When Nothing is Said, Everything Happens

Exploration of Communication Dynamics of, and Empathy in Interdisciplinary
Project Teams

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When Nothing is Said, Everything Happens

Exploration of Communication Dynamics of, and Empathy in Interdisciplinary Project Teams

By

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Preface

Before you lies the master's thesis "*When Nothing is Said, Everything Happens*". This thesis is about all the communication complexities of interdisciplinary project teams, including silence as one of the critical complexities of these project teams. With writing this last part of this thesis, I am now very close to fulfilling the graduation requirements of the Master of Science degree in Construction Management and Engineering at the Delft University of Technology. The finalisation of this degree, which consists of researching and writing this thesis, all started in March 2025. Exactly six months later, in September, the defence will take place, which will conclude this important chapter.

During my time as a student at Delft University of Technology, I grew and changed enormously. Starting with the BSc program in Civil Engineering, I was determined to become an engineer. Working on the technology, doing the calculations, and thereby fulfilling my fascination: working on the most complex structures and grand infrastructure. Gradually, I discovered that there was more to it than becoming a technician; there were other options that could still lead to a job in the sector. For that reason, I started an MSc program in Construction Management and Engineering, where I explored the management side of the sector.

While studying, I always took on a lot of extra projects: from playing a lot of sports to serving on committees to working hard in the hospitality industry. That's where I discovered that the team player in me was always interested in others and that my antennae were always up. Antennae to sense what others are thinking, what they have experienced, and what they need. I wanted to incorporate this trait into my graduation research. But that turned out to be a big challenge. Even though there were other former students who wanted to discover the world of empathy. I continued with it, albeit with some ups and downs. Perhaps with the ultimate goal of showing people that becoming an engineer is more than just doing hard math and realising the coolest and most complicated projects. With this thesis, I hope to have taken a step in that direction.

I would like to thank Paul, Erik-Jan, and Jorn for their help and trust in the process; even though I sometimes had doubts about my own project, you supported me enormously in realising this final product. You have both supported and challenged me, which has made the process extremely educational. Just as much thanks to you as to my friends and family. Their support was also much needed, even though they knew less about the subject. To the reader, too: thank you. I hope this research can inspire and show that technology is about more than just hard skills.

Jelmer Bloemhof

Delft, September 5, 2025

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Abstract

Interdisciplinary project teams in the architecture, engineering and construction (AEC) sector are increasingly faced with complex challenges that demand intensive collaboration across diverse professional domains. Three persistent communication barriers often hinder these collaborations: language and terminology differences, difficulty coordinating fragmented organisations, and fragile trust relationships. In addition, silence - both as non-verbal communication and as an organisational phenomenon - emerges as a subtle but powerful factor shaping team dynamics.

This thesis explores how empathy can address these communication complexities. Through a combination of a semi-systematic literature review, thirteen semi-structured interviews and direct observations from the Cruciale Mijl infrastructure project in Amsterdam, the study investigates the influence of empathic interactions on collaboration in interdisciplinary teams. The data were analysed thematically and supported by emotional observations, using established frameworks on psychological safety, organisational silence and empathy.

The findings suggest that empathy acts as a bridge: it allows professionals to navigate disciplinary differences, interpret silences more constructively, and foster an environment of psychological safety. Empathy was not merely an individual trait, but a collective competency cultivated through sharing perspectives, informal interactions and sustained emotional investment. The metaphor of an 'emotional bank account' illustrates how these investments foster resilience, enabling teams to cope more effectively with conflict and uncertainty.

At the same time, however, the study exposes persistent challenges. Many participants expressed scepticism about the practical value of empathy, or assumed that it was the responsibility of specific roles rather than a shared skill. This outsourcing of emotional labour undermines its collective potential. While empathy cannot resolve structural or political complexities, it demonstrably reduces communication friction, prevents destructive silences and improves the quality of collaboration.

The research contributes to project management theory by demonstrating the practical role of empathy in interdisciplinary teamwork. It recommends embedding empathy in team formation processes, recognising shared responsibility for emotional labour and facilitating reflective spaces where silence can be used constructively.

Keywords: empathy; interdisciplinary collaboration; communication dynamics; silence; psychological safety; AEC sector

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The thesis you see before you is the end result of more than six months of work. The entire process was supported by many people around me; I could never have come this far on my own.

First of all, Erik-Jan and Paul. I am extremely grateful to you for all the sparring sessions that I was able to have with you. With your knowledge and way of thinking, you have really made me think hard. You made me think about the direction of the research, which research questions I actually had to answer, and everything else I was constantly working on. You asked valid questions about my thought process and ensured that this thesis became a challenging but achievable academic step. I am most grateful for your accessibility and your always quick responses to my questions.

I must also thank Jorn for the same reason. You were the person in Amsterdam who was always there for me, both during and after office hours. Your previous experience with graduating guided me well through the graduation process and, of course, through all the work of the IB Amsterdam. Without you, I would not have been able to get in touch so easily with all the interesting stakeholders and team members of the Cruciale Mijl. You also ensured that I was able to think about the subject matter in a slightly more critical way from time to time, which of course led to this great end result.

Of course, I cannot forget the rest of my colleagues at IB Amsterdam. Not only did you help me with the research with all the interesting interview data, but your availability for a coffee and a chat also made the whole process more feasible for me.

Next, Merel and Marith. Your insights from a social perspective made me realise that a subject like empathy matters and that you can indeed set up a strong research project with it. I am extremely grateful to you for being willing to read my thesis from cover to cover. And it was not just Merel and Marith who helped me in this way. Iris, you could be found in the library almost every day, with or without me. You made the process so bearable, both by sparring with me from time to time, but mainly because you provided the necessary distraction. That is perhaps the most underappreciated but most important thing anyone could have done for me. Thank you for your knowledge and for listening.

I would be remiss in not mentioning all my other friends, my housemates, and my family. Not only did you provide me with tremendous support during my thesis, but ever since I started my studies at TU Delft, you have been my most important pillar of support.

AI Acknowledgement

Given the current developments in artificial intelligence (AI), it is important to mention that this research made use of available AI tools. Due to the privacy-sensitive interview data, AI was not used for data analysis, but mainly used as a sparring partner. It revealed several options that I, as a researcher, would not have been able to consider myself, which certainly helped with important thought processes and decision-making moments.

List of Abbreviations

AI	Artificial Intelligence
CE	Civil Engineering
IB Amsterdam	Engineering Office of the Municipality of Amsterdam
RO	Research objective
RQ	Research question
SQ	Sub research question
AEC	Architecture, Engineering & Construction

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I. Introduction

Setting the context for the research, using contextual information and research design
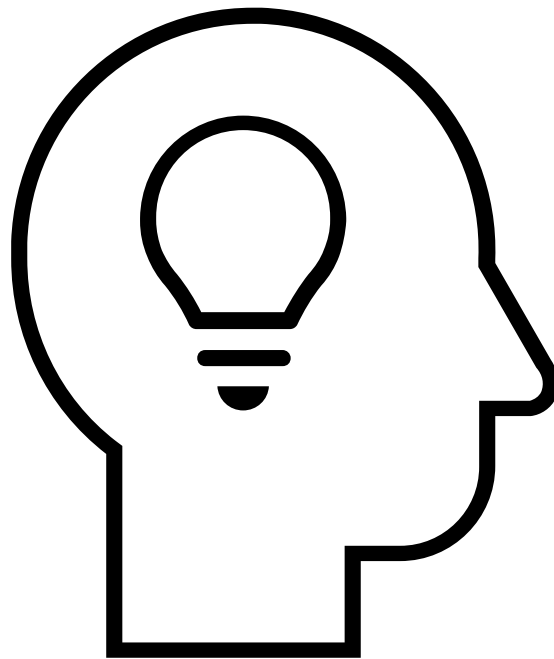
I.a Context

This first subsection will dive into the research context of this master's thesis. Background information on the motivation for this research is provided. This section, therefore, serves as an outline for the problem statement and further sections in this paper. This section is mainly concerned with the current challenges of interdisciplinary project teams, what is at stake and where there is room for improvement.

Project Success: Depending on Time, Money, and Results?

Large, complex civil engineering projects face many challenges. Ever-tightening nitrogen legislation, buildings and structures that need to be prepared for increasingly extreme weather conditions, and growing financial challenges due to global conflicts and shortages of building materials. Due to an ever-changing political landscape, climate change and other related challenges, the Architecture, Engineering & Construction sector (AEC) needs more in-house expertise. Specialists must know more complex legislation, regulations on nitrogen emissions, and the ever-expanding environmental and social plans of today's cities (Dwars et al., 2025; Keusters, Hertogh, et al., 2024; Van Loon & Van den Dool, 2025). These specialists work in increasingly larger teams, leading to surprising and sometimes challenging collaborations (Barković, 2010).

With these ever-growing complexities, interdisciplinary working is slowly becoming the norm. With interdisciplinary thinking and working, one tries to interact and integrate perspectives or insights from different disciplines. Large engineering teams are usually interdisciplinary, as a movable bridge or urban redevelopment project requires the melding of several specialities. A vital motto is: Together you can do more than alone (Slot, z.d.). Interdisciplinary working also enables teams to tackle complex issues by looking at the problems/challenges from different angles (Nissani, 1995).

Interdisciplinary collaborations involve cooperation between multiple disciplines, intending to achieve a common goal. To achieve this goal, knowledge is needed from all the various disciplines, which together will achieve a cross-disciplinary goal. Even though this type of collaboration may be more challenging than before, the exact client requirements still apply. Work still has to be done within a limited budget, there are tight deadlines for delivery, and high quality must still be guaranteed. All this is combined with a significant staff shortage (Klumpenaar, 2025).

All this occurs in a complex playing field with experts from different backgrounds. Different origins and different educational backgrounds result in various norms and values. A considerable challenge to understand and comprehend each other, with tight deadlines and heavy workloads on their plates. How can pleasant cooperation be guaranteed when a project team needs to account for time, money, and project results?

Interdisciplinary Complexities

To bring different disciplines together and ensure that this collaboration runs smoothly, many obstacles can stand in the way. Due to various educational backgrounds, ethnic backgrounds, and ambitions, norms and values vary wildly. This can lead to a breeding ground for disputes, unrest, and different goals being pursued (Galaz-Delgado et al., 2021). Where the responsibility lies for preventing this is debatable; project leaders, the team or even the entire organisation.

In addition to complexities, interdisciplinary work often yields valuable and innovative insights, combining the visions of different disciplines to achieve a cross-disciplinary result (Arthars et al., 2024; Thompson, 2016). This is particularly successful when the collaboration is well managed,

the team is guided adequately, and everyone's voice is heard. It is easy to overlook someone; it often happens in interdisciplinary work when someone's voice is not heard.

Moreover, that is precisely what we need to be looking for. Increasingly complex interdisciplinary project teams that have to solve increasingly complex problems. How can these teams, in addition to the pressure to perform in terms of time, money, and quality, achieve good results through pleasant cooperation? Because this may be subjective, and this perception differs per person and team, there is still no clear guideline to facilitate this.

Communication is Key

At the Amsterdam Municipal Engineering Department (hereinafter referred to as IB Amsterdam), it has also become clear that certain aspects of collaboration are pretty complex. Observations during working hours, collaboration sessions, and interviews have revealed that communication is a critical factor in collaboration. Specific disciplines feel less heard than others, while other team members are too hesitant and do not always clearly express their opinions or views. In other cases, important information is lost due to silence. These silences are tactical, but sometimes also accidental. Communication seems to be the oil that keeps everything running smoothly, but it is also the flammable substance that could go up in flames at any moment.

As mentioned, communication is a critical element in interdisciplinary collaboration. With various disciplines, each with its own language, much energy must be invested in understanding each other's motivations, backgrounds, and professional language (Roth, 1993). If this foundation is not solid, there is plenty of room for all kinds of problems due to miscommunication. This can include conflicts, misinformation, mutual frustrations and hostility. These are just a few of the possible outcomes.

Communication is about understanding, convincing, and making each other's opinions and views visible. Communication goes beyond spoken words and includes body language and non-verbal communication (Dragojlovic & Samuels, 2021). All communication says something, each in its way. The message's sender and receiver are essential in this process; if the other person is not understood, there is a high risk of disagreement.

In intensive collaborations that are intended to last for a long time, it is essential to place a high priority on communication. People must understand that problems can be addressed quickly and that discussions can be structured and professional (Winowiecki et al., 2011). Only in this way can a collaboration be maintained effectively.

Three Communicational Complexities

According to literature, interdisciplinary project teams in the Architecture, Engineering, and Construction (AEC) sector consistently face three significant communication challenges.

First, language, terminology, and cultural misalignments are common obstacles. Each discipline uses its jargon, technical vocabulary, and conceptual frameworks, meaning a term used by an architect may carry a different meaning for an engineer or contractor. Combined with multicultural and multilingual teams, this often leads to misunderstandings and reduced clarity (Cakir et al., 2022; Koirala et al., 2025).

Second, coordination complexity and sectoral fragmentation create persistent communication barriers. AEC projects often involve dozens of organisations: design consultants, multiple engineering specialisations, contractors, clients, and regulators, making information flow highly complex. Poorly defined roles, late involvement of key actors, and siloed use of tools like BIM can

lead to misalignment, rework, and conflict despite technical integration potential (Al Qasem & El-Sayegh, 2025; Galaz-Delgado et al., 2021).

Third, trust deficits, feedback latency, and conflict escalation are frequent issues. Large teams across organisations often lack the social proximity and established trust needed for smooth communication. This can result in slow responses, sometimes taking over a week to address critical information requests, leading to project delays, rushed decisions, and cost overruns of 3 to 5 per cent attributable directly to communication breakdowns (Oliver, 2019; Winowiecki et al., 2011).

Together, these challenges underscore that in AEC, communication barriers are not only linguistic, but also structural and relational. Addressing them requires technical solutions, such as interoperable platforms, standardised communication protocols, and social measures, including early stakeholder involvement, trust-building, and cross-disciplinary training. Table 1 presents the communicational complexities described in this subsection.

Table 1: Communicational Complexities of Interdisciplinary Project Teams

Complexity	Description
Language & Terminology Gaps	Jargon, discipline-specific terminology, accents and cultural norms impede clarity.
Coordination & Fragmentation	Complex stakeholder networks, unclear roles, and weak social integration disrupt communication flow.
Trust & Feedback Latency	Delayed responses, lack of familiarity, and mismanaged conflict escalate inefficiencies and costs.

Observations have shown that silence and other non-verbal communication are also a complexity, but less supported by scholarly publications.

Sensing the Silences

Non-verbal communication is a challenging form of communication that encompasses much more than body language and other subtle hints the sender conveys. These slight hints can reveal a person's emotions, insecurities and other hidden stories. In addition to the well-known forms of non-verbal communication, there is also silence. Silence can convey a message in many ways, reinforce the power of words and give someone space to think about what has been said (Baltezarević et al., 2022).

Silences are a compelling but complex means of making people think and giving others room for interpretation. It is a challenging tool to understand, as it can have many meanings. Silence also plays a significant role in interdisciplinary collaborations, in both positive and negative ways. Is there a way to fully understand this? Are we able to accurately interpret silence? There are indications that empathy can help in this regard.

Empathy – A Critical Factor in Interdisciplinary Collaborations?

Making verbal communication clear and understandable is relatively simple. If the sender and receiver speak the same language, there is little room for problems and challenges, and one will quickly understand the other. Verbal communication does, therefore, eliminate the easiest difficulties. Body language and different, sometimes hidden signals are more challenging to pick up and require more knowledge about each other to be understood. Several characteristics can contribute to this, but human factors such as empathy appear to be essential.

Even though empathy is described in many forms and ways, the following sentence seems to be a fairly unambiguous definition.

Empathy is the ability to engage with the perspectives and emotions of others in a variety of ways (Yeomans, 2016).

Recent research has shown that project managers in the AEC sector have less empathy than colleagues from other sectors (Keusters, Bakker, et al., 2024). Does this cause problems, but more importantly, can a higher level of empathy make a difference here?

It is not yet completely clear whether empathy can be learned or whether it is an innate skill. Due to the enormous diversity of definitions, ideas and beliefs about empathy and its purpose, providing a clear answer to the above question is incredibly challenging. Nevertheless, there are many indications that empathy impacts collaboration and professional relationships in the AEC sector, even though hard evidence has not yet demonstrated this (Butler & Chinowsky, 2006; Clarke, 2010). A handful of master's students of the Delft University of Technology have already explored different aspects of empathy in the AEC sector (Ambagts, 2024; Batelaan, 2021; Bertels, 2022). This has yielded countless insights, followed recently by a publication that has opened more doors to further research.

We all want the following: better project results, smoother collaboration, better understanding of each other, and working towards a better world. All this while dealing with time pressure, financial constraints, and other social challenges constantly lurking around the corner. Will empathy be crucial here? Hopefully, this thesis will provide more insight into this question.

Problem Statement

The ever-changing political, social, and climate challenges in society bring increasingly complex issues to the AEC sector. Problems that require larger teams with knowledge from more perspectives. Interdisciplinary working is becoming the new norm, with expertise from different disciplines coming together to form a whole that transcends individual disciplines. One of the biggest challenges they face is in the area of communication. Given their different backgrounds and ambitions, how can people make themselves understandable, and how can the recipient understand this?

Non-verbal communication, especially silence, is the biggest challenge here. This form of communication leaves the most room for interpretation. There are indications that empathy can help people understand and sense each other better and assess this form of communication. Given the lower empathic skills of project managers in the AEC sector, this research aims to investigate the impact of empathy on interdisciplinary work and whether interdisciplinary team members can assess each other better with the help of empathy. All this is aimed at making collaboration a more pleasant experience, despite the external pressures of today's challenges.

Interdisciplinary work always comes down to three main communication barriers that must be overcome. A higher level of empathy can potentially overcome these three obstacles. Due to the proven lower empathy scores of project managers in the AEC sector (Keusters, Hertogh, et al., 2024), this research focuses on the impact of empathy on interdisciplinary project teams and ways to raise (awareness of) the level of empathy among the team members of these interdisciplinary project teams.

Research Objective (RO)

Considering the challenges identified for interdisciplinary project teams, the following RO fits well with the research of this master's thesis:

To explore and understand how empathy influences the communication dynamics of interdisciplinary Architecture, Engineering & Construction (AEC) project teams. Particularly in navigating the three core communication complexities and silence.

This objective includes multiple sub-objectives:

- The exploration of team members' experiences of how empathy affects the team's ability to navigate through communication dynamics. This includes non-verbal communication and silence as well.
- Understanding the experiences of interdisciplinary project teams and how team members' perceptions can influence the dynamics of interdisciplinary project teams. Therefore, this study allows rich and in-depth insights from practitioners' perspectives.
- As an ultimate objective, this research aims to open space for unexpected themes and awareness of the importance of soft skills in the AEC sector. More information on how this objective will be tackled can be found in the following section (Research Design).

Empirical Context

This study concerns a specific context in which research will be conducted. The focus is on one of the municipality of Amsterdam's most significant infrastructure projects, the Cruciale Mijl (Municipality of Amsterdam, 2024). The Cruciale Mijl is an infrastructure project concerning the redevelopment of IJburglaan (a street in the Amsterdam Zeeburg district), including the associated tramway. Due to growing traffic volumes and increasing tram frequency, more dangerous situations occur on the road, necessitating a redesign. Part of the road should eventually be constructed underground, leaving more space for public space and allowing the tram to cross the busy IJburglaan more safely. An overview of the project location can be found in Figure 1.

The Cruciale Mijl is an infrastructure project involving many disciplines. These include urban planners, civil engineers, transport companies and many other bodies involved in public space, transport, and politics. The project is interdisciplinary because the separate disciplines cannot provide their input apart from each other. The different disciplines must come closer together, work intensively with each other, and make concessions to achieve cross-disciplinary designs and other results. The separate disciplines are not clearly visible in the designs; they will show a blend of several disciplines. That is precisely where the challenge lies. Each team member must bring specific values to ensure all aspects are covered in the resulting designs eventually.

The project is currently still in the design phase. In this phase, many agreements must be made. This results in many opportunities for collaboration and information sessions. This provides a perfect context for this research, given that the disciplines are most closely intertwined at this point in the collaboration. For this reason, it is to be assumed that the likelihood of friction is slightly higher in this project phase, and mutual communication is a critical element of the collaboration. This also means that the team members are best placed to provide up-to-date information about their perception of the collaboration.

