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Empathic Ability as a Driver for Project Management

Guus Keusters *, Marcel Hertogh, Hans Bakker, Erik-Jan Houwing

Delft University of Technology, Stevinweg 1, 2628 CN Delft, the Netherlands

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ABSTRACT

Empathy is receiving increasing attention as it can contribute to the collaboration and connectedness required for today's global challenges. A similar trend reveals itself at the scale of project management, given the change from technological to integration-driven challenges in projects. The necessary integrated approach affects the key competencies sought in project team participants. Since empathy enhances one's feeling for and understanding of the project participants' interests, it could support the integration assignment. Therefore, focusing on the Dutch civil engineering industry, this study investigated whether the project team's empathic ability drives project performance. The results suggest a positive correlation between the team's empathic abilities and performance. Additionally, the study provides insights into the industry's current level of empathic ability, prompting the conclusion that there is room to improve performance by increasing the project teams' empathic abilities.

1. Introduction

The existence of empathic skills in humans can be explained from an evolutionary perspective and the need to collaborate and understand other's interests to survive. The growing interconnectedness of societies and systems calls for collaboration and connection to tackle today's global challenges. This development drives increased attention to empathy to counter the focus on self-interest and individualism (De Waal, 2019). The same challenge of connection and integration reveals itself within today's project management as growing interdependencies and contrary interests characterise projects. Civil engineering projects in particular are increasingly driven by the need to collaborate and integrate a growing number of interests and parties (Demirkesen & Ozorhon, 2017; Leclère, 2020). Therefore, it is generally valuable to explore the interaction between empathy and project performance and particularly focus on civil engineering projects.

An important driver for increasing integration is the need to merge urban mitigation and adaptation strategies to address climate change and realise the sustainable development goals (IPCC, 2022). These transitions introduce new spatial claims and types of land use, especially in urbanised deltas. Where civil engineering is defined as the design and construction works serving the public domain, such as transportation infrastructure and water management, civil engineering projects are concerned with the built environment and play a crucial role in these transitions. Integrating project goals related to the transitions introduces new project functions, e.g. adapting to drought, flooding, heat stress or biodiversity, which need to be integrated with enduring and more traditional ones, such as mobility (Hertogh, 2013; Visser, 2020). As a result, the civil engineering project's problem definitions are becoming increasingly complex, reflected in the growing number of contradicting stakeholder interests that need to be adopted and integrated (De Schepper, Dooms & Haezendonck, 2014; Maddaloni & Davis, 2017). Meanwhile, more and new disciplines are introduced in the projects and need to be integrated at a lower level of abstraction of the project processes. Additionally, civil engineering projects suffer from a history of poor performance and have found it hard to achieve predefined goals in terms of costs, time and quality (Flyvbjerg, Bruelius & Rothengatter, 2013; Locatelli, Invernizzi & Brookes, 2017), further emphasising the need to improve. In short, due to integration challenges, managing civil engineering projects is becoming increasingly complex, while performance is already a struggle.

While many variables influence project performance, the competencies of the team's participants have been broadly identified as a crucial factor for project performance in the literature (Bakker & de Kleijn, 2014). Research focuses on the critical role of project management and leadership competencies (Nicholas & Steyn, 2017; Toor & Ofori, 2008). In addition, the team's competencies have also been identified as an important factor for performance (Scott Young, Georgy & Grisinger, 2019). While the characteristics of civil engineering projects are subjected to the integration of a growing, dynamic context, competencies to adopt the context of the project problem and integrate it into the problem definition and the solution have become essential to

* Corresponding author at: Delft University of Technology, Stevinweg 1, 2628 CN Delft, The Netherlands.
E-mail address: a.c.a.m.keusters@tudelft.nl (G. Keusters).

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project success. Recognition of the impact of this development on the team's competencies is crucial (Moradi, Kähkönen & Aaltonen, 2020).

Empathy is defined as a person's ability to feel, understand and share another person's world with self-other differentiation (Hakkanson Eklund & Summer Meranius, 2021). It is often described as stepping imaginatively into the other's shoes to gain an understanding of feelings and perspectives. Although it is often confused with sympathy, it differs where it does not allow the observer to develop personal emotions. The empathic ability has an affective (experiencing, feeling) and a cognitive (understanding) dimension, which are intertwined (Gerdes, Segal & Lietz, 2010). Empathy is related to the project manager's tasks and competencies essential for project success, such as communication, collaboration, and trust (Solares Menegazzo, Cruz-Ortiz, Ortega--Maldonada & Salanova, 2015). Moreover, empathy is acknowledged as an important ability to adopt the needs and emotions of the user in the design process and to foster performance (Heylighen & Dong, 2019), especially in product design and architecture. These disciplines are characterised by high human interaction and context integration by nature. On the other hand, since empathy occurs mainly between individuals and is affected by in-group bias, it involves the risk of prioritising individual interests over best-for-project. Moreover, it could hinder an attitude of decisiveness and determination, which is also critical in project management (Bloom, 2018).

Empathy will be most effective during project stages that place high demands on interpersonal interactions and when understanding mutual interests is crucial. This is especially the case in the integrated design process, which we define in this study as the course of human activities whereby an existing situation is transformed into a plan for a new one in order to satisfy needs, including and balancing the interests of all parties and disciplines involved (Keusters, Bakker & Houwing, 2022). The positive correlation between this process and project performance has been demonstrated (Chan, Scott & Chan, 2004; Doloi, 2013; Love, Sing, Carey & Kim, 2015), and the importance of the design process is growing, given its increasingly collaborative and interdisciplinary character (Koutsikouri, Austin & Dainty, 2008).

The increasing need for adopting and integrating project context, stakeholder interests, functions and disciplines also links the empathic ability to today's engineering project performance. After all, and more generally, experiencing and understanding the feelings, needs and interests of stakeholders, the participants of the adjacent disciplines and colleagues in the project team could facilitate adopting the project context, defining the design problem and finding the best possible solution, consequently improving performance.

Although correlations between empathy, design processes and performance have generally been discussed, the interaction between the team's empathic abilities and the performance of engineering projects has not yet been investigated in detail. Furthermore, no quantitative data are available on the empathic abilities of project teams or their relationship with performance. Therefore, the research question guiding this study is whether the empathic ability of the participants of the integrated design team is a relevant variable affecting the project performance, where the study's context concerns civil engineering projects.

This mixed-method study comprised eight representative projects in the Dutch civil engineering industry. It is the first study that used quantitative data on the team's empathic abilities to investigate its relationship with project performance and delivers initial insights into the empathic abilities in the industry today. Additionally, it proposes guidelines for improving the performance of projects by focusing on empathy, given its increasingly integrative character.

2. The interaction between empathy, the integrated design process and project performance

Empathy is subject to different views and interpretations, and reassessments of claims on human social interactions are ongoing (Mezzenzana & Peluso, 2023). Scholars agree that empathy is the ability to have an emotional response to another's emotional state and reflect on that by perspective-taking. De Waal (2012) considers cognitive perspective-taking a secondary development built around more elementary mechanisms, such as state-matching and emotional contagion. As such, empathy can be interpreted as an emerging element in human-related factors crucial for project management, given the increasing number of participants and their conflicting interests in projects.

Common ground in the concept of empathy can be found when focusing on empathy related to managing design processes and performance. Empathising in a design process comprises entering, discovering and immersing in the user's world and interest, connecting to resonate with the user and finally detaching to take appropriate action. Kouprie and Sleeswijk-Visser (2009) described a process of "*wandering around*" in the user's world, stepping in to gain a deep understanding and stepping back to take competent action. In this process, empathic behaviour manifests itself by connecting, listening, openness and willingness to feel and understand the other or even non-human stakeholders (Talgorn & Ullerup, 2023).

The self–other distinction is an important aspect of empathy. Although the process of empathising induces similarity between the feelings one experiences oneself and those expressed by others, Decety and Lamm (2006) stress the importance of avoiding self-other confusion. Empathy is predominantly other-orientated, which is where it differs from sympathy. Sympathy concerns the other's well-being, whereas the goal of empathy is to understand and feel the other person's experiences (Wispe, 1986). Sympathy refers to 'relating' and allows the observer to have his own emotion as a response to the other's emotion, while empathy relates to 'knowing' and does not allow the observer to develop his personal emotion. The self-other differentiation promotes empathy to an applicable concept in a professional and competitive setting.

