management higher management is involved. The managers may not have a strong need to collaborate before the case is presented to them for their official decision. Resource allocation decisions are made on a case-by-case basis, influenced by an organization’s focus on efficiency and specific asset interests. This reactive approach can limit the consistency of collaborative efforts and reflect the hierarchical nature of these organizations, where decision-making tends to be top-down.

6.6 Summary of Patterns - SQ3

In summary, the thematic patterns identified through the empirical data offer insight into how the tensions might be managed to favor more favorable outcomes. These patterns encourage managers of IOC to reflect and assess the organizational collaborative capacity within their specific context.

1. **Positional Rules:** Managers should reflect on how their organizations’ current positions and roles might impact collaboration. Successful cases, illustrate that developing a collaborative strategy is not purely an intraorganizational endeavour—it often arises from cross-boundary interactions and mutual exploration. Managers can assess whether their organizations are investing enough time in understanding their counterparts’ positions and exploring solutions in interorganizational contexts. The potential to introduce new roles or modify existing roles can also be considered as a

mechanism to enhance structural flexibility and align collaborative actions with broader goals.

2. **Reframing Goals:** Managers are encouraged to consider how their organizational goals can be reframed to align with collaborative objectives. In successful cases, scope was widened to consider mutual benefits, resulting in more effective collaboration. Managers can ask themselves if their current project or asset goals can be expanded to align with the goals of their partners, recognizing interdependencies that may lead to long-term mutual benefit rather than focusing solely on immediate organizational gains. Reflecting on how to bring collaborative goals to the forefront—rather than subordinating them to organizational goals—can create a basis for more successful IOC initiatives.

3. **Pushing Boundary Rules:** The ability to change boundary rules to support greater structural flexibility was highlighted as a key factor in successful IOC. Managers can evaluate if their organizations are stuck in a passive role or if they are capable of actively seeking collaboration, even if that requires moving beyond traditional boundaries. Asking whether they can expand their organization's scope of responsibility or adapt roles to fit collaborative needs can be a useful point of reflection.

4. **Awareness of Institutional Rules:** Collaborative learning was found to be crucial for understanding institutional rules and boundaries within the organizations. Managers can assess whether they are facilitating the right environments for their teams to learn about and challenge existing institutional rules. The involvement of strategic managers in explorative, interorganizational settings and their commitment to adjust organizational processes demonstrates the potential value of cross-boundary collaborative learning. Managers can reflect on whether they are fostering a culture of learning about their counterparts' challenges, and motivations in addition to understanding their own organizational constraints. Thus helping to align goals and expectations across organizations.

5. **Individuals Leading Collaboration:** A key pattern emerged that collaborative efforts are often sparked by individuals rather than initiated by organizational leadership. Managers can reflect on the extent to which their leadership is facilitating or hindering these efforts. Are they encouraging boundary-spanning individuals within their teams? Are they willing to take risks and invest in initiatives that are not immediately aligned with organizational efficiency but hold potential for long-term collaborative success? Managers can also reflect on the balance between top-down and bottom-up approaches—ensuring they are receptive to the initiatives taken by employees who see the value in cross-boundary collaboration and support them adequately.

In summary, these contextual patters invite managers to critically assess the flexibility, adaptability, and openness of their organizations to collaboration in other contexts. By reflecting on these aspects—changing positional roles, reframing goals, challenging institutional boundaries, fostering collaborative learning, and empowering individuals—managers can gain insight into their organizations’ capacity for horizontal collaboration and take steps towards improving their collaborative readiness. The patterns do not provide fixed solutions but instead create a foundation for managers to think deeply about how IOC could be cultivated within their specific contexts.

7 Discussion

The findings from this study reveal several themes that influence Dutch IOC. This discussion chapter interprets the findings in light of existing literature and theory, highlighting both the successes and challenges faced by Asset Administrations in establishing and maintaining IOC.

7.1 Balancing Goals with Shared Collaborative Objectives.

A nuanced picture emerges where the line between intraorganizational preconditions and interorganizational conditions of IOC is often blurred. To enhance organizational collaborative capacity, participation in interorganizational processes can help develop the right organizational conditions. This creates a "chicken-egg" dilemma, where preconditions such as social capital and collaborative learning, identified by Hocevar et al. (2006) as part of the lateral mechanisms domain, must be fostered through engagement in interorganizational activities. Collaborative learning, for instance, is found to be a key component, but its benefits are mainly realized through interorganizational collaborative processes rather than internal ones.

A theme across the study is the tension between organizational goals and the overarching shared goals necessary for effective IOC. While practitioners recognize the value in collaborative goals, the evidence suggests that a commitment to organizational interests remains high on the agenda. This tension aligns with literature that suggest organizations are inherently risk-averse and prioritize their internal mandates, particularly in contexts of high accountability and regulatory oversight (Ostrom, 1992; Chris Ansell, 2008). Perhaps this aligns with the pattern of reframing goals that either hides or justifies risks at stake. However risk management is not discussed by practitioners in precondition to IOC. How might risk management work with a goal setting process?

Progress in the empirical case occurs when organizations explicitly prioritize relationship-building and collaborative goals over financial considerations. This approach seems to foster trust and build momentum towards joint initiatives, consistent with the literature. The concept of postponing financial discussions in favor of relationship topics suggests an emergent strategy that prioritizes relational capital over transactional gains. This has implications for how infrastructure organizations should approach negotiations and strategic planning—emphasizing mutual understanding and alignment before diving into detailed cost-sharing agreements.

