

***Exploratory Study on the Innovation,
Freedom, and Flexibility of Subcontractors in
the Construction Industry***



2025

Akash Swamy Vellaisamy Saravanan
Vincent Färdow

Abstract

Title: Exploratory study on the Innovation, Freedom, and Flexibility of Subcontractors in the construction industry.

Authors: Akash Swamy, Vellaisamy Saravanan, and Vincent Färdow

Supervisor: Dr. Louise Bildsten, Lund University

Background: The construction industry is a very traditional sector. The construction supply chain is very complex and fragmented since every project is site-based and unique. The distinctive nature of the construction industry is its heavy reliance on subcontracting. A common practice in the industry is to organize projects with a tier of subcontractors working for a main contractor. Since it is a knowledge-intensive sector, most innovation occurs through lessons learned and is often tacit in nature. This so-called sticky knowledge possessed by the subcontractors is a significant driver of innovation.

Purpose: The purpose of this thesis is to investigate how project management attributes like leadership influence innovation among subcontractors. It aims to explore how subcontractors' sticky knowledge can be leveraged to impact project outcomes and how this knowledge is shared within project environments. Additionally, the study examines the dynamics of the contractor–subcontractor relationship affecting subcontractors' autonomy and ability to innovate.

Methodology: The study follows an exploratory study approach. A case study is the chosen research methodology. Data is collected through semi-structured interviews with contractors, site managers, and subcontractors of various firms from India and Sweden. Potential gaps in research are identified through pattern matching and a cross-case synthesis.

Conclusions: Project management aspects like leadership and work description have a significant impact on the ability of subcontractors to innovate. Further late involvement of the subcontractors in the project has its drawbacks. Enhancing early collaboration, consistent leadership, and flexible work specifications can help in creating an environment that promotes innovation.

Keywords: Innovation, contractors, subcontractors, leadership, construction supply chain management, sticky knowledge.

Acknowledgement

We would like to express our gratitude to everyone who contributed to the creation of this thesis.

A special thanks goes to our supervisor, Louise Bildsten, who has been a guiding hand throughout the entire duration of this project. Your ideas, kind words, and enthusiasm have truly made it possible to both endure and complete this work.

We also extend our sincere appreciation to all contractors and subcontractors who agreed to be interviewed. Without your participation and willingness to share your experiences, this report would not have been possible.

Finally, we'd like to thank Lund Tekniska Högskola and the Division of Engineering Logistics for providing the resources and academic support that helped us throughout this project.

Vincent Färdow & Akash Swamy
05/2025

Table of Contents

1. INTRODUCTION	1
1.1 Background	1
1.3 Problem Formulation	1
1.4 Contribution	2
1.6 Structure of the report	3
2. METHODOLOGY	4
2.1 Research Philosophy	4
2.2 Research Approach	4
2.3 Research Design	5
2.3.1 Qualitative vs Quantitative Study	5
2.3.2 Theory Development	6
2.3.3 Case Study	6
2.4 Data collection	8
2.4.1 Qualitative and Quantitative Data	8
2.4.2 Interview	8
2.4.3 Observation	10
2.4.4 Documents	11
2.5 Techniques and Procedure	11
2.5.1 Literature Review	12
2.5.2 Case selection	12
2.5.2 Data analysis procedure	12
2.6 Validity, Reliability, and Credibility	13
3. THEORY	15
3.1. Construction Supply Chain Management	16
3.1.1 Challenges of Construction Supply Chain	17
3.2 Innovation	17
3.2.1 Role of Subcontractors in Innovation	18
3.3 Project Management	18
3.3.1 Project Phases	19
3.3.2 Challenges in Construction Project Management	20
3.4 Key Performance Indicators	21
3.5 Leadership	22
3.5.1 Leadership Styles	22
3.5.2 Leadership impact on subcontractors	23
3.6 Contracts	24
3.6.1 Contract Types in Construction	24
3.7 Work Description	26

4. EMPIRICAL STUDY	27
4.1 Contractors	28
4.1.1 Interview 1	28
4.1.2 Interview 2	30
4.1.3 Interview 3	33
4.1.4 Interview 4	35
4.2 Subcontractor	38
4.2.1 Interview 1	38
4.2.1 Interview 2	43
5. ANALYSIS	47
5.1 Contractor	48
5.2 Subcontractor	51
5.3 Summary	55
6. DISCUSSION	58
6.1 Limitations of the study	59
6.2 Inclusion of Subcontractors in Early Planning	59
7. CONCLUSION	60
7.1 Research Questions	60
7.2 Contribution to the industry	63
7.3 Future research	63
REFERENCES	65
APPENDICES	71
Construction Supply Chain	71
Project management	71
Leadership	71
KPI	72
Contracts	72
Work description	72
Interview Questions for Subcontractors	73
Project management	73
Leadership	73
KPI	73
Contracts	73
Work description	74

1. INTRODUCTION

The introduction chapter provides an overview of the study's background, followed by the formulation of the research problem and the main purpose of the thesis. It then expands on the study's goals, objectives, and limitations of the study. The chapter concludes with a summary of the report structure.