Figure 1: Cruciale Mijl Project Location

I.b Research Design

This section tells the reader more about the approach of this study. The components covered are the research questions, scope, and methods applied. This section concludes with the limiting constraints regarding this research's scope and the study's empirical context.

Research Questions

Several research questions must be answered to achieve the aforementioned RO. These questions consist of a main research question (RQ) and three subquestions (SQ), each focused on a different aspect or discipline within the dynamics of interdisciplinary project teams. Starting with the main question, which asks the overarching question of this research:

RQ: How can empathy address the communicational complexities of interdisciplinary project teams?

This RQ addresses the RO as stated above. This question concerns the impact of empathy on the dynamics of interdisciplinary project teams in general. The RQ is too broad and complex to be answered unambiguously and in one go. In order to provide a sufficient and complete answer, this question must be divided into several sub-questions. In the case of this research, there are three SQs. Each SQ has its approach and objective, ultimately allowing all aspects of the RQ to be addressed. Starting with SQ1:

SQ1: What characterises the communication complexities of interdisciplinary project teams?

SQ1 focuses on the communication complexities that arise in interdisciplinary project teams. The emphasis here is on the three defined complexities, together with the observed complexity: silence. The dynamics of these complexities can, as expected, be revealed through observations and interview results, seen from the perspective of the members of the Cruciale Mijl project team. This question is important to discover the characteristics of the communication of interdisciplinary project teams and which complexities can potentially be influenced by empathy. Next, the second sub-question (SQ2) reads as follows:

SQ2: What role does empathy play in the interactions of interdisciplinary project teams?

The second sub-question delves deeper into the interactions between members of interdisciplinary project teams. What types of interactions can be distinguished, and what role does empathy play in these interactions? Based on interviews and observations, this study will determine which interactions can be influenced and whether team members need specific tools to apply empathy effectively in their work. The third sub-question (SQ3) addresses the final aspect of this study:

SQ3: How can empathy be used as a collaborative tool in interdisciplinary project teams?

Empathy is sensing another person's emotions and truly seeing things from their perspective. While empathy is about the silent side of communication (you feel the other person's emotions without discussing them directly), it can also open doors in communication. This research question will investigate how empathy can be enhanced in complex interdisciplinary project teams, and how empathy can address the complexities mentioned in Table 1. SQ3 brings this study to a full circle, allowing answers to the RQ and conclusions to be drawn from the research findings. The methods used to do so can be found in the following subsection.

Research Methods

Several methods are required to fully and correctly answer the aforementioned research questions. This subsection explains how each research method contributes to correctly answering the question and how the method is used.

Review of Previous Studies

A review of previous studies is central to this research. This research method delves into studies completed in the past. It compares different outcomes and assesses which outcomes are more reliable than others (Snyder, 2019). There are numerous options for the review of previous studies, each suitable for a different application. A literature review is a methodology mostly applied to a larger research project. It serves as a starting point for research to explore existing knowledge on a specific topic, whereby it identifies knowledge gaps and other remarks concerning the research scope (Knopf, 2006). For this thesis, a semi-systematic approach was chosen, to which the following characteristics are linked:

A semi-systematic approach contains a qualitative and quantitative nature, where semi-systematic searches are conducted for evidence and support a stated hypothesis. Because of a much-researched topic from several disciplines, many different results can be found, which have to be compared. The primary sources are research articles. Due to the sheer volume of articles, it is simply not possible to review all individual articles. Hence, a semi-systematic search for the information provided by all publications is necessary.

Interviews

The second research method is interviewing. This is a useful method to interpret the information obtained in the literature in a practical context. This research method will test the conclusions of the review of previous studies. Testing involves whether the theory corresponds to what happens in reality and whether significant differences exist.

Interviews are among the most familiar strategies for collecting qualitative data (DiCicco-Bloom & Crabtree, 2006). For qualitative research, the interviewer needs to create a place where the interviewee feels safe to tell everything in depth. Even though interviewing is one of the best-known and most common research methods, it remains undeniable. It remains a phenomenon of interest to scientists, and research continues.

> *"The purpose of the qualitative research interview is to contribute to a body of knowledge that is conceptual and theoretical and is based on the meanings that life experiences hold for the interviewees."* - (DiCicco-Bloom & Crabtree, 2006)

Furthermore, semi-structured interviews will be conducted during the study. Some pre-conceived questions will be asked as the basis of the interview, from which other topics will be touched on. The average duration of this type of interview is usually between 30 minutes and an hour (DiCicco-Bloom & Crabtree, 2006); this will also be the case in this research.

All interviewees are directly involved in the Cruciale Mijl project, ranging from a project manager (internal) to a coach (external). Thirteen interviews were conducted for this study. These involved various Cruciale Mijl team members, ranging from technical managers to team coaches. This method of conducting interviews makes it easier to obtain a comprehensive overview of the needs and insights of the various disciplines involved in this project team.

To process the interview results, it was decided that the interviews should be transcribed first. These transcripts were then thoroughly analysed, looking for connections, frequently recurring

themes, and statements. These themed statements were presented in clear tables, from which certain concepts emerged. These concepts guide the research and provide the necessary arguments to answer the research questions.

Observations

In addition to data from the review of previous studies and the interviews, this study also uses observational data. This concerns the researcher's observations during the interviews, working hours, and collaboration sessions that the researcher attended. Observations allow researchers to study people in their native environment in order to understand 'things' from their perspective. This research method, therefore, gives the researcher the possibility to gain a more comprehensive understanding of the people being studied (Baker, 2006). Because empathy is interpreted differently by each individual, personal perception of the issue is essential. This personal perception can be captured well by the researcher's observations.

The researcher's observations are quantified using a so-called mood meter in an overview showing four quadrants with 25 possible emotions (UnitedHealth Group, n.d.). This mood meter is a tool that the Yale Centre for Emotional Intelligence designed. It assesses emotions on two scales: pleasantness on the x-axis and energy on the y-axis. These scales create four different quadrants, each with its characteristic factors. More information can be found in the 'additional interview results' section.

The observed emotions are then identified, analysed and linked to interview quotes. This adds an extra dimension to the research results and can either support or refute the interview results. Because this analysis method depends on the researcher's view, it represents the most subjective aspect of this research.

The Research Methods and Their Application

The table below lists all research questions, with the corresponding research methods linked to them. It shows that for each question, the theoretical basis is formed by reviewing previous studies, after which the practical significance is sought using either interviews or observations. This approach ensures that all theoretical concepts are tested for practical relevance.

Table 2: Research Questions and the Associated Research Methods

Research Question	Used Research Method
RQ: How do empathic interactions influence the dynamics of interdisciplinary project teams?	All research methods mentioned below.
SQ1: What characterises the dynamics of interdisciplinary project teams communicatively?	Observations.
SQ2: What role does empathy play in the interactions of interdisciplinary project teams?	Interviews.
SQ3: How does empathy address the communicational complexities of interdisciplinary project teams?	Interviews and observations.

Scope and Limitations

This research contains topics that are incredibly broad, open to interpretation, or otherwise unclear to encompass. This subsection addresses all these ambiguities to set a clear framework for this research, following what can already be found in section 1. These limiting factors are mainly intended to arrive at the most targeted answers. This concerns the ultimate goal of exploring the impact of empathy on interdisciplinary project team dynamics in AEC projects.

The review of previous studies uses publications from 2020 or earlier as much as possible. Some older 'classic' publications are used, but these are included to a limited extent in the results compared to more recent publications. This is the main factor that makes the review of previous studies semi-systematic. In addition to abstraction based on publication year, abstraction based on context and location of publication was also used. More information on the search terms can be found in Section II.a.

In addition, interdisciplinary collaborations in the AEC sector were chosen for this study. Interdisciplinary collaborations occur in many sectors, such as the health sector, the scientific world, etc. The research results on empathy and project management show lower empathy scores in the AEC sector. This makes this sector particularly relevant for investigating the concept of 'empathy'. This limitation is also due to the empirical context of the research at the IB.

Reading Guide

This report is structured as follows. Part I of this report introduces the research. Section I.a provides the background and context of the research, which forms the basis for the rest of the report. The RO is clarified based on issues raised in the literature and the researcher's observations. This chapter continues in Section I.b, highlighting all the research questions: one central question and three sub-questions guide addressing the RO. The corresponding methods are presented in the same section, explaining how these methods contribute to this research.

The report then continues with Part II, a review of previous studies. This part of the research comprises the theoretical basis. Starting with the plan of approach for the review of previous studies in Section II.a, which outlines the focus of this research method and its search terms. The literary foundation is laid out in two different aspects and divided into two sections. Section II.b deals with all information concerning the communication of interdisciplinary project teams, while Section II.c provides more information about empathy and its potential contribution to interdisciplinary work in the AEC sector. Eventually, this part concludes with the research framework in section II.d.

With the theoretical foundation of Part II, the report continues with the third part of the study, which presents the interview and observation results. Section III.a discusses the setting of the interviews in more detail, including the standard structure of each interview. Section III.b then delves into all the interview results. An overview of all abstracted concepts can be found in that section, followed by observations made by the researcher during the interviews and collaboration moments of the Cruciale Mijl project team.

The report concludes with Part IV, which contains the discussion and conclusion. Section IV.a discusses the research. Here, the review results of previous studies are compared with the interview and observation results. Possible points of doubt are identified, followed by recommendations for the AEC sector and future research. Section IV.b concludes the research with a conclusion. This section answers all research questions, together with a concluding conclusion of this research. This is a compilation of findings from the literature, interviews and observations.

II. Review of Previous Studies

Providing background information on empathy and interdisciplinary work through previous research and publications
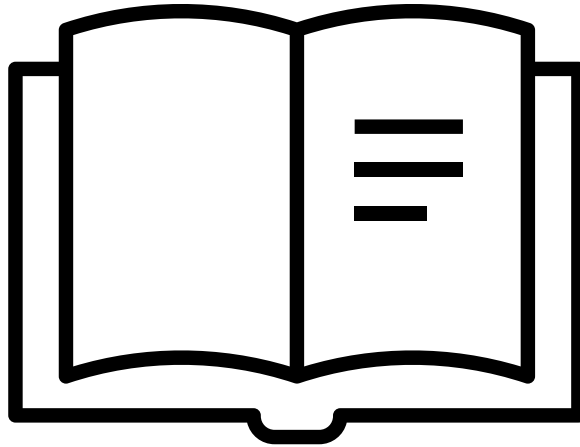
II.a Search Terms and Thematisation

Based on the research questions and other aspects of Part I, two main themes have been identified to form the basis of the review of previous studies: Communication Complexities of Interdisciplinary Project Teams, and Empathy. This subsection provides more information about these themes and the corresponding search terms. These themes and search terms structure this research method, offering guidance through the complex web of publications and other sources.

Approach

The review of previous studies is conducted in a structured way. With a combination of targeted search terms and conceptual frameworks, this review ensured that information from broad-based studies and more specialised research came together. This includes broad-oriented research on communication in various sectors and more specific studies on collaboration of interdisciplinary project teams in the AEC sector.

A systematic search strategy was employed across academic databases such as Scopus, Web of Science and Google Scholar to build a comprehensive body of literature. Initially, broad terms such as 'interdisciplinary communication' and 'collaboration in project teams' were used to establish a theoretical foundation. These were then refined into more context-specific combinations, such as 'AEC project communication', 'boundary objects in construction teams', 'feedback cycles in interdisciplinary collaboration', and 'trust building in engineering teams'. This dual approach enabled the review to integrate general theories of workplace communication with empirical studies specific to interdisciplinary practice.

The main steps in this research method were as follows: start by identifying the difficulties associated with communication within interdisciplinary project teams. By using the aforementioned search terms, a clear picture of these complexities and challenges can be outlined. Next, the potential role of empathy is examined. Empathy is often cited in the literature as a crucial factor contributing to more effective communication within teams. Based on these previous studies on empathy, the potential of applying this skill is assessed. Given the broad occurrence of empathy in publications, the definition of empathy is first clarified, after which the potential application and usefulness of empathy can be assessed.

Key Frameworks

In light of the extensive nature of this research, a semi-structured approach was deemed the most suitable. The basis of the study was formed using the overarching search terms, after which other search terms were identified by chance. This methodological approach unveiled the multifaceted nature of the phenomenon, thereby establishing the foundation for the subsequent research efforts. In the literature, many researchers have addressed aspects of communication challenges, empathy, and other complexities. These findings led to three interesting frameworks that come in handy for this research. By using these three frameworks as a basis, the research was given a solid foundation, from which other search terms emerged that could provide more context for this research. The following three frameworks serve as the common thread in this research:

Yeomans (2016) on empathy:

This publication provides a comprehensive framework for comprehending empathy as a multidimensional construct in professional communication. The author defines five different types of empathy, with each type reflecting a distinct way in which individuals engage with the perspectives of others. This typology ought to be useful in the context of interdisciplinary
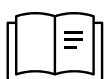
collaborations, where team members must navigate through a complex web of different languages, working methods, and associated emotions. Therefore, Yeomans' framework provides a lens through which to explore empathy as a promising resource.

Morrison & Milliken (2000) on organisational silence:

Morrison & Milliken have developed a framework to conceptualise organisational silence as a collective phenomenon. Organisational silence includes withholding concerns, critiques, and suggestions, whereby this silence emerges from fear of negative reactions and other entrenched cultural norms. The framework emphasises the necessity to perceive silence not as a passive absence of communication, but rather as an active systemic barrier to learning and innovation. It is therefore argued that silence should be recognised as an organisational phenomenon, thus justifying its inclusion alongside more commonly acknowledged complexities.

Edmondson (1999) on psychological safety:

Edmondson's framework has become foundational in the realm of workplace communication. Psychological safety is defined as the shared belief that a team is safe for interpersonal risk-taking, whereby team members can voice ideas, admit mistakes, and ask questions without any fear. This concept demonstrates how relational dynamics influence the distribution of knowledge. It is evident that in circumstances where psychological safety is lacking, members frequently resort to silence. By fostering psychological safety, project leaders establish an environment where the differences between team members and disciplines can be put to good use. This framework provides a benchmark for evaluating team communication; well-functioning interdisciplinary project teams are those that provide space for open dialogue, collaborative learning, and innovative problem-solving.

These three frameworks form the basis for the research results, with the following interview results and observations serving to confirm or refute them. More information about these frameworks, amongst others, can be found in the following subsection.

Two Research Themes

The following subsections of Part II focus on two main themes that can be found in the literature. These are the communicative complexities of interdisciplinary project teams on the one hand, and empathy on the other. All relevant publications that provide sufficient information to answer the research questions are presented in these two themes. Whereas the first section, Communication Dynamics of Interdisciplinary Project Teams, mainly identifies the challenges and complexities, the second part, Empathy, is the section that will provide clues to the solutions to these complexities. This has been assumed based on previously completed studies on empathy.

II.b Communication Complexities of Interdisciplinary Project Teams

This section is concerned with the various forms of team dynamics at play in interdisciplinary project teams. It will follow up on the previously mentioned dynamics in Section 1. The primary purpose of this section is to answer SQ1: *What characterises the communication complexities of interdisciplinary project teams?*

The increasing complexity of interdisciplinary projects and their collaboration in public and spatial projects brings opportunities and tensions. Project teams are becoming increasingly diverse, comprising professionals from various disciplines, organisational backgrounds and related communication styles. This diversity is frequently characterised as a positive, enriching factor. However, it necessitates constant coordination at both the substantive and relational levels. In addition to opportunities, this also presents many challenges and complexities.

Interdisciplinary collaborations in AEC projects can be challenging due to communication challenges. This section reviews the key complexities identified in prior studies: Language & Terminology Gaps, Coordination & Fragmentation, and Trust & Feedback Latency. Together, these complexities illustrate how communication difficulties can hinder well-streamlined project outcomes.

Language & Terminology Gaps

One of the most persistent barriers in interdisciplinary project teams is the professional language and terminology difference. As each discipline develops its technical vocabulary, symbolic codes, and interpretive frameworks, there is a risk of miscommunication or misinterpretation of project objectives. The team members must understand each other's approach; otherwise, they risk becoming entangled in perpendicular goals.

Carlile (2004) conceptualises these knowledge boundaries as syntactic, semantic and pragmatic. At the syntactic level, differences in jargon can hinder basic communication. Semantic boundaries occur when identical terms have different meanings in different disciplines. Pragmatic boundaries emerge when differences in priorities or goals prevent mutual understanding.

Terminological discrepancies between architects, engineers and contractors often result in conflict and delays in the integrated design process (Dossick & Neff, 2010). Such discrepancies hinder decision-making and reduce opportunities for collaborative problem-solving. These challenges are not unique to the AEC sector. Lingard et al. (2004) found that, when examining healthcare teams, disciplinary jargon created communication risks, particularly about time-sensitive decisions. This demonstrates the universality of the problem in interdisciplinary contexts.

There are already some bridging mechanisms in place to cope with this complexity. One suggestion is to use boundary objects, such as design drawings, Building Information Models (BIM), or prototypes, which allow professionals from different disciplines to negotiate meaning without requiring complete technological alignment (Bechky, 2003). These shared artefacts serve as translation devices across different fields of expertise. While this complexity impedes efficiency and collaboration, it can be mitigated through translation practices and shared visual or digital tools.
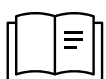
Coordination & Fragmentation

A second major challenge lies in the inherently fragmented nature of project teams. Interdisciplinary projects usually comprise temporary alliances of organisations and professionals, each with priorities, reporting lines and schedules. Complex AEC projects are inherently discontinuous and require intensive coordination to overcome structural fragmentation (Lundin & Söderholm, 1995). Unlike permanent organisations, project teams cannot rely on long-term routines or shared cultures to maintain alignment.

Koskela & Howell (2002) criticise the traditional construction model for being highly siloed, with separate contractual and disciplinary boundaries that create communication bottlenecks. Emmitt & Gorse (2006) reinforce this point, stating that fragmented communication between design and construction stakeholders is one of the leading causes of inefficiency. Performance improves when coordination is underpinned by frequent, timely, problem-solving communication, reinforced by shared goals and mutual respect (Hoffer Gittell, 2002). This finding is particularly relevant to interdisciplinary projects, where technical interdependence requires more than transactional coordination.

Tools as BIM platforms can reduce fragmentation by enabling real-time collaboration across organisational boundaries (Davies & Mackenzie, 2014). However, they caution that digital tools alone are insufficient if not paired with relational practices such as trust-building and shared governance. Therefore, coordination and fragmentation require deliberate technological and relational integration mechanisms to prevent communication from collapsing under complexity.

Trust & Feedback Latency

Interdisciplinary project teams often suffer from fragile trust and delayed feedback loops (Meyerson et al., 1996). These issues undermine team cohesion and learning. This publication describes project teams as relying on 'swift trust' – a fragile and provisional trust that emerges out of necessity but requires constant reinforcement. Delays in addressing concerns or validating contributions, for example, erode this form of trust quickly. When responses are delayed or withheld, individuals perceive the environment as unsafe for speaking up, leading to silence and disengagement. Edmondson (1999) highlights the importance of timely feedback for fostering psychological safety in teams.

Manu et al. (2015) found that mistrust and communication delays in construction supply chains resulted in rework, increased conflict and higher transaction costs. These findings suggest that delayed communication can have significant financial consequences in the AEC sector. A possible interference is 'digital mediation' (Olanrewaju et al., 2020). This publication demonstrates that digital project management tools can accelerate feedback cycles. However, they also warn that impersonal digital exchanges can reduce interpersonal trust unless balanced with direct, empathic interaction opportunities.

In essence, trust and timely feedback reinforce each other. When feedback loops are slow or absent, trust deteriorates. Conversely, trust enables open and timely feedback. Interventions that cultivate both are critical to overcoming communication barriers.

Previous studies have revealed that communication complexities in interdisciplinary project teams arise from technical misalignments and relational and structural barriers. Language and terminology gaps hinder shared understanding and coordination, and fragmentation obstructs collaboration across temporary and siloed organisations. Trust and feedback latency weaken the relational fabric of teams. These challenges highlight the need for empathy, structured
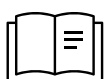
communication mechanisms and supportive organisational practices in interdisciplinary AEC collaborations. The table below summarises the complexities, existing tools and their limitations.