Empathy cannot be considered an all-or-nothing phenomenon. First, someone's empathic abilities depend on one's empathic horizon, which can be defined as the individual's range of understanding of and empathy for user experiences in different contexts, such as background, culture, age and gender. McDonagh-Philp and Denton (2000) argue that expanding one's horizon is a never-ending process if actively considered, implying an expanding ability to empathise with increasing age. Next, the literature has demonstrated that empathy is affected by in-group bias, which means that it is easier to empathise with group members or familiar individuals (De Waal, 2012; Decety & Lamm, 2006). Although this implies a lack of empathy for out-group individuals, it can be activated by outsiders. Finally, someone's emotional state, engagement in or commitment to the project can also affect someone's level of empathy (Kouprie & Sleeswijk-Visser, 2009). Although the positive effects of empathy have been widely endorsed, some limitations have also been raised. Bloom (2018) attributes rational competencies to humanity above all. Therefore, he considers empathy-based and individual-orientated decision-making in the here and now inferior to human rational decision-making.

The empathic abilities of the project team participants can contribute to performance via the integrated design process in two ways (Keusters, Batelaan, Sleeswijk-Visser, Houwing & Bakker, 2023). Firstly, a sound design problem definition is essential (Cross, 2001). This requires a deep understanding of the project's context. It is suggested that the designer's ability to feel and understand the other's interests and concerns about the project will enhance adopting the project context, accurately defining a design problem definition, and finding solutions. The understanding of context applies at different levels of abstraction of the design process. At the higher levels of abstraction, the project context is mainly dominated by the stakeholders affected by the project. At this system level, feeling and understanding their concerns and interests is crucial and has become a key managerial challenge (Unterhitzenberger, Wilson, Bryde, Rost & Joby, 2021; Witmer, 2019). At the lower levels of abstraction, the integration of disciplines governs the design process. The empathic ability of the project participants to feel and understand

the concerns and interests of the participants of the adjacent disciplines or parties could help define the design problem at the component level and consequently find the best solutions (Baiden & Price, 2011). So, empathy could support mutual understanding and the adoption of interests and perspectives at any level of the integrated design process.

Secondly, empathy supports the performance of a group or team with the same characteristics and interests by fostering collaboration and creating an emotionally safe working atmosphere where people feel free to share their ideas and concerns (Miyashiro, 2011; Roberge, 2013). By viewing integrated design teams as groups that perform through social processes (Bucciarelli, 1988), empathy could also enhance the performance of civil engineering project teams. The relationship between high-performing teams and transformative leadership and the mediating role of empathy is demonstrated in the literature (Socas, 2018; Solares Menegazzo et al., 2015; Toor & Ofori, 2008). Moreover, the literature relates empathy to other factors essential for project management and success, such as communication, collaboration, trust and human interaction (Köppen & Meinel, 2015; Moradi et al., 2020; Valente, 2016). Thus, empathy could be part of a tangle of mutually dependant, human-related factors affecting team performance, project management, leadership, and project performance.

The hypothesised positive correlation between empathy, the integrated design process and project performance is visualised in the research model in Fig. 1. Being a comprehensive process and closely interacting with several other critical processes in project management, the positive correlation between the design process and performance is evident and demonstrated in the literature (see Section 1). Where the literature tends to the positive effects of empathy on design processes and (team) performance, downside effects or possible over-representation of empathy also need consideration, since they might introduce a lack of a best-for-project attitude, decisiveness and determination.

Project performance can be defined in many ways and depends on the participant's perspectives (Koops, 2017; Kylindri, Blanas, Henriksen & Stoyan, 2012). Besides the well-known iron triangle success criteria (cost, time, quality; Nicholas & Steyn, 2017), stakeholder satisfaction has become a critical success criterion. The public character of civil engineering projects implies large numbers of heterogeneous and increasingly assertive stakeholders, such as politicians, residents, or interest groups, affecting or affected by the project and contributing to the project's social complexity (Davis, 2014; Westerveld, 2003). Finally, the importance of health and safety during construction and the total project life cycle has grown over the past decades (Silva, Warnakulasuriya & Arachchige, 2019). Therefore, in this study, we defined project performance as the extent to which predefined goals related to cost (1), time (2), quality (3), safety and health (4) and stakeholder satisfaction (5) are achieved. These criteria rule the civil engineering projects and Economically Most Advantages Tender (EMAT) criteria of today's tenders in the Netherlands.

The performance of the integrated design process is determined by the extent to which the predefined budget (cost (a) and time (b)) related to the design process are met. Additionally, the extent to which the process is disrupted (by integrating stakeholder interests (c) and interface issues (d)) and the quality of the design product (related to the stakeholders (e) and interface issues (f)) are used as success criteria. Criteria c) to f) refer to the aforementioned integration challenges of the design process at the stakeholders' and discipline levels.

3. Research methods

This study investigated eight projects where the level of empathic ability, the performance of the integrated design process and project performance were measured. While empathic abilities and (to some extent) performance can be measured quantitatively, the interactions between the variables can only be verified qualitatively, given the complex and human character of the subject under study. As such, the research is characterised as a mixed method multiple case study, where the quantitative data enriches the qualitative data. Fig. 1 shows the research methods used.

The cases were selected in the Netherlands based on a broad variety of project sizes (contract value €25–800 million), owners (12 different authorities, with some projects having several owners), contractors (10 different companies, with some projects being awarded to joint ventures consisting of several contractors), types of integrated contract (Design & construct (#4), Design Build Finance & Maintain (#1), 2-phase contracts (#2), Design & Construct Alliance contract (#1)) and project scope (comprising flood defences, railway works, road works, viaducts, bridges, tunnels or combinations). As such, the projects and the project teams were considered representative of the Dutch civil engineering industry.

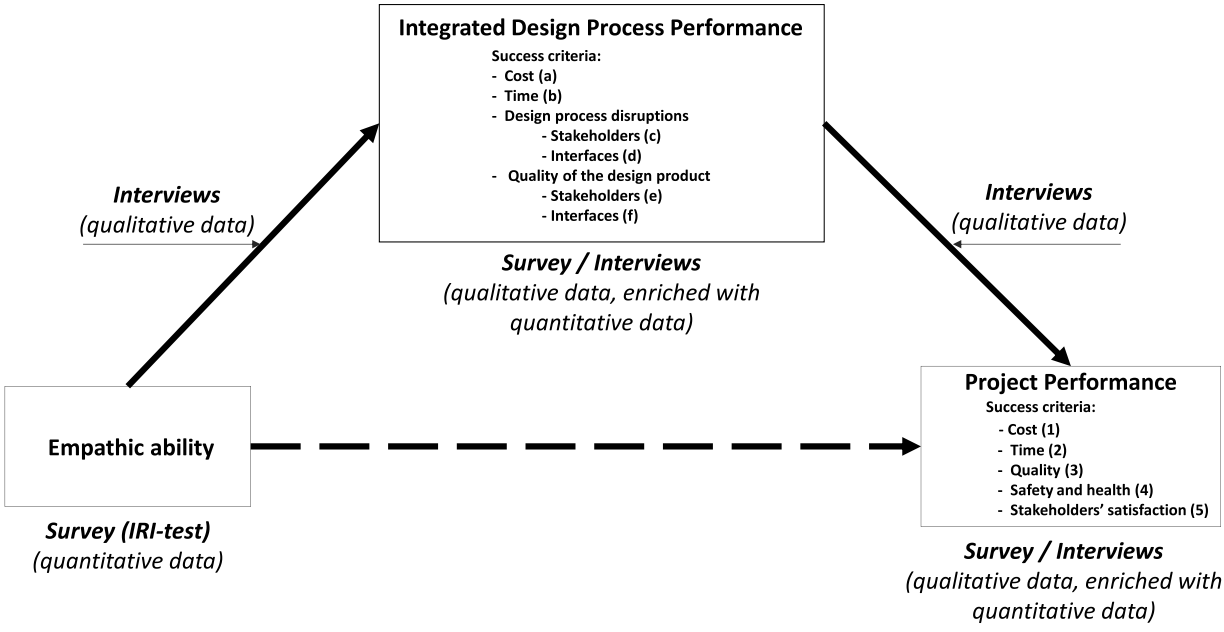


Fig. 1. Research model and research methods.