1.1 Background

The construction industry is a highly project-based and complex working environment (Gidado, 1996; Winch, 1998). The construction of buildings is also knowledge-intensive and depends on experienced professionals. Consists of contractors and subcontractors. Big contractors in Sweden are, for example, NCC, Skanska, and Peab, while subcontractors are smaller firms specializing in electrical, carpentry, or plumbing works. A common practice in the industry is to organize projects with a tier of subcontractors working for a main contractor. In such environments, a common means of identifying improvements and innovations is through lesson-learned activities. Through such activities, new practices can evolve and be formalized. However, capturing and formalizing best practices has proved to be a difficult area to succeed (Carrillo et al., 2013). Lessons are often tacit and held in people's heads or minds (Hadjimichael et al., 2023). This tacit knowledge is widely known as sticky knowledge. With reductions in workforces, this learning or knowledge is often lost unless it is captured and/or shared (Davenport & Prusak, 2010). This study explores the drivers and barriers for innovation by subcontractors and about utilization of tacit knowledge.

1.2 Purpose

The main goal of this project is to explore the impact of project management and leadership on innovation by subcontractors and to further understand how to use their sticky knowledge to influence a project and how this knowledge is shared. The study also aims to understand how the nature of a contractor-subcontractor relationship affects the freedom of subcontractors to innovate.

1.3 Problem Formulation

Every construction project is unique, which leads to high variability in the production process. The products and practices involved are thus complex, increasing the uncertainty of the outcomes. Common industry practice is to employ specialized firms for requirements based on that firm's expertise. These small firms and employees are collectively known as subcontractors. These subcontractors can perform up to 90% of the total work in construction projects, thus making them crucial for the construction industry. The relationship between the main contractors and subcontractors is business-oriented and employee-oriented. The contractors act in a

decision-making role on a higher project level, while the employees drive the day-to-day activities. The success of a project is heavily dependent on the skills and knowledge of these subcontractors.

Despite their critical role, subcontractors are often excluded from early-stage decision-making and innovation processes. Much of the actual work is executed by these specialist firms, who frequently develop practical, on-site solutions based on their deep experience. This knowledge, commonly referred to as sticky knowledge, is tacit, informal, and difficult to compile, making it largely invisible in traditional project management frameworks. We believe that insufficient weight is given to this sticky knowledge possessed by subcontractor employees. There is no prevalent literature that balances these different interests and goals to understand which values should prevail in the construction industry to maximize equitable and sustainable efficacy. Further, there is no clear, full-fledged research on the construction supply chain from a subcontractor point of view and on how project leadership and top management attributes affect subcontractor-driven innovation. This project aims to address this gap.

Based on this, we have formulated three research questions to which we will attempt to answer through our study.

RQ1: How does project management affect innovation and sticky knowledge?

This question investigates how elements like leadership style, planning processes, and project organization impact the sharing and application of subcontractors' sticky knowledge, an area often overlooked in top-down structures.

RQ2: How much freedom does a subcontractor have to innovate during a project?

Here, the focus is on understanding the limitations subcontractors face, such as strict work specifications or inflexible contract structures, and how these constraints affect their ability to contribute ideas and improvements on-site.

RQ3: What could enhance innovation within construction projects and improve the relationship between contractor and subcontractor?

This question looks for actionable ways to foster innovation through better contractor-subcontractor relationships, aiming to bridge both a theoretical gap in understanding power dynamics and a practical need for more inclusive, effective collaboration.

1.4 Contribution

The project will address two primary gaps in the building construction industry. The first one relates to the importance of sticky knowledge, and the other one relates to the use of this operational knowledge and innovation to drive the project towards success. Knowledge is recognized as one of the most valuable resources within any organization. Proposing a framework to increase the use of wasted knowledge will invariably increase the efficiency of the overall industry.

1.5 Limitations

The focus is limited to the project management aspects of the construction supply chain and how they impact innovation. Since project management is an umbrella concept, a few selected aspects, like leadership and contracts, are used as metrics to study the impact. The construction firms in focus are limited to housing and commercial building space development. India and Sweden are the two regions from which the cases are studied. This choice is made to maximize the available source and time. The subcontractors are also limited to the electrical field, but this scope can be expanded in the future.

1.6 Structure of the report

This master's thesis follows a fairly typical report structure. The first part of the report is theoretical information, while the latter part is more in-depth about the studied phenomena. The report structure can be visualized in Figure 1.

The thesis begins with Chapter 1, which provides an introduction and context to the research area chosen. Chapter 1 identifies the purpose of the study and develops the research questions and initial conceptual framework, providing a thorough overview of the thesis.

Chapter 2 presents the methodological approach and specific methodological procedures on which the study is based, describes the general methodological approach of the research, and specifies the design and timeline associated with achieving the study's goals.

Chapter 3 focuses on theory development and conducts a literature review on key concepts, frameworks, and models that relate to the study. This theory development is outlined to position the author's theory as an analytical framework from which to analyse the study data.

Chapter 4 describes the empirical element of the research, which states the process of collecting the data primarily through interviews and presents the findings.

Chapter 5 is an analysis of empirical findings against the theoretical framework, and enables the author to identify patterns, develop insights, and express implicative arguments.

Chapter 6 is a general discussion about the research process and provides reflections on the study as an experience, the challenges faced in the study, and limitations.

Finally, Chapter 7 contains the conclusions drawn from the study, addressing the research questions, discussing the implications of findings, indicating opportunities for future research, as well as directions for contributing positively to related future studies.