Table 3: Comparative Overview of Communicational Complexities

Communicational Complexity	Existing Tools	Imperfections and Limitations
Language & Terminology Gaps	Drawings & BIM models, glossaries, translation workshops, and cross-disciplinary training.	BIM and visual tools can be interpreted in different ways. Glossaries risk oversimplification. Training requires time and resources.
Coordination & Fragmentation	ICT platforms, BIM collaboration, integrated project delivery (IPD), relational coordination practices.	If not properly governed, digital tools can create data overload or reinforce silos. IPD requires cultural change and contractual redesign. Relational practices are challenging to sustain in temporary teams.
Trust & Feedback Latency	Digital project management systems, structured feedback cycles, workshops on psychological safety and regular check-ins.	Digital systems can make communication impersonal; formal feedback cycles can become bureaucratic; workshops depend on people being open voluntarily; trust is fragile in temporary coalitions.
Silence (observation)	*Inclusive leadership, reflective spaces, empathic listening.*	*Misinterpretation of silence.*

The complexities identified in the above table form the basis for the study's subsequent analyses. The subsequent section will examine the potential role of empathy in addressing these complexities. Based on a thorough review of the extant literature and the results of in-depth interviews, this study culminates with an appropriate conclusion about the impact of empathy on the communication challenges faced by interdisciplinary project teams.

Observed Communication Complexity: Silence

In addition to the three complexities mainly mentioned in the literature, there is also a complexity based on observations. This complexity encompasses the concept of silence. Silence is, as mentioned earlier, a form of non-verbal communication. This form of communication is challenging to assess accurately, given its potential constructive or destructive impact. This subsection will provide more theoretical background on this complexity.

The Dutch and English languages contain a range of words that can explain what specific silence she is. In both languages, terms like *unspoken*, *unsaid*, *unmentionable*, *taboo*, *ignored*, and *silenced* capture nuances in how and why something remains unsaid. Most of the silence is not neutral; it carries an underlying meaning and is often shaped by multiple factors, such as social and cultural factors.

Silence is a subtle yet powerful form of communication within interdisciplinary project teams. Although it is often interpreted as an absence of communication or disengagement, silence is a form of communication with cultural, relational and organisational implications. In contexts such as AEC projects, where diverse disciplines come together in high uncertainty, silences can hinder or facilitate collaboration depending on how they are enacted and interpreted.
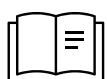
Very often, there is an additional factor that reinforces the meaning of silence. This is the body language of the sender. A great deal of information can be conveyed through posture and facial expressions if these are interpreted correctly. The challenge with body language is: we use it without being aware of it, although it is utterly important in the structuring of interpersonal communication (Mandal, 2014). Perceiving and interpreting other people's body language is therefore crucial for a streamlined collaboration.

Cultural and Organisational Perception of Silence

The meaning of silence varies greatly depending on the cultural context, which makes it particularly relevant in international and interdisciplinary teams. For example, Nakane (2007) demonstrates that, in Japanese communication, silence often conveys respect, attentiveness or an opportunity for reflection. In many Western settings, however, it is more commonly interpreted as disengagement or a lack of knowledge. Furthermore, Xu et al. (2015) argue that cultural variations can influence cognitive outcomes. While East Asian professionals may find silence conducive to focus and creativity, their European-American counterparts often perform better when encouraged to verbalise their thoughts.

These divergent interpretations can pose risks to interdisciplinary project teams, where silence may be misread as non-participation or passive resistance when it is a culturally normative form of engagement. This misalignment can lead to frustration, stereotyping or exclusion. Therefore, culturally sensitive interpretations of silence are indispensable for preventing misunderstandings and ensuring that team members from diverse backgrounds are accurately heard and valued.

Workplace silence has been identified as a significant barrier to organisational effectiveness. Morrison & Milliken (2000) describe 'organisational silence' as a collective phenomenon whereby employees withhold information about potential problems due to fear, perceived futility, or risks. This can lead to diminished innovation, lowered employee satisfaction and increased intentions to leave the organisation (Knoll & Van Dick, 2013; Morrison, 2014). Brinsfield (2013) highlights that silence often suppresses valuable knowledge flows, preventing organisations from learning and adapting to changing environments.

In project-based sectors such as construction, delays in raising concerns or highlighting design flaws due to silence can result in costly rework or safety hazards. Furthermore, healthcare research demonstrates that entrenched cultures of silence can contribute to ethical lapses and even catastrophic failures when critical warnings remain unspoken. Therefore, silence is not merely a personal communication choice but a systemic organisational issue with direct implications for project performance and safety.

Strategic Considerations for Silences

Not all silences are accidental or passive; many are chosen deliberately for defensive or strategic reasons. Pinder & Harlos (2001) distinguish between different types of silence, such as 'acquiescent silence' (where employees remain quiet due to resignation or perceived futility) and 'defensive silence' (where individuals withhold input to protect themselves from potential retaliation, embarrassment or conflict). Both can undermine collaboration, but defensive silence, in particular, reflects power imbalances and fear-based dynamics within organisations (Wang & Hsieh, 2013).

Silence can also take the form of pro-social silence, whereby information is deliberately withheld to protect colleagues or maintain group harmony (Dyne et al., 2003). While pro-social silence may temporarily stabilise relationships, it can suppress constructive criticism and hinder

organisational growth. In interdisciplinary teams, where conflicts often arise between professional logics and priorities, strategic silences may help to avoid escalation in the short term. However, they can also obscure underlying tensions that may resurface later in the project lifecycle. This makes the management of defensive and strategic silence an important leadership challenge.

Silence and Leadership

Silence is also influenced by the team's collective norms and the leadership's behaviour. When dominant voices dominate meetings, less powerful members often learn that silence is safer, leading to 'team silence' becoming a socially reinforced norm (Morrison & Milliken, 2000). This phenomenon is particularly apparent in hierarchical or male-dominated environments, where speaking up may be risky.

Leadership style has a strong influence on whether silence persists or is broken. Xu et al. (2015) demonstrate that humble leaders – those who acknowledge their limitations and invite contributions – create climates that encourage employees to voice concerns rather than remain silent. Similarly, inclusive leadership, characterised by openness, recognition and validation of diverse perspectives, reduces relational silence and promotes creative collaboration (Carmeli et al., 2010). In interdisciplinary teams, leaders must model openness and actively counteract the dominance of particular disciplines to ensure that quieter or marginalised voices are recognised and valued.

Silence cannot be separated from the power dynamics inherent in language use. According to Ardener's (2006) muted group theory, communication norms privilege certain groups and marginalise others, forcing them into silence. In professional environments, dominant discourses often favour technical, masculine or managerial communication styles, marginalising those who do not conform. Verouden (2018) highlights that, in interdisciplinary teams, those from peripheral disciplines may feel their perspectives are 'muted', causing them to withdraw rather than challenge dominant viewpoints. This form of silence is not a personal choice, but rather the result of structural inequalities that restrict who is heard and whose expertise is recognised. Addressing muted voices requires empathic awareness and structural interventions to rebalance communicative power, such as facilitation methods, roundtable discussions and the explicit recognition of marginalised disciplines.

Despite its risks, silence is not inherently dysfunctional. In some situations, it can play a constructive role in communication. For example, Brinsfield (2013) suggests that silence can encourage reflection, reduce information overload and prevent unnecessary conflict. In high-stress environments, brief silences can provide an opportunity for emotional regulation, enabling participants to pause before responding. However, dysfunctional silences driven by fear, futility or exclusion pose significant threats to organisational learning and adaptability. In nursing, for instance, silence resulting from a fear of authority has been associated with burnout and compromised patient safety (Morrison, 2014). The challenge for interdisciplinary project teams is to discern functional silences that enable constructive dialogue from those that signal disengagement or suppressed dissent.

This study deals with silence in the broadest sense. As the table on the next page shows, there are many different types of silence. This demonstrates the complexity of silence in collaborative situations. The next subsection will discuss empathy in more detail, including whether and how empathy can be used as a tool to mitigate these complexities, as well as other aspects of empathy.
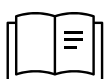
Table 4: All Possible Types of Silence, as found in Scholarly Publications

Type of Silence	Features / Characteristics	Implications
Unspoken / Unsaid / Unmentionable / Taboo / Ignored / Silenced	Language-based nuances describing why something remains unsaid; often shaped by social and cultural norms.	Not neutral – carries hidden meanings; may reflect power, exclusion, or cultural restraint.
Cultural Silence	Silence interpreted differently across cultures (e.g., respect and reflection in Japan vs. disengagement in Western contexts).	Can foster reflection and creativity (East Asia) or be seen as lack of participation (Western settings); risk of misinterpretation in interdisciplinary teams.
Organisational Silence	Collective withholding of information due to fear, futility, or risk (Morrison & Milliken, 2000).	Suppresses knowledge flows, reduces innovation, lowers satisfaction, increases turnover, and can cause project/safety failures.
Acquiescent Silence	Withholding input out of resignation or perceived futility (Pinder & Harlos, 2001).	Signals disengagement, lowers morale, and undermines collaboration.
Defensive Silence	Deliberately withholding information to protect oneself from retaliation, embarrassment, or conflict.	Reinforces power imbalances and fear dynamics; a major barrier to collaboration.
Pro-Social Silence	Information deliberately withheld to protect colleagues or maintain group harmony (Dyne et al., 2003).	Can stabilise relationships in the short term, but hinders constructive criticism and growth.
Team Silence	Silence becomes the norm in groups, reinforced by dominant voices or hierarchical structures.	Reduces diversity of perspectives; marginalises weaker voices.
Muted Silence (Muted Group Theory)	Structural inequalities in communication norms marginalise certain groups or disciplines.	Silenced groups withdraw; expertise is excluded; it requires structural interventions to rebalance power.
Functional / Constructive Silence	Silence is used deliberately for reflection, emotional regulation, avoiding overload, or preventing conflict.	Can enhance dialogue, support creativity, and improve stress management.
Dysfunctional Silence	Driven by fear, futility, exclusion, or authority pressure.	Hinders learning, adaptability, and safety; linked to burnout in professions like nursing.
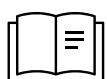
II.c Empathy

The complexities identified in the previous section call for targeted solutions to improve interdisciplinary collaboration. In this subsection, we explore how empathy can contribute to reducing the communication complexities discussed above, and what role it plays in the practice of AEC projects.

Empathy is increasingly recognised as a critical factor in shaping the dynamics of interdisciplinary project teams. Empathy acts as a vital unifying force in sectors such as architecture, engineering and construction (AEC), where professional expertise, organisational objectives and social values converge. It is not just an interpersonal virtue, but also a professional competency that influences collaboration and team cohesion. Building on Yeomans' (2016) typology of empathy, this section expands the discussion by drawing on additional insights from contemporary academic research to demonstrate how empathy can provide a practical and theoretical foundation for interdisciplinary teamwork.

The Definition of Empathy

Empathy is often mischaracterised as simply the ability to 'feel with' another person. However, scholarly debates reveal a more complex construct. While sympathy centres on one's compassionate reaction, empathy involves actively entering into the perspective of another, whether cognitively, emotionally or physically. Yeomans (2016) proposes five forms of empathy: cognitive, physical, emotional, instrumental and authentic. Each form represents a distinct pathway through which professionals engage with one another. The following table provides more information on the different forms of empathy, with a definition and key characteristics.

Table 5: Types of Empathy, According to Yeomans (2016)

Type of Empathy	Definition	Key Characteristics
Cognitive Empathy	Understanding what another person thinks or feels	Rational, analytical, perspective-taking without necessarily sharing emotions
Physical Empathy	Bodily experiencing another person's emotions ('emotional contagion')	Automatic, unconscious mirroring, which is a physical response to others' emotions
Emotional Empathy	Consciously and deeply feeling another person's emotions	Affective, emotionally engaged, shared emotional experience
Instrumental Empathy	Using empathy strategically to achieve specific goals	Goal-oriented, self-focused, profess-sional- and strategic application
True (Authentic) Empathy	Other-focused empathy with genuine concern for the other person	Altruistic, morally driven, self-transcending

This typology can be applied in AEC contexts, where interdisciplinary teams must navigate cognitive differences, such as disciplinary terminologies and logics, as well as collaboration's emotional and strategic dimensions. Here, empathy is best understood as a multi-layered, contextually adaptive capacity. In this way, empathy goes far beyond simply sensing and

empathising with emotions. It also encompasses understanding one another. Understanding each other's language, each other's perspective, each other's knowledge, and each other's goals. This makes it very versatile, even though its purpose is clear. Empathy is necessary to understand why someone else acts in a certain way. It can therefore be useful in both hierarchical and equal collaborations, and everything in between.

Empathy in the Workplace

Empathy in professional settings is not merely a matter of individual disposition. Instead, it is enacted as a relational process. In their 2012 publication, Pavlovich & Krahnke propose a theoretical framework for understanding empathy as a mechanism that facilitates social connection, fostering recognition and a sense of belonging among individuals. Clark (2007) conceptualises empathy as a 'ritualised recognition', theorising it as a social performance that affirms another's role in the discourse. In project teams, such processes have the potential to reduce friction, sustain engagement, and bridge the divides between disciplinary spheres.

Zhang (2023) extends this proposition by conceptualising empathy as a collective learning practice. Her research on urban project teams demonstrates that groups that normalise training – through training, discussion and reflection – demonstrate superior performance in trust building and complexity management. This further supports the notion that empathy is not inherently present in all individuals but rather a capacity that can be cultivated, rehearsed, and institutionalised.

Empathy might be able to address the communication complexities in interdisciplinary project teams. Language gaps, fragmentation, and trust deficits can potentially be reduced through empathy. The table below provides the argumentation for that, including relevant publications.

Table 6: Potential Applications of Empathy

Contribution	Explanation	Source
Bridging disciplinary languages	Cognitive empathy is the ability to interpret and translate different disciplines' specialised language and viewpoints. Its implementation can help professionals to mitigate semantic misunderstandings.	(Carlile, 2004)
Surfacing emotional undercurrents	Empathy, in its emotional and physical forms, has been shown to engender awareness of frustrations, anxieties and unspoken dissent that might otherwise remain concealed within silences.	(McClelland & Sands, 1993; Verouden, 2018)
Creating psychological safety	Authentic empathy is a prerequisite for environments in which diverse members feel safe to voice concerns or challenge assumptions.	(Edmondson, 1999)
Strategic navigation	Instrumental empathy enables team members to adapt communication and negotiation styles to achieve collective outcomes without erasing disciplinary differences.	(Yeomans, 2016)

Empathy, therefore, functions as both a stabilising agent and an enabler: it mitigates the risks of conflict while facilitating deeper collaboration.
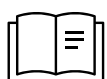
Empathy and Project Management

Empathy has recently become a prominent theme in literature about management and leadership, particularly within project-based organisations. Empathic project managers have been shown to anticipate stakeholder concerns, interpret latent tensions, and align competing goals (Keusters, Hertogh, et al., 2024). In teams with a technically oriented focus, De Zoysa et al. (2024) demonstrate that the introduction of empathy strengthens cohesion and motivation, thus countering the dominance of purely rational-technical approaches.

Nonetheless, Morano & Cole (2024) posit that empathy is accorded a marginal position in AEC curricula compared to healthcare and education, where its instruction is explicit. This oversight perpetuates a discrepancy between technical competence and interpersonal capability. Structured interventions, including empathy training modules, role-play exercises, reflective practices, and peer-to-peer coaching, have been shown to bridge this gap and embed empathy as a professional standard.

Empathy has also been demonstrated to intersect with power asymmetries. Junior or less dominant disciplines may encounter difficulties in asserting their perspectives. Empathic leadership has been demonstrated to balance these asymmetries by legitimising marginalised viewpoints and creating discursive space for alternative knowledge.

Stimulating Empathy

According to previous studies, empathy can be cultivated through intentional design and practice. A remark for this is: The integration of empathy within an organisational framework necessitates the establishment of supportive policies, the allocation of adequate training budgets, and endorsing empathy from senior leadership. Empathy risks being marginalised as an elective 'soft skill' without structural reinforcement. The following table presents four common applied interventions, according to previous studies.

Table 7: Possible Interventions to Enhance Empathy

Intervention	Explanation
Structured Learning Interventions	Training programs and workshops encourage perspective-taking and active listening (Morano & Cole, 2024).
Collective Rituals	Ritualised listening and acknowledgement can normalise empathy in routine interactions (Clark, 2007).
Digital Mediation	Tools such as BIM or digital dashboards can be coupled with empathic dialogue (Olanrewaju et al., 2020).
Reflective Spaces	Group reflection rounds and feedback cycles have been demonstrated to encourage members to articulate both cognitive and emotional responses, thereby embedding empathy into organisational processes.

Concluding Note on the Literature

Empathy has been demonstrated to be integral to the success of interdisciplinary collaboration. Yeomans' (2016) typology illustrates the multifaceted ways empathy operates, ranging from cognitive interpretation to authentic concern. When combined with insights from more recent scholarship, empathy emerges as a cultural anchor for interdisciplinary teams: a process that binds difference, supports inclusivity, and sustains cooperation in contexts of high complexity.

Empathy has been demonstrated to facilitate cohesion amongst diverse perspectives, organisational logics and personal values in AEC project teams. It can convert silence into a space of reflection, misalignment into a source of learning, and fragmentation into a state of cohesion. Fostering empathy is not only a moral imperative but also a practical necessity for delivering complex projects effectively, given the contemporary complexities of interdisciplinary project teams.

Empathy can be used not only to sense other people's emotions, but also to understand each other on other fronts. This is particularly interesting and helpful in interdisciplinary contexts because these collaborations go beyond emotions. There are many different norms and values at play there that need to be recognised, for which mutual understanding is greatly appreciated.

This is a clear indication that empathy can be used as a tool to tackle the aforementioned communication complexities. Table 8 shows the four communication complexities, each with an explanation of how empathy can address this complexity. This table also provides clear indications that empathy can be used overall to address the communicative complexities of interdisciplinary project teams.

Table 8: Communicational Complexities and the Possible Role of Empathy

Communicational Complexity	Possible Role of Empathy	Explanation
Language & Terminology Gaps	High potential	Empathy enables people to better appreciate each other's differences and to better understand other people's professional language. Empathy, therefore, has great potential to tackle this complexity.
Coordination & Fragmentation	Low potential	Coordination and fragmentation are types of complexity that must primarily be addressed at an organisational level. Empathy can help to ensure that the challenge is noticed and recognised sooner, but it cannot contribute much to actually tackling the complexity.
Trust & Feedback Latency	Average potential	This complexity can mainly be addressed by increasing psychological safety. Since empathy does play a role in this, there is some potential, but compared to the other complexities, it is at a moderate level.
Silence	High potential	Empathy is a skill that immediately improves understanding of other people's emotions, motivations, backgrounds and so on. According to the literature, empathy can also be used to deal effectively with silences and the accompanying body language. Hence, there is a high potential for empathy in tackling this complexity.

First, this section will conclude with a section devoted to the framework of this study. This section will provide structure for the rest of the study and will also provide guidance in answering the research questions. All these findings and indications found in the literature will be tested using interview results and observations in order to further stimulate the qualitative nature of this research. These qualitative interview results will reveal whether the information found in the literature can be confirmed or refuted. These results and comparisons with the literature can be found in the subsequent subsections.
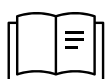
II.d Research Framework

This section explains the framework that will serve as the standard for assessing the research results. Based on the literature found and the researcher's interpretations, this section provides the structure for the rest of the research. The reader is taken through the research process step by step, starting with the problem statement and continuing with the existing knowledge and the aim of this research.

Problem Statement

Starting with the problem statement. As identified in the previous sections, interdisciplinary collaborations involve a number of communication complexities that are frequently mentioned in the literature. These complexities are supplemented by one additional complexity, which has been added to the scope of this study based on our own observations. This final complexity is silence. All complexities can be found in Figure 2, on the right.