The literature calls for the setting of collaborative goals to occur early within the organizations strategic development and that these goals are embedded into the collaborative culture (Verstrepen et al., 2009; Wesselink & Paul, 2013). In the successful empirical cases, however, these goals are not embedded in organizational culture but rather isolated within a focused strategy specific to individual assets. This key difference between empirical observations and the theoretical framework reveals that strategy is occurring at the interorganizational level within project teams, rather than through internal organizational self-assessment and stakeholder analysis before partner engagement.

7.2 Organizational Leadership in Driving or Hindering Collaboration

Compared with the theory, early leadership commitment is coincided with strategic action by the organization where further steps are taken to prepare and strategize (Verstrepen et al., 2009; Wesselink & Paul, 2013). The empirical data, suggests that this internal strategy is not yet happening at this early stage prior to the decision to allocate resources engage with partners. The decision to collaborate and allocate resources represents a point of tension in practice. The tensions felt by leadership to spend resources effectively and address more pressing organizational needs can be perceived as at-odds with commitment to collaborative

endeavours with intangible ends. This leads to a split where strategic action is occurring in different points of different processes. One occurring withing projects teams tied to asset-specific projects, the other being a voluntary participation in multi-actor teams to explore IOC. This reflects a broader trend in the literature that highlights the struggle of leaders to balance efficiency-driven goals with long-term collaborative strategies (Bryson, Crosby, & Stone, 2006).

The empirical data shows that successful collaborative efforts often begin with boundary-spanning employees rather than top-down mandates from leadership. This finding supports the notion that a bottom-up approach, initiated by motivated individuals, can be instrumental in overcoming organizational inertia (Williams, 2002). However, the lack of consistent leadership commitment to IOC beyond these initial stages might continue to results in fragmented efforts. The implications are clear: for sustained IOC, there needs to be a shift in leadership mindset from case-by-case approvals to embedding collaboration as a strategic objective. The literature on collaborative capacity (Foster-Fishman et al., 2001; Hocevar et al., 2011) highlights leadership commitment as a key precondition within the organizational purpose and strategy domain for building organizational capacity to engage in IOC. The findings in this study reinforce the importance of aligning leadership strategies with collaborative efforts. Without consistent leadership buy-in, efforts to build collaborative capacity are likely to be short-lived and unsustainable.

7.3 Institutional Barriers and the Importance of Structural Flexibility

Structural factors, such as organizational roles and responsibilities, are tied to specific organizational goals, which can foster internal silos and limit the scope for IOC. Internal fragmentation reflects how organizations are inclined to collaborate within their disciplinary expertise rather than across broader infrastructure networks. In the Theemswegtracé, The Railway Administration, in particular, is constrained by rigid governance structures that limit its flexibility in decision-making and innovation. This bureaucratic inertia contrasts sharply with the more agile, commercially-oriented mindset of the Port Authority. The findings align with existing studies that point to the inhibiting effects of rigid institutional boundaries on collaboration (North, 1990).

The Port Authority’s proactive approach in assuming non-traditional roles, such as leading the Theemswegtracé project, exemplifies the structural flexibility required for successful IOC. This suggests that to foster collaboration, a willingness to adjust traditional roles and responsibilities, and perhaps even adopt those typically held by their partners could contribute to collaborative capacity. This algins with Hocevar et al. (2011), creating adaptable structures—such as liaison roles and interagency teams—is critical to facilitating coordination and breaking down silos.

7.4 The Role of Collaborative Learning and Informal Networks

The study finds that informal networks, relationship-building, and boundary-spanning roles can support bridging gaps between formal structures and fostering understanding between diverse organizational cultures. These findings reinforce the importance of collaborative learning environments that are separate from daily operational pressures, allowing participants to explore mutual interests and align goals (Senge, 2006).

However, collaborative learning remains sporadic and largely confined to pilot projects or voluntary initiatives. For it to become an integral part of IOC, organizations must institutionalize these learning opportunities. Creating formalized settings for interagency learning—such as joint training programs or collaborative workshops—could enhance practitioners' understanding of each other’s challenges, thereby building a stronger foundation for collaboration. The findings also suggest that collaborative learning environments make institutional boundaries more visible and therefore easier to push. This is consistent with the emphasis on lateral mechanisms in the literature (Hocevar et al.,

2011), which promote horizontal interactions and effective information sharing as essential elements of collaborative capacity.

7.5 Limitations

While this study offers insights into organizational preconditions to IOC, the patterns identified are contextual. While these patterns are interesting for the studied group of practitioners, focus organizations and case projects. There are not inherently transferrable to other contexts without some supplemental contextual analysis. Therefore, several limitations that should be acknowledged.

7.5.1 Methodological Limitations

Firstly, the literature review, may not have covered all relevant theories and studies on organizational aspects of IOC. The scope was limited to the most prominent and accessible works, which could lead to an incomplete theoretical foundation. Furthermore, the literature review focused primarily on Western contexts, which may limit the applicability of the findings to non-Western settings.

Secondly, the qualitative, exploratory nature of this study allowed for an deep dive in order understand the experiences and perceptions of participants. However, qualitative research is inherently subjective, and the findings are dependent on the perspectives of a relatively small group of individuals. This limits the generalizability of the results to a broader population. This makes it especially challenging to study an organization, as it simply consists of individuals all with subjective experiences. The explorative approach was beneficial for uncovering insights in an under-researched area, but it also meant that the study did not employ a structured hypothesis-testing method. As a result, the findings are descriptive rather than predictive, and the conclusions drawn may need further validation through quantitative approaches.