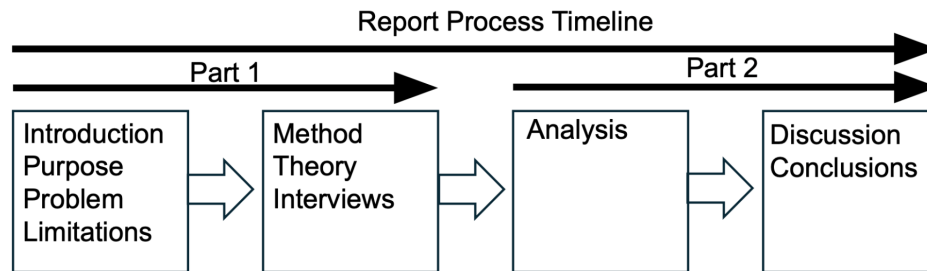


Figure 1: Visual presentation of the report processes

2. METHODOLOGY

Chapter Two presents the methodological framework that is being used throughout the study. The chapter begins with an outline of the methodological theory, providing insights into the chosen approach adopted for this research. It then justifies why a case study method is used instead of other methods, such as case surveys, etc. Furthermore, it details what different data-gathering methods are available and identifies the ones that are used in this case. To ensure the credibility of the results, a section is included explaining how the report achieves high validity and reliability through theory and the practical steps that are undertaken to ensure methodological rigor.

2.1 Research Philosophy

The term research philosophy relates to the development of knowledge and the nature of that knowledge (Saunders et.al, 2006). It contains assumptions on how the researcher views the world. Two common philosophical positions are epistemological and ontological. Epistemology constitutes what concerns acceptable knowledge in the field of study. Ontology is concerned with the nature of the phenomenon. The epistemology branch has three main schools of thinking - positivism, realism, and interpretivism. Positivism is taking the philosophical stance of a natural scientist. It means the thinking is that reality exists, and the end product can be measured similarly to natural sciences. Interpretivism is the thought process in reality that cannot be measured. The essence of realism is what the senses show us in reality, equating to scientific enquiry. Realism can be further branched into direct realism and critical realism. Direct realism says that what one experiences through the senses portrays the world accurately. Critical realism argues that senses often deceive and that experiences are images and not the actual truth (Saunders et. al., 2006).

In the supply chain sector, all three philosophies are interchangeable. Since our chosen area is the construction industry, and with the idea of performing a case study, we are choosing to treat the entire research from a critical realist standpoint. This gives us the benefit of analyzing the interviews as they unfold, as well as separating the influence of the human mind from reality wherever it is necessary. For example, if we identify a gap between what subcontractors report and what site managers believe is happening on-site, a critical approach will allow us to view these differences as indicators of deeper systemic issues, rather than simply as conflicting perspectives.

2.2 Research Approach

The research approach defines how the theory that is being used in the research is developed. Generally, there are two types of research approaches - deductive and inductive. In a deductive

approach, a theory is developed and data is collected revolving around the theory. In an inductive approach, data is first collected and then a theory is developed based on the gathered data (Saunders et. al., 2006). Then there is an abductive approach, which is a mix of the former two. The researcher can alternate back and forth between the two approaches to create a more robust study (Kovács et al., 2005).

This report is abductive and includes both a deductive and an inductive approach. The reasoning for this is that there is currently no established theoretical framework that explains the correlation of the subject. This means that a solely deductive approach would be difficult to implement. Meanwhile, an inductive approach would be too shallow and generalizable, with the possibility of the thesis questions being left unsolved. This means that it has aspects derived from inductive methods, such as data collection through semi-structured interviews, along with deductive methods, such as literature review. For example, initial assumptions about contractor-subcontractor collaboration were challenged by practical examples, leading us to adjust our perspective on the theoretical framework throughout the report, see figure 2 for illustration. This results in a more comprehensive and iterative study that can compare existing literature to field research, along with data collection.

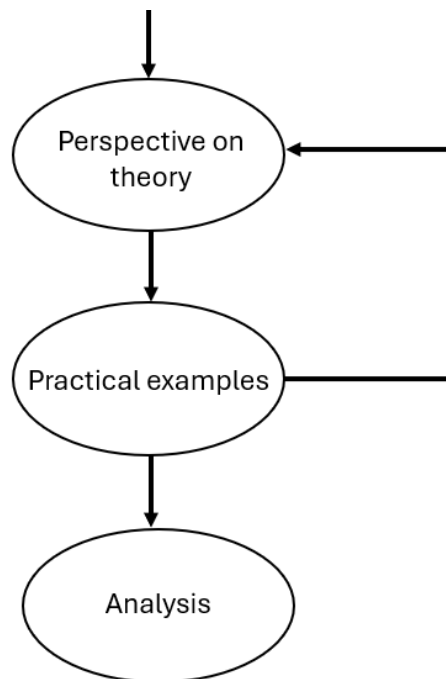


Figure 2: Visual presentation of the Abductive reasoning approach

2.3 Research Design

Research is often characterized by systematic data collection and interpretation of the gathered information (Saunders et al., 2006, p.5). Saunders further defines research design as the general plan of how you will go about answering your research questions. For research to be carried out

successfully, a suitable design must be used (Asenahabi B.M., 2019). The research design guides the execution of the research and provides a framework for the collection and analysis of data. The choice of design reflects priority decisions given to the range of dimensions of the research process (Bell et al., 2022). There are three distinct approaches to designing research: the quantitative method, the qualitative method, and the mixed method (Asenahabi B.M., 2019).