These complexities can be addressed using various tools. Literature has shown that (BIM) drawings, structured feedback cycles and the like can help mitigate these complexities. However, there are also many indications that empathy can contribute here, too, albeit in a different way. This soft skill can be applied in a completely different way, for several reasons. Empathy is quite challenging to learn, difficult to determine, and therefore also challenging to apply. Nevertheless, the focus of this research is to determine, based on observations and interview data, how empathy can be applied correctly and how this contributes to mitigating the aforementioned complexities.
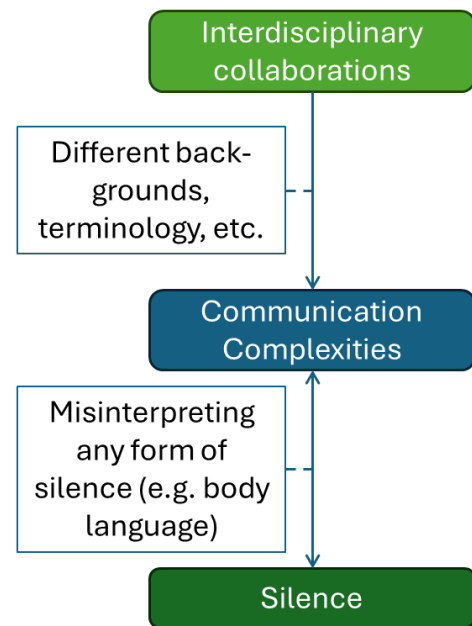
Figure 2: Problem Statement in Three Concepts

Tools to Mitigate the Complexities

The following figure shows that tools already exist that can address these complexities. These mainly include tools such as (BIM) drawings and other physical tools. The literature has already proven that these have some effect, which is why they lead to mitigated complexities. These physical tools have already been researched and are already being used in practice; therefore, they are not considered in this research.
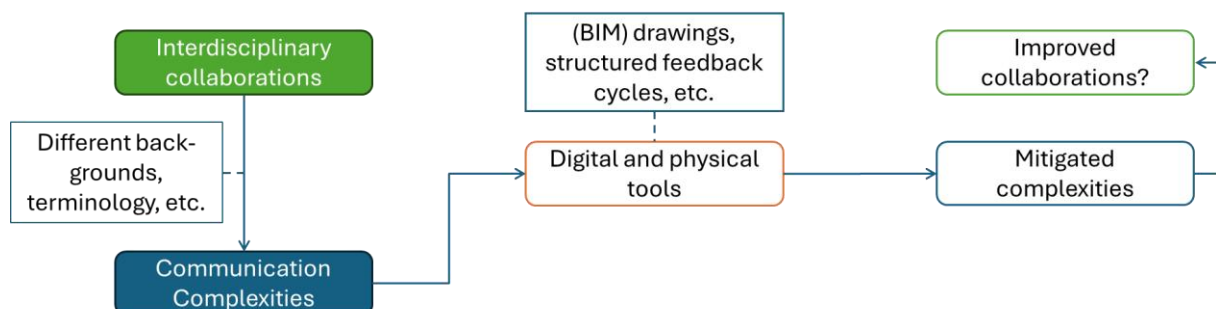
Figure 3: Overview of the Existing Tools
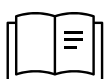
There are indications that empathy can contribute to the challenges identified above. This is due to aspects of empathy, such as better understanding someone else's emotions, background, and motives. Because of these characteristics, there are also clearer indications that silences can also be dealt with effectively by using empathy as a tool. This possibility is illustrated in the figure below (Figure 4). The purpose of analysing the interview data is therefore to discover where the potential opportunities and interventions lie for using empathy in an appropriate and effective way in interdisciplinary collaborations.

This study, therefore, examines the following aspect:
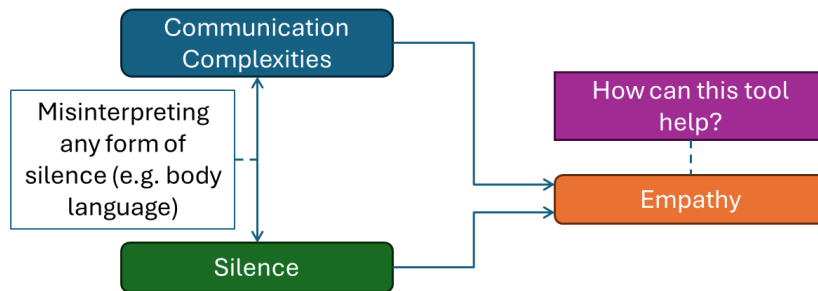
Figure 4: Empathy as a Tool

The research, therefore, expects that empathy can be used as a human tool in interdisciplinary collaborations. Due to the characteristics of empathy, consisting of a better understanding of each other's emotions, backgrounds, motives, and the like, empathy is considered a very suitable tool. This possible relationship of empathy is shown in Figure 5, shown below. The possibility of empathy as a tool for addressing both the three complexities identified in the literature and the observed complexity will be central to this study and will therefore be tested.
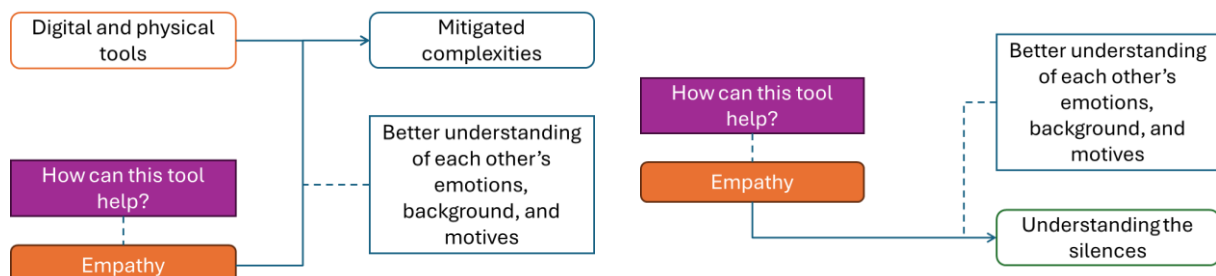
Figure 5: Empathy in Relation to Complexities and Silence

The relationships between all concepts depicted here will be examined in this research. The purple balloon is the guiding principle in this research. The question that will therefore be asked continuously is: how can the concept of empathy be used as a tool, and what can we learn from a project team such as that of the Cruciale Mijl?

Research Overview

In order to ultimately present this as broadly as possible, the following chain is of utmost importance in this study. This chain, therefore, examines whether empathy can be used as a tool for mitigating communicative complexities. With additional evidence: if silence is a complexity, and this complexity can be reduced with the help of empathy, does this also improve interdisciplinary collaboration?
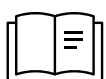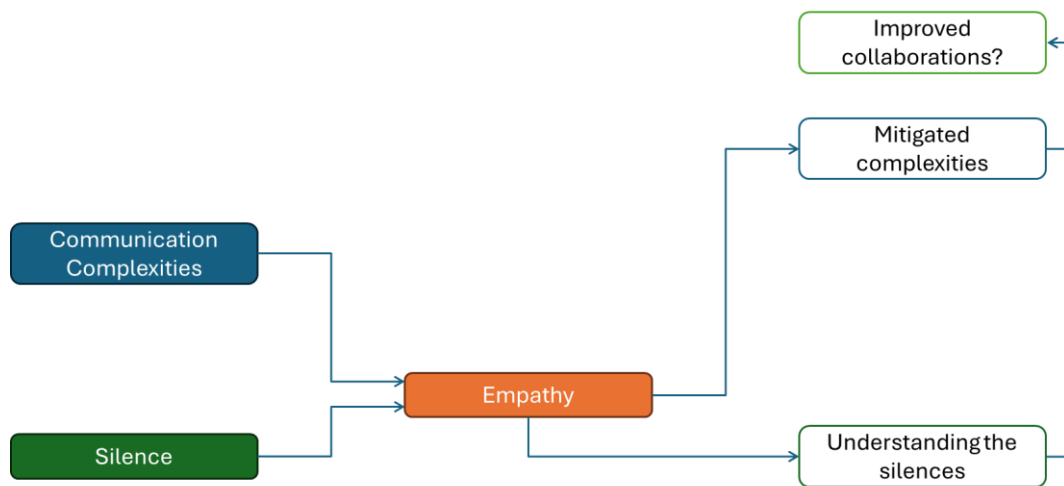
Figure 6: Empathy as a Central Factor in the Framework

The figure above (Figure 6) shows a simplified overview of where empathy fits into the system. Where two pillars of complexity are identified on the left, empathy is the potential tool to mitigate them. This potentially leads to mitigated complexities and a better understanding of these silences. The question is ultimately: Does this lead to improved collaboration? This question is therefore placed in the top right-hand corner as the final question, which is not considered an official research question.

The Complete Framework

Figure 7 below shows all of the relationships discussed earlier that are relevant to this study. The left side of the figure, plus the existing digital and physical tools, mainly covers the literature review and the problem statement. The next steps, which involve empathy, mitigating complexities and understanding the silences, are examined on the basis of the interview results and observations covered by this study. All of this should then lead to improved collaboration, although testing this is not within the scope of this study. This requires more observations over a longer period of time. More information on this can be found in the discussion.
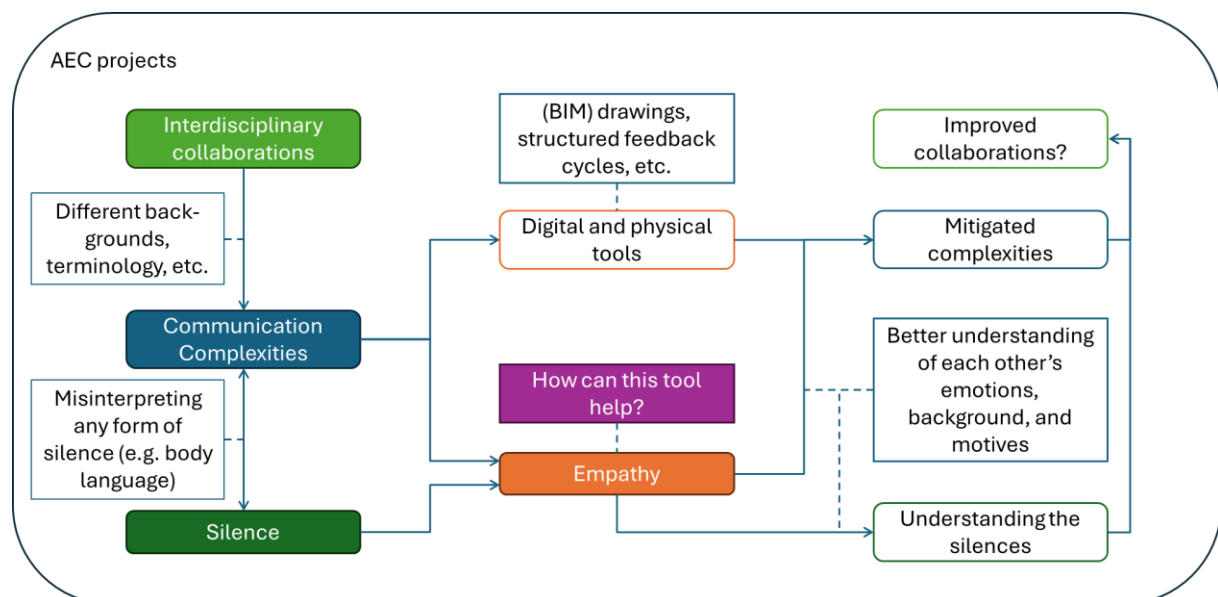
Figure 7: Research Framework

The following subsections will provide more information about the research results.
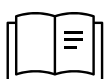
III. Interviews & Observations

Looking for research context through the eyes of the Cruciale Mijl project team members
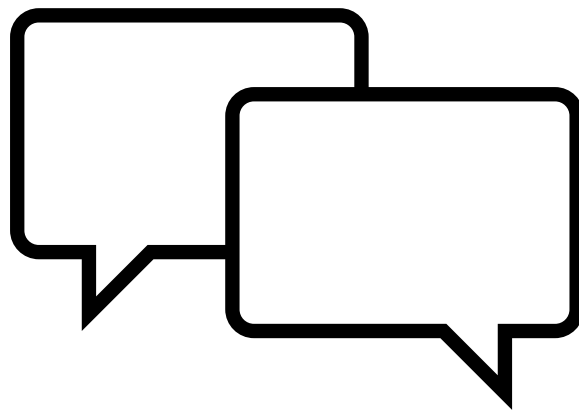
III.a Interview Set-up

The literature review in Part II created a theoretical framework by highlighting concepts such as communication complexities and the concept of 'empathy'. Building on these findings, Part III is devoted to the results of the qualitative research, which tests these theoretical insights in the practice of the Dutch AEC sector. The interviews with experts provide concrete examples and in-depth perspectives that complement and enrich the literature review, clarifying the links between theory and practice.

This section narrates the setting of the interviews, tells more about the interviewees, and explains the structure and questions asked during the interview. In doing so, this section forms the preliminary basis of the interview results.

Interviewees

For the context of this study, the interviewees are stakeholders in Amsterdam's infrastructure and urban planning project, the Cruciale Mijl. During collaboration days, called 'ateliers' (workshops) in the project, these stakeholders were observed and approached afterwards to ask questions regarding how to work together, the link between interdisciplinary working and empathy, and other questions linked to the research. Contrary to the name workshop implies, it involves a relatively static setup, with team members sharing their knowledge and info and then discussing it.

The disciplines of those interviewed ranged from urban planners, technical managers, and traffic engineers to communications officers attending the project to assess the social aspects of the project. By considering all corners of the disciplines in this study, interesting insights will be made regarding empathy and interdisciplinary work. Given the interviewees' privacy, it has been decided not to disclose any personal or traceable information in this study. All thirteen interviewees have been able to review the processed interview results and have given their consent for publication in this study.

Interview Questions

As mentioned earlier in this study, semi-structured interviews were chosen for this study. In this approach, no guiding questions are asked, but mainly open-ended questions that allow the interviewee to steer the conversation to his or her liking, without working towards specific answers. However, interviewees are informed about the interview topic so they can partly prepare for the answers they will give. Because of the specific topic of the study, this is required; one will observe the meaning of empathy and other hard-to-encompass terms beforehand to understand the subject matter of the interviews better. The guide to this can be found in Appendix I, Interview Protocol. That section contains the questions the interviewer discusses with the interviewee before the interview and topics that are desirable to come up during the interview.

Interview Setting

The interviewee is informed in advance as little as possible about the content of the interview. This way, the interview is kept as open as possible, without bias. The interview will be conducted in a closed place so that no outside influence will be allowed. It also allows for quiet recording so the conversation can be listened to properly. At the start of the interview, the interviewee is informed of the privacy risks, as mentioned in the consent form (Appendix II). Once all these conditions have been gone through, the interview can begin. The conversation will then follow a natural course, with the interviewer trying to create as safe an atmosphere as possible. This is intended to get the results on paper as honestly and concretely as possible.

In addition to analysing the interview data in the form of transcripts, observations have added an extra dimension to this study. During the interviews, the interviewer noted the interviewee's attitude, considering the mood meter developed by the Yale Centre for Emotional Intelligence. This tool allows all observations to be made transparent and the interview data to be analysed in a workable way.

Participant Profile

In order to present the information more clearly and thus make it more transparent, this section will provide more details about the interviewees and the focus of the coding of the interview results. A clear table (Table 9) makes it understandable to see how this study arrived at the correct conclusions and on what the researcher's interpretations are based.

Starting with the participants in the interviews. Based on a set of characteristics, the profiles of the interviewees are outlined without revealing too much information. This is required due to privacy legislation and ethical considerations in this study. For this reason, directly traceable characteristics such as gender, exact age, position, and period of employment are omitted and generalised into categories. All participant profiles can be found in the table below.

Table 9: Participant Profiles

[nr.]	Function	Yrs. of Experience	Involved since the beginning of the project?
1	Engineer	20+	Yes
2	Manager	20+	Yes
3	Manager	5-10	No
4	Extern	n/a	No
5	Engineer	5-10	No
6	Engineer	5-10	No
7	Manager	0-5	No
8	Manager	10-20	Yes
9	Engineer	20+	Yes
10	Manager	5-10	Yes
11	Extern	n/a	No
12	Engineer	20+	Yes
13	Extern	n/a	No

This table shows the following characteristics: role within the project, years of work experience (at IB Amsterdam), and whether the participant has been involved in the project since the beginning. These characteristics provide an overview of who was involved in the interviews, adding an extra dimension to the interview results. There are three options for the role within the Cruciale Mijl project: Engineer, Manager and External. For the external party, there is a wide variety of options; the only requirement is that the participant does not work for the municipality of Amsterdam, but is involved in the project through another stakeholder. The other variables are self-explanatory.

Interviews Log

The first interviews provided a variety of perspectives from different stakeholders, each of whom approached the project from their own discipline. Together, these perspectives painted a rich picture of how the team functions, how outsiders perceive it, and how experiences differ from person to person. One striking lesson that quickly emerged was that every individual experiences a project and its dynamics uniquely. This realisation highlights one of the biggest challenges when dealing with intangible concepts such as empathy within interdisciplinary teams.

Notably, there was a clear contrast between insiders and outsiders and between long-term members and newcomers. Insiders spoke of the effort invested in maintaining work quality and the influence of the team's atmosphere on productivity. They almost unanimously agreed that nurturing relationships between team members from the outset has positive effects throughout the project's lifespan. Some even suggested that a safe and inclusive atmosphere enhances collaboration and creativity, as it creates space for everyone's opinions and emotions.

However, others were quick to point out that the 'soft side' of project management – such as empathy and atmosphere – cannot guarantee results alone. Technical expertise and hard skills remain equally essential. They argued that the two pillars can either strengthen or undermine one another, depending on how they are balanced. The most effective teams are built on a strong social foundation where members feel safe to contribute openly and have a robust technical knowledge and experience base. A key principle that emerged from this is that, when forming a project team, it is crucial to consider the skills and potential of individual members and how they complement one another. Once assembled, the team must build trust and familiarity by understanding each other's strengths, weaknesses and working methods. This foundation becomes invaluable when challenges or unexpected issues arise, providing a solid foundation to build on rather than fixing problems later.

As the number of interviews increased, these initial insights were largely confirmed and further nuanced. With more disciplines represented, ranging from engineering and technical expertise to sociological perspectives, the variety of experiences became clearer still. Different backgrounds shape different collaboration expectations and create diverse needs within the team. Although these conclusions may seem obvious, substantiating them proved more complex, highlighting the need for further interviews and analysis.

What stood out across this broader pool of voices was the recognition of how much team members could learn from one another. Many spoke of their respect for colleagues from other disciplines, describing moments when they consciously stepped back to let others take the lead during collaborative sessions. This diversity of perspectives encouraged growth and, in some cases, seemed to elevate the project. Interestingly, no one could identify an apparent reason when asked why specific projects ran so smoothly. Success seemed to emerge organically, reflected less in measurable outcomes and more in the team's overall satisfaction.

Most of the earlier findings were reaffirmed when the final interviews were conducted. Responses were consistent with what had already been heard, albeit sometimes expressed from slightly different angles. While no groundbreaking revelations surfaced, this absence confirmed the picture's completeness. The recurring themes of interdisciplinary complexity and widely varying perceptions of empathy stood out once again. Personality differences highlighted how norms, values and emotional needs diverge from person to person, shaping how empathy is understood and expressed.

Ultimately, the interviews converged on a few essential truths. Collaboration in interdisciplinary teams is inherently complex, enriched, and complicated by the diversity of perspectives. Maintaining a balance between soft and hard skills is vital, and success is rooted as much in the social foundations of trust and respect as in technical expertise. Although empathy is interpreted differently by each individual, it remains a central factor in shaping the quality of collaboration. These insights formed the basis for subsequent coding and thematic analysis, in which recurring patterns could be identified and explored in greater depth.

Coding Framework

To analyse the interview data, a coding framework was developed to capture recurring patterns and translate them into meaningful categories. The purpose of this framework is to provide a systematic and transparent structure that enables a reliable interpretation of the interviews. This section outlines how the framework was constructed, why the chosen themes are relevant, and how they will guide the subsequent presentation of results.

Development of the Framework

The framework emerged through thematic analysis combining deductive and inductive elements. Initial sensitising concepts were derived deductively from the central focus of this study – interdisciplinary collaboration, communicative challenges and empathy – as described in the literature. Inductively, themes were allowed to emerge directly from the data, ensuring that the participants' voices shaped the analysis rather than being confined by preconceived categories.

The analytical process progressed in several stages. First, open coding was conducted to capture salient statements across all transcripts. These codes were then grouped into broader categories through axial coding, paying attention to similar, divergent and contradictory patterns. Finally, selective coding combined these categories into five overarching themes that best represented the dynamics described by the participants.

To enhance the reliability of the framework, the codes were repeatedly compared with the raw data to ensure consistent and accurate interpretation. Where transcript sections could reasonably fit under multiple themes, double-coding was applied, or the quotation was assigned to the theme that most directly captured its core meaning. Documenting these decisions ensures that the coding process remains transparent and traceable for the reader.

