CHALMERS
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Data-Informed Decision-Making within Construction

Definition, Practices and Challenges

Master's thesis in Design and Construction Project Management

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ABSTRACT

The construction industry has historically relied on experience and intuition rather than structured data when making decisions, despite increasing digitalisation and growing access to data. At the same time, the industry continues to face recurring challenges such as delays, cost overruns and projects failing to meet expectations. This study investigates how decision-makers within a large Swedish contractor define and use data-informed decision-making, as well as the barriers and opportunities associated with its implementation. A qualitative research design with an abductive approach was adopted, based on 15 semi-structured interviews with employees from different roles and departments within the case company. The empirical findings were analysed using thematic and narrative analysis and interpreted in relation to decision theory and existing literature on data use in construction. The findings show that data-informed decision-making is primarily viewed as a situational process in which data and human judgement are combined, where data is used to support, verify and challenge human judgement when evaluating alternatives and making decisions, rather than replacing it. The study also identified opportunities to improve decision-making through better utilisation of existing data and increased use of data on historical outcomes and processes. The findings suggest that such improvements could strengthen decision-making in several ways. However, structural, cultural and knowledge-related barriers were found to limit the implementation of more data-informed practices. The study concludes that data-informed practices have the potential to strengthen decision-making within the studied organisation, but that realising this potential depends on addressing organisational barriers rather than simply increasing the amount of available data.

Key words: Data-informed decision-making, construction industry, decision-making, digitalisation, human judgement, bounded rationality, data utilization, barriers, construction management, Swedish construction.

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Simon Kollberg & John Karlsson
Gothenburg, June 2026

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1 Introduction

This chapter provides a background on decision-making within the construction industry, with a specific focus on data-informed practices and their potential to improve project outcomes. The chapter then presents the aim of the study, the research questions, the company collaboration and the delimitations.

1.1 Background

Decision-making plays a key role in organisations and society, as individuals continuously make decisions that influence processes, outcomes and future development. Research within decision theory has therefore long focused on understanding how decisions are made and how decision-making can be improved through different forms of support and information. With the increasing availability of data and digital technologies, new opportunities have emerged to support decision-making processes through more data-based approaches (Elragal & Elgendy, 2024; Dufva & Dufva, 2019).

Some industries have become increasingly data-intensive in recent years and thereby strengthened their decision-making processes, but there are still some industries that remain characterized by older ideas and processes. One of these industries is the construction industry, that to this day bases their decisions more on human judgments in the form of experience and intuition rather than data (Elkhayat et al., 2024; Love et al., 2023). Whether this more cautious approach to data-related decisions is beneficial or not for the construction industry is hard to say, as decision-making in the construction industry is a highly complex process that requires understanding of human values and unreliable conditions (Lawani et al., 2023). For example, the industry involves decisions with significant architectural values, where an understanding of aesthetics and design is essential (Ekici et al., 2019). Furthermore, construction is a labour-intensive sector in which understanding of people's needs and emotions is critical (Lawani et al., 2023). On top of that, the construction sector is highly sensitive to macro effects such as geopolitical situations and statesmanship (Gupta et al., 2026). These aspects are difficult to support without human perspectives and are therefore challenging to replace with data alone (Love et al., 2023).

Despite this even the construction industry has developed towards more data-informed decision-making processes in recent years (Li et al., 2023). Perhaps not at the same rate as other industries, but examples of data-informed decision-making in construction are the implementation of BIM (Building Information Modeling) in design methodology, as well as the growing use of large databases to manage administrative processes and decision-making (Radman et al., 2025; Li et al., 2023). So, although the construction industry has progressed more cautiously in its digital transformation compared to other sectors, there is an increase in the adoption of data when making decisions (Li et al., 2023).

Studies have shown that data-informed practices have improved decision-making and overall performance in several industries (Elragal & Elgendy, 2024). Research has also identified potential benefits within the construction industry from a broader implementation of data-informed decision-making (Li et al., 2023).

At the same time, the construction industry is characterised by frequent delays and budget overruns, particularly within the Swedish construction sector, where projects

often fail to meet expectations (Chapman, 2025). Such shortcomings may create financial and operational challenges within construction firms, while also contributing to inefficient use of public resources and reduced societal value from construction projects (Eliasson, 2025). These issues highlight the need for improvements in areas such as decision-making within the construction industry, while the potential benefits associated with data-informed decision-making underline the relevance of further research within the field.

Existing studies often focus on digital tools or technology adoption in isolation, rather than on how decision makers interpret, evaluate, and integrate data into their professional judgement. This lack of conceptual clarity and empirical insight makes it relevant to investigate how data-informed decision-making is currently defined and practiced in the Swedish construction industry. Furthermore, since decision-making in other industries has evolved and, to some extent, improved through the use of data as a complement to human judgement, the question arises whether the construction industry can mitigate the number of projects not meeting the expectations by developing more data-informed practises into their existing decision-making practises.

1.2 Aim and research questions

This thesis aims to investigate how decision-makers within a large Swedish contractor interpret and define data-informed decision-making. Furthermore, the thesis aims to explore how these decision-makers use data in their own decision-making processes in order to gain a better understanding of how different situations may require different approaches to decision-making, and how data may or may not function as a form of support. More specifically, the study investigates whether data can form a "backbone" of support that may strengthen decision-making processes or increase confidence in decisions. The study will also investigate whether there are any barriers to reaching such a state, where data can work as a "backbone" of decision support across the organisation.

In order to fulfil the aim of the study, the following research questions have been formulated:

RQ1: *How is data-informed decision-making defined and described by a Swedish contractor?*

RQ2: *To what extent could data-informed decisions potentially improve existing decision-making practices within the studied case company?*

RQ3: *What barriers exist to data-informed decision-making?*

By addressing these questions, the study seeks to contribute to a deeper understanding of what data-informed decision-making means in practice within the construction industry, and how data is used in relation to experience, intuition and other factors in decision-making. Furthermore, the study also aims to contribute with insights into how individuals within organisations may strengthen their decision-making or increase confidence in their own decisions through the integration of data-informed approaches.

By using a case company, a large Swedish contractor that describes itself as data-informed as part of its strategic direction, the study aims to explore how data-informed decision-making is understood and practiced within a project-based organisation. Since the study focuses on a large contractor operating within the

Swedish construction industry, the findings may also be relevant to similar organisations facing increasing expectations regarding digitalisation and data utilisation. The study is also of interest from a strategic perspective, as it explores to what extent such a strategic direction is reflected in practice across different levels of the organisation.

1.3 Company collaboration

This thesis was conducted in collaboration with a large Swedish contractor that operates within a project-based structure. The collaboration provided valuable access to decision-makers across different organisational levels and departments, which enabled the study to capture multiple perspectives on how data-informed decision-making is interpreted and applied in practice. Conducting the study within a single organisation also created the opportunity to analyse decision-making processes within a shared organisational context and culture, thereby reducing variations that could otherwise arise from differences between companies. Furthermore, the collaboration ensured access to internal experiences, reflections and practical examples that contributed to a deeper understanding of how data is used in relation to experience, intuition and professional judgement within the organisation.

1.4 Delimitations

This study is delimited to decision-making within a single organisation operating in the Swedish construction industry, which may affect the generalisability of the findings to other organisations, industries or national contexts. Although the case company operates across the Scandinavian market, the empirical investigation is limited to its Swedish operations. Consequently, the findings should be interpreted cautiously with regard to their generalisability to other national contexts.

Furthermore, the study focuses specifically on a large contractor operating within a project-based structure. The intention is therefore not to provide a complete representation of the entire construction industry, but rather to gain an in-depth understanding of how data-informed decision-making is interpreted and practiced within one organisational setting. At the same time, this delimitation enables the study to capture variations in how data is perceived and combined with experience, intuition and professional judgement across different decision-making levels, while maintaining a coherent organisational context.

The study does not aim to compare different construction companies, countries or contractual settings, nor does it seek to evaluate the technical quality or performance of specific digital systems, software or data tools. In addition, the intention is not to develop or implement new organisational structures or decision-making processes. Instead, the focus is placed on exploring existing practices and understanding how data is currently used as a complement to experience, intuition and professional judgement in decision-making within the studied organisation.

Lastly, the study is limited to the perceptions, experiences and reflections of the interviewed participants. As such, the findings are based on how these decision-makers describe and reflect upon their own decision-making practices, rather than on direct observation or quantitative measurement of actual decision outcomes or organisational performance.

2 Literature review

This chapter presents the theoretical framework of the study. It begins with an overview of decision-making theory, covering classical decision theory, dual-process theory, heuristics and biases, intuition and expertise, and the relationship between information and decision quality. This is followed by a definition of data-informed decision-making, a discussion of its importance within construction, and an overview of how data is used as a complement to human judgement in construction decision-making. The chapter concludes with an examination of the main challenges associated with implementing data-informed practices within the construction industry.

2.1 Decision-making theory

The following subchapter covers classical decision theory, dual-process theory, heuristics and biases, intuition and expertise, and the relationship between information and decision quality.

2.1.1 Classical decision theory – from full rationality to bounded rationality

Researchers often equate decisions with choices, and individuals typically mean the same thing when they say they have made a decision (Brunsson & Brunsson, 2014). This implies that they have recognized that multiple courses of action are possible and subsequently selected one of them. However, many actions are carried out without any explicit decision being made, and not all decisions lead to action. In some cases, individuals act without first making a conscious decision. In many organizations, individuals do not always need to make decisions, as there are established routines that guide behaviour in familiar situations. In other contexts, decisions are unnecessary because the appropriate course of action is perceived as self-evident.

How people make decisions, and how they should make decisions, has long been a subject of research. The field is well-established and has developed across multiple disciplines (Kaufmann & Kaufmann, 2016). Traditional decision theory was primarily concerned with how decisions ought to be made, commonly referred to as normative decision theory. The fundamental idea is to achieve an optimal decision through full rationality by selecting the alternative that maximizes total utility, that is, the extent to which a given action fulfils the decision-maker's objectives. However, the concept of utility is complex and somewhat ambiguous, as it can take on different meanings depending on context and individual preferences, and is inherently subject to interpretation.

Classical normative decision theories assume that decision-makers have access to all relevant information, can accurately identify and process this information, and have sufficient time to evaluate all possible alternatives. Under normal circumstances, these assumptions are rarely met. Although normative decision theory can serve as a useful ideal for rational decision-making, it is often not feasible in practice due to these limitations (Kaufmann & Kaufmann, 2016). In response to these challenges, Simon (1957) developed an alternative model based on more realistic assumptions about human decision-making. A key concept in his theory is *bounded rationality*, which suggests that individuals do not have unlimited capacity to gather and process

information. Instead, they rely on the information that is available and how it is structured. Rather than identifying the optimal solution, individuals settle for an alternative that is considered sufficiently satisfactory, a process Simon referred to as *satisficing*. He further argued that individuals simplify complex problems through mental models, which are subjective representations of reality. Once a decision-maker identifies an alternative that meets their criteria, they typically stop searching for additional information and make a decision. However, this process carries the risk that individuals may limit their information search too early, exert insufficient cognitive effort, and ultimately make suboptimal choices (Brunsson & Brunsson, 2014; Kahneman, 2012). Simon's work on bounded rationality became highly influential and laid the foundation for later descriptive research on how individuals actually make decisions and cognitive limitations.

2.1.2 Dual-process theory, heuristics and biases

How people actually make decisions is described by descriptive decision theory, which often highlights deviations from normative models (Kaufmann & Kaufmann, 2016). Kahneman (2012) popularized dual-process theory, which conceptualizes human reasoning as consisting of two systems: System 1 and System 2. System 1 is the mode of thinking most frequently used. It is fast, intuitive, and largely driven by emotions. Decisions made within this system occur automatically and require little to no conscious effort, leaving limited room for deliberate reasoning or critical reflection. In contrast, System 2 is more analytical and reflective. It is activated in situations that require careful thought, comparisons, and the processing of relevant information. Decision-making within this system is more cognitively demanding and requires conscious effort. As such, System 2 is primarily engaged in more complex situations where alternatives must be evaluated in order to reach well-founded conclusions. Because System 2 requires greater cognitive effort, individuals often rely on the faster and less effortful System 1 in everyday decision-making situations (Kahneman, 2012).

Experimental research has shown that individuals frequently rely on simplifications and mental shortcuts when making decisions (Brunsson & Brunsson, 2014). In line with dual-process theory, System 1 uses cognitive shortcuts which enables individuals to make judgments quickly and efficiently when time, information, and cognitive resources are limited. Kahneman and Tversky (1974) were pioneers in this area, arguing that individuals tend to rely on such mental shortcuts, referred to as heuristics, particularly in complex situations where deliberate analytical reasoning is difficult to maintain. Building on this perspective, Gigerenzer and Gaissmaier (2011) further argue that heuristics should not only be viewed as cognitive limitations, but also as adaptive strategies that deliberately ignore parts of the available information in order to make decisions more quickly and efficiently. According to their perspective, heuristics can in some situations function effectively in complex and uncertain environments where complete information is rarely available. In such contexts, heuristics may therefore lead to sufficiently accurate or even highly effective decisions.