Although several methods are available to measure empathic abilities, such as observational methods and neurological scans, self-report tools are most used as they provide valuable and easily accessible data. This study applied the most commonly used Interpersonal Reactivity Index (IRI) of Davis (1980). The IRI-test has the advantage of the availability of a Dutch version, the validity and reliability of which have been demonstrated for measuring empathic tendencies. (De Corte et al., 2007). In addition, the index provides insights into the affective and cognitive abilities of the participants by measuring a total empathy score that consists of four sub-scale scores: Fantasy (FS), Perspective-taking (PT), Empathic-concern (EC) and Personal-distress (PD). PD and EC assess the affective dimension of empathy, while PT represents the cognitive dimension. FS is assigned to the cognitive (Ewin, Chugh, Muurlink, Jarvisd & Lucke, 2021) and the affective dimension (De Corte et al., 2007).

For each subscale, participants were asked to answer seven questions on a five-point scale, from 0 (does not describe me well) to 4 (describes me very well). Additionally, characteristics of the respondents were collected, such as age, gender, discipline and the number of team participants they supervised. Finally, the respondents were asked to score their perception of the project's complexity related to integrating stakeholder interests and disciplines. These variables were supposed to drive complexity and possibly moderate performance.

All participants interacting with the integrated design process received an invitation to participate in the survey, which was conducted based on anonymity following the guidelines of the Delft University of Technology ethics committee. The analysed sub-groups were chosen such that individuals could not be identified. In total, 462 participants responded to the survey, representing an average response of 50% across the eight projects. 86% of all respondents were men, representing the Dutch civil engineering sector (CBS, 2021). 82% of the respondents represented a contractor, which can be explained by the fact that the responsibility for the design scope of the integrated contracts mainly rested with the contractor in the cases.

Subsequently, the integrated design process and project performance were measured through semi-structured interviews. In total, 33 interviews were conducted, three to six interviews per project, with the owners' (#17) and contractors' (#16) key actors of the projects and the integrated design process, such as project managers, contract managers, technical managers and design managers. Three of them were women. The interviews lasted approximately one hour and consisted of two parts. In the first part, the interviewees were asked to score the project performance with performance criteria see Fig. 1) on a scale from 0 (very poor performance) to 4 (very high performance). Each score was defined as objectively as possible to make the scores of the interviewees comparable across the projects. The interviewees had the opportunity to explain their scores. Finally, considering all performance criteria, the interviewees were asked to score the overall project performance on a scale from 0 to 4. This score was considered a assessment in which all criteria were subjectively weighted.

Likewise, the interviewees assessed the performance of the integrated design process. They were asked to score criteria a) to f) (see Fig. 1) on a scale from 0 to 4. Finally, they had to score the overall performance of the integrated design process on a scale from 0 to 4, subjectively weighting all criteria.

The second part of the interviews focused on the interaction between project performance, the integrated design process and the empathic ability of the team, aiming to determine whether empathy was amongst the dominant variables affecting performance. The interviews unfolded based on two open-ended questions:

1. What were the dominant factors affecting the project performance criteria?
2. What were the dominant factors affecting the performance criteria of the integrated design process?

The data analysis was based on interview reports validated by the interviewees. First, each interview was mined to find the dominant factors, after which they were aggregated per case. Parallel to this analysis, the interview reports were coded. Quotations referring to the same phenomena were coded as concepts potentially relevant for theory-building. The concepts were ranked based on the highest groundedness. A theory regarding the interaction between empathy and performance could be derived from the main concepts and their interconnectedness (Corbin & Strauss, 2014). Atlas TI software was used to structure and analyse the data. The dominant factors influencing performance were tested against the main concepts and found to correspond in all cases.

Finally, for each case, the interview data analysis was merged with the quantitative empathy and performance data analysis to arrive at conclusions regarding the interaction between empathy and performance. A cross-case analysis was then conducted to draw general conclusions on the relationship between empathy and performance and to build a theory on how empathy influences performance.

4. Results

4.1. Levels of the empathic ability of the sample

Since the sample is considered large and representative, it can provide insights into the current empathic abilities of the civil engineering construction sector. Therefore, it is valuable to analyse the sample in addition to the interaction between empathy and the performance of the cases. Fig. 2 shows the levels of the teams' empathic abilities and the average level of empathic ability across all eight cases. In addition, the figure shows a level of empathic ability derived from a literature study by Keusters et al. (2023), comprising 4184 respondents without specific characteristics, such as control groups. Therefore, this level, which is based on a 50/50 split between men and women, is considered a reference to facilitate comparison.

The figure indicates that the levels of empathy vary across the 8 cases (between IRI=51.8 and IRI=57.9). Furthermore, the average level of empathy across the cases (IRI=55.3, marked black) was relatively low compared to the reference level from the literature (IRI=63.3). Zooming in on the data, we notice the striking differences between the empathy levels of men and women, both from the sample of this study (women IRI=64.0, men IRI=54.7) and from the literature review (women IRI=67.5, men IRI=59.1). Although the sample's relatively poor levels of empathic ability can be partly explained by the overrepresentation of men (84%), both women and men in the sample scored lower than the averages from the literature.

The cognitive empathic dimension (PT) of the sample scored higher than the literature reference (sample IRI=17.7, literature IRI=16.6), whereas the affective dimension (EC + PD) scored lower (sample IRI=26.1, literature IRI=30.3). So, the relatively low affective abilities of the project teams' participants are a key driver of the low overall scores. The sample also scored lower on the fantasy (FS) dimension (sample IRI=12.2; literature IRI=16.4).

The distribution of the empathic abilities across age and supervising roles of the project teams is worth mentioning, see Fig. 3. The empathic abilities show a declining trend with age, contrary to expectations based on literature insights, suggesting that more life experiences could extend someone's empathic horizon (McDonagh-Philp & Denton, 2000). Since the characteristics of the age categories are comparable, the conclusion could be that a generation with higher empathic abilities is entering the sector, or the sector is unable to retain people with more empathic skills. Additionally, the figure indicates that the empathic abilities decrease as respondents supervise more employees. This is considered remarkable since the literature demonstrates the importance of empathy-related skills for people with management roles. Correspondingly, respondents of the project management discipline scored below the sample's average (IRI=53.8, $N = 41$, N_{female}=3 (7%)).

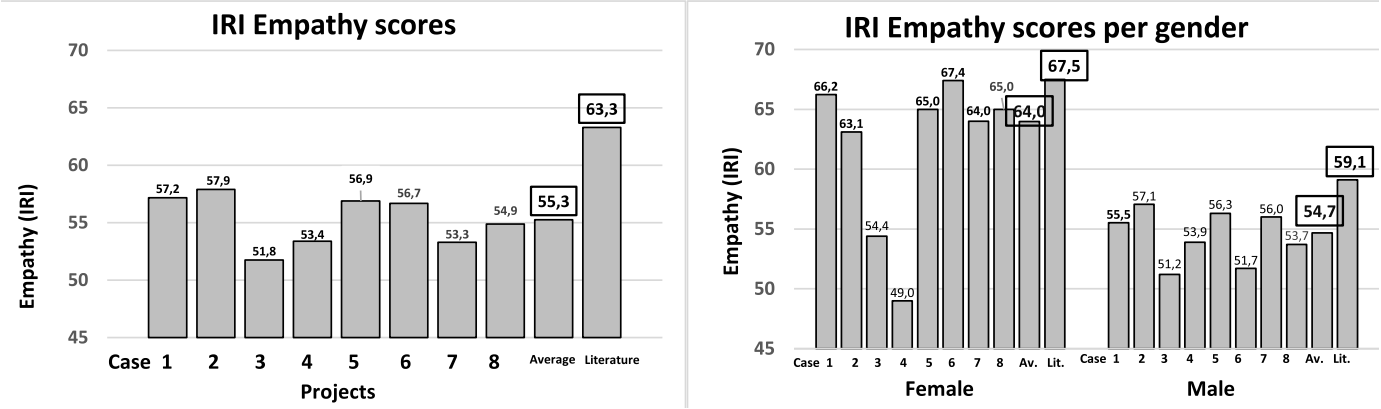


Fig. 2. Levels of the empathic ability of the eight cases and a reference level of empathic ability from a literature review (Keusters et al. (2023)).