The final framework consists of the following five main themes:

Table 10: Coding Framework

Coding Theme	Focus	Phrase Examples
Interdisciplinary Challenges	Recognising obstacles and uncertainties without clear solutions.	"There is not really a manual for this. Every organisation is different, and every person you work with is different. So there is no perfect way to approach this."
Communicative Challenges	Difficulties caused by misinterpretations, lack of dialogue, or assumptions in collaboration.	"Because you think you can sense what the other person is thinking, you talk less with each other and can still work in completely different directions."
(Un)comfort	Experiences of comfort or discomfort, ranging from trust and ease to unease or	"If the foundation is solid, if you can say: things are good between us, then you can handle a lot. Much noise, but also much silence."

	distrust in professional interactions.	
Responsibilities	Reflections on the distribution of responsibilities, including delegation, ownership, and shared accountability.	"A good client gives the team room to manoeuvre. To come up with their own ideas about how to tackle things."
Function-specific Comments	Positive and negative remarks that are tied to the perspectives of specific roles or disciplines.	"Understanding why an environmental manager thinks differently from a technical or contract manager. That also reflects social dynamics."

Relation to the Research Questions

The themes were not chosen randomly; instead, they address the research questions of this study. The first two themes help identify and confirm the complexities of interdisciplinary and communicative practices described in the literature. The third theme adds nuance by exploring how participants experience collaboration, emphasising the importance of comfort and trust. The final two themes focus on potential solutions, shedding light on how empathy and role clarity can mitigate challenges and support more effective collaboration.

Although presented as separate categories, the themes often overlap in practice. For example, communicative challenges are often associated with feelings of discomfort, while issues of responsibility are closely linked to interdisciplinary tensions. Recognising these interconnections is crucial for interpreting the results, as it reveals how multiple factors shape participants' experiences simultaneously.

This coding framework provides a robust methodological basis for analysing the interview results. It facilitates the systematic comparison of empirical data with concepts from the literature, eventually providing a connection between theory and practice. This framework can be used as a practical lens through which interdisciplinary collaborations can be critically examined and, where possible, improved.

Applying to Interview Results

Having established the coding framework and clarified the rationale behind the five themes, the following section presents the results of the interview analysis. Each theme is illustrated with selected quotations that capture the range of experiences, perceptions and challenges described by the participants. These quotations serve as evidence of the coding process and as entry points for interpreting the practical realities of interdisciplinary collaboration. The results are therefore organised by the above-identified themes, enabling a systematic yet flexible data exploration.

III.b Interview Results

This section is concerned with all the results produced through the interviews. The transcripts were thoroughly analysed using the coding framework from the previous subsection. These five themes formed the basis of the research results, from which the final conclusions were drawn from the case study. In addition to the interview data in the form of transcripts, observation data were also used. This extra dimension provides additional validation of the conclusions drawn from the interview data and provides additional arguments in the final discussion and conclusion (Part IV). Due to the participants' privacy, names and other words that could be used to retrieve personal details will not be disclosed here.

Comprehensive Analysis of Interview Data

The interviews can be concluded as presented in the previous subsection. In addition, the study also includes even more thorough analyses of the interview data to reach firmer conclusions. Using quotes from the various interviews, an attempt is made to find connections between certain statements, which may lead to answering the research questions. This section is divided into themes, each presented in tables accompanied by textual explanations. These different themes and associated tables ultimately lead to answers to the research questions.

First Theme: Challenges and Complexities

The first theme featured prominently in the interviews concerns interdisciplinary working challenges. These challenges can be understood in the broadest sense: collaborative challenges, challenges due to differences in opinions and challenges due to behaviours.

Table 11: Challenges of Interdisciplinary Project Teams

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"There is not really a manual to be made either. Every organisation is different, and every person to work with is different. So there is no perfect way to approach this." [1.1]	Working with people is a complex and different approach each time, making drawing up guidelines challenging. This quote negates the importance of any handouts.	Rejection of standardisation
"Then it's up to the people who have a bit more soft skills to make sure the conversation is done properly." [1.2]	Some interviewees claim they lack empathic skills. Therefore, they lash out at 'empathic behaviour' to team members who have more affinity for this.	Outsourcing (empathy)
"... You will not solve that complexity with empathy." [1.3]	Some interviewees fear that many complexities cannot be solved with empathy. This makes it considerably more challenging to work on empathy and seriously bring it to the public's attention.	Scepticism

The table above (Table 11) highlights three quotes, each addressing a challenge. These challenges can all be traced back to denial in their own way. Denial of a solution, denial of one's competence, and denial of the possible usefulness of empathy. Moreover, these three quotes already bring into focus somewhat clearly how everyone has different views on communication challenges, and how these challenges can or cannot be overcome.

There are, of course, many more challenges. Table 12 shows challenges traceable to communicative origins.

Table 12: Communicative Challenges of Interdisciplinary Project Teams

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"A lot of work is done based on assumptions." [2.1]	Assumptions are nice; they can save much time in design processes. However, it is also a risk; assumptions create more room for error.	Cognitive bias
"Because you think you can sense each other, you talk to each other a little less, and you can still work in a totally different direction." [2.2]	A seemingly pleasant appearance (being able to feel each other out) can create misconceptions and additional challenges.	(Possible) false consensus
"Even if you do not fit through the same door with each other, you can actively work on that and make sure that the extra conversations allow you to continue working just fine. If the cooperation is going really well, it can also be the case that you fall into one thing you think of each other." [2.3]	Less pleasant collaborations can be addressed by starting the conversation. Indeed, even if things are going well, even if things are going badly, keep having the conversations. Silences can be fine, but one must remain alert to the risks involved.	Erosion of reflection

Of course, assumptions and knowing and feeling each other well are not just negative concepts. They can save energy, simplify processes, and make collaborations pleasant. However, they risk being seen as a possible 'relational illusion'. The risk is that certain information can disappear into the silence of assumptions and personal comfort, or that information changes because of this silence. Both sender and receiver must be convinced that the information is being conveyed correctly, and if in doubt, this will have to be addressed.

Second Theme: Personal Matters

There have been events in history that have strained relations. The death of the team manager brought up more unusual emotions when working together in 'regular' situations; people were more irritable, and more energy was required to open work-related conversations. Almost all team members recognise this as a complicated period, even for a few who joined the team later in the process.

These types of events require a greater understanding of each other, making it necessary to think longer about what will be said, and can determine the interpersonal relationships of team members. The second theme that comes up when analysing the interview data is, therefore, personal matters. Similarly, the interviewees' statements are presented in Dutch and analysed in English. This is to preserve the original text and intention.

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"If the basics are right, if you can say: things are fine between us, then you can handle a lot. A lot of noise, but also a lot of silence." [3.1]	You must take the time to get the basics right in intensive collaborations. This can make the collaboration feel so much more natural.	Psychological resilience
"You are used to saying, I think this, I want that; this should be this, this should be that. But I first went for three-quarters of an hour talking about his vegetable garden in France. And the last fifteen minutes I did business with him." [3.2]	Even if it does not sound hugely logical, businesses should occasionally start with silly dicking and gabbing. It is not guaranteed to work but can produce pleasant results if appropriately sensed.	(Building trust with) informality
"... They still talk, but only from behind body armour. Then I started slacking off and drinking a lot of coffee. Gradually, the good atmosphere began to return." [3.3]	Working together is not always pleasant; you do not always have a choice. As with the previous quote, though, it can be worked on. Chatting (talking) is often the cheapest and best solution to mutual frustrations and flare-ups.	(Conflict recovery through) informality
"It is good to have moments where people can hear and listen to each other's perspectives. Looking for dialogue with each other. Or debate, or discussion." [3.4]	There should always be room for conversation, understanding each other's feelings, ideas, and world views, and finding rapprochement.	Perspective-sharing

All the statements in Table 13 can be linked to sensing one's needs, or 'relational sensing'. Needs in the broad sense; on an emotional level, on a professional level and everything in between. Empathy is about sensing someone's emotion, but sense can occur on more fronts. It is always nice to have people who can sense what everyone else needs, to make everyone feel at ease and ensure that someone's emotion is not overlooked. Relational sensing can be seen as an intuition that guides interpersonal dynamics. There is no guarantee that this will always be done properly.

Moreover, we must work harder where collaborations occasionally do not go quite right. The 'bulletproof vests' do not have a limitless effect; in the long run, even these will collapse if not actively acted upon. What is recognised by many interviewees is that you have to feel each other out. Initially, this will be a challenge, but for long-term collaborations, it can almost be called a hard requirement.

Third Theme: Roles within Interdisciplinary Project Teams

As mentioned earlier, interviewees are convinced that having some empathetic team members can contribute immensely to cooperation. Even if this is sometimes difficult to put into words, interviewees sometimes envisage who may be responsible for this. Therefore, the third theme of the interview results concerns the roles that team members can take on in collaborations, and which position is seen as the bogeyman or the glue of the group. The following table (Table 14) dives into the roles in similar teams and shows how to look at these different roles.

Table 14: Role-specific Statements during Interviews

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"The environmental managers, who often have a very empathetic profile, understand how the world works and in the process also function as a kind of 'liaison' between the professionals and the outside world. Actually, you can see this as a bridge between the 'blue' inner world and 'normal' outer world, where there are real people with common problems and concerns." [4.1]	People like to point to other people regarding empathy, understanding and connection. Attaching a label to this, such as "blue", is relatively easy. People think they can assess how the other person is put together, without being able to substantiate this very well.	Connecting people
"In management, there are often people who are not empathetic. If you are not empathetic, you will not be charged. Especially if you have to go and make a fairly narcissistic decision." [4.2]	Again, this is about the bias of team members regarding a particular function. It involves an observation of how most managers are put together.	Stereotyping
"Understanding why an environment manager thinks something is different from a technical manager or contract manager. That also reflects social dynamics." [4.3]	Each role and function has its motivations. It takes some effort to understand this, but it starts with recognising their differences.	Perspective-taking
"I am ultimately responsible for the technical team. So I have had to make sure the right person is in the right place." [4.4]	This statement is not only about the qualities of team members but also about personalities. The question is whether this responsibility for the composition only needs to lie with one person.	Connecting people

Table 14 shows quotes that interviewees said about different roles, what qualities these roles possess and how they are viewed. Some include prejudices about the other person and partly statements based on past events.

It is confirmed that an intermediary between the technical world and those outside it is needed – a person who understands both languages and can also translate for each other. There is almost complete consensus that the environment manager should fulfil this function, a crucial person of the Cruciale Mijl project team. It is a hefty responsibility for one person. The question is, therefore, whether she is the right person to guarantee the empathy level of the team. Table 11 does show that the people with the soft skills should do the talking, given that they are better at it.

A critical note to make with all the statements is one of the quotes from the interviews:

> *"... the money has run out in the city. It is hugely complicated; the whole playing field has become very complicated. You do not solve that complexity with empathy."*

Even though many collaborations can be eased with empathy, empathetic team members and mutual understanding, it does not make complexities disappear. As mentioned in the interviews,

the projected manager (e.g. the environmental manager) keeps the complex machinery lubricated.

Fortunately, there is also a recognition that everyone needs to put energy into working together to achieve an enjoyable outcome. More than once, the concept of an 'emotional bank account' was mentioned, a place where you have to actively put effort (money) into in order to be able to draw some energy from again at more challenging times. You need this emotional buffer to be harder on each other occasionally, without losing trust. Table 15 highlights statements about these 'emotional obligations', which are part of everyone's job responsibilities. There are no exceptions for these issues regarding team members not having to work on these.

Table 15: Emotional Responsibilities of Interdisciplinary Project Teams

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"It is not the president's responsibility. It's a shared responsibility." [5.1]	Even though many people seem convinced they want someone else in charge, it is everyone's responsibility to have an atmosphere and communication at a reasonable level.	Shared leadership
"A good principal gives space to the team. To be able to figure out for themselves how they are going to tackle it." [5.2]	A good example follows, even if everyone has to work for good cooperation. Moreover, certain things should not be imposed, but instead left to freedom.	Participative leadership
"I always call it the emotional bank account. There has to be a sufficient balance in that for everyone. It is also necessary to be able to collect something from each other." [5.3]	This is a statement made several times during the interviews. Occasionally, interpersonal bonding must be invested in as a buffer during challenging situations.	Resilience
"How do you interact with your colleagues? How will you make things together? The more complex and larger the project, the more attention should actually be paid to each other." [5.4]	The complexity of a project is often related to how intense and complex the collaboration is between project team members and stakeholders. Because of this added complexity, more attention must be paid to each other, so this statement is an extension of the emotional bank account.	Emotional capital

It is therefore good to read back in the results that almost everyone is convinced that interdisciplinary collaborating teams must work hard. Even if everyone has a different idea on how to tackle this, there is a general idea of having to tackle this. Even if external help is brought in, the effectiveness depends on the goodwill of the team members. For example, a course is only helpful if people are willing to put in the energy to make it work.

Key Outcomes of Interview Quotes

The keywords that emerge in each theme can be traced back to the table presented below. This table contains the basic interventions that will be highlighted in the conclusion.

Theme	Theme-level Keywords	Meta-direction (merged essence)
Interdisciplinary Challenges	diversity, alignment, complementarity, learning, value clash, coordination	**Integration through diversity:** harnessing different perspectives while striving for alignment and mutual learning.
Communicative Challenges	assumptions, misalignment, dialogue, transparency, polarisation	**Clarity through dialogue:** overcoming assumptions and misalignment with transparent, structured conversations.
(Un)comfort	psychological safety, informality, resilience, atmosphere, inclusion	**Trust and safety:** building resilient collaboration through psychological safety, informal bonding, and inclusive practices.
Responsibilities	shared responsibility, role accountability, facilitation, collective trust	**Shared accountability:** balancing individual roles with collective ownership, supported by facilitative leadership.
Function-specific Comments	stewardship, versatility, cohesion, emotional capital, dialogue facilitation	**Adaptive stewardship:** cultivating versatile skills, team cohesion, and emotional capital for sustainable collaboration.

These keywords are not only based on the quotes presented in Tables 11 to 15; Appendix III also contains several tables with additional quotes from interviews that support these keywords.

Additional Interview Results: Observations

Besides actual statements made by the interviewees, there are additional details to analyse. The interviewees' attitude, tone, and other expressions also reveal what people think about the issue. This subsection deals with this additional information that can be retrieved from the interviews and will link this to the results found earlier in the previous two subsections. It includes observations by the researcher, linked to all cues except spoken text.

Yale University's mood meter (Hoffmann et al., 2020) places the observations in an identifiable framework. This mood-meter contains four quadrants with several emotions. These, in turn, can be placed in colours, which can identify which types of emotions are most prevalent. This method allows the researcher to find out how people think about the subject matter from the researcher's perspective. Even though this method is mainly applied to children, it depicts emotions in an obvious and recognisable way. This advantage makes it easy to apply in this context. These results will then be discussed further in the Discussion, where the three components of this study (literature, interviews and observations) will be compared to substantiate the conclusions properly.

The mood meter looks as follows. It is recognisable with two axes; on one axis, the person's energy is plotted, and on the other, the pleasantness.
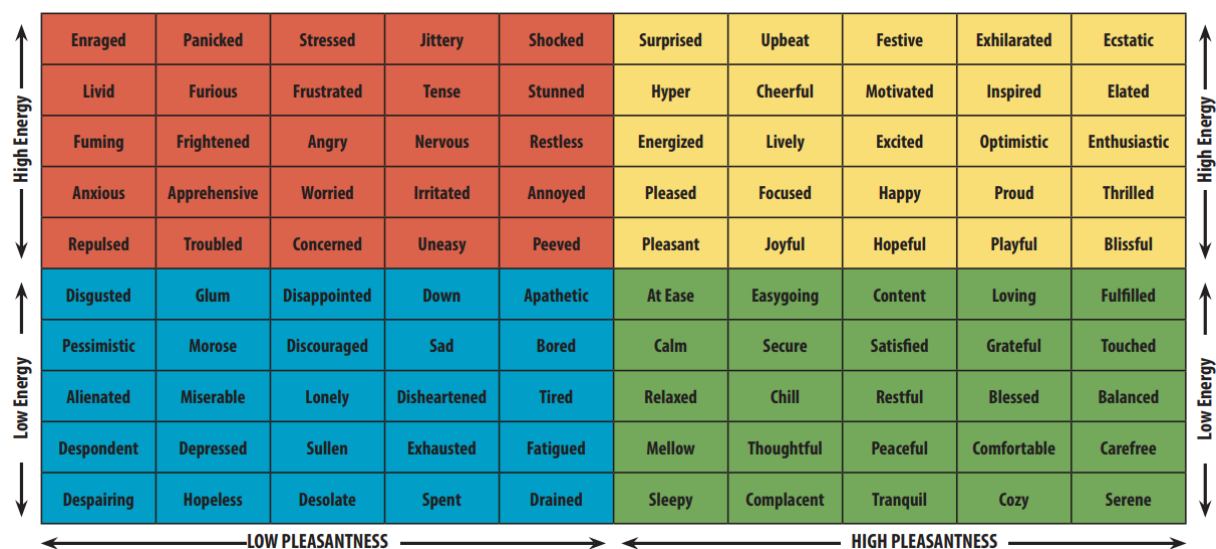
Enraged	Panicked	Stressed	Jittery	Shocked	Surprised	Upbeat	Festive	Exhilarated	Ecstatic
Livid	Furious	Frustrated	Tense	Stunned	Hyper	Cheerful	Motivated	Inspired	Elated
Fuming	Frightened	Angry	Nervous	Restless	Energized	Lively	Excited	Optimistic	Enthusiastic
Anxious	Apprehensive	Worried	Irritated	Annoyed	Pleased	Focused	Happy	Proud	Thrilled
Repulsed	Troubled	Concerned	Uneasy	Peeved	Pleasant	Joyful	Hopeful	Playful	Blissful
Disgusted	Glum	Disappointed	Down	Apathetic	At Ease	Easygoing	Content	Loving	Fulfilled
Pessimistic	Morose	Discouraged	Sad	Bored	Calm	Secure	Satisfied	Grateful	Touched
Alienated	Miserable	Lonely	Disheartened	Tired	Relaxed	Chill	Restful	Blessed	Balanced
Despondent	Depressed	Sullen	Exhausted	Fatigued	Mellow	Thoughtful	Peaceful	Comfortable	Carefree
Despairing	Hopeless	Desolate	Spent	Drained	Sleepy	Complacent	Tranquil	Cozy	Serene

High Energy — Low Energy (left and right axes)
◄— LOW PLEASANTNESS —► ◄— HIGH PLEASANTNESS —►

Figure 8: Yale Center for Emotional Intelligence's Mood Meter (Hoffmann et al., 2020)

The following explanation gives more context to the different colours. Red (top left) contains unpleasant emotions that are high in energy. One can think of anger and fear. This quadrant contains passion in addition to these emotions. All these emotions make us hyperalert and hyperfocused, and we may feel a surge of energy in our bodies.

The yellow emotions (top right) can be considered high-pleasantness and high-energy. Almost always related to positivity, along with something unexpected, a feeling of joy and celebration. These emotions also often have something to do with anticipating an event that will make us joyful.

At the bottom left, one finds the blue emotions. These emotions are close to sadness and depression; the opposite of the yellow. Usually, this colour has to do with a focus on failure or loss. In contrast, the green emotions (bottom right) often follow an event that makes us feel calm and content. The need to solve problems or put out fires is minimal.

Interpretation of Interviewee's Emotions

A wide range of emotions could be observed during the interviews. However, these emotions are mainly found in the middle of the graph; extreme emotions were absent during the interviews, especially on the blue and red sides of the spectrum. However, a clear distinction could be made between the interviewees' attitudes and the statements they made in the process. One of the interviewees had an apathetic attitude throughout the interview. He had little affinity with the subject matter of the interviews and showed this very clearly in his attitude and what he said. This was the only interview that took place entirely in the blue quadrant, and it also provided only a few insights into the results of this study.