However, research within the heuristics and biases tradition demonstrates that reliance on heuristics can lead to systematic errors and biases in decision-making (Kahneman & Tversky, 1974; Kahneman, 2012). These biases occur because mental shortcuts simplify information processing in ways that may deviate from logical reasoning. Since the pioneering work of Kahneman and Tversky, behavioural scientists have identified a large number of such cognitive biases, illustrating the extensive influence of heuristics

on human judgment (Flyvbjerg, 2021). Three well-documented and practically relevant biases are availability bias, anchoring bias and confirmation bias. Availability bias refers to the tendency to overestimate the likelihood of events that are easily recalled from memory, meaning that recent, vivid or emotionally significant experiences are weighted more heavily than more representative historical data (Kahneman, 2012). In decision-making, this can lead individuals to base judgments on what readily comes to mind rather than on a broader and more accurate picture of reality. Anchoring bias describes the tendency to rely too heavily on the first piece of information encountered when making a judgment, even when that information may be incomplete or misleading (Kahneman, 2012; Flyvbjerg, 2021). For instance, an initial cost estimate or a familiar technical solution can function as a mental anchor that subsequently shapes how alternatives are evaluated, making it difficult to adjust sufficiently even when new information suggests that a different direction would be more appropriate. Confirmation bias, closely related to these, refers to the tendency to seek out, favour and interpret information in a way that confirms pre-existing beliefs or preferred conclusions, while discounting information that contradicts them (Kahneman, 2012). Together, these biases illustrate how System 1 thinking can systematically distort judgment in ways that are difficult to detect, precisely because the reasoning feels natural and coherent to the decision-maker.

The heuristics and biases tradition has, however, also been subject to criticism. Researchers within the Naturalistic Decision-Making (NDM) tradition, such as Klein, argue that many biases identified within the HB tradition are based on laboratory experiments with limited resemblance to real-world decision environments characterized by time pressure, uncertainty, and professional experience (Kahneman & Klein, 2009). Rather than primarily emphasizing cognitive errors, the NDM perspective highlights how expert intuition and experience can support effective decision-making in complex environments. Flyvbjerg (2021) further argues that cognitive biases alone cannot fully explain decision-making in large projects and organizations, where political incentives, strategic behaviour, and power dynamics may also influence judgments and decisions.

2.1.3 Intuition and expertise

Intuition, often referred to as gut feeling, can be described as the ability to rapidly understand a situation or make a decision without conscious analytical reasoning (Brunsson & Brunsson, 2014). Research suggests that intuition is closely connected to accumulated experience, where previously acquired knowledge and patterns are processed subconsciously and retrieved rapidly in decision-making situations. Rather than actively gathering information from the environment, individuals rely on stored experiences and mental patterns developed through exposure to similar situations over time. As a result, experienced decision-makers may quickly distinguish between relevant and irrelevant information and recognize patterns that guide their judgments.

The accuracy of intuitive judgments is therefore often dependent on the quality and relevance of prior experience. In familiar environments where individuals receive repeated and reliable feedback, intuition can become highly effective (Brunsson & Brunsson, 2014). Kahneman and Klein (2009) argue that expert intuition develops when decision-makers operate in environments that are sufficiently predictable and where opportunities exist to learn recurring patterns through experience. Klein (2015) and the NDM perspective further describe intuition as a form of tacit knowledge built

through extensive exposure to real-world situations, where experienced individuals recognize patterns and rapidly identify plausible courses of action without comparing multiple alternatives.

At the same time, intuition is not always reliable. In unfamiliar or highly uncertain situations, decision-makers may incorrectly interpret patterns based on earlier experiences that are not applicable to the current context (Brunsson & Brunsson, 2014). Kahneman (2012), as mentioned before, describes intuition as largely stemming from System 1 processes, which are fast and automatic and can enable efficient judgments, but which may also lead to premature conclusions and cognitive biases. From the heuristics and biases perspective, intuitive judgments are therefore not necessarily irrational or inaccurate, but they can give rise to systematic errors, particularly in environments characterized by uncertainty, limited feedback, or low predictability (Kahneman & Klein, 2009). The differing perspectives on intuition therefore suggest that intuitive decision-making can be both a valuable source of expertise and a potential source of error, depending on the conditions under which judgments are made.

2.1.4 Challenging the assumption that more information is better

Within traditional decision theory, access to more information is often assumed to improve decision quality by reducing uncertainty. However, research suggests that the relationship between information and decision-making is more complex than assuming that more information automatically leads to better decisions. Brunsson and Brunsson (2014) argue that additional information may reduce uncertainty when decision-makers understand the situation and trust the information available to them. In such cases, new information can function as an additional "piece of the puzzle" that strengthens confidence in a decision.

At the same time, additional information may also increase uncertainty. When decision-makers are unsure how to interpret a situation, which information is relevant, or whether the available information is reliable, increasing the amount of information may instead create confusion and make decision-making more difficult. Furthermore, uncertainty may also stem from difficulties in evaluating and balancing different preferences, values and objectives against one another. In such situations, additional information does not necessarily resolve uncertainty, as the challenge lies not in the lack of information itself but rather in how the information should be interpreted and prioritized (Brunsson & Brunsson, 2014).

This perspective is also reflected in research on heuristics and bounded rationality. Gigerenzer and Goldstein (1999) argue that simple heuristics, which deliberately ignore parts of the available information, can in some situations perform as well as or even better than decisions based on demanding logical reasoning. Their research suggests that additional information and computation do not necessarily improve judgments and may, under certain conditions, reduce the accuracy of decisions.

2.2 Definition of a data-informed decision

In the context of using data for making decisions there are several ways to describe that process. In a study by Elragal and Elgendy (2024) they assessed how ready an organisation is for data-driven decision-making and stressed the importance of distinguishing and defining different decision practices. It was stated that commonly

used terms are data-informed, data-driven and data-centric decision-making, and these terms hold different meanings but are often mistaken for being the same thing. Elragal and Elgendys research on the definition of these terms also align with Dr. Muge Abac at Humber College Institute of Technology & Advanced Learning, and states as follows. In data-informed decision-making, data is one of several elements considered in the decision-making process, and the data informs the decision makers rather than dictates them. Data-informed decisions also allow human judgements such as experience or intuition to be key factors in decisions, making it a flexible decision process. Moreover, data-informed suggest relatively little use of data as organisations systematically stores data that is available to decision makers but not necessarily used. Data-driven decision-making use data as the primary driver for decision-making and are less flexible than data-informed decisions as it relies heavily on quantitative factors, with less regard to the qualitative. Data-driven decision-making also requires an intense use of data that is accepted and implemented in a coherent way throughout the whole organisation. Furthermore, companies that are data-driven have personnel that work exclusively with organising and analysing data in relation to the needs of the decision makers. Lastly, data-centric decision-making refers to organisations whose business model is based on data, and data itself is part of the value creation process within the organisation (Elragal & Elgendy, 2024; Abac, 2024).

Figure 2.1 Data centricity: the human/machine spectrum. (Deutsch & Leed, 2015).

Defining to which degree data is used in construction is a complicated task. In a study by Deutsch & Leed (2015) on companies' relation to data in the construction industry, it is conveyed that some parts of the industry or segments of a company are heavily reliant on data whereas others are little to non. For example, a firm or segment that is working with BIM, make almost all their decisions based on changes in their model. This suggests a very data intense decision process that implies a data-driven decision-making approach. However, Deutsch & Leed (2015) acknowledge that the construction industry is in general not defined as a data-driven industry and leans towards a more data-informed or data-enabled industry, meaning being aware of the data but not leveraging it.

2.3 The importance of data-informed decisions in construction

Today in the Swedish construction environment it is very common for projects to suffer from delays, cost overruns or failure to meet contracted performance. At the same time these projects play a crucial role in achieving positive economic and social outcomes for a society, as well as in many cases being financed by tax money. In addition to that the construction industry has some of the biggest climate impacts out of all industries,

making up 20% of Swedens total climate emissions, with a large portion coming from the operating phase (Boverket, 2025). Therefore, the often-occurring failures to meet the demands in construction projects becomes a very unsustainable practise in our society, one that needs improvements (Chapman, 2025; Eliasson, 2025).

Because of the above-mentioned impacts that the construction industry has on our society, it is of great value to enhance the operating efficiency within it (Eliasson, 2025). One way to do that is by elevating decision-making with the help of data, as many other industries have done. Studies show several benefits within construction when implementing data-informed decision-making such as, improving management, collaboration, knowledge sharing, risk mitigation, planning and accounting. These are benefits that can raise value from construction and mitigate its adverse effects on society, making data-informed decision-making an important subject to study and strive for within construction (You & Wu, 2019).

2.3.1 Benefits of data-informed decision-making

It is often thought that experience is the key for making good decisions, and whereas that is largely true, making decisions based on data can be just as good or sometimes even superior. In a study made by Goldberg (1969) they investigated how well clinical experts diagnose psychiatric conditions compared to statistical methods. The study focused on distinguishing between psychosis and neurosis using data from 861 different personality profiles. The results showed that the clinical experts were outperformed by a simple statistical rule based on a few test scores, which achieved a higher diagnostic accuracy. This study concludes that clinical expertise does not necessarily lead to superior diagnostic accuracy and that consistent, data-based decisions can outperform human judgment in complex diagnostic tasks. These findings challenge the assumption that experience alone leads to better decisions and support the use of structured data-informed approaches in decision-making.

In construction the literature suggests that being data-informed can improve decision-making as well. A study by You and Wu (2019) propose a framework for construction companies to better utilise data by integrating systems like BIM and ERP (Enterprise Resource Planning) into one unified data platform. They studied a construction company and analysed its current decision-making challenges and argues that a data-informed approach can improve decision-making by making data more accessible, reliable, and usable across the organization. By integrating operational project data from systems such as BIM with financial and commercial data from enterprise systems such as ERP, the framework allows decision-makers to base their judgments on constantly updated and accurate information rather than delayed, incomplete or experience-based inputs. This improves both operational decisions, such as cost control and procurement, and strategic decisions at the management level. Moreover, based on their analysis the authors explain that when a key person in a project leaves the project, a knowledge gap appears that often have negative impact on the quality of decision-making. Their data-informed approach is developed to mitigate these adverse effects on decision-making, by making it easier to transfer knowledge between the workforce, making the project more resilient towards change in personnel. It is also explained that this data-informed framework gives all project members easier access to information as well as correct and updated data, which in turn leads to easier and faster decision-making with less risk and delays.

In another study by Sheikhkhoshkar et al. (2025) a knowledge-based decision support system for construction planning and control was developed. They collected data from industry experts through interviews and surveys, built a knowledge archive using rule-based methods, implemented an inference engine, and combined this with a mathematical optimization model. The system was then applied to a real construction case project to demonstrate how it can recommend suitable planning and control approaches. The study found that a data-informed approach enables more systematic and structured decision-making by combining expert knowledge with data-driven rules. The system helps decision-makers match planning and control methods to the specific needs of a project, leading to better alignment between project requirements and chosen strategies. By structuring and reusing expert knowledge, the approach supports learning across projects and avoids repeating past mistakes. In addition, the integration of data in decisions allows decision-makers to evaluate multiple alternatives and find more optimal solutions, improving planning, quality and control of construction projects.

2.4 How is data used as a complement to human judgement in decision-making within construction

For a long time, data has been used in construction, even though practitioners and firms in the industry often state that they are not fully prepared to handle data on top of their existing ways of working. What has changed in recent years is not the existence of data itself, but the increased ability to capture, structure and apply it in our decision-making processes.

One of the most common ways data is used in construction is through BIM. Which can be understood not only as a digital tool, but as a structured way of organizing and integrating large amounts of project-related data into a single model. Making models for environments and constructions has been done for centuries (Deutsch et al., 2015), but BIM has significantly improved the ability to use that information for decision-making. Compared to earlier approaches, where decision-making relied more heavily on experience, intuition and simplified calculations, BIM allows decision makers to use data along with their human judgements to test solutions, evaluate alternatives and better predict outcomes within construction (Bilal, 2019). In Sweden, BIM is widely used across construction projects to support coordination and knowledge transfer between stakeholders, and as more actors such as suppliers and manufacturers are integrated into these systems, decision-making becomes increasingly supported by structured data (Disney et al., 2022).

Construction management also relies heavily on data for decision support. With access to multiple suppliers, sub-contractors and consultants, contractors continuously evaluate alternatives based on available data, such as price levels and prior accomplishments. In these situations, data acts as a complement to experience, where previous relationships and subjective judgments on construction-partners are combined with data on them. This enables more grounded decisions when selecting partners and planning future collaborations (Bilal, 2019).