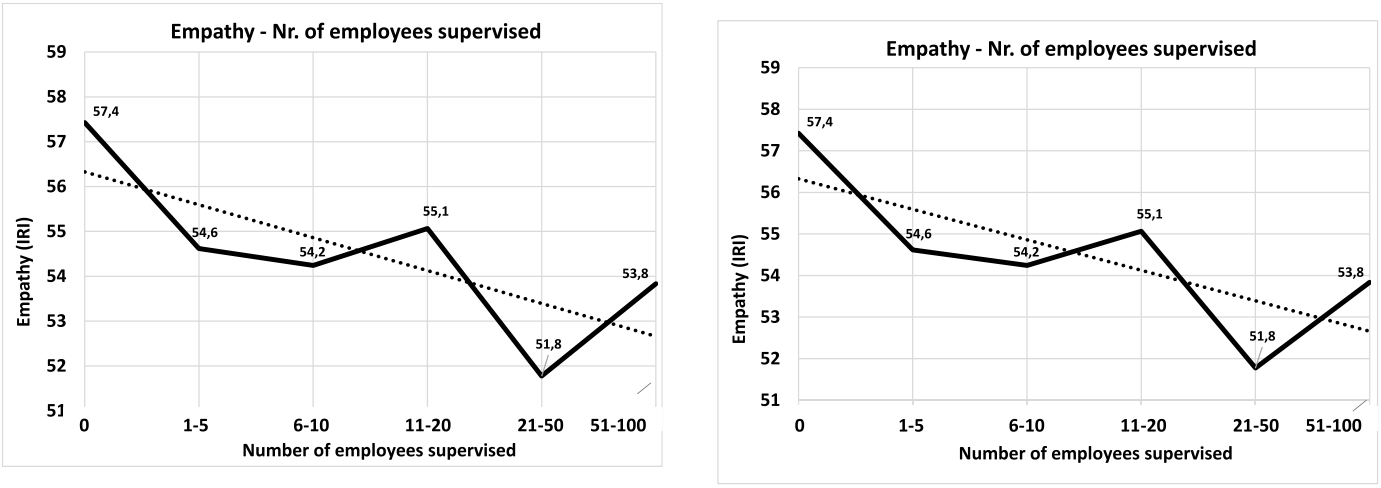


Fig. 3. Levels of empathic ability with age and number of participants supervised.

4.2. Quantitative data analysis

The quantitative data analysis assessed relationships between the empathic ability scores, the integrated design performance scores and the project performance scores. Initially, relationships from the quantitative data were verified by plotting the levels of empathic ability and performance scores. The interviews revealed different perspectives on the performance between the owner and the contractor. Given their separate budgets for the projects, this was considered natural for the cost criterion. However, other criteria were also considered from different viewpoints, with owners being more demanding concerning stakeholder satisfaction and quality and contractors focusing on costs, safety and time. For this reason, the data analysis was split between the owner's and the contractor's perspectives.

First, Fig. 4 suggests a relationship between the overall performance of the integrated design process and project performance, which aligns with the theory (Koutsikouri et al., 2008; Love et al., 2015). Next, the figure shows the scores and linear trend lines of the empathic abilities and the overall performance scores of the contractors' and owners' teams. Both from the perspective of the contractor and the owner, weak relationships appeared between the level of empathic ability and the overall performance of the integrated design process and the overall project performance. However, given the number of cases and the spread of the data, the correlations are not significant. The cost and time performance criteria indicated similar weak, non-significant relationships with performance. For the other project performance criteria (quality, safety, stakeholders' satisfaction), no clear relationships could be determined from the quantitative data. The integrated design performance criteria (cost, time, disruptions and quality) suggested positive correlations with empathy, but none could be classified as significant. Since the owner of Case 5 had no participants involved in the integrated design team, no owner empathy measurement was available for this case.

The interviews were experienced as open and transparent and revealed the complexity of objectively assessing performance. Apart from the owners and the contractors having different perspectives, the criteria were also assessed differently within the owner and contractor teams. One of the reasons was that factors outside the team's sphere of influence were identified as impacting performance, such as unrealistic budgets or time schedules allocated to the project before the project team under study was involved. These exogenous factors seemed to be differently accounted for in the scores by the interviewees. Additionally, the construction phase had just started for some projects, meaning the respondents could only share performance forecasts rather than make objective assessments.

As a result, it was concluded that the hypothesis could not be tested purely quantitatively. For this reason, an additional analysis was performed in which the quantitative performance scores were enriched with the qualitative data from the interviews by considering the interviewees' explanations of the scores, the outlined project context and the measured project complexity. By doing so, the project performance and the performance of the integrated design process were categorised into high, average or low performance levels, see Table 1. Based on these classifications, an overall performance category was aggregated per

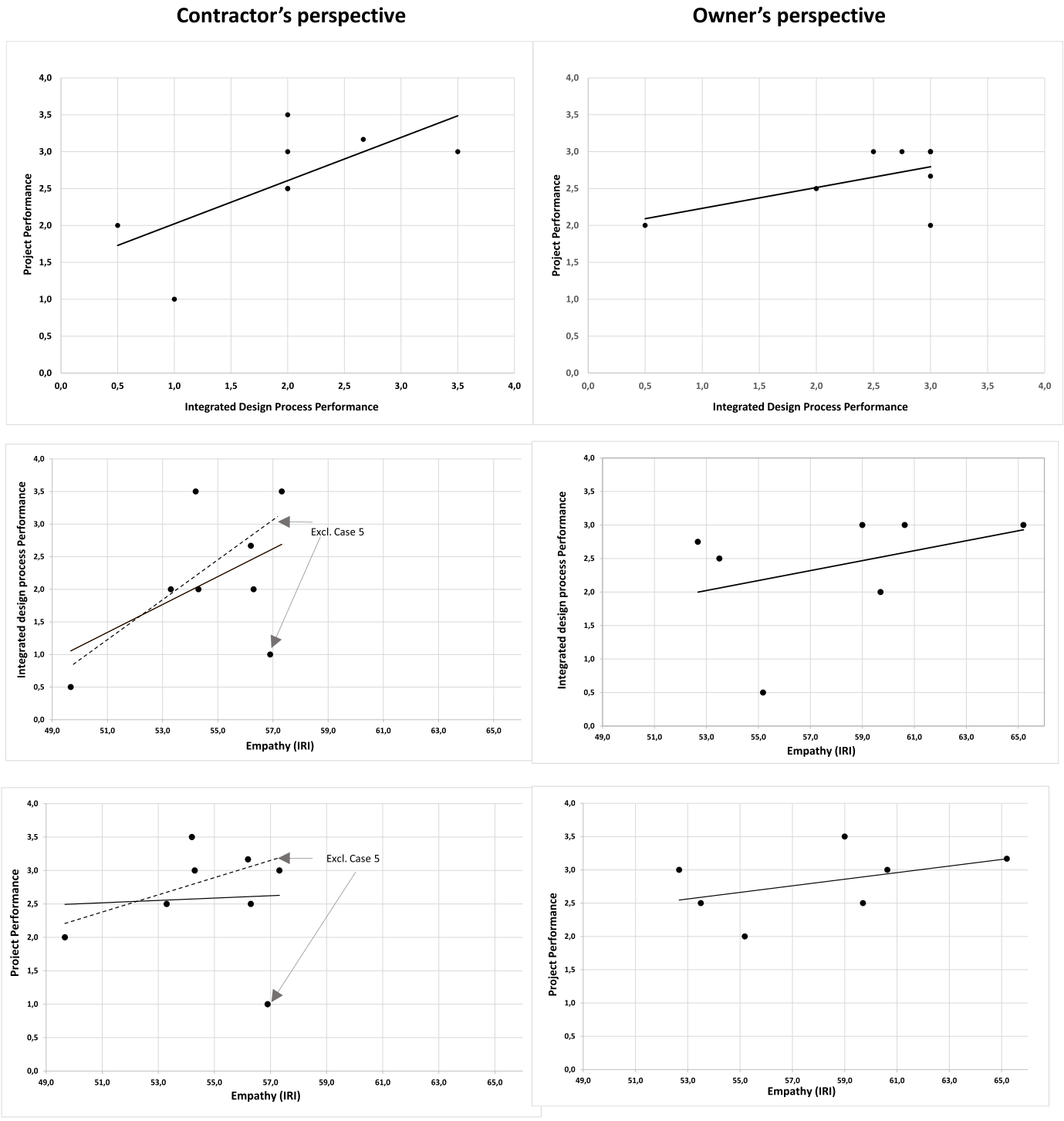


Fig. 4. Linear trendlines of relationships between levels of empathic ability and performance based on quantitative data.

case. Seeing as project performance matched integrated design process performance in most cases, the resulting aggregated score was evident for most cases. Performance categories differed from the contractor's perspective in case 4 and the owner's perspective in cases 1, 4 and 7. For these cases, the overall performance category was based on the additional interview data.