2.3.1 Qualitative vs Quantitative Study

Cresswell (2009) claims that quantitative study methods are generally used for closed-ended questions, whereas qualitative methods are better suited for open-ended questions from a research standpoint. If a concept or phenomenon needs to be understood because little research has been done on it, then it merits a qualitative approach. Qualitative research is exploratory and is useful when the researcher does not know the important variables to examine (Cresswell, 2009). Quantitative methodology is concerned with attempts to quantify social phenomena, collect and analyze numerical data, and focus on the links among a smaller number of attributes across many cases. Qualitative methodology, on the other hand, is more concerned with understanding the meaning of social phenomena and focuses on links among a larger number of attributes across relatively few cases (S.K. Antwi et al., 2005).

Our study lies in the spectrum of open-ended questions as it tries to understand a phenomenon that is not commonly explored in the construction sector. Hence, the research will follow a qualitative study approach, which suits the goal of the project. The design will be twofold, consisting of theory development and empirical study. A case study is the chosen qualitative method.

2.3.2 Theory Development

As mentioned before, the first part of our study is theory development. According to Anfara and Mertz (2014), a useful theory tells an enlightening story about some phenomenon, which gives new insights and broadens one's understanding of the phenomenon in focus. In qualitative research, theory development is crucial as it helps researchers move beyond a mere description of data. For instance, grounded theory is a method where researchers develop theories based on the data collected during their studies. This approach aims to generate and discover theories rather than just describe findings (Tavallaei, M. & Talib, M. A., 2010).

In this study, general theories on the construction supply chain are dwelt upon and, in turn, are connected with the subcontractor's perspective. The theory development is done using a literature review. An initial tentative framework compiling all different aspects of the construction industry is developed based on these theories. This framework will be further improved with the obtained data points, addressing the gaps between the literature and actual real-world practices, giving us a clearer picture of how much of subcontractors' potential is being utilized.

2.3.3 Case Study

A case study is carried out within specific constraints and time frames, which do not have definitive guidelines regarding scope or duration (Bell et al., 2016). However, a general rule of thumb is that case studies typically do not extend over multiple years. Common data collection methods that suit case studies include interviews and observations (Bell et al., 2016). Case studies have both apparent advantages and disadvantages (Ejvegård, 2009). One advantage of case studies is the depth they offer, allowing for rich detail and a strong focus on the phenomenon being studied. However, they can sometimes become overly theoretical and detached from reality. This may result in the phenomenon functioning as expected within the case study environment but not necessarily applying to real-world situations. The extent of this issue depends on the complexity of the case study and the nature of the phenomenon being examined (Ejvegård, 2009).

Case studies are conducted to examine a phenomenon, thus making it of an exploratory nature (Meredith, 1998). The phenomenon can take various forms, including a company, a division within a company, an event, or a sequence of events (Fitzgerald & Dopson, 2009). Case studies are best suited to answer questions such as why, what, and how, which further emphasizes the exploratory nature of the research methodology (Meredith, 1998). There exists a wide range of case studies with different goals and characteristics (Olhager, 2024; Voss et al., 2002). A case study can be explorative or theory testing when some research has already been conducted. With a case study that aims to be as explorative, the primary focus is rather on fewer cases with greater depth. The focus transitions to more cases as the case study transitions more toward theory testing or refinement. This transition to more cases is to understand how applicable it is in general. It is important to note if single case studies or multiple case studies are to be used, since they have these characteristics. There is also a question of resources since multiple case studies often demand more resources than single cases. A common disadvantage of single case studies is, therefore, the limited generalisability. While multiple case studies often do not allow for in-depth investigations (Olhager, 2024; Voss et al., 2002).

A method developed by Malhotra & Grover (1998) can be applied to understand the concept of different forms of case studies. Figure 3 displays several different research methodologies that correlate with the knowledge possessed, along with the placement of this thesis. It shows that case studies are within the area of hypothesis generation, where knowledge about the phenomenon is generally low. This differs from more explanatory research, such as simulation, where knowledge tends to be higher. Even though this is the case, case studies can, as previously stated, still be more or less exploratory based on the characteristics of the case study (Malhotra & Grover, 1998).

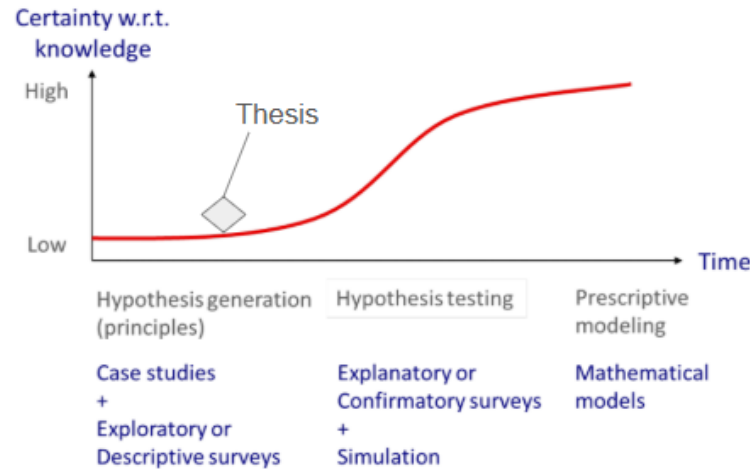


Figure 3: Maturity Cycle of Research (Malhotra & Grover, 1998)

This thesis is a case study, which implies that it is exploratory based on the model presented by Malhotra & Grover (1998). The main goal of this thesis is to develop theories around the chosen subject. This means that it aims to identify key variables and the correlation between them, as well as try to understand why and how these correlations adapt. The main objective of this thesis is to address the research question outlined in Chapter 1. Rather than testing a specific hypothesis, the research aims to generate new hypotheses based on the findings. Therefore, a case study with theory-building characteristics is suited to further understand this relationship to enhance cooperation between stakeholders. The report placement in the maturity cycle is therefore quite centralized, which indicates that the knowledge about the subject is low but not non-existent.