Another way data complements human judgement is by giving structure to and handling large amount of information (Bilal, 2019). For example, minimising risk is a central part of decision-making in construction, and a way to do that is by using one's experience to relate a current situation to earlier experienced outcomes (Del Missier,

2013). However, even experienced project managers that have the experience to sense risk in a project are limited by the human ability to remember and process large amounts of detailed information from earlier experiences and current project conditions (Maule, 2009). Data therefore functions as a complement to human judgement by storing and structuring information. In this sense, data helps fill the gaps in human memory and reduces the reliance on purely intuitive judgement. Furthermore, data analytics enables organizations to process and analyse large amounts of project-related information in ways that support more informed decisions (Bilal, 2019).

2.4.1 Using data on historical decisions and processes for decision-making

In general construction companies do not tend to have a structured way of gathering data on project outcomes and are very inefficient when it comes to transferring knowledge and experience between projects. This is largely due to the lack of learning culture and tools to support organisational learning within construction. However, studies show that by changing the culture in the way projects are handled and by using supporting tools for data gathering, construction companies may improve their performances and gain competitive advantages (Eken et al., 2020).

In a study done by Bilal et al. (2019) they analysed large amounts of data from past construction projects to understand how different project characteristics affect profitability. They found that by gathering and analysing data from earlier projects they could identify patterns in how different kinds of projects, regarding contract form and project conditions, affect project outcomes and that it could be used to make better informed decisions in future projects. The study focused on profitability but suggests that similar data-informed approaches can be used to support other types of project decisions.

Eken et al. (2020) developed a tool to capture, store, and reuse experiences from earlier construction projects. When applied by managers with over ten years of experience in construction it turned out to support better judgement in decision-making and provided better context to new project processes. A key insight from the study was that past projects did not have to be identical to the present project, even partially similar historical data was valuable for decision-making.

2.5 Challenges in using data within construction

Elkhayat et al. (2024) have conducted a comprehensive review of 124 peer-reviewed articles to explore the development in technology acceptance and adoption within the construction industry. The study has recognised that the construction industry is known for not being the most technically advanced industry and has a generally conservative approach to new methods. Because of this, decision-making within construction has historically relied less on structured data and more on conventional practices and professional judgement. Despite that, the industry has in recent time incorporated more data into its decision-making processes and has seen an uprise in data-informed decisions. This development can prove to be very beneficial for the industry, but challenges remain before construction can utilise data to its fullest to improve decision-making (Elkhayat, 2024).

2.5.1 Structuring the data

A study by Radman et al. (2025), which developed and tested a real-time data-driven framework for construction projects, identified through their literature review, case studies and project observations that construction projects generate a lot of data, but the industry still struggles to transform this data into reusable knowledge for future decision-making. One of the main reasons for this is the lack of structure in the gathered data, which is caused by several reasons. Firstly, the data comes from many independent systems, such as BIM, Excel, site reports and other systems. These systems do not communicate properly and stores data in different formats and structures which makes it hard to combine and assign to the relevant process. Furthermore, data within construction projects repeatedly get updated from contract variations and developments in the project. Stakeholders therefore run the risk of having different data, for example the sub-contractor might work with older versions of a drawing, whereas the consultants have the updated versions. This type of misalignment is a common reason for delays in construction and highlights the importance of integrating and connecting data in a structured way (Radman et al., 2025).

There is also a lack of traceability in the gathered data from construction projects and the literature states that often it becomes unclear where the data comes from, who created it and when it was updated. This dilemma leads to a lack of trust in the data and hinders the industry moving towards being more data-informed, as well as feeding the conservative culture around digitalisation that envelops the construction industry. Likewise, this lack of structure in the data also stifles the ability to use data on historical decisions and processes, that formerly mentioned can improve decision-making processes (Radman et al., 2025).

2.5.2 Cultural barriers

Cultural barriers hinder the construction industry to implement new data-informed decision processes on several organisational levels (Hassan et al., 2024; Van Tam et al., 2024). A study by Tan et al. (2025), which examines resistance to BIM innovation in the construction industry from both organizational and psychological perspectives, suggests that resistance to digital transformation is strongly influenced by human perceptions, cognitive biases and behavioural responses to change. The study further highlights that on an individual level there is the factor of human aversion to change, as people in general are not comfortable with change (Tan et al., 2025). At the same time, construction has historically relied on traditional workflows and established working methods, with the limited implementation of newer technologies, making large portions of the industry accustomed to its ways (Tan et al., 2025; Taja & Amin, 2025). This is further reinforced by the construction industry's historically low productivity growth, cyclical market conditions, and documented resistance to organizational and technological change (Garcia & Molloy, 2023; Correira & Ribeiro, 2023; Taja & Amin, 2025). Also, social pressures and negative perceptions about job losses due to adopting digital technologies contribute to the resistance against digital transformation (Hassan et al., 2024). Studies on the subject therefore suggest that social factors might be the most crucial factor as to why construction is struggling with implementing more data-informed approaches, as it is often stated that the technology is available but not implemented (Hassan et al., 2024; Van Tam et al., 2024).

However, the literature suggests that cultural resistance to new digital practices in construction cannot be explained solely by a general reluctance to change, but also that it is influenced by systematic cognitive biases that shape how individuals perceive and evaluate new technologies (Hassan et al., 2024; Tan et al., 2025). Studies on innovation resistance show that decision-makers are affected by biases such as status quo bias, loss aversion, and sunk cost effects, which lead them to favour existing methods even when more efficient alternatives are available. These biases influence how information is interpreted, often amplifying perceived risks and costs while downplaying potential benefits (Tan et al., 2025). As a result, resistance to data-informed decision-making is not always based on objective evaluation, but rather on subjective perceptions shaped by prior experience and psychological tendencies (Van Tam et al., 2024; Tan et al., 2025). This highlights that cultural barriers are not only rooted in organizational norms, but also in individual cognitive processes that systematically influence decision-making (Hassan et al., 2024; Tan et al., 2025).

In addition, low levels of awareness regarding the benefits of digitalisation contribute to scepticism and reduce the willingness to adopt new data-informed approaches. This lack of awareness is not only a technical issue, but also a cultural one, as it shapes attitudes toward data, and influences how comfortable individuals feel when using data and digital tools (Hassan et al., 2024).

Another cultural barrier can be found at top-level management, where executives often face strong pressure to deliver favourable short-term financial performance (Wang, 2024; Zhang et al., 2023). Literature on managerial short-termism suggests that career concerns, compensation incentives and reputation pressures may lead managers to prioritize short-term results over long-term investments and strategic transformations (Ladika and Sautner, 2020; Zhang et al., 2023). Because digital and technological transformations are often costly, risky and associated with uncertain long-term returns, managers may become reluctant to initiate large-scale changes that could negatively affect short-term performance indicators (Wang, 2024; Zhang et al., 2023).

2.5.3 Skills and knowledge barriers

A challenge for implementing data-informed decision-making identified in the literature is the lack of skills, awareness, and digital literacy within the construction industry. Hassan et al. (2024) emphasize that insufficient knowledge, limited training capabilities, poor digital literacy and inadequate technical support hinder stakeholders' ability to effectively utilise digital tools and data within construction projects. Similar challenges have also been identified in a Swedish context. Gharaibeh et al. (2022), in a study examining barriers to digital implementation within the Swedish construction industry, identified lack of digital knowledge and skills, limited training opportunities, low awareness regarding the benefits of digital technologies, and reluctance toward changing established work practices as important barriers to implementation. Furthermore, Andersson and Eidenskog (2023), through a qualitative case study of a highly digitalized Swedish consultancy firm, show that digital transformation creates tensions related to changing professional roles, work practices and knowledge structures, and that successful digital transformation requires new forms of expert knowledge, coordination strategies and organisational adaptation. In addition, the absence of structured training and limited access to technical support reinforce these challenges, making it difficult for organisations to transition toward more data-

informed practices (Gharaibeh et al., 2022). As a result, even when data and technologies are available, they may remain underutilised due to insufficient competence and understanding among users (Hassan et al., 2024).

Another important knowledge barrier is the lack of interdisciplinary understanding between those working with data gathering and digital tools, and those working with construction operations. Construction projects rely on knowledge from multiple disciplines, but this knowledge is often fragmented across professional and organisational boundaries (Li et al., 2022; Biersteker, 2023). As a result, data may be collected, structured, and analysed in ways that do not fully align with the needs of people in production. This means that even when data are available, its value can remain limited if the people using the data do not share a common understanding of what the data represents, how it was generated, and how it relates to actual project activities (Li et al., 2022).

A related challenge is that data can be difficult to interpret when users lack understanding of the operational processes behind it. In construction, the value of information depends heavily on context, like the user's role, current task, site conditions and the dynamic nature of production work. If data is presented without this operational context, it may not reflect what is actually happening on site and can therefore be difficult to apply in practice (Fathi et al., 2026). This suggests that the barrier is not only a lack of technical skill, but also a lack of process understanding (Tariq et al., 2025). To use data effectively, decision-makers need to understand how the underlying work is performed, what the data refers to, and under what conditions it was generated (Pfitzner et al., 2024). Otherwise, data risks being seen as abstract or disconnected from operational reality (Fathi et al., 2026; Tariq et al., 2025).

3 Methodology

This chapter presents the methodology applied in this study and explains how the research was constructed. It begins with a description of the research approach, followed by the literature review and the interview study. Thereafter, the empirical analysis is explained. Finally, research quality is discussed, including the use of AI, ethical considerations and a critical discussion of the chosen methodology.

3.1 Research approach

In order to answer the research question and fulfil the aim of the study, a qualitative research design with an abductive approach was adopted. A qualitative research design was considered appropriate as the study seeks to understand how individuals within the case company interpret and apply data-informed decision-making in practice. This aligns with an interpretivist perspective, where emphasis is placed on understanding how and why individuals act, through their own perspectives and interpretations (Bell et al., 2022). Since the objective was not to measure the extent of data usage, but rather to explore how decision-makers reason, reflect and act on data, a qualitative method provides the necessary depth.

The research process was initiated through a literature review to establish a theoretical foundation. However, given the broad and evolving nature of the topic, an abductive approach was employed. This approach allows for a continuous interplay between empirical observations and theoretical development, where insights from interviews guided the narrowing of the literature (Dubois & Gadde, 2002). This iterative movement between theory and data made it possible to capture nuances in how data-informed decision-making is understood and practiced within the construction industry and also improved the quality of the paper.

Following the data collection, the interviews were transcribed and analysed using thematic and narrative analysis. Thematic analysis enabled the identification of recurring patterns and key themes across respondents, while narrative elements helped capture how individuals constructed meaning around their decision-making processes. The empirical findings were then analysed in relation to the theoretical framework, allowing for a synthesis that addressed the research questions.

3.2 Literature review

The topic of decision-making is extensive, multidisciplinary and has been widely researched over time. To manage this breadth, the literature review in this study followed a structured yet flexible approach. Initially, a broad search was conducted to establish a general understanding of decision-making, including perspectives on how individuals make decisions, intuition, heuristics and the increasing role of digitalisation in decision-making. This was followed by a gradual narrowing of focus towards data-informed decision-making and its potential within the construction industry. As the research progressed, additional literature was incorporated based on insights emerging from the interviews, ensuring that the review remained relevant to the empirical context. This iterative process reflects the abductive approach, with an interplay between empirical observations and theoretical development (Dubois & Gadde, 2002). To draw an example, insights from the interviews indicated that although the case

company possessed large amounts of data, challenges related to structuring, accessibility and traceability sometimes limited its practical use in decision-making. This then directed the literature review towards data structuring.

For this study, relevant academic articles and books were primarily collected from databases such as Scopus, ResearchGate and the Chalmers University library. Additional sources were identified through backward snowballing, by reviewing reference lists of key articles and books. To ensure the reliability and quality of the literature, emphasis was placed on authors, peer-reviewed journal articles, highly cited publications and well-established academic sources.

3.3 Interview study

The empirical data in this study was collected through semi-structured interviews with employees holding different decision-making roles across various departments within the case company. These roles included, among others, department managers, project managers and business developers, see Table 3.1. Since it early in the research process became evident that a qualitative approach was most suitable to answer the research questions, semi-structured interviews were selected as the primary data collection method. An interview guide was developed based on recurring themes identified in the literature, in combination with discussions with the supervisor and the overall aim of the study, including the interests of the case company. The interview guide is presented in Appendix I. Semi-structured interviews were chosen as they allow for a balance between structure and flexibility, enabling the researcher to explore predetermined topics while also allowing respondents to elaborate on their experiences and introduce new perspectives (Bell et al., 2022). This was particularly relevant for this study, as it aimed to capture how individuals interpret and use data-informed decision-making in practice. During the interviews, focus was placed on asking open-ended questions to avoid leading the respondents and to allow for their own interpretations, opinions and experiences to emerge. Follow-up questions were used to probe deeper into relevant topics when needed.