The same categorisation was applied to the levels of empathic ability, classifying the cases into categories of high, average or low levels of empathic ability. Subsequently, the empathic ability and performance levels could be compared for each case. Table 1 shows the results regarding the relationship between empathy and performance.

If the performance and empathy categories matched (High-High, Medium-Medium, Low-Low), the case was considered to confirm the hypothesis. Case 5 shows high levels of empathic ability and low performance, indicating that the hypothesis should be rejected. If the case presented a combination of high and average or low and average categories, the hypothesis was confirmed to some extent and subject to a full qualitative analysis to draw final conclusions.

From the contractor's perspective, five cases confirmed the hypothesis, two confirmed the hypothesis to some extent, and one (case 5) refuted the hypothesis. From the owner's perspective, the hypothesis was confirmed for four cases, while the hypothesis was confirmed to

Table 1
Categorisation of levels of empathic ability and performance (based on performance scores enriched with interview data) and hypothesis verification per case.

Case	Contractor			Owner			Hypothesis confirmed or rejected
	Quantitative Are empathy and performance scores aligned	Qualitative Are dominant factors related to empathic abilities?	Hypothesis confirmed or rejected	Quantitative Are empathy and performance scores aligned	Qualitative Are dominant facrors related to empathy?	Hypothesis confirmed or rejected	
1	Yes	Yes	Confirmed	Yes	Yes	Confirmed	Confirmed
2	Yes	Yes	Confirmed	Yes	Yes	Confirmed	Confirmed
3	Yes	Yes	Confirmed	Yes	Yes	Confirmed	Confirmed
4	Yes	Yes	Confirmed	To some extent	Yes	Confirmed	Confirmed
5	No	To some extent	Rejected	–	To some extent	–	Rejected
6	To some extent	Yes	Confirmed	Yes	Yes	Confirmed	Confirmed
7	Yes	Yes	Confirmed	To some extent	Yes	Confirmed	Confirmed
8	To some extent	Yes	Confirmed	To some extent	Yes	Confirmed	Confirmed

some extent for three cases, pending qualitative analysis.

4.3. Qualitative data analysis

The qualitative data from the second part of the interviews were used to investigate the dominant factors that affected the performance of the integrated design process and project performance and whether these factors interacted with the teams' empathic abilities. First, in all cases, the interviewees confirmed the positive correlation between the integrated design process performance and project performance. Then, the dominant factors for project performance overlapped with those determining the integrated design process performance. The factors indicated by the interviewees were aggregated to form the three dominant factors per case, see Table 2.

The table generally shows three dominant categories (A, B and C), all related to empathic behaviour, as described hereafter. One category (D) includes items not related to empathy. The categories are substantiated by a selection of quotations from the interviewees referring to their experiences in the project, which are shown in '*italics*' and were translated from Dutch into English.

4.3.1. An integrated design process approach

The interviewees indicated the importance of '*integral considerations and integral motivating the decisions, to arrive at the best-for-project solution.*' '*This requires a team that wants to merge and not only thinks from its own world. So, it has to do with people; it is the people who do it in this process.*' '*People need to listen to each other, talk to each other, understand each other.* '*An integrated nature of the team promotes collaboration and requires empathy. So, for the overall result of the project, it helps to be more empathic*'. As inhibitors for integrality, '*Different cultures, lack of connection, inability to think beyond the parties' own interests*' were indicated.

Empathy is considered a competence that supports understanding other disciplines' problems or interests and consequently supports integration and performance. Listening, understanding and talking to each other are considered expressions of empathic behaviour.

4.3.2. A proper problem definition and verification process

A recurring issue was the lack of a sound design problem definition (the specifications), causing scope and contractual discussions delaying the entire planning. To determine the problem definition, '*one needs to understand the context very well, be able to build a relationship. … That requires much effort from people. It tends towards empathy. Do you understand the other person's behaviour, do you ask the right questions?*' '*The team constantly has to ask itself the question: "Does this provide a good product for the user… beyond the interests of each party?"*' Defining and interpreting the problem definition is a wicked challenge, introducing the inevitable iterative design process. However, '*the designers determining the requirements are far from flawless. If they could not properly capture what the stakeholders really want, meeting the requirements will not necessarily imply the quality of the design is good.*' '*Do you understand what the other person is doing? Do you understand that, and do you ask the right questions about it? Ask questions: "What is bothering you?"*'

Adopting the project context and being able to feel and understand the emotions and interests of the stakeholders is important for a good design process and project performance. Empathy contributes to defining an accurate design problem. As such, this category appeared in four cases and is therefore considered relevant. Asking questions, thinking beyond the parties' interests, understanding, and capturing what the stakeholders really want are expressions of empathy.

4.3.3. Competencies for team collaboration, shared understanding of interests

Collaboration and team composition related to collaboration were amongst the three dominant factors in all cases. Behaviour or abilities related to empathy and supporting collaboration were frequently reported during the interviews. '*Within the management team, we needed to be sensitive to each other, be open and empathise with each other's world.*' '*Shifting into the role, interests and points of view of the other.*' '*Good collaboration requires being open in what is bothering you and putting yourself in the other person's shoes.*' '*Paying attention to each other… being and staying connected.*'

Mutual understanding was mentioned as an important condition for collaboration. Moreover, it was stressed that it was not self-evident and required additional effort. '*Organisations have to truly understand each other to come together.*' '*It requires empathy to understand why [-] reacts in a certain way.*' '*We had the patience to reflect on those interests by asking questions.*' '*When one says that the collaboration is good, the question arises: "How is the empathy? Do we really understand each other?" That is often not the case. We settle for good relationships, but empathy is something else. Empathy is not the same as interacting and communicating pleasantly.*' Empathy-related behaviour, such as understanding, shifting into the other's role, connecting, and giving attention, were identified as playing a role in collaboration.

Table 2 shows that, for seven cases, two or three dominant factors affecting performance were related to expressions and behaviour referring to empathic abilities. The interviewees of these cases confirmed the positive correlation between empathy and the integrated design process performance and project performance. In case 5, the interviewees proposed other dominant factors such as ownership, cost awareness and risk management.

4.4. Merging quantitative and qualitative analyses

The combined results of the quantitative (Table 1) and the qualitative analyses (Table 2) are presented in Table 3. The qualitative and the quantitative analysis confirmed the hypothesis for cases 1, 2 and 3. Therefore, for these cases, the hypothesis could definitively be confirmed. For case 5, the quantitative analysis ran counter to the hypothesis. The qualitative analysis confirmed that empathic abilities were

Table 2
Dominant factors affecting the integrated design process performance and project performance.

Dominating factors for project performance and performance of the integrated design process	Case							
	1	2	3	4	5	6	7	8
A: Integrated approach of the design process	**Integrated approach** of the design process and the **Verification process**	**Integrated approach** of the design process	**Integrated approach** of the design process	**Integrated approach** of the design process		**Integrated approach** of the design process	**Integrated approach** of the design process	**Openess** (open communication)
B: A proper problem definition and verification process			Proper **problem definitio**n and specifications	Proper **problem definitio**n and specifications			Proper **problem definitio**n and specifications	Proper **verification process**
C: Competencies for collaboration and shared understanding of interests	Competencies related to **Team Collaboration** **Team composition** balanced related to empathy, "getting things done" mentality, knowledge	Competencies related to **Team Collaboration**	Competencies related to **Collaboration** in a alliance type of contract and contractual conditions	Competencies related to **Team Collaboration** and **Mutual Understanding**	Competencies related to **Team collaboration** and **Integrated approach**	**Shared understanding** of problem definition and assignment	**Shared expectations and understanding** of the assignment and collaboration	**Team composition** (balanced related to openess / empathic and "getting things done" mentality)
D: Other		**Contract**, providing E**arly Contractor involvement** and an integrated approach			**Risk Management / Cost awareness** **Ownership**	**Processes** fit for the assignment / technology and experience above processes		
Hypothesis: The dominant factors for performance relate with empathic abilities.	**Confirmed**	**Confirmed**	**Confirmed**	**Confirmed**	**Rejected**	**Confirmed**	**Confirmed**	**Confirmed**

Table 3
Combination of the results of the quantitative and the qualitative analysis and the verification of the hypothesis per case.