Thematic analysis was used to identify patterns in the data, which involves some degree of interpretation by the researcher. This subjective interpretation could introduce bias, particularly in categorizing and prioritizing themes. Additionally, the absence of triangulation methods (such as incorporating quantitative data or using multiple coders) may have impacted the reliability of the analysis.

7.5.2 Contextual Limitations

The study is context-specific, focusing on the Dutch infrastructure sector, particularly the Railway Administration and the Port Authority. The findings may not be directly applicable to other infrastructure sectors or regions with different regulatory, cultural, and economic environments. The specific nature of the Dutch infrastructure landscape, including its governance and regulatory structure, may have influenced the identified themes and their relevance.

Additionally**,** The study concentrated on two major infrastructure organizations—the Railway Administration and the Port Authority. While this provided rich insights into the dynamics between these entities, it does not account for the perspectives of other important stakeholders, such as government bodies, contractors, or end-users. Including a broader range of stakeholders could have provided a more comprehensive view of the challenges and opportunities for IOC.

Other Limitations

The data collection occurred within a limited time frame, providing a snapshot of IOC efforts at that particular time. The dynamic nature of collaborative projects means that the factors influencing collaboration may evolve over time. Longitudinal studies would be needed to capture how these dynamics change as projects progress and external conditions shift.

The study relies on interviews with participants, which are inherently subjective. Participants may have provided socially desirable responses or may not have fully disclosed challenges

due to organizational sensitivities. This can result in a bias toward more favorable views of IOC or a reluctance to discuss certain barriers openly.

7.6 Reflection

The success of interorganizational collaboration (IOC) is influenced not by any single precondition but by a complex interplay of multiple intraorganizational and interorganizational factors. These conditions interact dynamically—sometimes concurrently, sometimes sequentially—shaping how effectively organizations can collaborate. This nuanced perspective emphasizes that alignment across motivations, leadership, and resource allocation must be adapted to suit the specific context, rather than following a standardized approach. Context, therefore, is the "elephant in the room," and the challenge of accommodating diverse contextual realities underscores both the richness and the difficulty of researching IOC.

The wide-ranging body of literature on IOC demonstrates that no single consensus or model fits all situations. Collaboration, by nature, is a highly complex issue that varies across industries, stakeholders, and settings. As such, the existing literature reflects a multitude of approaches, often with differing and sometimes conflicting findings. There is no universally applicable roadmap for achieving successful IOC—each collaboration is inherently shaped by its unique context. This research, too, merely skims the surface of this complexity, attempting to identify meaningful patterns within the specific environment of Dutch infrastructure administrations.

Despite the inherent complexity and the contextual limitations of this research, the patterns and insights found remain valuable. They provide a reflective lens through which managers can better understand their own collaborative contexts, serving as an invitation to assess whether similar challenges, opportunities, and conditions are present within their specific environments. While the findings may not be prescriptive, they do offer a framework for reflection and adaptability—encouraging practitioners to think critically about the alignment between their collaborative efforts and their organizational objectives.

Facilitating IOC between infrastructure administrations is likely to become increasingly relevant in the face of evolving societal challenges. As a Dutch-American I have commuted on the subway systems of New York City and cycled along the flood defenses of Zeeland in the Netherlands, in both contexts infrastructure forms the backbone of everyday life. Most users of critical infrastructure likely take it for granted, this only increases the responsibility of those who manage it to act ethically and collaboratively, ensuring its resilience and reliability especially in the face of growing political, environmental, and socio-economic challenges.

Collaborative capacity is not just an abstract concept; it is an actionable and valuable approach to safeguarding society’s critical systems. Thus, while this research has its limitations, it provides essential groundwork. The patterns observed here offer a reference point to help comparable infrastructure organizations chart a path toward more resilient, effective, and ethically grounded collaboration across new horizons.

8 Conclusion

This thesis has explored the complex landscape of interorganizational collaboration (IOC) among Dutch infrastructure administrations, examining the factors that enhance or inhibit collaborative efforts. The findings reveal an intricate interplay between intraorganizational and interorganizational conditions and that the success of IOC is influenced by a dynamic mix of multiple factors, including motivations, leadership, structure, and the alignment of organizational strategies. To answer the main resource question, infrastructure administrations can enhance their collaborative capacity by assessing their own specific context in comparison to key patterns present in the scientific literature and empirical evidence to guide the development of a context-specific collaborative strategy.

To answer the first sub question, the literature review identified theoretical preconditions for IOC, integrating various approaches to collaborative capacity across organizational domains and factors, as well as prescriptive process design models. This resulted in a theoretical framework that provided a basis for empirical observations through semi-structured interviews, coded according to the theoretical constructs of leadership commitment , collaborative strategy that including goals and stakeholder understanding, and structural flexibility.

The second sub question was answered by identifying success factors and challenges from the empirical data to understand what practitioners in The Netherlands are experiencing. A consistent tension between organizational goals and shared collaborative objectives emerged in the empirical context. The findings indicate that while practitioners recognize the value of setting collaborative goals, a commitment to internal mandates often supersedes a broader, collective vision. This tension reflects the inherent risk aversion of organizations. However, progress in the empirical cases demonstrates that prioritizing relationship-building and collaborative goals—especially over financial considerations in the early stages—can foster trust and build the momentum needed for successful collaboration. This finding reinforces the idea that relational capital should take precedence over transactional gains during strategic planning and negotiation.