The selection of interviewees was guided by the aim of capturing a broad range of perspectives within the organization. Efforts were made to include participants from different roles and departments. Consideration was also given to achieving variation in age and gender among respondents. However, all interviewed participants held several years of professional experience within their respective roles, meaning that the sample does not include the perspectives of less experienced employees. Potential participants were contacted via email and provided with information about the purpose of the study and their potential contribution. An initial set of interviewees was identified through contacts of the authors and the supervisor, after which additional participants were contacted through snowball sampling. In total, 15 interviews were conducted, which was considered sufficient as recurring patterns and themes emerged in the data. The interviews were conducted either digitally via Microsoft Teams or in person at the case company's office in Gothenburg, depending on the availability and location of the participants. The average interview lasted around 31 minutes. All interviews were recorded with the verbal consent of the participants and subsequently transcribed. To ensure confidentiality, all respondents were anonymized. Both authors were present during all interviews.

Table 3.1 *List of interviewees and their roles within the company, along with the format and length of each interview.*

Label	Format	Length
Department Manager		
DM 1	In person	30 min
DM 2	Online	
Operations Manager		
OM 1	In person	32 min
OM 2	Online	29 min
Project Manager		
PM 1	Online	36 min
VDC-Coordinator		
VC 1	In person	28 min
Design Manager		
DeM 1	In person	48 min
Site Supervisor		
SS 1	Online	22 min
Business Developer		
BD 1	Online	30 min
BD 2	In person	34 min
BD 3	Online	28 min
BD 4	Online	28 min
AI-Specialist		
AI 1	In person	29 min
R&D-Coordinator		
RD 1	In person	28 min
Purchaser		
P 1	In person	27 min

3.4 Empirical analysis

To analyse the empirical data gathered from the interviews, a combination of thematic and narrative analysis was applied in order to identify recurring patterns, themes and underlying meanings. Thematic analysis enables a systematic identification and organization of patterns across qualitative data, making it suitable for exploring how individuals interpret and describe their experiences (Bell et al., 2022). Furthermore, elements of narrative analysis were used to capture how respondents constructed and communicated their experiences of data-informed decision-making, providing a deeper understanding of their reasoning and context.

As mentioned in the previous subchapter, all interviews were recorded and subsequently transcribed. Each interview and its corresponding transcription were reviewed more than once to ensure accuracy. The transcripts were systematically analysed, and segments of data were grouped into themes manually, using colour coding in an excel spreadsheet, the themes are presented below in Figure 3.1. This approach facilitated a structured categorization and visualization of the data, making it easier to identify commonalities, differences and connections across interviews. Manual coding allowed for flexibility and close interaction with the data. Finally, the themes were synthesized and analysed, forming the basis for this study's findings.

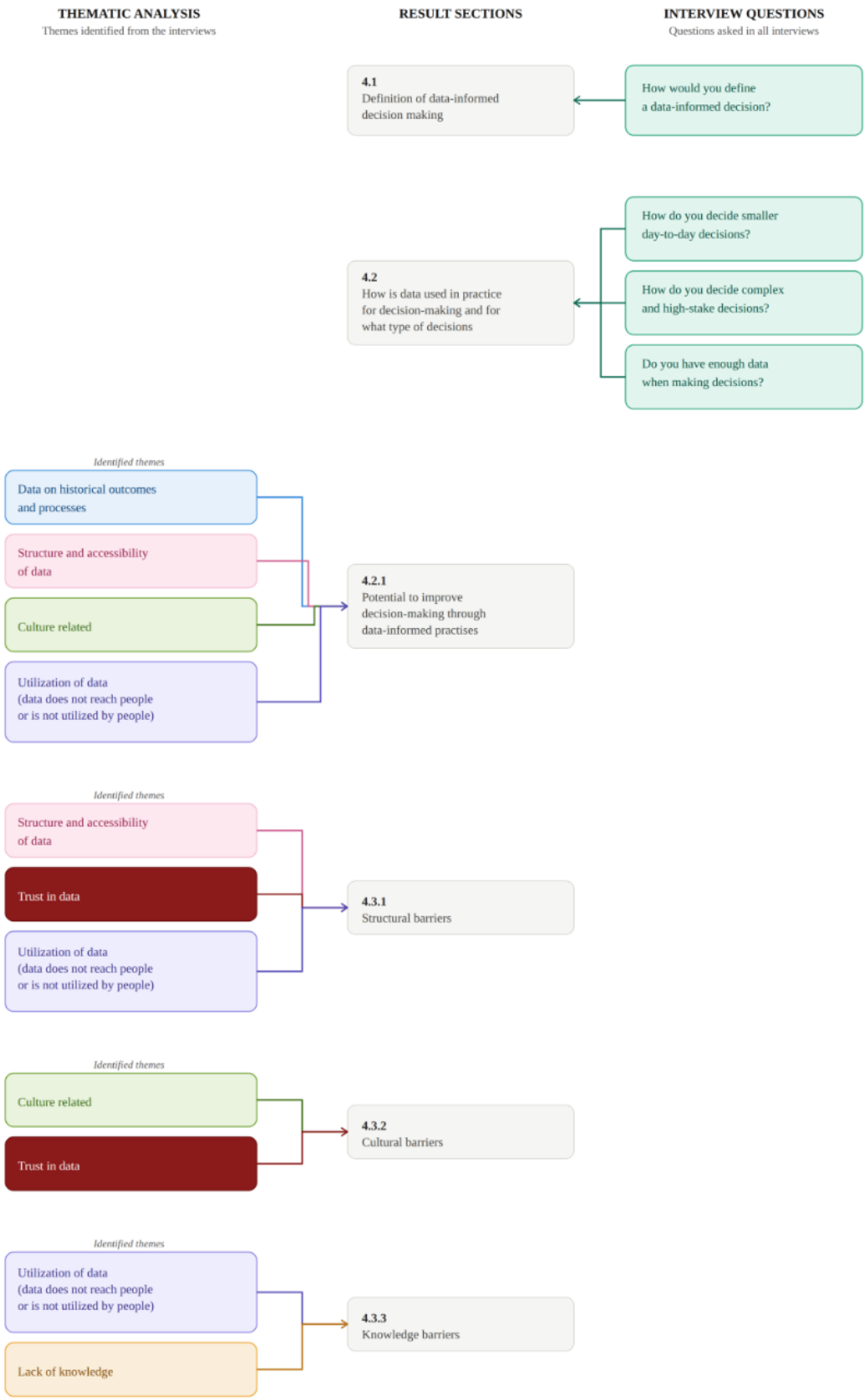

Figure 3.1 Illustration of the themes used in the thematic analysis and how they relate to the results. Along with some set questions asked in all interviews.

3.5 Research quality

This subchapter is divided into three parts, the use of AI in the research process, ethical considerations and a discussion of the chosen methodology.

3.5.1 Use of AI

During the process of conducting this thesis, AI-tools have been used as a support to the writing process. Mainly, the language model ChatGPT has been utilised to help with rephrasing sentences, improving clarity and refining the overall readability of the text, as well as to support idea development. The use of AI has not replaced independent analysis or critical thinking. All content has been carefully reviewed, evaluated and revised by the authors to ensure accuracy and alignment with their own understanding of the subject. The authors take full responsibility for the final content of the thesis, and all interpretations, analyses and conclusions are their own. The use of AI has not involved generating unverified facts or claims, nor has it been used in a way that compromises academic integrity or originality.

3.5.2 Ethical considerations

Ethical considerations have been taken into account throughout the research process. The privacy and confidentiality of all interviewees were respected, and participants have therefore been anonymized in the study. It was also deemed necessary to keep the case company anonymous in order to further protect the identity of the interviewees and to respect the company's competitive position.

Informed consent was obtained from all participants prior to conducting the interviews, including consent to audio recording. Participants were informed about the purpose of the study and their voluntary participation. To ensure compliance with data protection regulations, including GDPR, all collected data has been handled with care. No personal or identifiable information has been shared with any external or open-source AI tools. Any information used in such tools has been anonymized to prevent identification of individuals or the case company.

3.5.3 Discussion of the methodology

The chosen research methodology, based on a qualitative research design, is well suited for this type of study as it enables a deeper understanding of how employees within the case company perceive and work with data-informed decision-making. However, despite the methodological strength, several limitations should be acknowledged. While semi-structured interviews provide flexibility and allow for in-depth insights, they also introduce challenges related to subjectivity and consistency. Although efforts were made to avoid leading questions and to allow respondents to express their own perspectives, the interviewers may still have influenced how participants formulated their answers through their own biases. Furthermore, even though all interviewees were anonymized, loyalty to the organization may have affected the openness of responses. Some participants may have felt hesitant to share critical views, which could have influenced the quality and completeness of the data collected.

There is also a risk of response bias, where interviewees may provide answers, they perceive as socially acceptable or aligned with organizational expectations, rather than their genuine views. In addition, interviewees may engage in post-rationalization of their decisions. As described by Brunsson and Brunsson (2014), individuals tend to retrospectively construct logical explanations for decisions that may initially have been based on intuition or other non-rational factors. This tendency to justify decisions through rational arguments, regardless of how they were originally made, may affect the accuracy of the data and should therefore be considered when interpreting the findings.

Furthermore, as all interviewees held several years of professional experience, the findings primarily reflect how experienced decision-makers perceive and use data in their decision-making. The perspectives of less experienced employees are therefore not captured in this study. This should be considered when interpreting the findings, as less experienced decision-makers may relate to and use data differently than those with extensive experience.

The sample size is another factor that may influence the results of the study. While a limited number of interviews can affect the results of the study, the sample was considered sufficient as recurring patterns and themes emerged across the interviews, indicating a degree of saturation. However, since the study is limited to a single case company within the Swedish construction industry, the findings may not be fully generalizable to the entire sector. At the same time, the case company is relatively large, and when combined with insights from existing international literature, the findings may be considered applicable on a broader scale. Furthermore, differences in national and organizational contexts may also influence the applicability of the findings, and the use of international literature may not fully reflect the specific conditions of the Swedish construction industry, as per this thesis delimitation.

Overall, while the chosen methodology has enabled rich and context-specific insights, the findings should be interpreted with these limitations in mind. To build on this study, future research could include multiple organizations within the construction industry to enhance the generalizability of the results.

4 Results

This chapter presents the empirical findings from the interview study conducted within the case company. The findings focus on how decision-makers within the organisation define and interpret data-informed decision-making, how data is used in relation to experience and intuition in different decision situations, what perceived opportunities exist for improving decision-making through more data-informed practices, and what barriers currently limit the use of data in decision-making processes.

4.1 Definition of data-informed decision-making

The results show that there was no clear way of describing or defining a data-informed decision as many interviewees claimed that they never really thought about what a data-informed decision was, or what type of information that actually counts as data, making the question somewhat philosophical for some of the interviewed. Although, despite almost all interviewees making their debut in defining a data-informed decision, as well as originating from different roles and practices, their definitions and stipulations were on a fundamental level similar. Almost all interviewed (n=11) said that a data-informed decision is one not solely based on experience or gut feeling, but a decision based on data or supported by data. The data itself was often described as costs, numbers, statistics, quality requirements or human judgements rendered into structured data points.

> *"When you make a decision not only based on intuition or gut feeling, but have for example numbers to verify the decision, not only I think or believe this" -PM1*

> *"To have access to information that me as a decision maker can base my decision on instead of gut feeling or what I think is correct, but I am the one making the decision, based on the information that is available" -BD1*

> *"Decisions that are not only based on gut feeling, but there is some sort of input for the decision like statistics, some sort of quality assured data" -OM1*

A repeatedly voiced thought on defining data-informed decisions (n=7) was that decisions can be validated and verified with data, which was generally described as a benefit to decision processes because you feel more confident in your decision as it is supported by data that display the situation. Moreover, a few (n=3) interviewees mentioned that data-informed decisions take into account several peoples judgements as the data are based on input from several people and not only yourself, which in turn verifies the decision further.

> *"You are not only making a decision based on gut feeling, you have a verified solution for the decision ... it is not only my thoughts, but several different disciplines have been involved with their thoughts in the decision" -DM1*

"You have a decision that you in retrospect can derive from a certain data ... which you cannot do in the same way with a decision based on experience" -BD3

One interviewee also added that the ability to validate your decisions with data marks a cultural change in decision-making as you in some cases cannot decide based on your own opinions when there is data on what is the right decision.

"A lot of the information needed for decisions exist today ... If you make the wrong decision and are badly informed because of yourself, because you have not looked at the data, the consequences are bigger today, because the information is there to make the right decision" -VC1

When defining data-informed decision-making, several (n=7) mentioned availability of data. Meaning that you can only be data-informed with the data that you have access to, and the decision is first and foremost based on the decision maker. In essence, when making data-informed decisions, human judgements such as experience or intuition is part of the decision process as the data can be incomplete or insufficient. Depending on the situation and decision at hand, data and human judgements can cooperate in making a decision, or you can corroborate the right decision with available data, while human judgements take over in the absence of data.