Case	Contractor			Owner			Hypothesis confirmed or rejected
	Quantitative Are empathy and performance scores aligned	Qualitative Are dominant factors related to empathic abilities?	Hypothesis confirmed or rejected	Quantitative Are empathy and performance scores aligned	Qualitative Are dominant facrors related to empathy?	Hypothesis confirmed or rejected	
1	Yes	Yes	Confirmed	Yes	Yes	Confirmed	Confirmed
2	Yes	Yes	Confirmed	Yes	Yes	Confirmed	Confirmed
3	Yes	Yes	Confirmed	Yes	Yes	Confirmed	Confirmed
4	Yes	Yes	Confirmed	To some extent	Yes	Confirmed	Confirmed
5	No	To some extent	Rejected	–	To some extent	–	Rejected
6	To some extent	Yes	Confirmed	Yes	Yes	Confirmed	Confirmed
7	Yes	Yes	Confirmed	To some extent	Yes	Confirmed	Confirmed
8	To some extent	Yes	Confirmed	To some extent	Yes	Confirmed	Confirmed

not linked to the dominant performance factors in this case, although empathy-related factors did affect performance.

For cases 4, 6, 7 and 8, the qualitative analysis confirmed the hypothesis, but the quantitative analysis confirmed the hypothesis only to some extent, either on the side of the contractor or the owner. The analysis hereafter combines the quantitative and qualitative interview data to arrive at final conclusions per case.

4.4.1. Case 4

In case 4, the owner's level of empathy was relatively low, while performance was average. The interviews revealed that design process disruptions were caused by a poor problem definition and deficient stakeholder management, resulting in delays and scope changes. Since the owner was responsible for stakeholder management and the resulting design specifications, the issues could have been caused by the owner's poor empathic ability, limiting the attention paid to the stakeholders. As several of the factors influencing performance identified by the interviewees were linked to empathy, both in a positive and a negative sense, it was concluded that levels of empathy had a positive correlation with performance.

4.4.2. Case 6

In case 6, all performance and empathy scores were average, apart from the contractor's level of empathy, which was just slightly above average. For this case, a 2-phase contract was applied with a joint owner-contractor team during the first phase. The interviewees indicated that this team had to grapple with an unrealistic budget from the beginning of phase one, negatively affecting performance (especially the cost and time criteria). The team did not manage to overcome the budget issue, which was attributed to a lack of integrality and shared understanding of the project goals. The interviews confirmed that the lack of empathic abilities could have played a role here. While the contractor's level of empathic ability scored only slightly above average, higher empathic abilities could have helped to solve the difficult budget problem. Since the qualitative analysis revealed the role of empathy in the process and the quantitative analysis did not contradict the interaction, a correlation between empathy and performance was confirmed for case 6.

4.4.3. Case 7

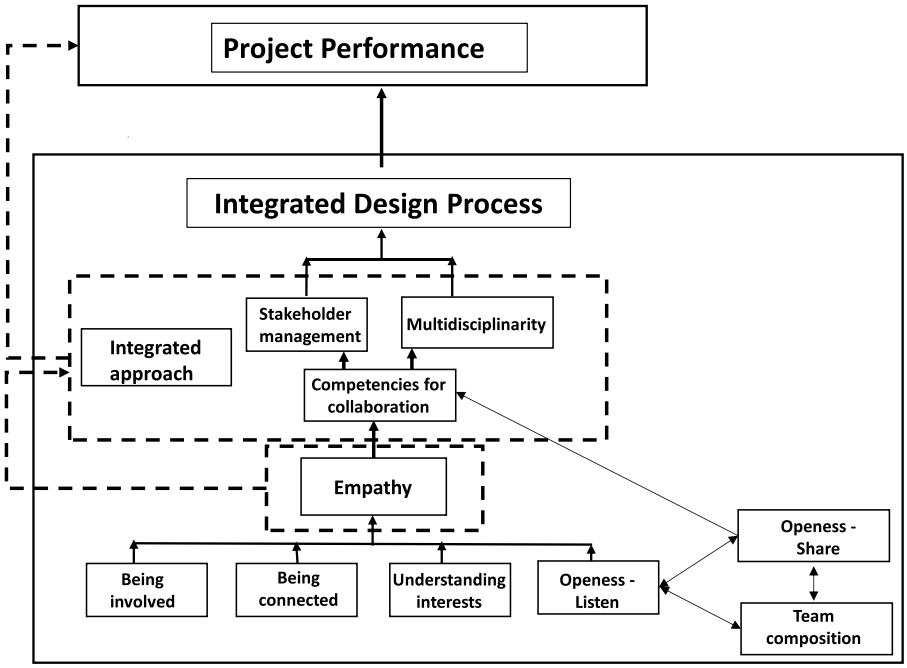
By the time the interviews and the survey of case 7 were conducted, construction had started, but the design phase had not yet been finalised. At that time, the performance scores were forecasted as average. However, the contractor and the owner mentioned project risks caused by a lack of mutual understanding of the consequences of scope changes and contractual issues that had not yet been settled. The owner scored relatively low on empathy, and although the contractor's empathic ability was average, it was the second lowest of the eight cases. The lack of mutual understanding of contractual positions and interests was linked to the relatively low empathic abilities of the teams. Both parties acknowledged the risks this implied for the project. Therefore, it was concluded that case 7 demonstrated a correlation between the empathic abilities of the team and performance.

4.4.4. Case 8

In case 8, the empathic abilities of the owner and the contractor were average, while performance scores were higher than in any other case. Diving deeper into the data, the difference between the relatively poor empathic ability of the construction management team (IRI=47.3; $N = 6$) and the relatively high empathic ability of the project management and the design management team (IRI=60.1; $N = 7$) is remarkable. The positive effects of this difference on performance were confirmed by the interviews, where the project success was explained by the project management and design management team's willingness to share problems and to work closely together, resulting in mutual understanding. At the same time, the project also benefited from the "getting things done" attitude of the construction management team, which could have benefited from relatively poor empathic abilities. In several cases, it was revealed that an optimal team composition consists of members with higher levels of empathy for project management, stakeholder management and design management roles, while participants with lower empathic abilities would do better in construction roles. In summary, it was concluded that an optimal distribution of empathic abilities across the team fostered performance, confirming a correlation between empathy and performance.

Fig. 5 reflects the results of the process of coding and theory-building on how empathy interacts with performance. The figure includes the concepts with the highest groundedness across the eight cases. The relationships were built up based on relatively high code co-occurrences of the concepts. The figure shows that the integrated approach of the design process is crucial for project performance and is determined by the extent to which stakeholder interests and disciplines are integrated into the process and the solution. The team's competencies, specifically empathic abilities, are important for the extent to which the team collaboratively arrives at an integrated approach. Expressions of empathic behaviour are listening, willingness to understand the other's interests, connection (talking to each other, being in contact) and involvement with team participants and other parties' participants. Sharing, interpreted as being open to proactively sharing one's interests and issues, was often mentioned as important for success (third highest groundedness). This concept is not considered part of empathic behaviour and was introduced as a crucial counterpart to being open to listening. The importance of balancing between empathic listening and proactively sharing one's problems and feelings was emphasised, reflected in the balanced team composition concept, which also scored relatively high.