Leadership also plays a role in either driving or hindering collaboration. The study finds that while leadership is crucial for embedding collaboration as an organizational strategy, successful collaborative efforts often begin with boundary-spanning employees who take the initiative to push collaboration forward, often without direct top-down mandates. This bottom-up momentum is instrumental in overcoming organizational inertia, but sustained success in IOC requires a shift in leadership mindset—from ad-hoc approvals to a proactive, consistent commitment to embedding collaboration as a strategic priority.

Collaborative learning emerges as a critical enabler of IOC, yet it remains underutilized. Informal networks, proactive relationship-building, and cross-organizational learning provide platforms for understanding each other's constraints and aligning goals. Institutionalizing collaborative learning opportunities could help build stronger foundations for collaboration, particularly in environments where operational silos and rigid structures persist.

To address the third research sub question, the thematic analysis of empirical findings identifies patterns of shifting roles, redefining rules, and pushing boundaries to yield success and avoid the challenges associated with IOC. These patterns underscore the importance of structural flexibility and institutional adaptation. While this research aims to identify relevant patterns within the specific context of Dutch infrastructure administrations, it is by no means exhaustive. The findings are not intended to be prescriptive but rather to provide a reflective framework for practitioners to assess and adapt to their unique situations.

Facilitating IOC between infrastructure administrations will continue to be a topical and relevant goal globally. With growing political uncertainty and socio-economic challenges, the ethical responsibility to safeguard our infrastructure will play a key role in shaping future policies. Infrastructure forms the backbone of our societies, quietly supporting every aspect of modern life. Ensuring that these systems are resilient, interconnected, and adaptable is a task that demands collaborative effort.

While the complexity of IOC may seem daunting, the patterns observed in this research provide a foundation for reflection, growth, and further exploration. By understanding the organizational dynamics that have affected past collaborations, infrastructure administrations can better assess their capacity for collaboration and tailor their strategies to address unique challenges. The insights gained through this research—however context-specific—offer guidance for infrastructure administrations to assess their collaborative efforts and ultimately contribute to safeguarding society's critical infrastructure systems.

9 Recommendations

The following recommendations are offered to industry professionals and researchers. The implications for practice aim to invite managers to assess collaborative capacity within their own contexts. The recommendations for research invite further study either building upon topics of this work or filling gaps left by limitations.

9.1 Implications for Practice

First, managers can evaluate their strategic priorities and aim to understand if recalibration is needed to better balance individual and collective goals. Leadership at all levels are encouraged to see beyond immediate organizational efficiencies and understand the long-term value of collaboration.

Second, managers can investigate internal silos within their own organization and identify pathways for multidisciplinary engagement in their contexts. Introducing formal cross-functional teams that work on collaborative projects have been observed in helping bridge these internal divides by fostering a culture of shared learning and problem-solving, and their feasibility should be considering.

Additionally, consider the prevalence of bottom-up initiatives for IOC. Managers can assess to what degree boundary-spanning individuals are empowered with adequate resources and working in the right roles.

Finally, structural flexibility is observed as a core component of IOC in this context. For other organizations to embrace it, this may require revisiting governance models and allowing for more decentralized decision-making, enabling organizations respond more swiftly to collaborative opportunities. For practitioners, this means being open to assuming non-traditional roles and embracing the ambiguity that often accompanies complex partnerships.

9.2 Recommendations for Further Research

First, explore the integration of collaborative goals in organizational culture. This could investigate how collaborative goals can be effectively embedded within the strategic framework of infrastructure organizations. Exploring ways to align organizational missions with collaborative efforts can provide insights into overcoming the persistent tension between individual and shared goals.

Additionally, the role of leadership in facilitating long-term collaboration. Research could focus on how leadership strategies can be developed to promote a proactive, consistent commitment to collaboration, rather than relying on ad-hoc approvals. Understanding the conditions that lead to sustained leadership engagement could provide valuable lessons for enhancing IOC.

Research could focus on how to institutionalize collaborative learning opportunities within infrastructure organizations. Studies could examine the impact of formal learning environments—such as joint training programs and cross-organizational workshops—on enhancing practitioners' understanding of each other's constraints and opportunities, thereby improving collaborative capacity.

Additionally, investigate structural flexibility and its role in IOC. Structural flexibility is observed as a contextually valuable factor for successful IOC, yet its implementation is inconsistent. Future research could explore how infrastructure organizations adapt their governance models, roles, and responsibilities to foster flexibility and responsiveness in collaborative endeavours. Such research could highlight best practices for adjusting traditional roles to better meet collaborative needs.

Finally, develop metrics for assessing collaborative success. There is a need for further research into developing metrics for evaluating the success of IOC initiatives. Future studies could investigate which indicators—such as relational quality, goal alignment, and structural adaptability—are most effective in measuring collaborative success. Establishing such metrics could provide a systematic approach for organizations to assess and refine their collaborative efforts over time.

References

Abramowicz, L., Banaszak, J., Jayanth, T., & Zarrinkoub, H. (2018). Collaborative contracting: Making it happen. *McKinsey & Company*, *Global Inf*(June), 1–5.

Ansell, Chris G. (2008). Collaborative Governance in Theory and Practice. *Journal of Public Administration Research and Theory*, 543-571.

Bakker, H. L. M., & de Kleijn, J. P. (2018). *Projects and People: Mastering Success*. NAP Process Industry Network.