At the other end of the spectrum, one interview played out entirely in the yellow-green spectrum, which resulted in fine, relaxed conversations and nice, well-reasoned answers. The interviewee was in the yellow spectrum's Pleased, Joyful, Happy and Proud range. The interviewees did not get much higher in this range, with an occasional outlier to Optimistic. It is interesting to see how someone's emotions can shift quickly, depending on the questions and how comfortable they feel. The following figure shows how all emotions are passed.
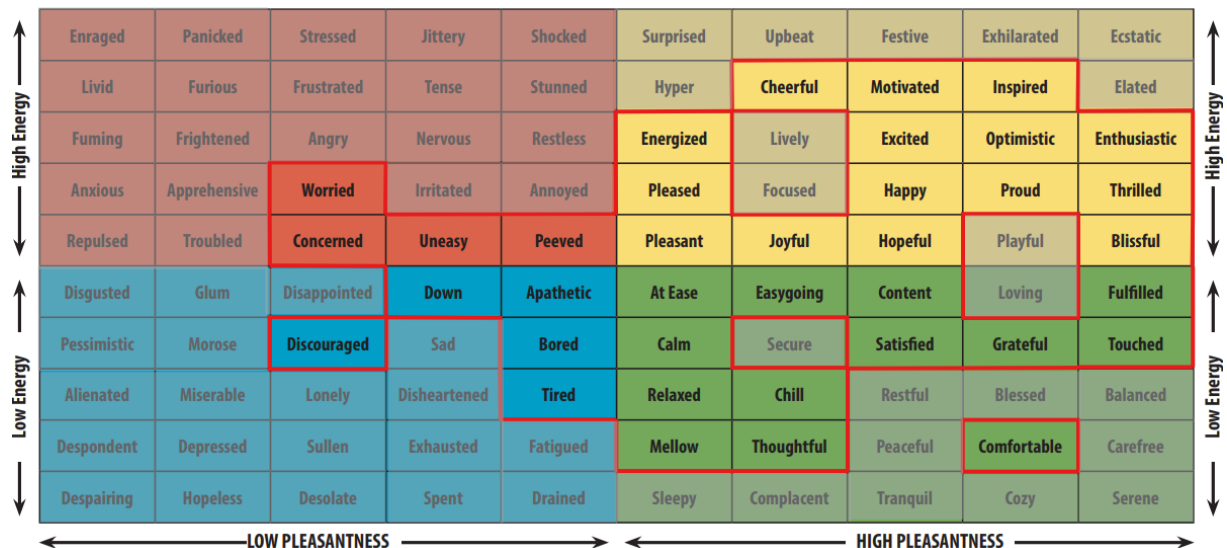
Enraged	Panicked	Stressed	Jittery	Shocked	Surprised	Upbeat	Festive	Exhilarated	Ecstatic
Livid	Furious	Frustrated	Tense	Stunned	Hyper	Cheerful	Motivated	Inspired	Elated
Fuming	Frightened	Angry	Nervous	Restless	Energized	Lively	Excited	Optimistic	Enthusiastic
Anxious	Apprehensive	Worried	Irritated	Annoyed	Pleased	Focused	Happy	Proud	Thrilled
Repulsed	Troubled	Concerned	Uneasy	Peeved	Pleasant	Joyful	Hopeful	Playful	Blissful
Disgusted	Glum	Disappointed	Down	Apathetic	At Ease	Easygoing	Content	Loving	Fulfilled
Pessimistic	Morose	Discouraged	Sad	Bored	Calm	Secure	Satisfied	Grateful	Touched
Alienated	Miserable	Lonely	Disheartened	Tired	Relaxed	Chill	Restful	Blessed	Balanced
Despondent	Depressed	Sullen	Exhausted	Fatigued	Mellow	Thoughtful	Peaceful	Comfortable	Carefree
Despairing	Hopeless	Desolate	Spent	Drained	Sleepy	Complacent	Tranquil	Cozy	Serene

High Energy / Low Energy — LOW PLEASANTNESS — HIGH PLEASANTNESS

Figure 9: Observed Emotions during the Interviews

Figure 9 shows the emotions and corresponding attitudes observed during the interviews. It can be seen that the vast majority of the emotions are located on the right-hand side of the figure; however, there is something to note about this. Many interviewees started in the middle of the figure, dangling between blue, red, yellow and green emotions. Some participants were doubtful about the topic, their attitude, and what they had to say about it. As the interview progressed, this shifted almost every time (except one interview) towards the yellow-green side. This was evident in: more thoughtful answers, a more relaxed attitude and a more enthusiastic tone in which answers were given. Occasionally, the participant became emotional or touched, but fortunately, this was mainly in the green quadrant.

The following figure highlights the emotions that were by far the most common. This also allows one to recognise a pattern in how many interviews were conducted. As mentioned earlier, almost every interview started with relatively flat emotions, then from the middle it gradually shifted to the 'high pleasantness' side. Every interviewee was 'At Ease', which was noticeable the whole time. The second half was generally 'Thoughtful' with 'Proud' statements. The five most common emotions during the interviews:

Table 17: The 5 most Observed Emotions

Emotion	Explanation
At ease	The most standard emotion found almost continuously among interviewees. People felt confident enough to give all the answers, without distrust or feeling elated.
Grateful	A common emotion. When interviewees started discussing their team and its dynamics, gratitude was almost always found. Despite some intense events, people were grateful for how the team functioned with each other and gave each other space and trust during challenging moments.
Apathetic	Many interviews began with this emotion. This can be attributed to the disinterest of many of the interviewees. Many did not know exactly what questions were to come and were sceptical about the empathic aspect of this research.
Pleased	After a while, many interviewees were delighted that a very different aspect of project management was being addressed for once. Many interviews concluded with fine words of thanks and genuine interest in the results of this research.

Proud	Without exception, every team member interviewed was proud of their team, of their city, and of how they are tackling this project.

These five most common emotions are not the most extreme emotions on the spectrum. This is natural, given the neutral nature of the study. The aim has not been to provoke extreme emotions, but to address the topic of empathy in a neutral and accessible way to team members of interdisciplinary project teams. However, three salient emotions still require just a little extra explanation. These are the following three emotions:

Table 18: Remarkable Observed Emotions during Interviews

Emotion	Explanation
Concerned	Concerned emotion came up several times during the interviews; this usually involved concern about another team member, his/her emotion and its possible effects. This indicates that people in this project team care about other people's emotions and feelings.
Comfortable	During the interviews, more details emerged, with people feeling they could entrust this information to the interviewer. Occasionally, it was stressed that this information did need to be kept between them, but they visibly felt comfortable enough to share it.
Motivated	The last notable emotion emerged when discussing everyone's contribution to empathy and mutual bonding. There was regular evidence of motivation to do their part; people seemed motivated to invest actively in both the project and the atmosphere.

It is important to note that all observed emotions give a subjective impression of the situation. This analysis is based on the researcher's interpretation, without input from the interviewees. Now that all interview and observation results have been discussed, the next subsection will focus on the conclusions that can be drawn from these research results. Here, an additional link will be made between these two research elements.

Concluding Remarks on the Interview Results

After this analysis of the additional signals from the interviewees, a concluding subsection of the interviews follows. This establishes links between the statements and the observed utterances of the interviewees. Overall, it can be concluded that the interviews covered a wide range of interviewees, each with a different view on the research issue. This ranges from bringing problems and challenges to the surface to confirming how to approach them.

Starting with the challenges. Regarding the cooperation of the Cruciale Mijl project team, there is some scepticism about the role of empathy. Several interviewees do not exactly give the impression that empathy has anything to do with improving collaborations. Moreover, if they acknowledge that empathy can contribute, some prefer outsourcing it to team members with 'soft skills'. Another recurring statement is the rejection of a standardised approach. Every project and person is different, so it cannot be worked on.

There are some more cryptic, harder-to-reference challenges. On the communication front, there are some challenges. Specific issues are not voiced; they are 'assumed' by the bulk. This can lead to pitfalls like faulty consensus or unfounded bias. These two concepts are not necessarily a problem, but intermediate validation is needed before mis-navigating the project.

Looking at character traits and other personal variables, there are also many great solutions lying within the diversity of an interdisciplinary project team. Occasionally, stepping back and chatting 'informally' with each other can mitigate or even avoid uncomfortable situations. Mutual understanding can emerge by occasionally looking from the other person's perspective or sharing perspectives. With certain functions within a team that many believe are made for connecting people inside and outside the team, many great things can be achieved. There is a clear consensus about everyone's role; everyone must contribute to the cooperation within the project, even if only in their/own way. Even if some assume that others will put out the communication fires, it is a task for all to set a good foundation. It is also recognised that at more challenging times, it is easier to guide the other team members through these challenging situations.

Including additional observations during the interviews can put certain statements into perspective. A few were sceptical about the contribution of empathy to better project management. It was also not their responsibility to work on empathy for these few. This is a challenge if you want to work with your team on concepts like empathy. All heads need to be in the same direction. So the challenge lies in convincing them, too, of what empathy can do for the final results of an interdisciplinary project team. What they were right about is the fact that the effects of empathy are difficult to express in project outcomes. There is no single way to get the effects down on paper.

So let that be the biggest challenge. In the design phase of a project, of course, many issues at play only become measurable at a later stage. Any gains made in the design phase through emotional capital, perspective sharing, and emotional resilience can potentially only become measurable much later in the project. Subjective results are already being achieved; people go to work feeling more comfortable, heard, and above all, in their place. This effect cannot be expressed in hard figures, but can be determined if additional interviews are conducted.
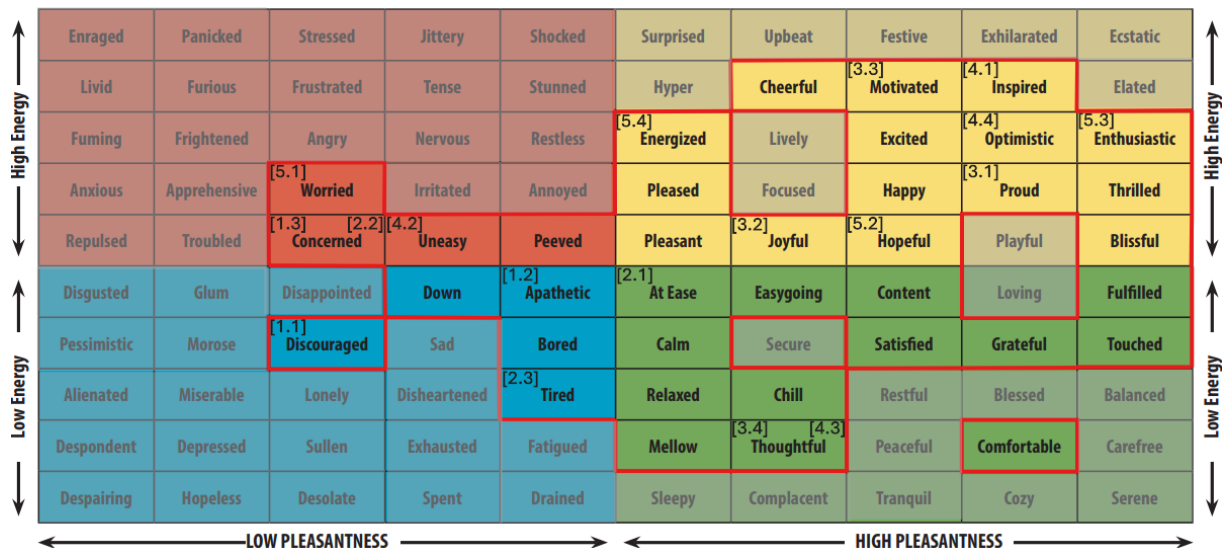
High Energy									High Energy
Enraged	Panicked	Stressed	Jittery	Shocked	Surprised	Upbeat	Festive	Exhilarated	Ecstatic
Livid	Furious	Frustrated	Tense	Stunned	Hyper	Cheerful	[3.3] Motivated	[4.1] Inspired	Elated
Fuming	Frightened	Angry	Nervous	Restless	[5.4] Energized	Lively	Excited	[4.4] Optimistic	[5.3] Enthusiastic
Anxious	Apprehensive	[5.1] Worried	Irritated	Annoyed	Pleased	Focused	Happy	[3.1] Proud	Thrilled
Repulsed	Troubled	[1.3] Concerned	[2.2] [4.2] Uneasy	Peeved	Pleasant	[3.2] Joyful	[5.2] Hopeful	Playful	Blissful
Disgusted	Glum	Disappointed	Down	[1.2] Apathetic	[2.1] At Ease	Easygoing	Content	Loving	Fulfilled
Pessimistic	Morose	[1.1] Discouraged	Sad	Bored	Calm	Secure	Satisfied	Grateful	Touched
Alienated	Miserable	Lonely	Disheartened	[2.3] Tired	Relaxed	Chill	Restful	Blessed	Balanced
Despondent	Depressed	Sullen	Exhausted	Fatigued	Mellow	[3.4] [4.3] Thoughtful	Peaceful	Comfortable	Carefree
Despairing	Hopeless	Desolate	Spent	Drained	Sleepy	Complacent	Tranquil	Cozy	Serene
Low Energy									Low Energy
LOW PLEASANTNESS					HIGH PLEASANTNESS				

Figure 10: Observed Emotions, with linked Quotes from the Interviews (Table 18)

'Hopeful' indicates that many interviewees became more enthusiastic as the interviews progressed. They began to see more and more what kind of contribution was already being made or could be made, often confirming with detailed answers how they could contribute to it. This can be seen in the graphs in Figures 8 and 9, which show all possible emotions.

Placing the Interview Quotes in the Mood Meter

Starting with more wait-and-see and possibly more negative emotions, interviewees shifted to an increasingly enthusiastic and hopeful mood. Figure 10 helps to understand the link between the quotes and the emotions in making this visual. In this figure, the quotes from the tables are linked to the emotion they reflected at the time. To help make it understandable, a table with all the quotes is added below.

The challenges in the first two tables, linked to the quotes [1.x] and [2.x], are mainly found in the two left quadrants. This is relatively easy to understand, given that challenges generally carry a negative tone and emotion. Looking at the following table with the quotes [3.x], it is noticeable that they are found purely to the right of centre. As such, these statements are somewhat hopeful, but less extreme in emotion than those in the last two tables [4.x] and [5.x]. These statements have well-spoken emotion, mainly with some outliers in the blue and red quadrants. Regarding solutions, interviewees are predominantly positive, hopeful and reassured. They do acknowledge occasional negative emotion. This may be based on a realistic view of the issue, or a possibly sceptical view.

This confirmed that interviews generally shifted from relatively negative to more positive. When touching on the challenges of project work, more negative emotions often emerged. This was a topic that almost always came up at the beginning. Subsequently, interviewees were in a better mood when talking about solutions. Thus, a shift to the right was visible in almost every interview. With a few emotional outliers due to sensitive topics as exceptions, only yellow emotions were observed about the qualities of the project team. There was a consensus on how the team was put together and the state of cooperation and atmosphere.

Finally, it is worth mentioning that the interviewees are more engaged with emotions, empathy, and related subjects than they expect. The team members had more answers ready than they anticipated.

Table 19: All Illustrative Quotes

Quote nr.	Illustrative quote
[1.1]	"There is not really a manual to be made either. Every organisation is different, and every person to work with is different. So there is no perfect way to approach this."
[1.2]	"Then it's up to the people who have a bit more soft skills to make sure the conversation is done properly."
[1.3]	"... You will not solve that complexity with empathy."
[2.1]	"A lot of work is done based on assumptions."
[2.2]	"Because you think you can sense each other, you talk to each other a little less, and you can still work in a totally different direction."
[2.3]	"Even if you do not fit through the same door with each other, you can actively work on that and make sure that the extra conversations allow you to continue working just fine. If the cooperation is going really well, it can also be the case that you fall into one thing you think of each other."
[3.1]	"If the basics are right, if you can say: things are fine between us, then you can handle a lot. A lot of noise, but also a lot of silence."
[3.2]	"You are used to saying, I think this, I want that; this should be this, this should be that. But I first went for three-quarters of an hour talking about his vegetable garden in France. And the last fifteen minutes I did business with him."
[3.3]	"... They still talk, but only from behind body armour. Then I started slacking off and drinking a lot of coffee. Gradually, the good atmosphere began to return."
[3.4]	"It is good to have moments where people can hear and listen to each other's perspectives. Looking for dialogue with each other. Or debate, or discussion."
[4.1]	"The environmental managers, who often have a very empathetic profile, understand how the world works and in the process also function as a kind of 'liaison' between the professionals and the outside world. Actually, you can see this as a bridge between the 'blue' inner world and 'normal' outer world, where there are real people with common problems and concerns."
[4.2]	"In management, there are often people who are not empathetic. If you are not empathetic, you will not be charged. Especially if you have to go and make a fairly narcissistic decision."
[4.3]	"Understanding why an environment manager thinks something is different from a technical manager or contract manager. That also reflects social dynamics."
[4.4]	"I am ultimately responsible for the technical team. So I have had to make sure the right person is in the right place."
[5.1]	"It is not the president's responsibility. It's a shared responsibility."
[5.2]	"A good principal gives space to the team. To be able to figure out for themselves how they are going to tackle it."
[5.3]	"I always call it the emotional bank account. There has to be a sufficient balance in that for everyone. It is also necessary to be able to collect something from each other."
[5.4]	"How do you interact with your colleagues? How will you make things together? The more complex and larger the project, the more attention should actually be paid to each other."

General Interview Results

Overall, the interviews provided an interesting perspective on the issue. Where the literature offered some interesting views, the interviews were able to confirm and refute some of these. To begin with, the literature claims that empathy scores are lower among engineers than in sectors like healthcare. Many interviewees refuted this claim by stating that they were concerned with the impact of empathy, and that they were convinced they had better empathic skills than, for example, healthcare professionals.

On the themes that came up in the interviews, not all 13 interviewees were unanimous. For some participants, empathy was difficult to grasp. On the other hand, the Cruciale Mijl interdisciplinary team also includes some team members who highly value empathy, feeling, and communication. It seems they set a good standard in communication and interpersonal norms. The following quote is a good example of this:

"You have the environment manager, responsible for stakeholder management. You can also call that one the 'oil' of a project."

While this statement looks mostly positive, there is also a downside. Many people expect individuals like the environment manager to take this responsibility, and in doing so, drag the team along. Fortunately, some team members also recognise that it is a shared responsibility. This can be seen in statements like the following:

"We all have the task of ensuring that the whole thing comes to fruition. However, that is a process of give and take."

Moreover, challenges are there. Whereas currently it can be linked to challenges due to climate change, more complex legislation and the like, a few years ago the challenge lay with barriers imposed by COVID-19. This is therefore confirmed by the following two statements from the interviews:

"I have made zoning plans three times in my life. The first time, two hundred pages sufficed. The second time, it was already two thousand pages. We did not print the last one, but I think we did twenty thousand research pages."

Therefore, this statement confirms that the construction industry faces increasingly complex issues in the Netherlands. It is also widely recognised that more and more disciplines are needed to solve these issues. During COVID-19, an additional challenge was that people were not allowed to sit together. From everyone's workroom, the situation was as follows:

"... [By COVID-19] we were no longer sitting together, but all on everyone's screen in 32 boxes. That does not promote soft skills."

Because of these causes and associated quotes, the need for good cooperation is increasingly recognised. It is jokingly said that government workers only drink coffee and, therefore, have more time for small talk. This is also recognised (with a wink) by several interviewees, as in the following quote:

"I think there should also be a lot of coffee. Fortunately, we can do that very well here at the municipality."

Now that all the results have been discussed, all that remains is the discussion and conclusion. The following sections will deal with this final part of the study.

IV. Discussion and Conclusion

Providing the comparison between literature and reality, and the answers to the research questions
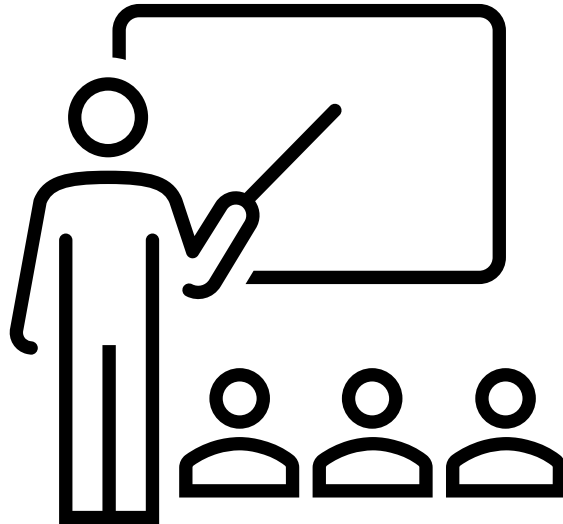
IV.a Discussion

This section discusses the extent to which this study was conducted correctly and provides discussion points on the accuracy of the results. The review of previous studies will be compared with the interview results and observations, with any critical elements explained in more detail. This was then laid out using five pillars. In addition, this section discusses recommendations for this study in case future studies are dedicated to it again.

Empathy: a Shared Responsibility or a Delegated Role?

It is the question that has been asked over and over again. Should we point the finger at the person with the most potential for empathy, or are we all responsible for ensuring a certain empathy standard? If it is up to some of the interviewees, specific functions are responsible for empathy; in the case of the Cruciale Mijl, this is the environment manager. This role is also often filled by someone with an affinity for empathy, highly developed social skills, and other 'soft skills'. A few see empathy as a shared responsibility, but this opinion is in the minority.