"I am the one making the decision, based on the information that is available. I will never have enough data, there is always data that is missing and it will never be perfect ... I must decide based on the data I have and if I trust it" -BD1

"If you have data available and are able to use the data, then you can take data-informed decisions ... data supports our decisions and help us view the bigger picture" -BD2

"We get as close as possible to reality based on the data we have and make a decision based on that ... the data will never be 100% correct, but the data available can support our decisions ... the decisions are based on data as far as possible... and assumptions are handled in a transparent way" -P1

Added by some (n=4), the concept of being data-informed also referred to the company's strategy that people should try to work more with the possibilities available today in order to make more precise decisions, evaluate all possibilities, predict future needs and be technologically in the forefront of the industry. In this sense, making data-informed decisions is a way of describing the organisations processes and culture when it comes to handling its business idea.

"Being a data-informed company is part of our strategy and development" -BD1

"The concept to be data-informed is part of the firm's strategy, to be able to visualize different needs at different divisions ... and be able to prepare for future needs" -P1

"A popular interpretation for data-informed decisions is what change we want to achieve, rather than what a data-informed decision actually is" -BD3

Data-informed decision-making was by several (n=7) described as a visualization of our decisions, as data can in an objective way compare alternatives and construe differences between them. Making it easier for decision makers to grasp the situation and make rational decisions compared to making decisions entirely based on internal feelings, especially when many factors influence the decisions.

"Data-informed decisions visualize what alternatives we have and what consequences they have by using the data we have available" -AI 1

"A lot of factors are related, and data helps us visualize the whole picture, through which we can take data-informed decisions" -BD3

"Sometimes in the industry we tend to make the decision that we always make in a certain situation because that is the easiest one to make. When we are data-informed we are not only making the traditional and easy choices, but we challenge that decision by visualizing what alternatives are the best with calculations and data" -PM1

The results from the interviews points altogether at a rather shared view of what a data-informed decision is, and almost all had a clear-cut way of describing it, with only a few (n=3) saying that they did not have a definition or was not quite certain of what a definition could be for a data-informed decision.

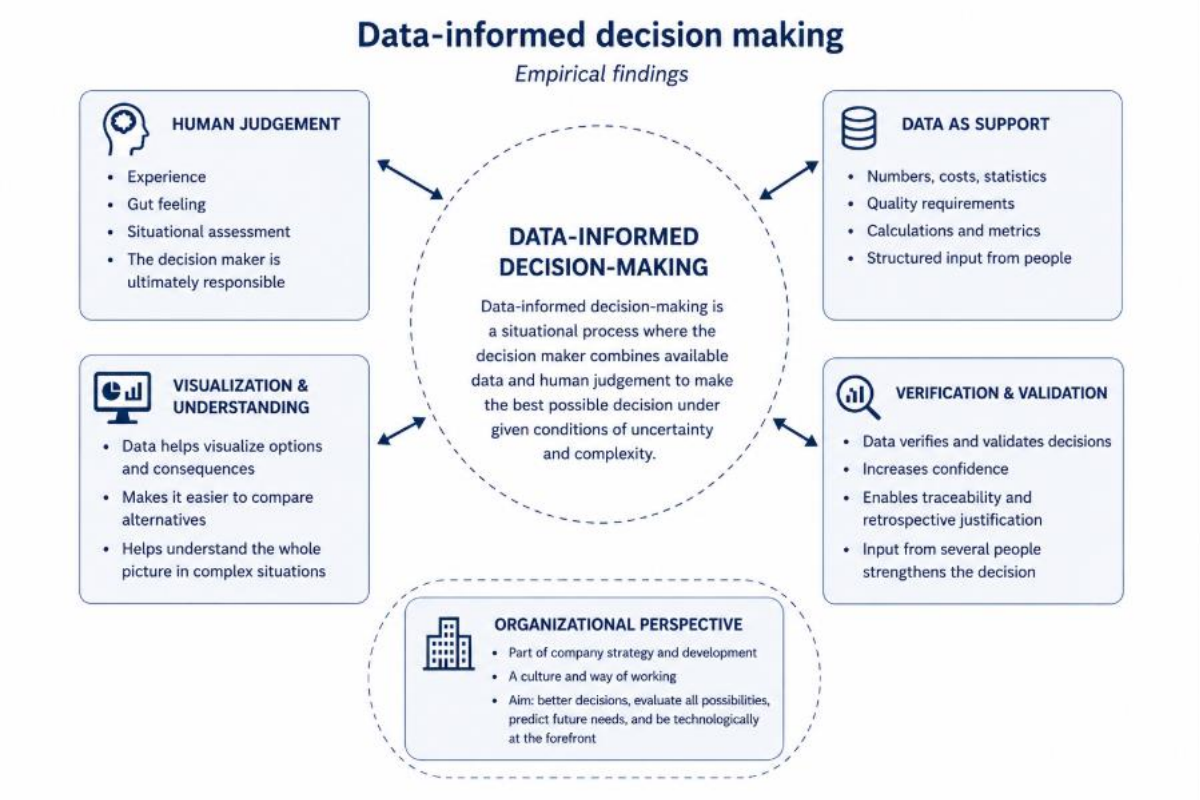

Figure 4.1 Illustration of data-informed decision-making.

4.2 How is data used in practise for decision-making and for what type of decisions

How data is used in practise for decision-making, is very much determined by the type of decision and the availability of data. The interviews disclose that decisions that are repeatedly made on a daily basis by decision makers in construction, are often decisions on prioritising what to do in the short term. This includes who to support, in which order to execute processes and avoiding collisions in the project planning, among other things. It is explained by almost all (n=12) that these daily decisions are primarily based on experience and intuition, as these decisions frequently need to be taken quickly to mitigate standstills in production or commercial processes, leaving limited time for more extensive data gathering or analysis. Smaller day to day decisions also involve a lot of subjective judgements like for managing people, and this subjectivity can be complicated to transform into data. All things considered, the empirical findings suggest that more extensive data-informed support was often perceived as less necessary in many day-to-day decisions, where rapidly accessible experience, team communication and operational understanding were often considered sufficient due to the speed at which decisions often need to be made and the demands of everyday project work.

> *"I am taking a lot of decisions about what to do in the present moment, what to do and not to do ... decisions on how to get an answer as quick as possible ... these are fully based on gut feeling and experience" -BD2*

It is conveyed in the study that decisions that are the most supported by data are technical solutions for construction specific tasks and economical decisions when comparing costs for technical solutions or contract work. Furthermore, it is stressed by several (n=8) that the bigger and more complex a decision is, the more data you want to have or need to make a decision.

"The more complex a decision is, generally the more data you want" -BD1

In the present case, these decisions that are bigger and more complex is often where the combination of data and human judgements work together judging from the interviews. When a big decision occurs with substantial impacts, the importance of verifying the decision rises, and as reflected in the definition of data-informed decision-making, this is one of the central ways in which data is used within decision processes.

"In the middle of a project we had two technical solutions that we could proceed with for quite a sensitive area. One solution that was a traditional solution that we had a lot of experience implementing, and one alternative solution that would be better for the environment and less time consuming, but the alternative solution had not been performed before in Sweden, and we had little to non experience in implementing that solution. So, one safer solution with less risk, and one more risky solution but with more benefits ... in this uncertain situation we gathered large amounts of data to evaluate the best alternative ... we landed in the alternative solution that hadn't been done before and the outcome was great" -PM1

At the same time, bigger decisions tend to be more complex, and some (n=4) interviews suggested that data may in certain situations provide a limited or one-sided representation of complex project realities, which further emphasizes the importance of combining data with human judgement and contextual understanding, to see the bigger picture and factors beyond what the data can tell.

"We might say that we want to build a house out of wood, because the data shows that wood is less expensive, but that might only apply in the short term, because if there is a fire the wood will be severely damaged ... if there is a leakage the wood will be damaged ... so the cheapest option depends on the situation and risks at hand" -DM1

The results therefore point to a combination of data and human judgements when processing bigger and more complex decisions as beneficial. Since experience and intuition can sense and include factors that might be beyond the data like macro effects or subjective matters, whereas data can confirm costs and technical requirements that are harder to verify based on human judgement. Moreover, in some situations our intuition say that things might be in a certain way, and we have a gut feeling telling us to decide towards a particular direction. Furthermore, bigger and more complex decisions often times need to be based on more than our internal

feelings, and this is where data becomes a valuable complement to our human judgments, as it can verify our thoughts. The interviews revealed that there is often enough data, but sometimes hard to find the right data. Whereas if our human judgement is telling us something, we know what data to look for, making it easier to find the data and on top of that giving us the convenience to verify our internal feelings. In this way, data and human judgements complement each other in decision-making, which was suggested by almost all (n=13) interviewees.

> *"The data is there to verify or challenge our gut feeling but never replace it ... The numbers might tell us that our gut feeling is wrong, or sometimes our gut feeling can sense that the data is wrong. Both need to work together, and the best scenario is when the data and gut feeling are matching" -PM1*

> *"You can verify your experience and gut feeling with data ... When the situation is uncertain it is important to verify your decisions with data and calculations, gut feeling alone is not okey" -DeM1*

Another way the study express data as a complement to human judgement is by turning human judgements into data. Several (n=8) interviews mentioned that the data used often derive from many actors with their own calculations and opinions, and in this way, the data used to make decisions are based on several people's judgements and experience which is a way of integrating human judgements into a structured form and improving communication. As earlier mentioned in the definition of data-informed decision-making, this is also a way of verifying decisions as you use data based on numerous peoples' judgements instead of solely oneself.

> *"The data is based on not only my thoughts, but several peoples ... which gives us the ability to see the whole picture and take a collective decision" -OM2*

Furthermore, two interviewees explained how they turned subjective feelings into data by letting people on site assign a colour to their perception of the safety in certain situations, red if it was bad, green if it was good and yellow if it where somewhere in between. This was argued to make it easier to detect areas that needed improvement on site and demonstrates how data complement human judgements in decision-making processes.

> *"It can be hard to know what is working and what is not regarding work environment ... as the work environment is expressed subjectively and individually ... by letting everybody on site put a colour on several procedures, we created our own data, making it easier to see what areas needed improvements" -PM1*

In relation to the questions concerning what the decision-makers base their decisions on, it was asked if they felt that they had enough data available when making decisions. The answers to this question were widespread with no common ground, as

some said that they had enough data, some said that it was overall enough data except some particular kind of data, and some said that they absolutely needed more data. However, nearly all said or implied that more data was welcomed and generally benefiting, although some felt it was not necessary for decision-making in their position.

4.2.1 Potential to improve decision-making through data-informed practises

By far the most common suggestion for using data to improve decision-making was turnout-data on historical decisions and processes. This was mentioned in next to all (n=14) interviews as something that was lacking in decisions processes or something that would improve decisions-making substantially. Data on historical decisions and processes was described as having structured information on outcomes from earlier projects regarding a wide range of aspects such as technical solutions, cost outcomes and subcontractors. Both in terms of having numbers on the outcomes as well as thoughts on working relations, for example how time consuming, costly or complicated a specific solution was, or earlier work experiences with a certain subcontractor.

> *"We are bad at doing follow-ups on our costs ... we lack data on outcomes" -PM1*

> *"We do not document outcomes to such a great extent, but data on earlier outcomes would be beneficial to have" -SS1*

This data was however described as rarely available or non-existing in construction projects. Several explained (n=6) that the reason for this originates in the nature and culture of the construction industry, as construction is always very forward-looking with a high focus on mitigating stand stills and quickly moving on to the next step in projects. Because of this, the industry rarely finds time to pause and reflect, and projects tend to move quickly from process to process, which leaves little time and effort for documentation of outcomes. On top of that, it was explained that most people in the industry are problem solvers and like to solve problems, which gives a sense of contentment in not having all the answers, and that can hinder efforts towards more data-informed approaches such as using data on historical events.

> *"In the construction industry we like to solve problems and when the problem is solved, we tend to move on to the next problem, without any reflection on our earlier decisions" -DM2*

> *"We can be better at collecting data on outcomes, the few possibilities to find that kind of data are not very structured and hard to use" -DM1*

Most interviewees stated that there was no data on historical outcomes, suggesting that it barely exist, but according to some (n=5), data on historical outcomes exists but

is either hard to interpret or not accessible. It was conveyed that there was no structured way of organizing and describing data on historical decisions and outcomes, making it hard to find or interpret if you do find it. Moreover, it was said that data on outcomes was not accessible to everyone at the firm, partly because of data-security reasons, but also structural reasons. The interviews explained that data does not travel between different projects which stifles knowledge transferring at the firm, and data on historical outcomes from the firm's database are not available to the people working in production, and generally only available for the top-management.