Bresnen, M., & Marshall, N. (2000a). Building partnerships: Case studies of client-contractor collaboration in the UK construction industry. *Construction Management and Economics*, *18*(7), 819–832. https://doi.org/10.1080/014461900433104

Bresnen, M., & Marshall, N. (2000b). Partnering in construction: A critical review of issues, problems and dilemmas. *Construction Management and Economics*, *18*(2), 229–237. https://doi.org/10.1080/014461900370852

Bresnen, M., & Marshall, N. (2002). The engineering or evolution of co-operation? A tale of two partnering projects. *International Journal of Project Management*, *20*(7), 497–505. https://doi.org/10.1016/S0263-7863(01)00043-6

Bruijn, J. A. de, Heuvelhof, E. ten, & Veld, R. in 't. (2010). *Process Management: Why Project Management Fails in Complex Decision Making Processes* (2nd ed.). Springer-Verlag. https://doi.org/DOI 10.1007/978-3-642-13941-3

Bruins, A. R. (2020). 'Infra moet hoger op de politieke agenda komen.' *NG Infra Magazine*, *03*, 25–17.

Bryson, J. M., Crosby, B. C., & Stone, M. M. (2006). The Design and Implementation of Cross-Sector Collaborations: Propositions from the Literature. *Public Administration Review*, 44-55.

Corbin, J., & Strauss, A. (2014). *Basics of Qualitative Research*. SAGE.

Fisher, R., Ury, W., & Patton, B. (1982). Getting to YES: Negotiation Agreement Without Giving In. In *Penguin Group: Vol. 3rd Ed.* https://doi.org/10.2307/1340747

Foster-fishman, P. G., Berkowitz, S. L., Lounsbury, D. W., Jacobson, S., & Allen, N. A. (2001). Building Collaborative Capacity in Community Coalitions : A Review and Integrative Framework 1. *American Journal of Community Psychology*, *29*(2).

Gray, B. (1985). Conditions Facilitating Interorganizational Collaboration. *Human Relations*, *38*(10), 911–936.

Hardy, C., Phillips, N., & Lawrence, T. B. (2003). Resources, knowledge and influence: The organizational effects of inter Organizational collaboration. *Journal of Management Studies*, *40*(2), 321–347. https://doi.org/10.1111/1467-6486.00342

Havenbedrijf Rotterdam. (2024). *About the Port Authority*. Retrieved from Port of Rotterdam: https://www.portofrotterdam.com/en/about-port-authority

Havenbedrijf Rotterdam. (2021, May 31). *Steel arch bridge Theemsweg route across A15 and N15 successfully installed*. Retrieved from The Port of Rotterdam: https://www.portofrotterdam.com/en/news-and-press-releases/steel-arch-bridge-theemsweg-route-across-a15-and-n15-successfully-installed

Hibbert, P., Ring, P. S., & Huxham, C. (2010). Managing Collaborative Inter-organizational Relations. In S. Cropper, M. Ebers, C. Huxham, & P. Ring (Eds.), *Oxford Handbook of Inter-Organizational Relations*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199282944.003.0015

Hocevar, S. P., Jansen, E., & Thomas, G. F. (2011). Inter-Organizational Collaboration: Addressing the Challenge. *Homeland Security Affairs*, *7*(2).

Kwibisa, N., & Majzoub, S. (2018). Challenges Faced in Inter-Organizational Collaboration Process. A Case Study of Region Skåne. *Journal of Sustainable Development*, *11*(5), 34. https://doi.org/10.5539/jsd.v11n5p34

Madden, J. R. (2017). Inter-organizational collaboration by design. In *Inter-Organizational Collaboration by Design*. https://doi.org/10.4324/9781315468617

Marktvisie. (2020). *Samenwerken aan een vitale en duurzame sector*. https://www.marktvisie.nu/

Martin, N., Verdonck, L., Caris, A., & Depaire, B. (2018). Horizontal collaboration in logistics: decision framework and typology. *Operations Management Research*, *11*(1–2), 32–50. https://doi.org/10.1007/s12063-018-0131-1

Mattessich, P. W., & Monsey, B. R. (1992). Collaboration: What makes it work. A Review of Research Literature on Factors Influencing Successful Collaboration. In *Amherst H. Wilder Foundation*.

Maurer, I. (2010). How to build trust in inter-organizational projects: The impact of project staffing and project rewards on the formation of trust, knowledge acquisition and product innovation. *International Journal of Project Management*, *28*(7), 629–637. https://doi.org/10.1016/j.ijproman.2009.11.006

Merriam-Webster. (2022). *Thesaurus* . Retrieved from Merriam-Webster: https://www.merriam-webster.com/thesaurus

NG Infra. (2020, September). NGinfra en NWO openen nieuwe call. *NGinfra Magazine NR 3*, p. 11.

NGinfra. (2022). *What is NGinfra*. Retrieved from Next Generation Infrastructures : https://www.nginfra.nl/over-ons/

North, D. C. (1990). *Institutions, institutional change and economic performance.* Cambridge: Cambridge University Press.

Ostrom, E. (1992). Governing the Commons: The Evolution of Institutions for Collective Action. *Natural Resources Journal*.

Pomponi, F., Fratocchi, L., & Tafuri, S. R. (2015). Trust development and horizontal collaboration in logistics: A theory based evolutionary framework. *Supply Chain Management*, *20*(1), 83–97. https://doi.org/10.1108/SCM-02-2014-0078

Raišienė, A. G. (2012). Sustainable Development of interorganizational relationships and social innovations. *Journal of Security and Sustainability Issues*, *2*(1), 65–76.