The concepts seem to point towards cognitive empathy (understanding, listening, connecting), rather than affective empathy (feeling), which aligns with the results of the IRI-test. It also underpins that the interviewees referred to (cognitive) empathy rather than sympathy,



Nr.	Concept	Grounded
1	Integrated approach	81
2	Collaboration	79
3	Openess - share	69
4	People's competencies for interaction	55
5	Openess - listening	53
6	Being connected	52
7	Understanding	51
8	Design problem definition	48
9	Team composition	46
10	Interests	38
11	Talk to each other	38
12	Contract	37
13	Being in contact with	33
14	Trust	33
15	Sharing problems, knowledge	25
16	Having shared expectations / goals	23
17	Stakeholder management	23
18	Knowledgeable	22
19	Verification and Validation	22
20	Being involved	19

Fig. 5. Overview of relationships between performance, the integrated design process and empathy, and the top twenty concepts with the highest groundedness.

which is more superficially concerned with others and focuses on one's own emotions.

5. Discussion

The cross-case analysis based on the results presented in Table 3 reveals that the hypothesis could be confirmed for seven out of eight cases. Therefore, referring to the research question, this study suggests a relevant correlation between the team's empathic abilities, the integrated design process performance and project performance. Consequently, empathy emerges as a vital human-related factor in today's project management. The growing relevance and the currently relatively low levels of empathic abilities of project teams can be explained by the increasingly integrative character of civil engineering projects which is new for the sector and requires competencies that were less called upon until now. Empathic abilities contribute to the integration challenges of contemporary and future projects by enhancing the mutual deep understanding of interests. Furthermore, the interview data confirm the interaction between empathy, leadership and team collaboration as argued in the literature (Moradi et al., 2020). This study indicates in particular potential regarding the project managers' empathic abilities, given their relatively low scores, and their crucial role in leadership and performance.

Generally, the study indicates relatively low levels of empathic ability in the sector. In addition, women outscore men on empathic abilities. Consequently, performance could be improved by increasing the levels of empathic ability of the project teams, particularly by increasing the currently low gender diversity. The positive role of gender diversity in project teams is demonstrated in the literature and is based on women's focus on cohesiveness and collaboration (Baker, Ali & French, 2019). This study substantiates the positive role of gender diversity from an empathy perspective.

The interview data also revealed that the distribution of empathic abilities across the team needs to be taken into account because empathic abilities are considered beneficial for collaboration between parties and the integration challenges but might be counterproductive for less integrative tasks or during the construction phase when a "getting things done" attitude is more effective. The concepts of "Openness–Share" and "Team Composition" seem to refer to the downside effects or overrepresentation of empathy in project teams and point to the need for a balanced and targeted use of empathy to contribute to performance. Furthermore, it is noted that the type and intensity of peoples' emotions can affect project decision-making (Svensson & Pesämaa, 2018). It can be argued that high empathic abilities could recognise true emotions and that the perspective-taking dimension provides additional assurance to an appropriate response. However, more research is needed to investigate how empathy moderates the type and intensity of emotions for decision-making in project management.

The generalisation of the study's conclusions depends on the context of the cases. Some considerations need to be discussed in this respect. In case 5, the empathic abilities of the team were not a dominant factor for performance, as the interviewees considered poor risk management, low cost-awareness and lack of ownership more decisive for the poor performance. The project's complexity related to integrating stakeholders' interests and multidisciplinarity scored the lowest of all cases. Where the research model assumed integration as a main driver of current project complexity, it seems the project could not benefit from the team's relatively high empathic abilities since the integration challenges were limited, making other factors more dominant for performance. As such, the study suggests a certain level of integration, i.e. integrating stakeholder interests and disciplines, necessary for empathy to support performance.

The data were collected in the Dutch culture, which can be classified as feminine and long-term orientated. In a project-based setting, this culture prioritises collaboration and builds relationships and trust (Hofstede, Jonker & Verwaart, 2010). In such a culture, reflected in the qualitative data (see Fig. 5), empathic abilities can find a breeding ground and enhance performance relatively easily, which might not be the case in cultures or types of contracts focusing less on collaboration and relationships.

Finally, the interviewees indicated human-related behaviour such as involving, connecting, listening, collaborating, understanding, and trusting as supportive of integration and performance (see Fig. 5). The process of empathising described in Section 2 (entering, discovering and immersing the user's world; Kouprie & Sleeswijk-Visser, 2009) refers to this behaviour. Therefore, the study's results introduce empathy as a factor in the field of mutually interacting human-related variables affecting performance. As such, a positive correlation between empathy

and performance could have been found through mediating variables other than the integrated design process, such as collaboration, which the interviewees confirmed. This interplay between empathy and other human-related factors (e.g. collaboration, trust) needs further study.

6. Conclusion

This study confirms the importance of integration in today's projects and suggests that the project team's empathic abilities could contribute to an integrative approach and the performance of projects. This is a relevant conclusion in the realm of project management. Specifically in civil engineering, the transitions related to climate change and biodiversity and their interaction with the built environment will increase the need for integration. The current empathic abilities of the civil engineering sector are relatively low compared to the reference values from the literature, mainly caused by below-average affective abilities. Consequently, in practice, there is room to potentially improve project performance by increasing the empathic abilities of the teams. Given their relatively low empathic abilities and their crucial role in leadership, the focus should be on the project managers. Since women tend to have higher levels of empathic ability than men, this study also contributes to substantiating the effectiveness of gender diversity in projects, especially when women occupy more management positions. In addition, the integration challenge in projects can be supported by enhancing in-group empathy of disciplinary teams through the use of processes and tools focusing on mutual understanding and exchanging one's interests and concerns.

The study is the first to combine quantitative data on empathic abilities with qualitative data to establish a relationship with performance. This has led to initial insights into the relationship between empathy levels and performance in projects and the distribution of empathic abilities across teams. The generalisation of the results is determined by the study's context, of which, in particular, the integrative nature of the projects and the Dutch culture of civil engineering projects, focusing on collaboration and relationships, enabled the positive effects of empathy. More study is needed to gain insights into the role of empathy beyond this study's context, the desired levels of empathic abilities to support performance, and the interplay with other human-related factors.

CRediT authorship contribution statement

Guus Keusters: Writing – original draft. **Marcel Hertogh:** Writing – review & editing. **Hans Bakker:** Writing – review & editing. **Erik-Jan Houwing:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Baiden, B., & Price, A. (2011). The effect of integration on project delivery team effectiveness. *Internation.al Journal of Project Management, 29*, 129–136.

Baker, M., Ali, M., & French, E. (2019). The impact of women's representation on performance in project-based and non-project-based organizations. *International Journal of Project Management, 37*, 872–883.

Bakker, H., & de Kleijn, J. (2014). *Management of engineering projects: People are key*. The Netherlands: NAP - The Process Industry Competence Network.

Bloom, P. (2018). *Against empathy*. London: Vintage.

Bucchiarelli, L. (1988). An ethnographic perspective on engineering design. *Design Studies, 9*(3), 159–168.

CBS, (2021)., *De arbeidsmarkt in cijfers*, Centraal Bureau van de Statistiek, Den Haag.

Chan, A., Scott, D., & Chan, A. (2004). Factors affecting the success of a construction project. *Journal of Construction Engineering and Management, 130*(1), 153–155. https://doi.org/10.1061/(ASCE)0733-9364(2004)130:1(153)

Corbin, J., & Strauss, A. (2014). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage Publications Inc.

Cross, N. (2001). Design cognition: Results from protocol and other empirical studies of design activity. In C. Eastman, W. Newstatter, & M. McCracken (Eds.), *Design knowing and learning: Cognition in design education* (pp. 79–103). Oxford: Elsevier.

Davis, K. (2014). Different stakeholder groups and their perceptions of project success. *International Journal of Project Management, 32*, 189–201.

Davis, M. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology, 10*.

De Corte, K., Buysse, A., Verhofstadt, L., Roeyers, H., Ponnet, K., & David, M. (2007). Measuring empathic tendencies: Reliability and validity of the Dutch version of the interpersonal reactivity index. *Pyschologica Belgica, 47*(4), 235–260.

De Waal, F. (2012). The antiquity of empathy. *Science (New York, N.Y.), 336*, 874–876.

De Waal, F. (2019). *The age of empathy*. Souvenir Press.

Decety, J., & Lamm, C. (2006). Human empathy through the lens of social neuroscience. *The Scientific World Journal, 6*, 1146–1163.