"Data on outcomes would be great to have ... the data exist somewhere, but everybody does not have access to it" -AI1

"There is a database on historical outcomes, but it is very confidential. Only the top-managements has access to it" -OM1

The study clearly points out that data on historical outcomes are very much sought after, and it was described that this kind of data would enable several benefits in decision-making processes. The interviewees explained that access to historical metrics from previous projects could improve the ability to predict future situations and support more precise and well-grounded decisions. Examples frequently mentioned in the interviews included data regarding the cost and performance of different solutions, as well as previous experiences of working with specific subcontractors. By analysing how similar decisions and situations had turned out in earlier projects, decision-makers argued to gain a stronger foundation for evaluating alternatives, estimating risks and anticipating potential outcomes before making decisions. Another common way of describing its use was the possibility of learning from previous mistakes and unsuccessful outcomes. Interviewees described how data on historical processes and results could make it easier to identify recurring problems, track where things had gone wrong and detect areas in need of improvement. Thus, historical data was described both as support for predicting future outcomes, and as a tool for organizational learning.

"It would be great to have turn-out data on the working experience with a subcontractor, not only expected price and actual price ... there is a lot of data on outcomes that would be great to have" -OM1

"A lot of times we have withheld a decision on business development because the situation is unclear. The decision gets postponed and three years later we make the decision to develop and realise we should have made the change straight away as it would have given a lot of value ... if we had turn-out data that showed us that 9 out of 10 times we end up making the change we had planned earlier, it would be easier to take the decisions in the present time, as we can predict common future outcomes" -BD2

"We lose the lessons-learned process when we don't follow up our results" -PM1

"Access to more historical data in the projects, could be used to see how earlier outcomes on different decisions came out, like costs, climate impacts and time, depending on what is needed ... there is a huge interest in this kind of data" -AI1

"Let's say we are going to build for example a water treatment plant and we have several earlier projects of similar character. If we have experience-metrics on those projects so you can see trends, we can get a better view of the possible material purchases instead of making an educated estimation every time ... so data on earlier outcomes would be great to have ... Moreover, if we have a recurring supplier base, how does it come that supplier A and B always stay within budget, but supplier C and D always overshoot the budget by 10%-15%? Something is driving this and it can be several things, but with historical data we can see these trends and detect the root cause more easily ... and today we can be much better at the experience feedback through more data on outcomes" -P1

Another reoccurring (n=8) suggestion to improve decision-making from the interviews was to utilise the existing data more. Some said that the ones who need it do not have access to the data, because of either structural or confidential reasons, but it was argued that they know the data exists. Others, mainly supporting roles, suggested that the available data need to be utilised more by people working in production as available models and data sets are not used to the fullest potential.

"It is important that decision-makers ask about the available data before they make a decision ... in this way the organisation learn how to be data-informed, through setting good examples and acting in data-informed ways" -BD1

"Primarily there is a lack of access to data, the data exist but we don't utilise it" -AI1

"When we provide the data to production, they should utilise it more ... you can verify your human judgements with data" -DeM1

"Our design models contain a lot of valuable data, but it hasn't been recognized by production ... production does not make use of the possibilities in these models" -DM1

"I don't think all the projects utilise the possibilities that exist with data that is available in all projects" -BD2

However, both sides argued that more data is consistently well-received as it can be used to verify decisions and compare alternatives. To expand the use of data and data-informed practises the interviewees advised several actions. Such as, work more extensively at showing examples on how data can be used as a decisions tool for those who need it. Furthermore, visualize specific divisions data to other divisions, for

example including the sustainability divisions data, like CO2-metrics, into the programs used by the purchasing division. Moreover, also make use of large language models to a greater extent, which were argued by some to ease the handling of data.

"We need to show how good looks like, if you haven't seen the possibilities (with being data-informed) than you don't know the benefits" -BD1

"It is important to show what the data can do and its benefits" -P1

"We should visualize climate data better for people working in purchasing, so they have the information in their systems. So, when they get their price for a unit they also see for example the CO2-data for that unit. That would make them more informed in their decisions ... however, some system development is needed for that, as well as discussions with external stakeholders" -RD1

4.3 Barriers to data-informed decision-making

Several barriers were brought up in the interviews, and these were described as barriers for the interviewed as well as to the whole company and industry. The barriers were brought up in a context in which these barriers stifle possible improvements data-informed practises could have on decision-making.

4.3.1 Structural barriers

The study shows that data-informed decision-making within construction suffers from a lack of structure in the data, and the structural problems manifest in several ways. Nearly all (n=12) interviewed stated that the lack of structure was one of the main barriers to being data-informed when taking decisions, and the challenges were highlighted in several ways. A commonly mentioned struggle was the access to data, as many (n=10) said that the data is hard to find or not available in time. On top of that, some (n=5) also mentioned that the systems can be rather messy and hard to navigate in, which makes the search for data demanding. A related issue to the trouble of finding data was the difficulty of interpreting the data. Many (n=10) of the interviewed mentioned that the data lack defined, systematic and consistent descriptions, for example the same type of data can be called different things or that the data is named in ways that do not match its function.

"A lot of data exists and the needed information is somewhere, but you do not always find it, and it is rarely presented in a simple way" -OM2

"We have a lot of challenges with the data today ... we have a lot of data sources in the company, but they are unstructured, they are not visualized like you want them to be and especially not available in one place" -P1

It was explained that the lack of structure in the data makes it hard to utilise in decision-making, leading to decision makers choosing other ways of gathering information and supporting their decisions, such as making phone calls for help or coordinating extra meetings. The interviews revealed that these structural difficulties derive from data being spread across many separate systems that do not communicate properly with each other, as well as a lack of routines and standardized ways for collecting and storing data.

> *"A problem with the data is that it is reported in different ways, and because of that you need to process the data before it is useful for a decision ... All divisions work quite structurally on their own, but connecting for example purchasing data to project-results is not a compatible process. Then you need a lot of detective work to figure out the circumstances around the different divisions data" -AI1*

> *"There is a lack of structure in the data, and it is very important to describe and code the data in a consistent way to make it useful" -VC1*

A few (n=3) also mentioned that a lot of the data being collected travels up the firm to the top-management, and in doing so, does not end up in the hands of those who need it at the operational level. It was conveyed that in a way it is the upper managements job to then supply strategy and tools based on the data they receive, but it was also argued that it could be utilised to a larger degree at the operational level and that the data would travel upwards thereafter.

> *"There is a database on several outcomes and metrics collected in recent years ... but it is not available for people at the company, only the top-managements has access to it ... the idea might be that the higher-ups lead the organisation through this data ... but this data should be used to a larger extent" -OM1*

> *"There is a lot of focus on sending data upwards in the organisation to the top-management, which does not benefit the projects ... if you give the data to the projects, then it will move upwards anyways. This have caused a lack of data in the projects. Data that they could have benefited from" -BD2*

Several (n=7) said that the firm is in a transitional phase now for working with the data in a more structured way, especially in making the data more interpretable through describing the data in more consistent ways internally. On top of that, this transition and the future was seen with optimism regarding better structured data that would be easier to utilise. However, at the same time it was argued that structural barriers would remain for the foreseeable future. It was conveyed that the most optimal solutions often seem to be wishful thinking, due to the external systems being used are far from perfect and that some changes are so big that it would not be possible from a technical or economical perspective.

"We are in a transitional sequence now in going from unstructured data to define and arrange data to a degree that is necessary, so we in the long run can get systems that can use the data in an applicable way" -BD4

"It might be a pipe dream, but it would be great to have a central function at the firm that owns the data-question company wide, that could deliver the data collected by the firm on demand, when and where it's needed ... but how you do that is unclear" -P1

"It is hard to supply the data for everyone, because when we buy software, it comes with license costs, and to give everybody these licences is too expensive" -AI1

"The higher ups that sets the strategy, knows that they will have their post a few years, like a term of office. They might not want to take on heavier costs (from structural revamps) during their term of office to risk not being re-elected the next time ... so these larger changes take time, but small developments are constantly being made" -OM1

4.3.2 Cultural barriers

A frequently occurring topic from the interviews was culture in the industry and how it often acts as a barrier to being data-informed. Several (n=9) said that the industry has for a long time had a strong reliance on experience and gut feeling in decision-making and people have a conservative approach to their practises where they want to do things the way it always been done. Because of this, decision makers in the industry sometimes have an aversion to implementing new ideas into their processes, which hinders the concept of being data-informed. It was conveyed by the interviewed that some people in the industry do not trust being too reliant on data in decision-making, largely due to the structural difficulties with the data earlier explained. Whereas some tend to have a fear for implementing more data as they think it could threaten their jobs by not being needed or take away the very sought-after problem-solving element within construction.

"It is a psychologically demanding change for some to go through, to go from relying on your gut feeling for many years to be data-informed ... it is hard for many to accept" -BD1

"There is a risk of killing the entrepreneurial spirit if the data shows all the answers" -OM1

Several (n=8) of the interviewed stressed that in order to combat the cultural aversion to data-informed decision-making it is important to show what benefits it can bring. They said that many do not see or know about the possibilities that exists with the available data these days and points out that it is important to demonstrate how data-informed decision-making can cut costs and time in projects. A few (n=3) also

mentioned that one's people are shown how they can use data, mainly referring to people working in production, they tend to be very satisfied and rarely goes back to their former practises.

"Peoples attitude changes quick as soon as they see that the data helps. Therefore, it is important to show the benefits with being data-informed" -BD1

"If you show the production team an example on how they can use the available data, they always like it and never go back to their former practises" -DM2

4.3.3 Knowledge barriers

The interviews revealed that in order to be data-informed, decision makers need a certain level of knowledge on the data and its origins. Several (n=8) mentioned the importance of knowledge and that lack of knowledge hinder one's ability to be data-informed, but through several different aspects. Some said that you need to understand the technical aspects of the data and how it translates into the real world, suggesting that it is hard to use data for decision-making if you do not have sufficient knowledge on what the data represents in terms of on-site metrics. Whereas others mentioned the importance of knowledge in digital tools, systems and its languages, implying that a lack of understanding in these makes it harder to find and utilise data, which impedes data-informed decisions.

"You need to know the craft to be able to make a reasonable assessment, so you don't fall victim to the data ... if you have the required knowledge, then the data is useful" -DM1

"If you have someone with little on-site knowledge gathering a lot of data for a decision, it can easily go wrong as they do not understand the situation" -PM1

"People have difficulties understanding how to use structured data when it is not presented as continuous text, and many do not know how to combine and group information in digital tools to get the information they need. Therefore, a basic understanding of how data systems are built and interpreted is necessary to effectively utilise data" -BD2

"When you get the data delivered to you as a support, many wonder how you should handle it as it can be hard to understand how it translates into practise in the real world. So, we need to work with the data in new ways to also get the understanding of what the data represents ... and we don't have all the answers for that yet. As people have difficulties understanding the data and trusting the data, we need to show to a larger extent how it can be used ... we won't see any significant increase in effectiveness by just including more data. Adjustments need to be made to truly be data-informed, different skills that we don't possess today" -DM2

5 Discussion

This chapter presents a reflective discussion of the study's findings in relation to the research questions and the literature review. The discussion focuses on how data-informed decision-making is understood and used within the studied organisation, the potential for improving existing decision-making practices through more data-informed approaches, and the barriers connected to implementing such practices within the construction industry. The chapter aims to further interpret and analyse the identified patterns, discuss how the different themes relate to one another, and connect the findings to relevant theory and previous research.

5.1 Decision-making in construction

The findings suggest that the uncertain and complex nature of the construction industry creates a decision-making climate where adaptability becomes highly important. Construction projects are characterised by constantly changing conditions, time pressure, fragmented information, human factors and external risks, where decision-makers rarely have access to complete or perfectly reliable information. This resembles the principles of bounded rationality presented by Simon (1957), where decision-makers operate under limitations in information, time and cognitive capacity rather than under conditions of full rationality. In such environments, individuals cannot realistically evaluate all possible alternatives or rely solely on perfectly structured analytical reasoning.

Because of these conditions, decision-making within construction appears to require flexible and situational judgement rather than fixed and standardized procedures. This aligns with theories regarding heuristics and intuition, where individuals operating in uncertain and complex environments rely on experience, pattern recognition and mental shortcuts in order to make decisions efficiently. The interview findings reflect this, as respondents described how fast-paced day-to-day decisions are often handled primarily through experience and intuition due to time pressure and the practical nature of construction work. This resembles the intuitive and rapid reasoning associated with System 1 thinking described by Kahneman (2012), where decisions are made quickly with limited deliberate analysis. At the same time, respondents explained that larger and more uncertain decisions require greater analytical support, where data is used to verify, challenge or strengthen human judgements. This resembles the more reflective and analytical characteristics of System 2 thinking, where individuals consciously evaluate alternatives and process information before making decisions.