Rijksoverheid. (2024). *Organisation of public transport*. Retrieved from Government of The Netherlands: https://www.government.nl/topics/mobility-public-transport-and-road-safety/public-transport/organisation-of-public-transport

Saldana, J., Miles, M., & Huberman, M. (2014). *Qualitative Data Analysis: A Methods Sourcebook* (3rd ed.). SAGE Publications.

Saukko, L., Aaltonen, K., & Haapasalo, H. (2020). Inter-organizational collaboration challenges and preconditions in industrial engineering projects. In *International Journal of Managing Projects in Business* (Vol. 13, Issue 5, pp. 999–1023). https://doi.org/10.1108/IJMPB-10-2019-0250

Senge, P. (2006). *The Fifth Discipline.* New York: Currency.

The European Commission. (2022, October 24). *Critical Infrastructure*. Retrieved from Home Affairs: https://home-affairs.ec.europa.eu/pages/page/critical-infrastructure_en

The United Nations. (2018). ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL. *UN Chronicle*, *51*(4), 17–18. https://doi.org/10.18356/24ef28d2-en

Thomson, A. M., Perry, J. L., & Miller, T. K. (2009). Conceptualizing and measuring collaboration. *Journal of Public Administration Research and Theory*, *19*(1), 23–56. https://doi.org/10.1093/jopart/mum036

Tushman, M. L., & Scanlan, T. J. (1981). Boundary Spanning Individuals: Their Role in Information Transfer and Their Antecedents. *Academy of Management Journal*, *24*(2), 289–305.

Vangen, S., & Huxham, C. (2003). Building Trust in Interorganizational Collaboration. *Journal of Applied Behavioral Science*, *39*(1), 5–31. https://doi.org/10.1177/0021886303253179

Van de Ven, A. (1976). A Framework For Organization Assessment. *Academy of Management Review*, 64-78.

Van Der Riet, A. (2020, September). De 'mythe van data dele' onkracht. *NGinfra Magazine*, pp. 30-33.

Verstrepen, S., Cools, M., Cruijssen, F., & Dullaert, W. (2009). A dynamic framework for managing horizontal cooperation in logistics. *International Journal of Logistics Systems and Management*, *5*(3–4), 228–248. https://doi.org/10.1504/IJLSM.2009.022497

Weber, E. P., Lovrich, N. P., & Gaffney, M. J. (2007). Assessing Collaborative Capacity in a Multidimensional World. *Administration & Society*, *39*(2), 194–220. https://doi.org/10.1177/0095399706297213

Weijnen, M. P. C. (2019). De bijdrage van infrastructuur aan de toegevoegde waarde van de nationale economie: een internationale vergelijking over de periode 1995-2016. *NGinfra, TU Delft*, 1–8.

Weiss, R. S. (1994). *Learning from strangers: The art and method of qualitative interview studies*.

Wesselink, M., & Paul, R. (2013). *Handboek Strategisch Omgevings Managment* (Third). Vakmedianet.

Williams, P. (2002). The Competent Boundary Spanner. *Public Administration*, 103-124.

Wood, D. J., & Gray, B. (1991). Collaborative Alliances: Moving From Practice to Theory. *The Journal of Applied Behavioral Science*, *27*(2), 139–162. https://doi.org/10.1177/0021886391272001

Yanga, Y., Nga, S. T., Xua, F. J., & Martin Skitmoreb. (2018). Towards sustainable and resilient high density cities through better integration of infrastructure networks. *Sustainable Cities and Society*, *42*, 407–422.

Yin, R. K. (2018). Case Study Research and Applications; Design and Methods. In *Sage Publications Inc.* (Issue Sixth Edition).

Zheng, X., Lu, Y., Le, Y., Li, Y., & Fang, J. (2018). Formation of Interorganizational Relational Behavior in Megaprojects: Perspective of the Extended Theory of Planned Behavior. *Journal of Management in Engineering*, *34*(1), 1–16. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000560

10 Appendices

10.1 Appendix A - NGinfra Workshop Meeting Minutes

Organizations Anonymously Represented: Port Authority, Water Utility, Ministry Infrastructure and Water Management, Electricity Transmission, Railway Administration, NG Infra.

1. What has your organization experienced as the main barrier to effective collaboration

Opposing interests between organizations is suggested as a barrier to effective collaborating.
“Organizations don’t work, people work. People who create added value to each other have motivation to collaborate.”
“In approaching collaboration, ask what’s in it for you? What are you going to get in return for working together?”
The Port Authority has devised a partnership through the SEM (Strategic Environmental Management) approach, “success is finding common goals.”

2. What are your organization's expectations of these collaborative relationships?

“Achieving your own goal. An organization’s own capabilities are very limited, therefore through collaboration, more can be accomplished.”
“Generally, Money. You do not achieve your own result if you don’t get the joint result.”

3. How does your organization see your future collaboration with other infrastructure managers?

“We have many forms that vary per project but also per environment.”
“Collaboration is often cut by region.”
“Also depends on the duration and type of collaboration. Is it incidental or structural?”

4. From your organization's perspective, what are the most important requirements for collaboration between organizations?

“There must be a willingness to collaborate, otherwise it will never succeed in the first place. SEM Technique.”
“There could be an impact from the new environmental law, this will change the relationship between stakeholders. Good to get involved.”
“You have your own motivation to collaborate, but is it also a role?”

5. Does your organization value cooperation between the client and the contractor? How do expectations differ?

“A lot. There is evolution in it, but we have the task to shape it properly.”
“In the collaboration horizontally, you try to find common goals and vertically you try to invest them well to achieve results. Without contractors, we have nothing”
“What we value is that contractors are not only responsible for their part but also for the total.”
“We are now making optimization tools, everyone can use them. When you go out together, it is important that you are open about things. Develop the results you aim to obtain through the collaboration together.”