On the other hand, literature is more convinced that empathy should be a team competence (Morano & Cole, 2024). They are convinced that depending on these 'empathic persons' can make the team and cooperation vulnerable, especially if this person falls away. It requires more energy to make empathy a team competence, making it a more stable factor in the organisation. The key question is: how can empathy become a permanent part of the work culture, rather than something left to specific functions? This is where people are still undecided. This uncertainty could be eliminated with the help of perspective-taking and other empathy strategies, but it will only work if everyone agrees to it.

Silence as a Paradox

At first glance, this study's theme of 'silence' is easy to understand. Silence can create space for reflection and prevent escalations, which makes it very functional. In addition, it can also save energy and make people more thoughtful. However, the literature revealed that silence has a lot of different faces, which must always be kept in mind. Silence often stems from assumptions, uncertainties and forms of hierarchy. As a result, it can have a destructive effect in addition to its constructive function. The line between the two is very vague and, above all, very difficult to monitor.

These findings from the interviews are confirmed mainly by the literature, although most of the interviewees only see the positive effects of silence. When looking at the literature, both recent work (Verouden, 2018) and older studies (McClelland & Sands, 1993) have pointed to the active role of silence in collaborations and the power it can give in situations of uncertainty and challenge. There are strong indications that recognising these forms of positive and negative silence is closely related to having empathy. If mastered, this art can make collaborations more energy-efficient and reduce the risk of unintended conflicts and challenges. Further analysis of the silences of Table 4 and how people can sense the differences is then required.

Limitations in Evidence

Something that both the literature and the interviewees agree on is the challenge of measuring the impact of empathy. It can be almost frustrating because there are all the clues. This is the case with more 'soft' factors; they are difficult to measure in 'hard' terms. A socially safe and empathetic working atmosphere seems to lead to better cooperation. This is reflected in the interview data, for example, in increased motivation, greater job satisfaction, mutual trust and improved communication. However, these effects are difficult to determine in terms of the

outcomes of a project, such as project duration, costs, and quality. Both in the literature and in the interview data, there is no uniformity regarding measuring conditions for a proper level of empathy.

Limitations of Qualitative Research

Qualitative studies using semi-structured interviews can provide many interesting insights. For example, this study has shown that the Cruciale Mijl project team adequately meets the need for empathy, and that different teams have different relationships and therefore different interpretations of empathy. However, the disadvantage of qualitative research is that the results may not be applicable to other situations. In this case, for example, another organisation may have different needs and a different social culture, yielding completely different results. Relationships in commercial and international contexts are different and would most likely yield different insights. Reliability can be enhanced by quantitative surveys and other observations, but unfortunately, this falls outside the scope of this study.

Another point to consider is the researcher's own perspective. Although the researcher probably has a more neutral view than the interviewed team members, the interviews may have taken a different turn during the process due to changes in social perceptions. Many interviewees said they were proud of their team and its achievements, but this pride and other positive feelings can mean that negative aspects and achievements are not mentioned. Fortunately, this was remedied in this study with the help of observations. This extra dimension to the research results meant that the interview data could be validated with an additional variable. This is a less substantiated research method than quantitative research methods, but it still adds an extra dimension to the results, making them more substantiated.

Empathy's Potential

Even though people have been searching for ways to improve the performance of project teams and their projects for a long time, empathy is unfortunately not the solution that solves all problems. Although empathy can make a difference in collaboration, emotional capital and social challenges, it is not a solution for complex technical, political and inter-organisational challenges. Empathy gives people more tools for reflection and collaboration, because with a higher empathy score, people listen better and understand better what others need. In the somewhat traditional world of civil engineering projects, empathy is, to a certain extent, an underutilised concept due to the primary focus on technical competencies. This is something that, unconsciously, interdisciplinary teams can benefit from. The interview data show that the different disciplines of interdisciplinary project teams can help each other with their empathic ability, which had not yet been demonstrated in the literature.

To address these discussion points, there are many recommendations for improving future research and collaborations between interdisciplinary project teams. The following subsection outlines all these recommendations, both at an academic and professional level.

Recommendations

Besides discussing notable discussion points of this research, it is also important to make some recommendations for the Amsterdam municipality and future research. This subsection elaborates more on these aspects of the research.

Recommendations for the Practice

Several recommendations have been made to give empathy a more prominent role within project teams and management. These comprise five clear steps that can guide you throughout the process. Although the basis is simple, effective and applicable to every situation, each team can implement these steps here.

The first step is to make empathy an explicit part of team building. It should be embedded from the very first moment of collaboration. Social barriers can be broken down by getting to know each other, including sharing personal information, discussing expectations of the project and focusing on desired working styles and personal challenges. This can lead to easier communication and quicker identification of issues and potential disputes at any stage of the process.

Secondly, responsibility for empathy should be spread across several people in the team, or even the entire team. While it is easy to single out the most empathetic person, this approach carries many risks. If they leave, the entire empathetic structure could collapse. Decentralising this responsibility enables everyone to actively contribute to a safe working culture where empathy is valued, providing a solid foundation for positive collaboration.

Empathy needs to be cultivated not only at the start of the work process, but also later on when situations call for mutual consideration and empathy. The third recommendation is to ensure regular check-ins, during which you explore people's emotions in greater depth to identify problems more quickly. This can also help to prevent discomfort and misunderstandings. At Cruciale Mijl, the 'design workshops' are suitable opportunities to make time for this, but every project and company has suitable opportunities to focus on. These can be team dialogues or one-to-one conversations.

Step four focuses on role models in project teams. As project leaders are primarily responsible for putting project teams together, they should be supported in setting a good standard for empathy. Given their important role, other team members will likely be happy to take this on. This involves developing empathic skills and facilitating empathy within the entire project team. This is necessary to give everyone the opportunity to express and recognise emotions.

The fifth and final recommendation could be modelled on the municipality of Amsterdam. As mentioned earlier, the municipality of Amsterdam and other government agencies are ideal places for informal meetings over coffee. Coffee breaks and the conversations that accompany them are useful for building trust. This increases emotional capital, making it easier to have difficult conversations and deal with challenging situations in a more emotionally balanced way. Therefore, it is important not to view coffee breaks as a waste of time, but rather as an investment in the softer side of collaboration and team management.

These five recommendations can provide a solid foundation for empathetic collaboration. This approach can benefit not only organisations within civil engineering, but virtually all forms of intensive collaboration.

Recommendations for Future Research

For future research, it would be beneficial to explore several aspects in more detail to provide better substantiation for certain statements and to gain a fuller understanding of empathy, silence and interdisciplinary collaboration.

Firstly, more cases are needed. Comparable case studies could provide valuable insight into the dynamics of other project teams, institutions and sectors. Further case studies and quantitative research could be employed to evaluate the generalisability of certain aspects of this study. These could involve studies of other municipalities, private contractors or international corporations.

To give the research results a more quantitative slant, empathy could be viewed in broader terms. Methods already exist for determining empathy levels, such as the IPI test. In addition to these methods, it would be helpful to develop a more applied test and/or measuring instrument to better determine empathy in project teams. This would enable empathetic behaviour and social safety to be measured in relation to project results and team member satisfaction. However, developing such tests is challenging, so it may be more useful to expand existing tests if necessary.

For future research, examining the hierarchy may also be helpful. Examining the contribution of each specific role in terms of empathy could provide valuable insights into team dynamics. This could also reveal whether there are measurable differences in empathy contributions from individuals in interdisciplinary teams. In addition to investigating the impact of empathy, the phenomenon of silence could be explored further: who speaks and who remains silent, and what are the reasons for this?

The fourth recommendation is to consider the long-term effects of empathy. For example, the long-term effects of actively focusing on empathy in the initial phase of a project could be researched. If monitoring is carried out throughout a project's entire duration, the effectiveness of social interventions can be closely monitored during implementation and in the event of conflicts. This approach enables empathy and other soft skills to be examined. It is logical that this approach would require considerable time, energy and money, but it could enable the impact of empathy and other social aspects of project management to be measured.

Another interesting avenue for future research is to take a closer look at silence. As this study has shown, silence can be experienced in both positive and negative ways. However, the difference between the two is vague and difficult to distinguish. Further research could investigate whether factors such as empathy could help to distinguish more clearly between constructive and destructive silences. This could help to clarify the additional, perhaps more complex, dimension of interdisciplinary work. Accurately assessing functional silences could prevent many conflicts, loss of knowledge and similar problems.

The list of possibilities is endless. These five possibilities provide good starting points for future research, all of which are aimed at improving our understanding of the social side of collaboration and ensuring that people feel heard.

IV.b Conclusion

This section presents the concluding note of this research. Here, the results are re-examined, interpreted, and presented in a concluding manner. This section is structured as follows: first, the research questions are addressed, with answers provided for each sub-question. Once all questions have been answered, the section concludes with a closing statement containing an overall conclusion about the research. In doing so, this is also the concluding section of this thesis, with a reference list and appendices following.

Starting with the conclusion of the first sub-question (SQ1): *What characterises the communication complexities of interdisciplinary project teams?* A lot is going on in terms of communication in interdisciplinary project teams. There are many interactions during project work: consultations here, collaboration sessions there, and the occasional short coffee break in between. These are moments when a lot is said about the project and other matters. In one-on-one situations, these interactions are relatively easy to define; they may depend on the relationship between the people involved, but in general, they are straightforward and without barriers.

However, every so often, the project teams come together in larger numbers. Many more people are present during these sessions, while only one person can speak. The rest have to absorb the information. This leads to much more non-verbal communication through body language. This 'silent' communication is difficult to understand, as these silences can be constructive and destructive. They can be constructive by giving others the space to speak and allowing time to reflect on what has been said. On the other hand, they can also be destructive due to uncertainties, assumptions (which may sometimes be incorrect) and other questionable causes.

Cooperation is highly dependent on this balance between verbal and non-verbal communication, where the following is central: *not everything said is relevant, but not everything relevant is said*. This continuous balance shows that it is important to sense and understand each other well.

The key complexities can be found in Table 3, where four complexities are defined. These have also been guiding principles in this study. The answer to SQ1 brings us to the next SQ.

SQ2 (*What role does empathy play in the interactions of interdisciplinary project teams?*) ties in with this. Empathy is the connecting factor between all team members with different backgrounds, perspectives and communication styles. Empathy is essential in recognising hidden tensions and frustrations, accurately assessing non-verbal communication and understanding someone's beliefs.

Empathy is not just about sensing emotions, but also about listening to each other, creating space for each other and bridging inequalities (on a social and technical level). Empathy is the important link in understanding the other person. This concerns both the spoken and the unspoken, whereby the unspoken can be even more critical for empathy.

This brings us to SQ3: *How can empathy be used as a collaborative tool in interdisciplinary project teams?* There is no clear-cut answer to this question, but the Cruciale Mijl project team does have an answer. There are several ways to give empathy a more prominent place in interdisciplinary work. A combination of active listening, maintaining informal contact and perspective-sharing appears to be the key to success. These three methods reduce noise in communication, remove many doubts arising from silences, and strengthen collaborations. What is more, every individual can contribute by chatting with others, both one-on-one and in groups.

This deposits "money" into the emotional bank account, which can be withdrawn at challenging moments.

The interviews revealed that certain actions can be useful in stimulating empathy, whether or not they improve collaboration. The lesson to be learned here is that empathy can enable differences to be used as strengths. Recognising differences and utilising them effectively can lead to better collaboration and ensure that:

- there is less ambiguity in the communication;

- team members feel more at home (psychological safety);

- everyone feels motivated to contribute;

- people can learn from each other's skills.

There are, of course, more advantages to empathy, but these are the most important outcomes of using empathy correctly.

These answers bring us back to the main question: *How can empathy address the communicational complexities of interdisciplinary project teams?* As mentioned earlier, empathy can improve both verbal and non-verbal communication complexities. It creates a safer climate where doubts can be openly discussed and destructive silences can be recognised sooner. It lowers the threshold for expressing concerns and ensures team members feel heard. This results in a greater willingness to share information.

Because everyone is on the same page, but mainly because everyone can better understand each other's perspectives, it is easier to work towards a common goal. Less energy is wasted in collaboration, and less information is lost in silence, making resolving minor issues or conflicts easier. This makes empathy a more crucial tool in interdisciplinary work than previously thought.

Empathy is not a universal solution. It does not solve traffic bottlenecks, rewrite policy documents, or resolve the increasing complexity of urban infrastructure projects. However, this research convincingly shows that empathy is a silent force; one that reduces the distance between people, makes differences more bridgeable and helps build trust, especially when projects seem challenging and sometimes endless.

Empathy is not naturally present in every Cruciale Mijl project team member, but it must be consciously and implicitly worked on. A safer working environment is created by initiating (and maintaining) conversations about emotions, collaboration and personal expectations. Not all team members are actively aware of this, and interviews have shown that some remain sceptical about the concrete benefits. Nevertheless, a shared conviction has grown during this study that empathetic interactions can lay the foundation for better collaboration, freer and more honest dialogue, and a more resilient team.

In addition, the interviews show that empathy is not an individual trait that only 'sensitive' people possess. Instead, it is a collective idea that needs to be worked on continuously: through informal conversations over coffee, joint moments of reflection and space to get to know each other, so the team is ready for challenging moments.

This research confirms that empathy does not only belong in healthcare or education, but also in the world of concrete and calculations. It is an indispensable but often invisible factor in the work of complex, interdisciplinary project teams. Therefore, the invitation to professionals, project leaders and policymakers is clear: dare to take the soft side of collaboration seriously, precisely because the tasks are so challenging.

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Appendices
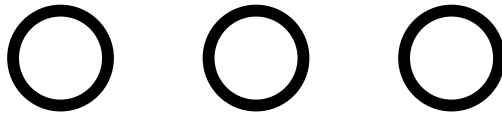
I.   Interview Protocol

This appendix covers the format of each interview, the questions that were asked and the purpose for which each interview was set up. It elaborates on the specific interview-related content.

INTERVIEW PART	INFORMATION	
INTRODUCTION	*Topic*	*Empathy in Project Management – Silent and Unspoken Dynamics in Interdisciplinary Project Teams*
	Goal	*To gain more information about the dynamics of interdisciplinary project teams at IB Amsterdam, which are linked to silence and empathy.*
	Confidentiality	*Interviewees are not named in the study. Anonymity is the primary focus regarding the publication of research findings.*
	Results	*The results are transcribed and stored securely. The results are published in the research report.*
	Duration	*30-60 minutes*
	Conditions	*Before the start of the interview, the informed consent form is read and signed if the interviewee agrees. In addition, the interviewee is asked if the interview audio may be recorded.*
	Before commencement	*The interviewee is asked if there are any questions before the interview begins.*
QUESTIONS	*1ˢᵗ question*	*Can you tell me more about your role at IB Amsterdam and/or the Cruciale Mijl project?*
	2ⁿᵈ question	*Looking at the Cruciale Mijl project, what aspects work with and against it? This concerns all aspects of working together on an interdisciplinary level (e.g. the workshops).*
	3ʳᵈ question	*Suppose you were in the lead in tackling this design process. How would you have arranged the collaboration?*
TOPICS		*Silences – in both adverse and favourable terms.*
		Can these aforementioned silences be judged appropriately?
		Are all disciplines involved in the Cruciale Mijl project well utilised and heard?
		The empathic ability of team members.
		Background of the interviewee.
CLOSING		*Always end with the question: Are there any things you would like to add to all the answers you have already given?*
		Expressing thanks to the interviewee for his/her cooperation.
		Leave contact information for additional additions and updates on the survey.
EXTRA REMARKS		*Ask only open questions. How, why, and how are the most important questions to ask.*
		Focusing on body language alongside everything said.

The table presented above provides the structure for the interviews. It contains all the information to be named mainly before the start and after the interview. The interview will be as open as possible, with as little guidance as possible in the questions and topics that will be covered.

II.   Consent Form

This appendix contains the consent form for the interviews. All participants received this in advance so that they had all the necessary information before giving their consent for the interview data to be processed.

PART 1: Participant Information

You are being invited to participate in a research study titled *Let's speak the Unspoken*. This study is being done by Jelmer Bloemhof from the TU Delft, in collaboration with Ingenieursbureau Amsterdam.

The purpose of this research study is to create awareness of the importance of empathy in interdisciplinary project teams and will take you approximately 30-60 minutes to complete. The data will be used for validation of and insights on the subject of the MSc Thesis. This semi-structured interview will mostly consist of open questions, related to empathy, project management, and personal experiences.

As with any online activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by storing all data anonymously, not using traceable information in the research, and treating all personal information with care. In this way, risks are mitigated as much as possible, and the chances of data leakage will be minimised. The publication of the study will be subject to additional scrutiny for any sensitive information.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions. Should there be any subsequent concerns about the answers given, the responsible researcher can still be contacted before 1 July 2025 to communicate changes.

For questions and/or comments afterwards, please contact:

Jelmer Bloemhof
jelmerbloemhof@tudelft.nl / j.bloemhof@amsterdam.nl
+316 13 335 383

PART 2: Explicit Consent points

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION		
1. I have read and understood the study information dated [*DD/MM/YYYY*], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☐	☐
2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☐	☐
3. I understand that taking part in the study involves: audio recording and additional notes of the interview. These will be deleted after the study and not shared with people outside the research team.	☐	☐
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		
4. I understand that taking part in the study involves the following risks: mental discomfort. I understand that these will be mitigated by the ability to stop the interview at any point.	☐	☐
5. I understand that taking part in the study also involves collecting specific personally identifiable information (PII) (name, e-mail and other optional contact information) and associated personally identifiable research data (PIRD) (personal statements during the interviews) with the potential risk of my identity being revealed through the research results.	☐	☐
6. I understand that the following steps will be taken to minimise the threat of a data breach, and protect my identity in the event of such a breach: pseudo-anonymisation, secure data storage and transcription of the interviews.	☐	☐
7. I understand that personal information collected about me that can identify me, such as name and personal contact information, will not be shared beyond the study team.	☐	☐
8. I understand that the (identifiable) personal data I provide will be destroyed at the end of the study (summer 2025).	☐	☐
C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION		
9. I understand that after the research study the de-identified information I provide will be used for the publication of the thesis and any related results.	☐	☐
10. I agree that my responses, views or other input can be quoted anonymously in research outputs.	☐	☐
D: (LONGTERM) DATA STORAGE, ACCESS AND REUSE		
16. I give permission for the de-identified audio recordings that I provide to be archived in the TU Delft repository so it can be used for future research and learning.	☐	☐

Signatures

_____   _____   _____
Name of participant [printed]   *Signature*   *Date*

I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Jelmer Bloemhof   _____   _____
Researcher name [printed]   *Signature*   *Date*

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III.   Comprehensive Interview Results

This appendix contains all tables relating to illustrative quotes from the interviews. These are the expanded versions of the tables from the report, containing more quotes that can be divided into the same five themes. These themes are as follows:

Coding Theme	Focus	Phrase Examples
Interdisciplinary Challenges	Recognising obstacles and uncertainties without clear solutions.	"There is not really a manual for this. Every organisation is different, and every person you work with is different. So there is no perfect way to approach this."
Communicative Challenges	Difficulties caused by misinterpretations, lack of dialogue, or assumptions in collaboration.	"Because you think you can sense what the other person is thinking, you talk less with each other and can still work in completely different directions."
(Un)comfort	Experiences of comfort or discomfort, ranging from trust and ease to unease or distrust in professional interactions.	"If the foundation is solid, if you can say: things are good between us, then you can handle a lot. Much noise, but also much silence."
Responsibilities	Reflections on the distribution of responsibilities, including delegation, ownership, and shared accountability.	"A good client gives the team room to manoeuvre. To come up with their own ideas about how to tackle things."
Function-specific Comments	Positive and negative remarks that are tied to the perspectives of specific roles or disciplines.	"Understanding why an environmental manager thinks differently from a technical or contract manager. That also reflects social dynamics."

These five themes provide structure to the final results and ensure that the interview results can be clearly presented in the final report. These are not even all the useful quotes; the transcripts were full of them. Nevertheless, this appendix should provide a clearer picture of what was said during the interviews and the tone in which it was said.