The findings further suggest that larger and more complex decisions within construction require a continuous interaction between analytical reasoning, experience and contextual understanding. This once again resembles the theories of bounded rationality and heuristics, which suggest that decision-making in uncertain and complex environments becomes adaptive rather than fully rational and standardized. Due to the complexity of construction projects, decisions often involve subjective assessments, situational understanding, human relations, safety considerations and long-term consequences that are difficult to fully translate into quantitative data. The industry also operates under high levels of uncertainty and risk, where technical, economic and human factors continuously interact. This further resembles the perspectives on intuition and naturalistic decision-making by Klein (2015), where experienced individuals use contextual understanding and pattern recognition to interpret situations

that are difficult to fully structure analytically. As a result, relying too heavily on structured calculations alone may become problematic, since the available information may not fully capture the broader context surrounding a decision. This also aligns with the arguments by Brunsson and Brunsson (2014), who suggest that additional information and analytical structure do not necessarily reduce uncertainty if the situation itself remains difficult to interpret.

Taken together, the findings suggest that neither human judgement nor analytical support alone is sufficient for effective decision-making in construction. Experience, intuition and contextual understanding are important for interpreting the broader project context, while data and analytical support help decision-makers verify assumptions, compare alternatives and visualise potential consequences. In this sense, decision-making within construction is best understood as an interplay between analytical support and human judgement, which aligns well with how data-informed decision-making is understood based on the results.

5.2 Definition of data-informed decision-making

To encapsulate a definition of data-informed decision-making based on the interview study, it becomes clear that a data-informed decision is one not only based on human judgements such as gut feelings or experience, nor is it exclusively based on data in the way a mathematical formula find its answer through fixed variables. Although many interviewees initially stated that they had never reflected on how to define a data-informed decision, most still converged around a similar interpretation once discussing the concept. There is a common understanding among the interviewed that decisions within the construction industry rarely are black and white and cannot be processed through one simple truth. As such, a data-informed decision helps us navigate and strengthen the decision process in a spectrum of possibilities that construction contains. It supports us when it comes to comparing alternatives and verifying decisions trough objective measurements, and in that way visualizes reality for us in a comprehendible way, which is more complicated to do in a decision solely based on our own mind's capabilities. However, data-informed decisions are taken by the decision-maker, and the one that makes the decision combine their human judgements with the data available. Thereupon chooses what aspects to base their decision on regarding factors such as availability and trustworthiness of these aspects. In this way, data-informed decisions are very much a situational way of taking decisions where the decision maker considers several views into the decision.

The way a data-informed decision is described based on the interviews also ties in with the interpretation made by some that data-informed decisions was not so much of a set way in making decisions, but more of a strategy and culture the organisation tries to implement when executing its business idea. The perception that decisions should not be taken on loose grounds and all pathways should be explored could be interpreted as the essence of a data-informed decision based on the study. However, this represents more of an organisational viewpoint and as the interviews were conducted from an individual perspective, with more focus on how people personally use data and their own relation to data-informed decisions, this organisational takeaway must be taken with caution. Still, some people directly pointed out this organisational way of viewing data-informed decisions and several alluded to the point that data-informed decisions are a way of describing the firm's culture for problem solving and decision-making.

The results from the empirical findings on what a data-informed decision is largely resembles how the literature define a data-informed decision. The definition that the literature suggests drives at the point that data-informed decisions is a flexible decision process were several factors takes into account in the decision-making process, such as data along with experience and gut feeling, which was the definition largely conveyed in the interviews. Furthermore, in data-informed decisions the literature suggests relatively little use of data in relation to the available amount of data existing in organisations that systematically stores data, which to a high degree coincide with the empirical findings that clearly states that the data exists, but is not fully utilised. As such, the empirical findings suggest that the interviewees understanding and definition of data-informed practises largely align with the literature's definition of data-informed decision-making. Accordingly, this data-informed way of taking decisions seemed to be the preferred way of tackling decision-making judging from the interviewed, as it was expressed by most participants that they want to take into account as much data and experience as possible for each decision. Although to which extent this type of decision-making was actually practised at the firm seemed to depend on multiple variables.

5.3 To what extent are data-informed practices integrated in the existing decision-making practices

The findings suggest that the existing decision-making practices in the case company are data-informed to a moderate degree, but it depends on the circumstances, personal preferences, type of role and the barriers to data-informed decision-making.

The results show that the existing decision-making practices are strongly shaped by experience and intuition. This does not necessarily indicate a low degree of data-informed integration but rather reflects the practical conditions of construction work. Many smaller, day to day decisions, especially in production, need to be made quickly in order to avoid delays, standstills or disruptions in ongoing work. In these situations, decision-making tends to be based on experience and intuition because it is fast, simple and immediately available. When time is limited, the process of finding, interpreting and validating data may be too slow compared to relying on accumulated practical knowledge. Such conditions may lead to decision-making becoming less data-informed, as decision-makers under time pressure often rely on familiar approaches and previously good enough solutions instead of systematically evaluating possibly better alternative solutions through available data in relation to the specific situation at hand. At the same time, systematically evaluating a larger number of alternatives is not necessarily desirable in every decision situation, as such processes may require additional time, resources and analytical effort that are not always justified within construction projects. This reflects the principles of bounded rationality presented by Simon (1957), where decision-makers operate under practical limitations and therefore often seek solutions that are sufficiently effective rather than theoretically optimal. For example, when a production issue arises on site, an experienced decision-maker may choose a solution that has worked well in similar situations before, rather than spending time gathering and analysing data on all possible alternatives. While a more extensive evaluation could potentially identify a better solution, the additional time and resources required may not be justified given the urgency of the situation. In this sense, the time pressure, uncertainty and operational demands that characterise many construction projects may also help explain why heuristics and intuitive decision-making play such

a prominent role within the industry. As suggested by Kahneman (2012) and Gigerenzer and Gaissmaier (2011), decision-makers cannot continuously rely on extensive analytical reasoning, but instead naturally make use of mental shortcuts and accumulated experience to navigate complex situations efficiently.

However, the findings also show that larger and more complex decisions tend to require more data support. When decisions involve substantial economic consequences, technical uncertainty, alternative solutions or long-term effects, data becomes more important as a way of comparing alternatives, verifying assumptions and increasing confidence in the chosen direction. In these cases, the contractor appears to work more clearly in a data-informed way, as data and human judgement are combined rather than treated as separate decision-making logics. As presented in the interviews, data can challenge gut feeling, but gut feeling can also help decision-makers question whether the data captures the full situation. The interviews also provided examples on the contractor's willingness to pause and reflect in uncertain situations, to evaluate the possible alternatives and gather additional information before proceeding, which were expressed as highly successful in situations involving substantial uncertainty or consequences. This aligns closely with Kahneman's (2012) description of System 2 thinking, where decision-makers engage in a more analytical and reflective decision process when faced with complex situations that require the evaluation of alternatives. It also resembles the normative ideal of decision-making presented in classical decision theory, where decisions are based on the systematic assessment of available information and competing alternatives (Kaufmann & Kaufmann, 2016). Although the interviews suggest that such an approach is not appropriate for every decision situation, the findings indicate that it may become increasingly valuable as complexity, uncertainty and potential consequences increase.

At the same time, Chapman (2025) and Eliasson (2025) describe the industry as characterised by recurring delays, cost overruns and failures to meet project expectations. Such shortcomings suggest a need for both efficient decision-making that enables projects to maintain progress and sufficiently evaluated decisions that reduce the risk of larger failures and unintended consequences. This dilemma could create uncertainty regarding how to handle decision-making in the industry. On the one hand, the findings suggest that many decisions benefit from the speed and efficiency enabled by human judgement and bounded rationality. On the other hand, the findings also indicate that more analytical and reflective decision-making may be valuable in situations where uncertainty and consequences become more significant. The challenge therefore may not simply be just to distinguish between day-to-day decisions and complex decisions, but rather developing a deeper understanding of where additional evaluation of alternatives is justified and where it is not. In this sense, an important aspect of data-informed decision-making may be the ability to determine when the benefits of further analysis outweigh the additional time and resources required. Therefore, the extent to which the construction company is data-informed can also be determined by their ability to identify the need for further evaluation or not.

An important aspect to take into account from the interviews, is that all interviewees had sufficient or extensive experience in their fields. This means that the results mainly reflect how experienced decision-makers combine data and human judgement in decision-making. Their experience gives them an advantage in interpreting situations, knowing what information to look for, judging whether data is trustworthy and making decisions when data is missing. However, this also means that the study does not fully capture the need for data support among less experienced employees. For someone with

less experience, data on technical solutions or historical outcomes may be even more important, since they cannot rely on the same accumulated pattern recognition as senior employees. For these employees, data might be more sought after also in the smaller day to day decisions in contrast to those with more experience.

Judging from the interviews and what the literature says on data-driven decision-making, it is quite apparent that the contractor studied is not data-driven. Mainly, due to the large number of qualitative assessments in the construction sector and the lack of coherently accepted and implemented ways of working with data throughout the organisation. However, the literature suggests that data-driven decision-making includes roles in the organisation that exclusively works with data as support to decision makers, which to some extent is similar for the contractor. Where some of the interviewed roles such as purchasing and VDC-coordinator are very data heavy roles that work with organising and analysing data in relation to the needs of the decision makers. Moreover, there are people working with systems like BIM and other digital tools at the firm which could be said to be data-driven practices according to the literature. This suggests that there are data-driven tendencies within the contractor, but overall, their practices tend to align more with the data-informed.

The results show that the interviewed generally want as much relevant information as possible when making decisions and want to utilise data-informed practises. There is a clear desire for more data, particularly data on historical outcomes and larger utilisation of the existing data. At the same time, several barriers still limit the degree to which data-informed decision-making can be integrated into existing practices.

5.4 Barriers to data-informed decision-making

It became quite apparent throughout the interviews that there are obstacles to data-informed practises in the studied case company, and the most commonly mentioned was the structural, cultural and knowledge-related barriers.

The structural barriers mainly dwell around difficulties in accessing and interpreting data, due to the different systems that data are treated in are not particularly compatible with each other, as well as a lack of consistency in describing and storing data. However, it was suggested in the interviews that the firm is in a transitional phase in making the data easier to interpret through more consistent descriptions, and some believed this shift would make it easier to utilise data to a larger extent and make it a more useful tool for decision-making. On the other hand, whether this change will ease their structural difficulties with data remains to be seen, as even though the internal treatment might get more consistent and easier to interpret, the external tools being used are beyond the case company's control. At the moment, many different systems are used throughout the firm's divisions, and these do not necessarily use the same descriptions or see to the specific needs of each division. For instance, a suggestion from the interviews was to include the CO2 data from the sustainability divisions systems into the ones that purchasing use, but at the moment it did not seem to exist a profound way of doing that because of the non-interoperability between the systems. In this sense, a larger structural overhaul might be needed to really be able to utilise data-informed practises to the fullest, but to which extent that is possible for the firm remains uncertain. Especially with regard to pressures on the top-management for delivering satisfying returns, a structural overhaul might not be a preferred strategic plan in the short-term.

These structural barriers are also strongly reflected in the literature, which describes how construction projects often generate large amounts of data, while fragmented systems, lack of integration and inconsistent data structures make the data difficult to access, combine and apply efficiently within decision-making processes (Radman et al., 2025). The literature therefore supports the empirical findings that the challenge is often not the absence of data itself, but rather how the data is structured and made available within the organisation.

The findings also indicate a divergence between production roles and supporting roles, as some supporting roles suggested that production is poor at utilising the data that is already available. This indicates a disconnect between those who supply, structure or develop data and those who are expected to use it in production. From a production perspective, data may be perceived as difficult to access, hard to interpret or not adapted to the realities of on-site work. From a support-function perspective, the issue may instead appear to be that production does not make sufficient use of existing data possibilities. This divergence suggests that data-informed decisions are not only hindered by structural barriers from a technical standpoint but also structurally in regard to communication and organisational aspects.

The cultural barriers identified in the study seem to be primarily connected to the construction industry's established ways of working and the difficulty of changing existing decision-making practices towards more data-informed approaches. Based on the interviews, data-informed decision-making does not only require structural conditions that support the use of data, but also a change in how decision-makers approach and evaluate their own decisions. It was described that decision makers have a tendency to make "the decision that we always make in a certain situation because that is the easiest one to make" and that decision-makers are not always comfortable with having their assumptions or preferred solutions challenged by data. The findings therefore suggest that becoming data-informed may require a cultural shift towards greater acceptance of using data to reflect upon, verify and sometimes challenge existing assumptions, experiences and traditional solutions.

Similar tendencies were also suggested in the literature on cultural barriers within construction. The literature review shows that construction has historically relied on traditional workflows, established working methods and professional judgement, and that the industry is often described as conservative in relation to technological and organisational change (Elkhayat et al., 2024; Taja & Amin, 2025). Studies on digital transformation in construction further suggest that resistance to change is not only a technical issue, but also a cultural and psychological one (Hassan et al., 2024; Tan et al., 2025). This helps explain why data-informed decision-making can be difficult to implement in practice, as it does not only require people to adopt new ways of working, but also to accept that their own experience-based judgement may sometimes need to be challenged by data.