10.2 Appendix B – [Pre]Collaborative Frameworks

10.2.1 Relational Behaviour (Zheng et al., 2018)

The Relational Behaviour Model by Zheng et al. (2018) focuses on the factors that influence effective collaboration between organizations by emphasizing the role of relational behaviours. The model identifies behaviours that foster trust, commitment, and the development of strong working relationships, which are critical for successful inter-organizational collaboration. Key components of the model include:

1. Communication Behavior

Open Communication: Promoting transparent and honest dialogue between organizations, which facilitates the sharing of important information and aligns objectives.

Timely Information Sharing: Ensuring that information is shared promptly and adequately to support collaborative decision-making and problem-solving.

Problem-Solving Communication: Focusing on collaborative problem-solving approaches that address issues constructively, rather than assigning blame.

2. Coordination Behavior

Joint Planning and Task Coordination: Working together to plan tasks and activities, ensuring alignment in strategies and approaches.

Resource Allocation: Collaborating on how resources (e.g., personnel, budget, materials) are allocated to maximize the effectiveness of joint efforts.

Process Adaptability: Being flexible in adjusting processes to accommodate changing conditions or the needs of partner organizations.

3. Conflict Management Behavior

Collaborative Conflict Resolution: Handling disagreements in a way that seeks mutual benefits and strengthens relationships.

Avoidance of Hostile Actions: Avoiding behaviors that escalate conflicts or create a hostile environment, instead fostering a cooperative spirit.

Proactive Conflict Resolution: Addressing potential issues before they escalate into significant conflicts.

4.Trust-Building Behavior

Reliability and Consistency: Demonstrating reliability in meeting commitments, which helps build trust over time.

Interpersonal Respect and Recognition: Acknowledging the contributions and perspectives of all parties, fostering mutual respect.

Investing in Relationship Development: Actively working to maintain and strengthen relationships through ongoing efforts, such as joint training or social interactions.

5. Commitment Behavior

Shared Goals and Vision: Establishing common objectives that all parties are committed to achieving.

Mutual Benefits and Reciprocity: Ensuring that the collaboration is beneficial to all parties, promoting a sense of shared responsibility. Long-Term Orientation: Focusing on the long-term success of the partnership, rather than short-term gains.

10.2.2 *Inter-organizational collaborative Capacity ICC Model (5) Organizational Domains & (13) Factors: (Hocevar et al., 2011)*

Domain	Factor	Description
1. Purpose & Strategy	Felt Need to Collaborate	Recognizes interdependence with others and the need to collaborate to achieve mission/goals.
	Strategic Action for Collaboration	Includes clear goals, senior leadership commitment, and willingness to consider other organizations' interests in planning.
	Resource Investments	Allocates budget and personnel to support collaboration efforts.
2. Structure	Collaboration Structures	Involves liaison roles, inter-agency teams/task forces, established roles, and internal processes for effective collaboration.
	Structural Flexibility	Allows adaptation as requirements change and demonstrates willingness to adjust procedures for coordination.
	Metrics	Sets criteria for evaluating collaboration efforts and routine mechanisms for assessing outcomes.
	Support for Individual Collaborative Efforts	Clearly structures goals, constraints, and authorities for collaborative work; links boundary-spanning personnel to strategic leadership.
3. Rewards & Incentives	Incentives and Rewards Systems	Rewards employees for building relationships and achieving collaborative results, considering collaborative talents in promotions.
4. Lateral Mechanisms	Social Capital	Builds social and professional relationships with counterparts in other organizations, fostering awareness and trust.
	Collaborative Tools and Technologies	Provides technical tools for collaboration, including interoperable systems and planning tools.
	Information Sharing	Supports norms and values that encourage sharing, ensuring adequate access to information relevant to collaborative activities.
	Collaborative Learning	Facilitates joint training, understanding of other organizations' capabilities, and systematic assessments of lessons learned to improve collaboration.
5. People	Individual Collaborative Capacities	Considers the attitudes, skills, knowledge, and behaviors of individual members that affect the organization's ability to collaborate.

10.2.3 19 factors of collaboration grouped in 6 categories. (Mattessich & Monsey, 1992)

Category	Factor	Description
1. Environment	History of Collaboration	Previous collaboration or cooperation in the community helps partners understand roles, expectations, and trust the collaborative process.
	Community Leadership	The collaborative group is recognized as a leader in the community.
	Favorable Political/Social Climate	The mission of the collaborative group is supported by political leaders, opinion-makers, resource controllers, and the general public.
2. Membership Characteristics	Mutual Respect, Understanding, and Trust	Members respect and understand each other's organizations, including cultural norms, values, limitations, and expectations.
	Appropriate Cross-Section of Members	The collaborative group includes representatives from all segments of the community affected by its activities.
	Self-Interest in Collaboration	Partners believe that the benefits of collaboration outweigh costs such as loss of autonomy.
	Ability to Compromise	Partners are willing to compromise, as decisions may not always meet everyone's preferences perfectly.
3. Process/Structure	Shared Stake in Process and Outcome	Members feel "ownership" of both the way the group operates and the results of its work.
	Multiple Layers of Decision-Making	Decision-making involves all organizational levels (upper management, middle management, operations) in the collaborative group.
	Flexibility	The group remains open to different organizational methods and ways of achieving its objectives.
	Clear Roles and Policy Guidelines	Partners understand their roles, rights, responsibilities, and how to carry them out.
	Adaptability	The group can sustain itself despite challenges by adjusting goals, members, or other elements as needed.
4. Communication	Open and Frequent Communication	Members interact often, discuss issues openly, share necessary information, and provide updates both within and outside the group.
	Informal and Formal Communication Links	Communication channels exist on paper, and personal connections are established to create a cohesive group.
5. Purpose	Concrete, Attainable Goals and Objectives	Goals and objectives are clear and realistically achievable by all partners.
	Shared Vision	Partners agree on the mission, objectives, and strategy, either from the outset or as they work together.
	Unique Purpose	The group's mission, goals, or approach differ from those of its member organizations.
6. Resources	Sufficient Funds	The collaborative group has a consistent and adequate financial base to support its operations.
	Skilled Convener	The convener has organizing and interpersonal skills, acts fairly, and is respected or seen as legitimate by the collaborative partners.