Theme 1: Interdisciplinary Challenges

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"There is not really a manual to be made either. Every organisation is different and every person to work with is different. So there is no perfect way to approach this." [1.1]	Working with people is a complex and different approach each time, making drawing up guidelines challenging. This quote negates the importance of any handouts.	Rejection of standardisation
"Then it's up to the people who have a bit more soft skills to make sure the conversation is done properly." [1.2]	Some interviewees claim they lack empathic skills. Therefore, they lash out at 'empathic behaviour' to team members who have more affinity for this.	Outsourcing (empathy)
"... You will not solve that complexity with empathy." [1.3]	Some interviewees fear that many complexities cannot be solved with empathy. This makes it considerably more challenging to work on empathy and seriously bring it to the public's attention.	Scepticism
"Because I do think that you all remain individuals with your own talents. One person is good at this, another at that. And we are all somewhat stuck in our roles. So you try to perform your role well, but it's also very nice when you can ask each other for help if you're stuck."	Collaboration benefits from recognising both the limits of one's role and the strengths of colleagues. Asking for help is framed not as a weakness but as a way of leveraging diverse expertise.	Complementarity
"I think that's good - that you just respond to each other and take each other seriously."	Acknowledging each other's contributions creates mutual respect and prevents people from feeling overlooked, which supports smoother interdisciplinary teamwork.	Mutual recognition
"It was a bit like: so many issues, so many problems, so many things that all had to be done yesterday. That it became a bit overwhelming and also took away a bit of the fun."	High workload and conflicting demands overwhelm teams, leading not only to stress but also to a diminished sense of satisfaction in working together.	Work pressure erosion
"That is not only in how you are shaped by your education or field, but also how you are as a person. Of course, we are all very different as human beings. You do often assume yourself - what you understand and how quickly you think. That is very different for everyone."	Professional roles and personal dispositions both shape collaboration, and differences in processing speed and understanding can widen gaps in teamwork.	Diversity of cognition
"Because sometimes you are just really very different. Then you can understand it and also understand where it comes from, but because the other person is so different and	Personality clashes, while understandable, create a disproportionate energy drain. Even if differences are rationally acknowledged, they manifest as	Emotional fatigue

very distant from you, it just takes so much energy that you don't always have in your busy working day or working week. Which then causes a lot of irritation."	emotional frustration in daily practice.	
"We really have a lot to learn together. It's good to be aware of that and also aware that it's actually totally okay."	Teams perceive learning as an ongoing necessity, and normalising this prevents defensiveness about shortcomings while fostering a shared commitment to improvement.	Growth mindset
"What could be better - I never say things are going badly, because things can always be better - is that we now need to make sure the noses are moving in the same direction."	Alignment is seen as an ongoing task rather than a fixed achievement. Even when things go well, leaders emphasise the need for continual recalibration to maintain focus.	Alignment-seeking
"Because they have different backgrounds and also different interests. Person K wants to have a high-quality public space - then you don't just go and put trees there. Person E would like to build a subway that is functional and purposeful - so just put trees on it."	Conflicting professional values can lead to competing definitions of what constitutes a 'good' outcome, requiring negotiation of standards across disciplines.	Value clash
"And yet then - understandably so - we overlook things. We thought we had everything, maybe we should have thought about it a bit longer in the beginning too."	Teams acknowledge a tendency to rush forward and miss details, suggesting that early-stage reflection is undervalued despite being crucial for avoiding downstream problems.	Premature closure
"Ik denk dat dat altijd de grootste uitdagingen zijn in dit soort projecten. Hoe bewaak je nou waar iedereen mee bezig is en dat we ook allemaal op dezelfde kant op gaan?"	Monitoring collective progress and ensuring shared direction are identified as the central challenges in large projects, with the risk of fragmentation if not actively managed.	Coordination challenge

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"A lot in work is done based on assumptions." [2.1]	Assumptions are nice; they can save much time in design processes. However, it is also a risk; assumptions create more room for error.	Cognitive bias
"Because you think you can sense each other you talk to each other a little less and you can still work in a totally different direction." [2.2]	A seemingly pleasant appearance (being able to feel each other out) can create misconceptions and additional challenges.	(Possible) false consensus
"Even if you do not fit through the same door with each other, you can actively work on that and make sure that the extra conversations allow you to continue working just fine. If the cooperation is going really well, it can also be the case that you fall into one thing you think of each other." [2.3]	Less pleasant collaborations can be addressed by starting the conversation. Indeed, even if things are going well, even if things are going badly, keep having the conversations. Silences can be fine, but one must remain alert to the risks involved.	Erosion of reflection
"It is often said that it can sometimes be difficult for us to collaborate with other parties."	Acknowledging external collaboration difficulties highlights that communication breakdowns are not confined to internal teams but extend across organisational boundaries.	Boundary friction
"You can keep that all separate, but it's also good to have moments where people can hear each other's perspective. Where you have more dialogue, debate or discussion. That's nice. I'm still looking for how that can be done, how we can facilitate that more so that you get more of a conversation between different parties."	Participants see structured dialogue as a missing but necessary mechanism for fostering deeper understanding across roles, beyond transactional interactions.	Facilitation gap
"Then sometimes you talk past each other and it also makes cooperation difficult, because you have to pay more attention to that in order to achieve something together from time to time."	Misaligned communication styles lead to misunderstandings that disrupt progress, showing the need for intentional strategies to bridge conversational gaps.	Misalignment
"So in a lot of work situations it's all just assumptions. Very often, even before important conversations, I would then philosophise: how are they going to react? And then whole scenarios were added. And then we sat there and it went completely the other way."	Over-reliance on pre-emptive scenarios illustrates how assumptions can distort expectations and undermine preparedness for actual conversations.	Scenario distortion
"Everyone does understand the other person's objectives. Whether	There is a gap between recognising another's goals in principle and fully	Superficial comprehension

one always understands the other's objectives is briefly the next question."	grasping their implications, which risks surface-level understanding without depth.	
"And then I personally do think, then maybe it's better to give the information. And name it instead of not giving it and naming it with it. Because on the one hand, you have a risk of it becoming a truth when it is far from being a truth."	Withholding or misrepresenting information can lead to false narratives solidifying, underscoring the importance of transparent communication to prevent misconceptions.	Narrative risk
"And we are completely on the other side and also have some principles. And then we say, well, we have little to do with each other."	Acknowledging entrenched positions highlights how strong principles can create polarisation and relational distance rather than constructive dialogue.	Polarisation

Theme 3: (Un)comfort

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"If the basics are right, if you can say: things are fine between us, then you can handle a lot. A lot of noise, but also a lot of silence." [3.1]	You must take the time to get the basics right in intensive collaborations. This can make the collaboration feel so much more natural.	Psychological resilience
"You are used to saying, I think this, I want that; this should be this, this should be that. But I first went for three quarters of an hour talking about his vegetable garden in France. And the last fifteen minutes I did business with him." [3.2]	Even if it does not sound hugely logical, businesses should occasionally start with silly dicking and gabbing. It is not guaranteed to work but can produce pleasant results if appropriately sensed.	(Building trust with) informality
"… They still talk, but only from behind body armour. Then I started slacking off and drinking a lot of coffee. Gradually the good atmosphere began to return." [3.3]	Working together is not always pleasant; you do not always have a choice. As with the previous quote, though, it can be worked on. Chatting (talking) is often the cheapest and best solution to mutual frustrations and flare-ups.	(Conflict recovery through) informality
"It is good to have moments where people can hear and listen to each other's perspective. Looking for dialogue with each other. Or debate, or discussion." [3.4]	There should always be room for conversation, understanding each other's feelings, ideas, and world views, and finding rapprochement.	Perspective-sharing
"Every project has its own unique dynamics. That depends on what you have to do, of course, but it also depends greatly on who you are working with. All people are different, of course, and they bring their own atmosphere with them."	Collaboration is shaped not only by the project's technical demands but by the interpersonal 'climate' generated by team members' personalities.	Interpersonal climate
"We do, but it is sometimes taboo in organisations to name your own failures. Of course, it is always easy to say that someone else is not doing a good job, but you have no control over that."	Fear of vulnerability inhibits honest reflection, as people find it easier to criticise others than to admit their own mistakes, which reduces collective learning.	Accountability taboo
"Of course, we had the death of the project manager - that was an intense period, though. We now have a new project manager again, so we are adjusting to each other, but that is also going well now."	Shifts in team leadership, particularly under traumatic circumstances, require resilience and adaptation, as teams must rebuild trust and rhythm.	Adaptive resilience
"I do think that, for example, for someone coming in, you do have to have a proper introduction. So that you are really introduced to everyone as it were."	Proper onboarding is framed as essential for creating comfort and integration, reducing the risk of alienation for new members.	Inclusion practice

"From a safe environment where you dare to say what you want to say. And that, of course, is also crucial. When you go home together to tell... Well, I say, hey, that one moaned. Well, yeah, that one came through again. Started talking about empathy again. But if you do that at home, then you get nothing out of it. Then we don't learn anything from it either. That's just dead in the pot."	A safe space for candid dialogue is vital for growth; venting in private without addressing issues openly prevents learning and resolution.	Psychological safety

Theme 4: Responsibilities

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"The environmental managers, who often have a very empathetic profile, understand how the world works and in the process also function as a kind of 'liaison' between the professionals and the outside world. Actually, you can see this as a bridge between the 'blue' inner world and 'normal' outer world, where there are real people with common problems and concerns." [4.1]	People like to point to other people regarding empathy, understanding and connection. Attaching a label to this, such as "blue", is relatively easy. People think they can assess how the other person is put together, without being able to substantiate this very well.	Connecting people
"In management, there are often people who are not empathetic. If you are not empathetic, you will not be charged. Especially if you have to go and make a fairly narcissistic decision." [4.2]	Again, this is about the bias of team members regarding a particular function. It involves an observation of how most managers are put together.	Stereotyping
"Understanding why an environment manager thinks something is different from a technical manager or contract manager. That also reflects social dynamics." [4.3]	Each role and function has its motivations. It takes some effort to understand this, but it starts with recognising their differences.	Perspective-taking
"I am ultimately responsible for the technical team. So I have had to make sure the right person is in the right place." [4.4]	This statement is not only about the qualities of team members but also about personalities. The question is whether this responsibility for the composition only needs to lie with one person.	Connecting people
"We all know that it is difficult and complicated, and that we may all have to make some sacrifices. But there is understanding, and there is no real mutual distrust."	Collective responsibility is reinforced by shared sacrifice, with trust preventing the emergence of destructive conflict despite challenges.	Collective responsibility
"I see that as my responsibility and that of the IPM team. We need to put the structure in place so that you can work on small pieces at a time to eventually get the job done."	Structural responsibility is framed as distributed across leadership teams, underscoring the need for incremental progress rather than top-down control.	Distributed responsibility
"Yes, communicating. That's what your research is about, I see. That's about communicating, speaking out, understanding each other. That's incredibly important. Questioning through, trusting. We need to know which path we are going to take. I think that will bring improvement, and we need to do that in the coming time."	Effective leadership is tied to continuous dialogue, clarity of direction, and trust-building, without which project improvement is unlikely.	Communicative leadership

"That is everyone's role. I think everyone should make the effort to get to know each other well. On the other hand, I also have to create certain conditions for it. We have weekly meetings with each other, but that is more on content and process, not cooperation. But you have to start facilitating that."	Responsibility for cooperation is shared, but leaders must also provide structures that make interpersonal connection possible.	Facilitated cooperation
"In my role, I have to influence that. You are a technical manager, so you have to monitor part of that scope and also you are responsible for it."	Role-based accountability requires managers to balance oversight with delegation, linking scope monitoring to responsibility.	Role accountability
"It's useful to understand a little bit of... What is your interest?"	Taking responsibility includes probing others' interests, since awareness of motivations helps prevent conflict and aligns decision-making.	Interest awareness

Theme 5: Function-specific Comments

Illustrative quotes from interviews	2nd-order construct	3rd-order construct
"It is not the president's responsibility. It's a shared responsibility." [5.1]	Even though many people seem convinced they want someone else in charge, it is everyone's responsibility to have an atmosphere and communication at a reasonable level.	Shared leadership
"A good principal gives space to the team. To be able to figure out for themselves how they are going to tackle it." [5.2]	A good example follows, even if everyone has to work for good cooperation. Moreover, certain things should not be imposed, but instead left to freedom.	Participative leadership
"I always call it the emotional bank account. There has to be a sufficient balance in that for everyone. That is necessary to also be able to collect something from each other." [5.3]	This is a statement made several times during the interviews. Occasionally, interpersonal bonding must be invested in as a buffer during challenging situations.	Resilience
"How do you interact with your colleagues? How will you make things together? The more complex and larger the project, the more attention should actually be paid to each other." [5.4]	The complexity of a project is often related to how intense and complex the collaboration is between project team members and stakeholders. Because of this added complexity, more attention must be paid to each other, so this statement is an extension of the emotional bank account.	Emotional capital
"I see that as my responsibility and that of the IPM team. We need to put the structure in place so that you can work on small pieces at a time to eventually get the job done."	Repeated emphasis on shared responsibility indicates a cultural push away from hierarchical authority toward distributed stewardship.	Shared stewardship
"The composition we have now has only existed for a month or so - that the team is complete and everyone is on-board. I still have to really work on that. I don't feel that's the case with everyone yet."	Newly formed teams require time and effort to bond; incomplete cohesion is acknowledged as a temporary but important challenge to address.	Team maturation
"I have to do something with this. At some meetings I chair, then you see these team dynamics. I also have a role in that and can intervene."	Leaders recognise their role in shaping group dynamics during meetings, balancing neutrality with timely interventions when necessary.	Dynamic stewardship
"The profession we're in - you have to know a little bit of everything."	Professional roles demand versatility, where breadth of knowledge is valued over deep specialisation, reflecting the interdisciplinary nature of the work.	Versatility
"Well, my role then is indeed to make sure that they use such a model to have the good	Tools and models are not ends in themselves but instruments to structure meaningful dialogue, showing how roles	Dialogue facilitation

conversation with each other about how we actually do it."	can focus on enabling constructive exchange.	

IV.   Reflection - June 2nd

This appendix contains the student's reflection on the graduation process. In a concise narrative, the student takes the reader through the stumbling blocks, boosts, and personal graduation experiences.

Academic Reflection

To begin with, the first part of the reflection will focus on the academic aspects of the MSc thesis. A particular academic level is required to graduate from TU Delft's Master's programme in Construction Management and Engineering. The student has some freedom in how this academic level can be achieved. A qualitative study was chosen in this case, where a specific theory is tested in a new situation (in this case, at IB Amsterdam).

I spent a long time searching for the right approach for this study, struggling to tie the knot. For a long time, I was not entirely convinced about the academic usefulness of this research. Until the interviews had begun. From then on, once the interviews had started, I discovered that people were nevertheless extremely interested in this research. Moreover, the fact that people working in the sector are encouraging this research is, in my opinion, a nice final push in the right direction to achieve a good result with full commitment.

There is still much ambiguity surrounding this study's exact approach; I expect this will become clearer as the interviews progress. Given that only four interviews have been conducted, with quite a few still to go, I am confident that this can eventually provide good guidance for the study.

However, this research method leaves some uncertainty about when sufficient information exists to complete the results. The interviews following 3 June will reveal when that point is reached. It was also concluded that, at first glance, this research method is a nice and straightforward way of conducting research; practice shows that there are still quite a few challenges ahead. Fortunately, the aim remains to have all the interviews conducted within the next four weeks, leaving sufficient time to process the results.

Personal Reflection

Next, a more personal take on the process. The first few months were a whirlwind of ideas, along with peaks and troughs on many fronts. Starting with the subject matter. Empathy started as a mega-interesting topic for me to broach, but I gradually discovered it is enormously challenging to capture. This has been one reason why it was sometimes mentally challenging to continue working correctly on my thesis. Constantly searching for the correct wording, sufficient literature, and enthusiasm from within myself sometimes took much energy.

This is one of the reasons I feel that I am not yet convinced that I have everything well underway. The momentum is not there yet, even though the first interviews are starting to change that. This makes me very confident that things will start rolling soon, when the results of the interviews start trickling in. This also makes it a very instructive process, with more frequent trial and error than I have experienced before in other courses and large projects.

Something I find quite lacking in this is collaborating with fellow students. Usually, that is the best motivation for me to submit deadlines on time. Now that I am alone, I muddle until the last moment before the deadline. Of course, this brings me back to a very instructive point: stepping outside my comfort zone and being more strict with my set deadlines.

As a result, I took a different approach: sitting at my desk strictly and only on weekdays, between 9 am and 5 pm, in search of rhythm and structure. It has not yet had the desired effect, but I have resolved to keep trying this. This is also partly due to the relatively long days I work when travelling to Amsterdam. With a travelling time of over an hour and a half each way, this takes much more energy than a day working in Delft.

Fortunately, there are also advantages to the days I can be found in Amsterdam. I am closer to the people and matters related to my research. Moreover, getting in touch with the right interviewees is easier, and I can quickly spar with project team members. With the bonus of travel time, I can reflect on the day and the thesis, or dream away on my own with a book or the landscape racing by – the perfect moment of reflection.

Conclusion

All in all, there are many things to learn during graduation. While I am still searching for the academic aspects of graduation, I have experienced much personal growth. The thesis has forced me to learn and deal with new sides of myself. I am starting to see more and more how important that aspect of a thesis is, and I try to put a positive spin on it. In the coming months, it will probably be a process of trial and error as well, but I have high hopes that it will all land on its feet.

V.   Reflection – July 25th

Academic reflection

Later in the process, just like with the previous reflection, doubts continue to arise. Which research question fits this topic best? Which questions should I ask during the interviews? It is remarkable that this can change on a daily basis, until everything has to come together on paper.

I am proud of what you now have before you. It took blood, sweat and tears, and it's not perfect yet, but it contains all the elements that I think this thesis needs. I hope that you, as a reader, feel the same way. On an academic front, it was great fun to discover a new way of researching: interviewing. This was a research method that I hadn't really used before in my student days. And I happen to find social issues extremely interesting. Some interviews were perfect; talking endlessly about someone's experiences and absorbing everything. Very often, just nodding was enough to let the other person continue talking until I had enough information to move on and draw conclusions.

It's really nice to have a little more freedom in how interviews can be interpreted in qualitative research. Because of the qualitative aspect, it was what was said that counted, not how many times something was mentioned. Now I just have to wait and see if the end result counts.

Personal reflection

Towards the end of the project, emotions have changed. Whereas on 2 June there were still many doubts about the project, the process and its outcomes, we are now moving towards the end. All the pieces of the puzzle are starting to fall into place. After completing all the interviews, the Cruciale Mijl project team needs clarity. It is excellent that it has taken shape after many ups and downs. The highs were the interviews, where I enjoyed asking the team members about the project, their needs and their views on the collaboration. I found this by far the most enjoyable part of the research. Moreover, the lows were the long days spent sitting at the laptop, trying to get all the results on paper and with fewer social stimuli. Of course, both are part of the job.

Processing interviews takes much time; extracting the correct information is a puzzle. Nevertheless, putting that into nice figures and tables to compare statements is fun. Adding aspects other than pure text was a nice boost; the product looks more attractive.

Now, the time has almost come to present the results. See if we can wrap it up nicely in September, and I hope it leads to a great result. The diamond still feels rough around the edges, so I hope to have perfected everything into a beautiful product after a few weeks.

It is both good and bad that I do not get stressed easily. Even a week before the deadline, I did not feel much pressure until suddenly, three days before, I could not tear myself away from my laptop. Working hard, wanting to get everything done, while the days before, I was staring into space. Is it a learning experience? Well, it is helping me get to know myself better.

VI.   Final Reflection – September 5th

Now that I am finishing the process, there is more tension and uncertainty than I had expected beforehand. Many insights come to mind; there are many doubts about when the report will be sufficient, and above all, it is hard work. It is very frustrating that this is happening in the final phase of the thesis; is this part of the process?

Of course, a huge weight was lifted from my shoulders after getting the green light. This was a sign of confidence from the committee that it could be completed. And yet it caused my doubts to increase. Suddenly, large parts of the report had to be rewritten, but how on earth was I going to do that?

Let's start with the introduction. List where the problem comes from. What do I want to address? What tools do we need for this? Based on these questions, go through the entire thesis again. A big challenge, but of course it had to be done. Before the big deadline of 5 September. Now that the last words are being written, we can look back on an interesting period. Interesting because of the whole learning process. The process of trial and error, and the process of constantly having to make choices. That happens to be one of my worst traits.

But what went well? From my perspective, I think the interviews were the most enjoyable and interesting part of the process. Trying to make the link between the literature and the professional world. Having interesting conversations with a wide range of people who all have something different to say about their experiences of collaborating at an interdisciplinary level. Linking that to the literature I found turned out to be the biggest challenge.

And yet I succeeded. Here it is. My master's thesis. It still needs to sink in, but apparently, I did it. I hope that a week later, I can be proud of the result and defend it well during the defence. These are the last words I will write about it. I am proud to be completing my career at TU Delft with this.