A related cultural barrier is that data-informed decision-making can be perceived as a challenge to professional identity. The interviews suggest that construction professionals often value being practical problem solvers, which is understandable, as construction projects require quick action, adaptability and the ability to handle uncertainty. However, the interviews also suggest that the fast-paced and action-oriented nature of construction work can leave limited room for structured follow-up, reflection and reuse of earlier experiences. Several interviewees described the industry as forward-looking, where people solve one problem and then quickly move on to the next. This may partly help explain why data on historical outcomes and knowledge

transfer were repeatedly described as limited, despite being highly requested forms of decision support. Data-informed decision-making may therefore benefit from a cultural shift where reflection, follow-up and documentation are seen as part of problem solving, rather than as administrative tasks that come after the "real work" is done.

Another cultural barrier concerns the lack of trust in data. Based on the interviews, this lack of trust does not seem to come from a general belief that data is unimportant, but rather from how data is often experienced in practice. The results show that data is frequently difficult to find, spread across several systems, poorly structured and not always presented in a way that makes it useful for decision-making. Nearly all interviewees identified lack of data structure as a major barrier, and some described that data often has to be processed before it can support a decision. When decision-makers repeatedly encounter data that is hard to access, difficult to interpret or disconnected from the actual production context, it is understandable that they may develop low trust in data-informed approaches.

This means that cultural resistance may partly be a consequence of earlier negative experiences with data. If data has previously been experienced as messy, time-consuming or unreliable, decision-makers may not see it as something that improves their work. Instead, they may return to familiar ways of gathering information, such as relying on experience, calling colleagues or arranging extra meetings. In this way, structural shortcomings in the data may contribute to distrust in data-informed approaches, while lack of trust can reinforce a culture of relying on the decisions and solutions that are traditionally used, rather than systematically evaluating alternative solutions through available data.

Knowledge barriers also appear to reinforce both the structural and cultural barriers identified in the study. The interviews suggest that decision-makers need to understand not only where data can be found, but also what the data represents, how it was created and how it can be applied in relation to the specific decision. Without this understanding, structural barriers such as fragmented systems, poor accessibility and unclear data structures may become even more difficult to overcome, as users may not know how to search for, combine or interpret the available information. In this sense, data does not only need to be better structured but also understood by the people expected to use it. Otherwise, data risks being experienced as abstract, unreliable or detached from the reality of construction work, which may contribute to low trust and strengthen cultural resistance towards data-informed approaches. The findings also suggest that knowledge barriers are not only related to digital competence itself, but also to the ability to connect data and practical construction knowledge. While some interviewees highlighted the need for better understanding of digital tools, systems and data language, the interviews also show that construction-related knowledge remains essential. To use data effectively, decision-makers must understand the operational context behind the data, including what work processes, site conditions and practical realities the data reflects. These aspects are also supported by the literature, which emphasises that digital literacy, technical skills and understanding of processes are all necessary for data to become useful in practice within construction (Hassan et al., 2024; Gharaibeh et al., 2022; Tariq et al., 2025). Furthermore, previous studies suggest that data may become difficult to apply when users lack understanding of the operational processes and practical context behind the information itself (Li et al., 2022; Fathi et al., 2026; Pfitzner et al., 2024).

A commonly mentioned way to reduce these barriers was to show how data can actually be used and what benefits it can create in everyday work. Several

interviewees argued that people may not see the value of data-informed decision-making until they are shown concrete examples of how it can support their own decisions, reduce costs, save time or make alternatives easier to compare. This suggests that practical demonstration can work as a bridge between structural, cultural and knowledge-related barriers. By showing *"what good looks like"*, data becomes less abstract, users develop a better understanding of how to apply it, and trust in data-informed approaches may increase. The interviews also indicate that once employees, especially in production, are shown how available data can support their work, they often become more positive towards using it.

5.5 To what extent could data-informed decisions potentially improve existing decision-making practices

The empirical findings suggest that data-informed practices could improve existing decision-making primarily through two areas, better use of data on historical outcomes and greater utilisation of already available data. Data on historical outcome was the most frequently mentioned improvement area, as interviewees described a need for better access to information about previous technical solutions, cost outcomes, subcontractor performance and lessons from earlier projects. Existing data was also described as underutilised, especially when available models, systems or datasets were not fully used by the people who could benefit from them. In this sense, the potential improvement is not necessarily about creating entirely new forms of data, but about making existing and historical data more accessible, understandable and useful in actual decision situations.

However, the findings also suggest that these improvements should not be overstated under the current conditions. Simply collecting more historical data or encouraging greater use of existing data would not automatically improve decision-making if the same structural, cultural and knowledge-related barriers remain. If data is difficult to access, poorly structured, hard to interpret or not trusted by decision-makers, its practical value becomes limited. This is also supported by the literature, which suggests that data improves decision-making when it is reliable, accessible and possible to integrate into existing work processes. Therefore, the degree to which data-informed decision-making can improve current practices appears to depend less on the existence of data itself, and more on whether the organisation can create the conditions needed for data to function as useful decision support.

The potential improvement is therefore conditional. If the identified barriers were reduced, data-informed practices could support decision-making in several ways. Based on both the interviews and the literature, data-informed practises could make it easier to compare alternatives, verify assumptions, learn from previous outcomes, identify recurring problems and increase confidence in decisions. This could be particularly valuable in larger and more complex decisions, where the consequences are greater and where decision-makers often want more data before deciding. At the same time, it is clear that decision-making in construction will continue to require human judgement, experience and contextual understanding. Data-informed decision-making should therefore not be understood as a replacement for existing decision-making practices, but rather as an approach that strengthens them through the integration of data as support for evaluating alternatives, verifying assumptions and broadening the basis upon which decisions are made.

Realising these improvements would likely require more than small adjustments. The results indicate a need for broader organisational development, including better data structures, improved system integration, clearer routines for documenting and sharing outcomes, and more accessible decision-support tools. Such structural changes would also need to influence how people work, since cultural barriers are partly connected to established decision-making habits and reluctance to let data challenge existing assumptions. In addition, knowledge barriers would need to be addressed through increased understanding of the data and how it can be utilised in practice. This means that the path toward more data-informed decision-making is demanding, as it requires changes in systems, routines, competences and culture at the same time.

Overall, the case company appears to be in a transition towards enabling more data-informed practices, and the interview findings suggest that the organisation is moving in a direction where data is increasingly seen as an important support for decision-making. However, the improvements are likely to be gradual rather than immediate. The findings suggest that data-informed practices have the potential to strengthen existing decision-making practices, but that this potential will remain limited until the main barriers are addressed. Therefore, the most realistic conclusion is that data-informed practices can improve decision-making within the studied company, but not simply by adding more data. The improvement depends on whether the organisation can make data accessible, trusted, understandable and embedded in everyday decision-making practices.

6 Conclusion

The aim of the study was to investigate how decision-makers within a large Swedish contractor define and use data-informed decision-making, as well as to explore its potential to improve existing decision-making practices and the barriers that may limit its implementation. Based on the empirical findings and the subsequent analysis, this chapter summarizes the main conclusions of the study in relation to the research questions.

RQ1: How is data-informed decision-making defined and described by a Swedish contractor?

Data-informed decision-making can be described as a decision process where the decision maker evaluates all knowledge at their disposal, as a first step in the process. This knowledge can derive from several aspects such as human judgements or objective data. Thereafter, it is up to the decision maker to choose what aspects to base the decision on. In essence, the decision maker is the one making the decision and no particular aspect drives the decisions.

The findings suggest that data-informed decision-making can be viewed as a process that encourages the comparison of alternatives and supports visualisation of these alternatives by using data to display complex situations. Furthermore, data-informed decision-making can also verify decisions and increase confidence in decisions through evaluation of several aspects.

After analysing the results, the study suggests that data-informed decision-making in construction should also be viewed as a process that considers which decisions need further evaluation and data, as decisions within construction require different levels of analysing.

To capture data-informed decision-making in a compiled definition the paper has construed the following definition:

Data-informed decision-making is a situational process where the decision maker combines available data and human judgement to make the best possible decision under given conditions of uncertainty and complexity through reasonable evaluation.

RQ2: To what extent could data-informed decisions potentially improve existing decision-making practices within the studied case company?

The studied case company's existing decision-making practises can potentially be improved by integrating data-informed practises to a larger extent, but to gain comprehensive improvements certain conditions need to be met.

The empirical findings suggest that there is a desire for data on historical outcomes and further utilisation of the already existing data, as it is a useful tool for supporting decision-making. The results also indicate that the existing decision-making practises are data-informed to an extent, and that such practises are looked upon as favourable among the interviewed. At the same time, it was evident that the company is not completely data-informed throughout the whole organisation, as there was a tendency to sometimes procced with established but non-evaluated decisions. Furthermore, there was a lack of utilisation of available data because of several reasons such as difficulties in obtaining data and an unwillingness by some to get their opinion challenged by data.

Therefore, the study suggests that data-informed practises can improve the existing decision-making practices at the company. The suggestion from the interviewed to gather, supply and use more data on historical outcomes and processes could be a step towards more data-informed practises along with improvements in decision-making. However, simply adding more data will probably not retain comprehensive improvements in decision-making. For the company to advance in their decision-making through data-informed practises, the barriers to data-informed decision-making need to be addressed first. This outlook became quite apparent in the study as even though the interviewees overall had a positive viewpoint on data-informed decision-making, the focus in most interviews mainly fell on the challenges and barriers to be data-informed.

All things considered, it should be emphasized that the studied contractor seems to be in a transitional phase for improving the circumstances for practising data-informed decision-making. Especially in regard to addressing the structural issues by working with internal data in a more consistent manner. Conclusively, the studied case company is moving in the right direction with the potential to improve their existing decision-making processes through data-informed practises.

RQ3: What barriers exist to data-informed decision-making?

The study found structural, cultural and knowledge-related barriers as the most common and biggest obstacles to data-informed decision-making.

Structural barriers were primarily related to fragmented systems, poor accessibility of data and difficulties in combining information from different sources. The findings show that data is often distributed across multiple systems and formats, making it difficult for decision-makers to locate, access and utilise relevant information. In addition, unclear data structures and limited traceability reduced the practical usability of data in decision-making processes.

Cultural barriers were mainly connected to established ways of working, reliance on human judgements and reluctance to change existing practices. The findings indicate that decision-makers often prefer familiar approaches and previously used solutions, particularly in fast-paced project environments. Furthermore, low trust in data and a tendency to rely on traditional decision-making practices were found to limit the adoption of more data-informed approaches.

Knowledge-related barriers were associated with limited understanding of digital tools, systems and data. The findings suggest that insufficient digital literacy and difficulties navigating existing systems can reduce the ability to utilise available data in decision-making. At the same time, interviewees highlighted the importance of understanding what the data represents in practice, as effective use of data also requires knowledge of the construction processes and technical aspects behind the information.

As a conclusion, even though data-informed decision-making can be viewed as a situational process, there is many barriers to data-informed decision-making that stifles the possible benefits from this kind of practise. The findings therefore suggest future research in relation to these issues to further improve decision-making within construction.

7 Future research

This study has contributed to a deeper understanding of how data-informed decision-making is defined, practised and challenged within a large Swedish contractor. However, the findings also identify several areas that would benefit from further research.

A first area for future research concerns the barriers identified in this study. Structural, cultural and knowledge-related barriers were all found to limit the implementation of more data-informed decision-making practices. Future research could therefore investigate how these barriers can be reduced or mitigated within construction organisations. Such studies could focus on individual barriers or examine how the barriers interact and reinforce one another in practice. This could contribute to a better understanding of how organisations can create conditions that enable more effective use of data as decision support.

A second area for future research concerns the need for further analysis or not in decision-making. The findings suggest that smaller day-to-day decisions often rely on experience and intuition, while larger and more complex decisions tend to involve greater evaluation of alternatives and increased use of data. Future research could therefore investigate specific decision situations in greater detail in order to identify which decisions benefit most from additional reflection, evaluation of alternatives and data support.

Building on this, future research could investigate whether more extensive evaluation of certain decisions leads to improvements that justify the additional effort required. Once decision situations that may benefit from greater use of data and evaluation of alternatives have been identified, future studies could assess whether the resulting improvements in decision quality, project performance or risk reduction outweigh the costs associated with gathering information and performing more thorough analyses.

Methodologically, these research areas could be explored through more extensive interview studies, case studies or pilot projects within construction organisations. More detailed investigations of specific decision situations may provide valuable insights into how human judgements and data can best be combined to support effective decision-making within the construction industry.

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Appendix I

Interview questions

How would you define a data-informed decision?

Can you give an example of how you use data when making decisions?

What smaller day-to-day decisions do you make?

How do you decide smaller day-to-day decisions?

What complex and high-stake decisions do you make?

How do you decide complex and high-stake decisions?

Do you have enough data when making decisions?

Do you trust the data?

Is there a lack of any particular data?

Do you have any suggestions for improving decision making through data-informed practises?

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