10.2.4 *Foster-Fishman, 2001 Key Elements of Collaborative Capacity & Strategic Action for Building collaborative capacity.*

Core Element	Specific Skills, Knowledge, and Attitudes
Core Skills and Knowledge	
- Ability to work collaboratively with others	- Conflict resolution - Communication skills - Understanding of norms and perspectives of other members - Broad understanding of the problem domain
- Ability to create and build effective programs/projects	- Knowledge of the targeted problem - Understanding of societal context - Skilled in policy, politics, and change management
- Ability to build an effective coalition infrastructure	- Skilled in group development - Knowledgeable about coalition roles, responsibilities, and committee work
Core Attitudes and Motivation	
- Holds positive attitudes about collaboration	- Commitment to collaboration as a concept - Views current system/efforts as inadequate - Believes collaboration will be productive and achieve goals - Believes collaboration serves their interests - Sees benefits as outweighing the costs
- Holds positive attitudes about other stakeholders	- Views other stakeholders as legitimate, capable, and experienced - Respects different perspectives - Appreciates interdependence - Trusts other stakeholders
- Holds a positive attitude about self	- Sees oneself as a legitimate and capable member - Recognizes one's own expertise and knowledge bases

Strategic Action for Building Member Capacity	Description
Understand current member capacity	- Assess existing skills and knowledge needed for coalition efforts. - Identify gaps between current member capacities and required skills.
Value the diversity of member competencies	- Recognize and make use of each member's unique assets (e.g., culture, language, skills, connections). - Create settings that maximize the use of these diverse talents.
Enhance current member capacities	- Provide training in technical, programmatic, and relational areas. - Encourage sharing and dissemination of knowledge among members. - Recruit new members with needed skills.
Engage in incentives management	- Understand and build on individual motivations for joining the coalition. - Enhance incentives for participation and reduce perceived costs. - Address signs of dissatisfaction.
Foster positive intergroup understanding	- Identify and share positive qualities and mutual interests of stakeholders. - Encourage members to share their expertise and motivations for joining. - Discuss differences in language, style, and traditions.
Build diverse membership	- Identify key constituencies for the coalition's issue and context. - Recruit a diverse and representative array of stakeholders. - Include diverse members in leadership roles.
Support diversity	- Identify barriers to participation and develop strategies to overcome them (e.g., carpooling, interpreters). - Create diverse subcommittees and provide technical assistance to enhance member capacities.

10.3 Appendix C – Interview Protocol

Introduction

Get to know each other. Establish a comfortable and trustworthy atmosphere where information can be shared freely. The data is for my own use and analysis of the collaboration and organizational processes. Results of the are only used for this master thesis will be archived in the TU Delft research repository. Nothing will be published without prior permission obtained.

- Introduce each other
- Permission to record the interview
- Research subject and context

Purpose and Strategy

- What motivates your organization to collaborate with others?
- How does your organization arrive at the decision to collaborate with another party (in this case another infrastructure organization)?
- What are the standard processes involved making this decision? Who initiates it?

Elements of Collaborative Capacity

See what preconditions are mentioned. Identification of pre-conditions are not the goal of the research, however according to the literature. Awareness of one's own capacity to collaborative is the first procedural step into improving it.

- Welke vaardigheden heft [organisatie] waardoor zij goed voorbereid zijn op samenwerking?
- Heeft [organisatie] goed houding en motivatie tot samenwerking? Hoe kan het verbeterd worden?
- Is [organization] aware of it's own abilities / capacity to collaborate?
- Does ProRail possess self-awareness of its ability to collaborate? How do they self assess their own collaborative capacity?

Processes and Procedures

Establish where and how the collaboration fits into or relates with the internal procedures of the organization. Does the organization strategize internally at all? What is done between the 'need to collaborate phase' and the actual initiation of the collaborative process and allocation of resources?

- How do internal processes (intraorganizational) compare to the collaborative processes (interorganizational)?
- How does [organization] identify and analyse the standpoints and interests of potential collaborative partners / other infrastructure administrations?
- How is the strategy per stakeholder determined before your enter negotiations?
- How does your organization adapt to collaborative processes?
- How can you incentivize other parties to collaborate?
- Between the decision to collaborate and the allocation of resources, what internal processes are followed?

Challenges

- What are the most important challenges to interorganizational collaboration does your organization encounter?
- How can your organization try to address/overcome address these challenges?

Opportunity to Add / Closing Remarks - Presents the opportunity for the interviewee to speak freely on the subject without being bound by a question. Is there anything you would like to add? Perhaps there is an idea that resonates with you that is relevant to the subject but I may not have asked about?