2.4 Data collection

Data collection and how the data is being put to use is the next logical step in case study research. This chapter will present different data collection methods that are being used in our study. As previously stated in Chapter 2.2, Interviews, observations, and literature reviews are commonly used for case studies. We intend to use all possible data points for a better-triangulated analysis.

2.4.1 Qualitative and Quantitative Data

Research methods can focus on either qualitative or quantitative data. An alternative is also to combine the two data types for a study that takes both into account (Voss et al., 2022). Qualitative and quantitative differences are usually seen in the data gathered (Nyberg & Tidström, 2012). Qualitative data rarely mentions numbers and focuses on “soft” metrics rather than quantifiable data. These questions can, for example, be why something is a certain way, or

perhaps, how it happened. As previously stated, case studies often aim to answer questions such as why, what, and how, which makes qualitative data a key part of case studies. Typical qualitative data-gathering methods are unstructured or semi-structured interviews, observations, or a survey with open-ended questions (Nyberg & Tidström, 2012; Eisenhardt & Graebner, 2007).

Quantitative studies instead focus on numerical data with statistical analysis as a tool to understand different phenomena (Halldórsson, & Arlbjørn, 2004). Quantitative studies are often applicable to test theories with different mathematical models that can be of different levels of complexity (Halldórsson, & Arlbjørn, 2004). Quantitative studies aim to receive answers that are not open to interpretation (Nyberg & Tidström, 2012). Data gathering methods for quantitative data can also be interviews, although structured, along with other methods where numbers are being gathered for further experiments (Nyberg & Tidström, 2012).

This thesis mostly focuses on qualitative data rather than quantitative data. This is because of the formulated research questions, which seek to explore a relatively new phenomenon using a case study as the research method. Along with the chosen research method, the primary data collection is through semi-structured interviews and literature reviews. This further reinforces that a quantitative study would be unsuitable given the chosen approach. Therefore, a qualitative approach is preferred to ensure coherence with the other choices that have been made throughout the report.

2.4.2 Interview

There are several different types of interviews, which have been briefly described in chapter 2.4.1, which covers the area, qualitative or quantitative. Interviews can be structured, unstructured, or a mix, often called semi-structured interviews (Bell et al., 2016). Unstructured interviews are very open and similar to an ordinary discussion rather than an interview. The answers in unstructured interviews tend to be longer and more extensive than they would otherwise be in structured interviews. Structured interviews are preferred when the analysis needs to be presented relatively quickly and clearly. While the results of structured interviews are often clearly defined, the answers from unstructured interviews are harder to present without proper post-analysis. As discussed in Chapter 2.4.1, structured interviews rely on quantitative measures, while unstructured interviews are based on qualitative data and open-ended responses (Bell et al., 2016).

Eisenhardt & Graebner (2007) describe interviews as an important tool for sourcing data and highlight them as a key contributor to well-conducted case studies. Case studies can apply many data-gathering methods and are not bound to interviews. However, unstructured or semi-structured interviews are preferred in case studies due to their nature of providing deep and rich insights into a studied phenomenon. Although this is the case, interviews in case studies

should be complemented by other data-gathering techniques to further strengthen the knowledge about a studied phenomenon. Increasing both validity and reliability in the process (Eisenhardt & Graebner, 2007; Halldórsson & Arlbjørn, 2004).

The apparent drawbacks of interviews, especially unstructured and semi-structured interviews, are that the interviewer has to remember and be able to interpret the interview subject correctly (Ejvegård, 2009). To reduce the risk of forgetting or misinterpreting the person who is being interviewed, there are several actions the interviewer can take. Recording the interview or taking notes are two different ways that can help to remember when analyzing interviews at a later stage. Recording someone is not always an option due to reasons such as that someone does not want to be recorded, which has to be accepted. On the contrary, taking notes is always ok as an interviewer. Taking notes during an interview can make the interviewer appear absent, while the notes often end up being less detailed than they could be. Additionally, the notes may be difficult to understand, even for the person who conducted the interview, because the focus may be put on taking notes rather than understanding the person (Ejvegård, 2009). This could be countered by having one person focus on the interview while another is taking notes (Ejvegård, 2009; Voss et al., 2002). Voss et al., (2002) present several sets of skills important for an interviewer that connect to this. Ask relevant questions and skills to interpret answers, being adaptable and flexible during the interview, being unbiased about the subject, and having a rich understanding of the topic are some skills that are mentioned (Voss et al., 2002).