Demirkesen, S., & Ozorhon, B. (2017). Impact of integration management on construction project management performance. *International Journal of Project Management, 35*, 1639–1654.

De Schepper, S., Dooms, M., & Haezendonck, E. (2014). Stakeholder dynamics and responsibilities in public-private partnerships: A mixed experience. *International Journal of Project Management, 32*, 1210. –1210.

Doloi, H. (2013). Cost overruns and failure in project management: Understanding the roles of key stakeholders in construction projects. *Journal of Construction Engineering Management, 10*, 267–279.

Ewin, N., Chugh, R., Muurlink, O., Jarvisd, J., & Lucke, J. (2021). Empathy of project management students and why it matters. *International Conference on Project Management /HCist - International Conference on Health and Social Care Information Systems and Technologies 2020 - Procedia Computer Science, 181*, 503–510.

Flyvbjerg, B., Bruelius, N., & Rothengatter, W. (2013). *Megaprojects and risks: An anatomy of ambition*. Cambridge, UK: Cambridge University Press.

Gerdes, K., Segal, E., & Lietz, C. (2010). Conceptualising and measuring empathy. *British Journal of Social Work, 40*(7), 2326–2343. https://doi.org/10.1093/bjsw/bcq048

Hakkanson Eklund, J., & Summer Meranius, M. (2021). Toward a consensus on the nature of empathy : A review of reviews. *Patient Education and Counseling, 104*(2), 300–307.

Heyligen, A., & Dong, A. (2019). To empathise or not to empathise? Empathy and its limits in design. *Design Studies, 65*, 107–124. https://doi.org/10.1016/j.destud.2019-.10.007

Hertogh, M. (2013). *Connect and renew, inaugural speech*. Delft University of Technology.

Hofstede, G., Jonker, C., & Verwaart, T. (2010). Cultural differentiation of negotiating agents. *Group Decis Negot, 21*, 79–98. https://doi.org/10.1007/s10726-010-9190-x

IPCC. (2022). In P. R. Shukla, J. Skea, R. Slade, A. Al K hourdajie, R. van D iemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, & J. Malley (Eds.), *Climate change 2022: Mitigation of climate change. contribution of working group iii to the sixth assessment report of the intergovernmental panel on climate change*. Cambridge, UKNew York, NY, USA: Cambridge University Press. https://doi.org/10.1017/9781009157926.010.

Keusters, G., Bakker, H., & Houwing, E. (2022). Improving the performance of civil engineering projects through the integrated design process. *Journal of Engineering, Design and Technology, ahead-of-print*(ahead–of–print). https://doi.org/10.1108/-JEDT10-2021-0519

Keusters, G., Batelaan, F., Sleeswijk-Visser, F., Houwing, E., & Bakker, H. (2023). The potential of the empathic ability for the performance of civil engineering projects. *Journal of Engineering, Design and Technology, ahead-of-print*(ahead–of–print). https://doi.org/10.1108/JEDT-08-2022-0431

Koops, L. (2017). *Creating public value - Optimizing cooperation between public and private partners in infrastructure projects*. Hilversum: De Toekomst.

Köppen, E., & Meinel, C. (2015). Empathy via design thinking: Creation of sense and knowledge. Ed's. In H. Plattner, C. Meinel, & L. Leifer (Eds.), *Design thinking research* (pp. 15–28). Switzerland: Springer.

Kouprie, M., & Sleeswijk-Visser, F. (2009). A framework for empathy in design: Stepping into and out of the user's life. *Journal of Engineering Design, 20*(5), 437–448.

Koutsikouri, D., Austin, S., & Dainty, A. (2008). Critical success factors in collaborative multi-disciplinary design projects. *Journal of Engineering, Design and Technology, 6*(3), 198–226.

Kylindri, S., Blanas, G., Henriksen, L., & Stoyan, T. (2012). Measuring project outcomes: A review of success effectiveness variables. In *MIBES Proceedings, 25-27 may 2012, Larissa* (pp. 212–223).

Leclère, D. (2020). Bending the curve of terrestrial biodiversity needs an integrated strategy. *Nature, 585*, 551–556. https://doi.org/10.1038/s41586-020-2705-y

Locatelli, G., Invernizzi, D., & Brookes, N. (2017). Project characteristics and performance in Europe: An empirical analysis for large transport infrastructure projects. *Transportation Research Part A*, 108–122.

Love, P., Sing, C., Carey, B., & Kim, J. (2015). Estimating construction contingency: Accommodating the potential for cost overruns in road construction projects. *Journal of Infrastructure Systems, 21*(2). https://doi.org/10.1061/(ASCE)IS.1943-555X.00002

Maddaloni, F., & Davis, K. (2017). The influence of local community stakeholders in megaprojects: Rethinking their inclusiveness to improve project performance. *International Journal of Project Management, 35*, 1537–1556. https://doi.org/10.1016/j.ijproman.2017.08.011

McDonagh-Philp, D., & Denton, H. (2000). User-centred design and the focus group: Developing the student designer's empathic horizons. In R. Kimbell (Ed.), *Design and Technology International Millennium Conference* (pp. 111–116). Wellesbourne: The D&T Association.

Mezzenzana, F., & Peluso, D. (2023). *Conversations on empathy, interdisicplinary perspectives on imagination and radical othering, introduction*. London: Routledge, Taylor & Francis.
Miyashiro, M. (2011). *The empathy factor*. Puddle Dancer Press.
Moradi, S., Kähkönen, K., & Aaltonen, K. (2020). Project managers' competencies in collaborative construction projects. *Buildings, 10*(3), 50. https://doi.org/10.3390/buildings10030050
Nicholas, J., & Steyn, H. (2017). *Project management for engineering, business and technology*. Routledge, Taylor & Francis Group.
Roberge, M. (2013). A multi-level conceptualization of empathy to explain how diversity increases group performance. *International Journal Business of Management, 8*, 122–135.
Scott Young, C., Georgy, M., & Grisinger, A. (2019). Shared leadership in project teams: An integrative multi-level conceptual model and research agenda. *International Journal of Project Management, 37*, 565–581. https://doi.org/10.1016/j.ijproman-2019.02.002
Silva, S., Warnakulasuriya, B., & Arachchige, B. (2019). A scale for measuring construction project success. *Studies in Business and Economics, 14*(1), 245–258.
Socas, J. (2018). Empathy: The key ingredient for better leadership. *International Leadership Journal, 10*(1), 98–110.
Solares Menegazzo, J., Cruz-Ortiz, V., Ortega-Maldonada, A., & Salanova, M. (2015). Positive Institutions and their relationship with transformational leadership, empathy and team performance. *Multidisciplinary Journal for Education, Social and Technological Sciences, 2*(2), 38–64.
Svensson, M., & Pesämaa, O. (2018). How does a caller's anger, fear and sadness affect operators' decisions in emergency calls? *International Review of Social Psychology, 31* (1), 1–7. https://doi.org/10.5334/irsp.89
Talgorn, E., & Ullerup, H. (2023). Invoking 'empathy for the planet' through participatory ecological storytelling: From human-centered to planet-centered design. *Sustainability, 15*, 7794. https://doi.org/10.3390/su15107794
Toor, S., & Ofori, G. (2008). Leadership for future construction industry: Agenda for authentic leadership. *International Journal of Project Management, 26*, 620–630.
Unterhitzenberger, C., Wilson, H., Bryde, D., Rost, M., & Joby, R. (2021). The stakeholder challenge: Dealing with challenging situations involving stakeholders. *Production Planning & Control, 32*, 926–941. https://doi.org/10.1080/09537287.2020.1776907
Valente, F. (2016). Empathy and communication: A model of empathy development. *Journal of New Media and Mass Communication, Conscientia Beam, 3*(1), 1–24.
Visser, J. (2020). *Creating new perspectives by integrating frames through design*. Gildeprint.
Westerveld, E. (2003). The project excellence model: Linking success criteria and critical success factors. *International Journal of Project Management, 21*, 411–418.
Wispe, L. (1986). The distinction between sympathy and empathy: To call forth a concept, a word is needed. *Journal of Personality and Social Psychology, 50*(2), 314–321.
Witmer, A. (2019). An ethnographic justification for establishment of a contextual engineering discipline. *Journal of Engineering, Design and Technology, 18*(2), 389–413.