In addition to data collection, interviews were conducted using a semi-structured approach. The primary purpose of these interviews was twofold: to validate the reviewed literature and to gather additional qualitative data on the subject. The study includes interviews from people in the construction sector, both from India and Sweden. This was primarily to further understand potential similarities and differences, thus highlighting the generalisability of the thesis. The relatively small sample size is justified by the exploratory nature of the study. This approach prioritizes depth over breadth, allowing for rich, detailed insights that help uncover underlying patterns and gain a deeper understanding of the subject matter. A detailed overview of the conducted interviews is provided in Table 1. Everyone displayed in the interview table gave consent for their names and roles to be used in this thesis.

Table 1: Interviews conducted during the thesis

Name	Company/Organisation	Role	Date	Topic
Anton Nilsson	Bravida	Subcontractor (Electrician)	2025-03-03	Introduction interview
Vincent Tiholt	No current	Subcontractor (Electrician)	2025-03-03	Introduction interview
Fredrik Siljehag	Skanska	Site Manager	2025-04-20	Introduction interview
Jonas	Skanska	Site Manager	2025-03-15	Introduction interview
Anton Nilsson	Bravida	Subcontractor (Electrician)	2025-03-31	Interview from appendices
Vincent Tiholt	No current	Subcontractor (Electrician)	2025-04-10	Interview from appendices
Shanmugam A.L	ALS Constructions	Contractor	2025-04-21	Interview from appendices
Ramesh R	Mayan Constructions	Contractor	2025-04-26	Interview from appendices
Neelakandan S	Sri Narayani Construction	Site Manager /Contractor	2025-04-30	Interview from appendices
Fredrik Siljehag	Skanska	Site Manager	2025-05-10	Interview from appendices

The interview template is available in the appendices. The structure was designed based on the selected theory to facilitate drawing conclusions and comparing literature with real-life situations. The interviews are qualitative, as stated multiple times throughout the report. However, they also contain a scoring system, which will be expanded upon in Chapter 2.5.2. Thus, the interviews introduce somewhat of a somewhat quantitative aspect to the thesis.

2.4.3 Observation

Observations can be used in studies for various purposes, including both primary data collection and validation of other data methods (Bell et al., 2016). Observations should be carefully designed and planned in detail when used for data collection. Alternatively, observations may serve to validate a study and act as a control for other data collection methods. In summary, observations can be used as the primary data collection method or as a validation tool (Bell et al., 2016). Morgan et al. (2016) expand upon observations and explain that it is a very qualitative research method. This approach enables researchers to collect data on individuals' or groups' actual behaviors, actions, and contexts, offering insights that may not be captured through self-reported methods like interviews or surveys (Morgan et al. 2016).

This thesis uses observation as a validation tool rather than a method for data collection. While the lack of on-site visits limits the use of observation for validation, it can still be a valuable tool during the interviews to help validate the data gathered. Even though the thesis didn't involve on-site visits, paying attention to non-verbal cues during interviews, like body language, hesitation, and reactions, still proved helpful. These subtle signals pointed out moments of uncertainty, which we then explored further with follow-up questions. This approach not only gave us a deeper understanding but also helped us cross-check the interview data against existing literature, making our findings more credible and reliable.

2.4.4 Documents

Reviewing documents plays a vital role in qualitative research, helping to substantiate and verify the findings from data collected through other sources. Bowen (2009) defines document analysis as a systematic procedure for reviewing or evaluating documents, both printed and electronic (computer-based and Internet-transmitted) material. Document study refers to the review by the researcher of written materials. These can include personal and non-personal documents such as archives, annual reports, guidelines, policy documents, diaries, or letters (Busetto, L., et al., 2020). The documents analyzed can take many forms, such as advertisements, meeting minutes, manuals, diaries, letters, newspapers, and various public records. This diversity allows researchers to gather a wide range of information relevant to their studies (Bowen, G., 2009). This approach can be valuable for various reasons. When used to analyze pre-existing texts, this method allows researchers to conduct studies they might otherwise not be able to complete. Conducting a document analysis can also reduce some of the ethical concerns associated with other qualitative methods. A critical aspect of conducting document analysis is the careful selection of documents. Researchers must ensure that the documents are authentic, credible, representative, and meaningful to avoid discrediting their studies (Morgan, H., 2022).

Since our scope is limited to the construction sector, the main documents that we will be focusing on are contracts, work plans, and project descriptions. These documents help in understanding the dynamics of contractors and subcontractors from a financial standpoint as well as their working nature.

2.5 Techniques and Procedure

In this section, we will look into the procedures we have followed in conducting the study. The literature review establishes a theoretical foundation by examining relevant research, industry standards, and best practices. Following this, the case selection process justifies how and on what basis our cases were identified, aligning with the research objectives. Finally, the case analysis involves a detailed description of how the analysis of the acquired data is to be carried out to extract key insights and validate findings. This systematic methodology ensures a comprehensive and reliable examination of the subject matter.

2.5.1 Literature Review

According to Denney and Tweksbury (2013), a literature review is a comprehensive overview of prior research regarding a specific topic. The overview both shows the reader what is known about a topic and what is not yet known, thereby setting up the rationale or need for a new investigation, which is what the actual study to which the literature review is attached seeks to do. The main purpose of a literature review is to critically analyze the extent of literature in a given research area, theme, or discipline, identifying relevant theories, key constructs, empirical methods, contexts, and remaining research gaps to set a future research agenda based on those gaps (Paul & Criado, 2020). Rowly and Slack (2004) further support the previous line of thought that a literature review helps to identify and back the research question, contextualize the question, propose a research design, and analyze the problem. Rowly and Slack (2004) also talk about four primary methods involved in doing a literature review for a thesis, namely citation pearl growing, brief search, building blocks, and successive fractions.

We decided to use the pearl growing technique and briefsearch for conducting our literature review. Pearl growing is the method where a preliminary source is identified. From the preliminary source, the secondary sources are referred to and rolled back to the main source for confirmation. In briefsearch relevant articles and sources are read through briefly.

We started with the previous course literature and then used online databases like SCOPUS, LuB search, and Google Scholar to find relevant published works. These include biblical sources, journals, and articles. The common keywords used to identify the preliminary sources were construction, with emphasis on subcontractors as secondary search terms wherever necessary.

2.5.2 Case selection

The unit of our case analysis is the relationship between contractors and subcontractors. For setting up the interviews, both construction companies and independent construction professionals were contacted. The construction companies were focused on gaining insights from a contractor's point of view. Site managers and firm managers were the planned potential of the construction companies. Some notable companies approached were, for example, Skanska, NCC. For the subcontractors sector, local electricians and plumbers, and their offices, were contacted. Due to the availability of sources and time constraints, we lined up three interviews with contractors from India and one from Sweden. As far as subcontractors were concerned, both of the cases were from Sweden. This sample size seemed sufficient for pattern matching and achieving repeatability.

2.5.2 Data analysis procedure

Unlike statistical analysis, a case study analysis depends more on a researcher's style of empirical thinking, along with presentation of enough evidence supporting the interpretations

(Yin, 2018). For a qualitative study analysis, generally there are four main strategies - relying on theoretical propositions, working on data, developing a case description, and examining rival explanations (Yin, 2018). Yin (2018) further mentions five common analytic techniques, namely pattern matching, explanation building, time series analysis, logic models, and cross-case synthesis. For the analysis of this study, the strategy of relying on the theoretical propositions and for the technique, a mix of pattern matching combined with cross-case synthesis is being chosen. Pattern matching is best suited to answer the “how’s” and it compares findings from a case with a predicted one. If identical patterns can be found across multiple cases, replication of a single case is achieved, and the cross-case results can be stated more assertively (Yin, 2018). Figure 4 shows the overall research design that is being followed in this study.

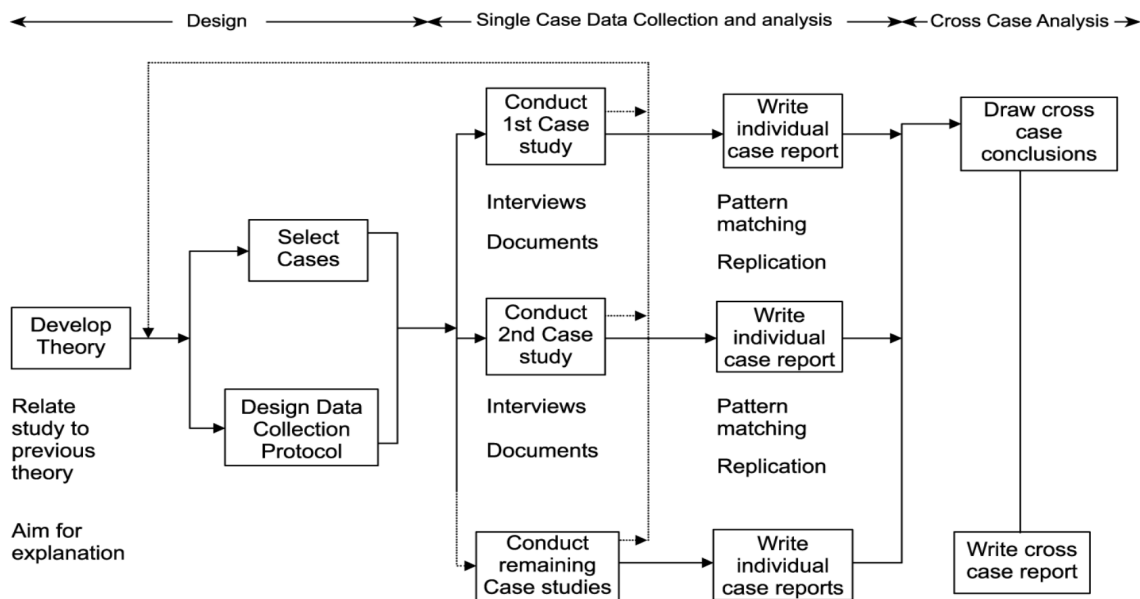


Figure 4: Research design methodology, Adapted from Yin (1994).

2.6 Validity, Reliability, and Credibility

Validity and reliability are important in every study being conducted to ensure a reliable result (Frostling-Henningsson, 2017). In short, validity is about doing the right things, while reliability is about doing things right. Both are important while doing case studies, and several methods strengthen both validity and reliability, thus also making the study more trustworthy (Frostling-Henningsson, 2017).

Reliability, as mentioned earlier, refers to "doing things right." This can be further understood as the consistency and rigidity of a study, indicating how repeatable it is and whether it leads to the same conclusion each time (Voss et al., 2002). Creswell (2009) confirms this and explains that reliability is closely related to the consistency and dependability of research results. Reliability

can be strengthened by using an audit trail to see by whom and when the research was conducted. Thus, allowing others to follow each step without becoming lost or having to make assumptions (Creswell, 2009).

Voss et al. (2002) have expanded on validity and present subgroups, construct, internal, and external validity. Construct validity can be ensured by using multiple references as evidence. The main objective is to ensure that you are indeed measuring what you intend to measure, not something else (Voss et al., 2002; Creswell, 2009). Internal validity is instead focused on ensuring that the relationship between the studied phenomena is related and not caused by other variables (Voss et al., 2002). External validity explains how generalizable the result is in general. External validity can be ensured by using replication in different settings, etc. By dividing the validity concept into subgroups, it can be easier to understand and separate it (Voss et al., 2002). However, this thesis will not expand further on validity and will primarily see it similarly to the “construct validity” explanation, if the studied subject is the phenomenon that is being studied. Validity is enhanced by using different sources of evidence, such as observation, interviews, documents, etc. If the findings are verified from different sources, it then strengthens the validity of the study (Tracy, 2010).

Creswell (2009) explained that validity is often linked to credibility due to their similarities. Credibility refers to whether a study’s findings are believable and trustworthy, much like validity relates to the accuracy and truthfulness of research. Expanding on this, credibility emphasizes resonance with participants, ensuring that their experiences are authentically represented. A study can be credible but not valid if the researcher accurately captures and presents participants' perspectives, yet the findings do not objectively measure the intended phenomenon. Credibility can be enhanced by peer debriefing, etc, discussing findings to reduce bias and to refine the interpretation of participants (Tracy, 2010). Credibility could also be enhanced by introducing participants with diverse backgrounds and experiences. This means that participants can bring different perspectives into the study and thus strengthen its coherence and trustworthiness (Tracy, 2010).

This thesis aims to strengthen reliability, validity, and credibility by implementing recommended strategies to improve each aspect. To enhance validity, the thesis has incorporated multiple data-sourcing techniques such as interviews, literature reviews as well and observation to some extent. Reliability is strengthened by an audit trail, documenting all research steps to ensure consistency and transparency. Although the human factor inevitably influences reliability, as this case study relies heavily on semi-structured interviews, it is difficult to replicate the exact conditions. Credibility is enhanced by including multiple participants with different roles within the research. Additionally, credibility is further strengthened by the inclusion of two researchers writing this thesis, enabling peer debriefing in connection with the interviews.

3. THEORY

This chapter presents the theory for the study, focusing on innovation and the use of sticky knowledge within the construction industry. The theories have been selected to directly support and respond to the research questions in Chapter 1.3. Along with other relevant theories, which are needed as support for the studied phenomenon.

Figure 5 illustrates the structure of the theoretical framework. At the core is project management, which is broken down into four key areas that are present in all construction projects: leadership, key performance indicators (KPIs), contracts, and work descriptions. The aim is to explore how each of these areas influences the use and transfer of sticky knowledge, and how that affects innovation on construction sites.

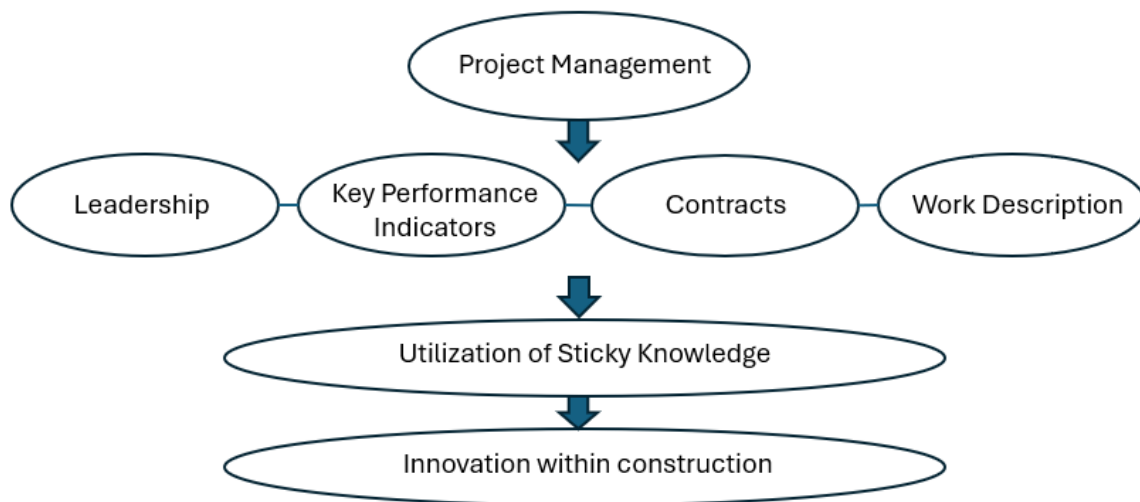


Figure 5: Hierarchy of theory chapters

3.1. Construction Supply Chain Management

The construction sector is one of the oldest industries and largest in many countries (Horvath, 2004). It is recognized for being traditional and, to a certain extent, underdeveloped in some aspects (Al-Wreikat, 2017). This industry has a significant contribution to the global economy (Ahmad et. al., 2018). Supply chain management is very much present in the construction industry, due to the continuous stream of information, material, and money between different stakeholders. Almost every construction supply chain (CSC) is unique, non-repeatable, and established for fulfilling the requirements of a single project (Shishodia et.al., 2019). Projects are site-based and individual undertakings that require a high level of specialized knowledge. A typical CSC is a long (Tah, 2005) and complex (Meng et.al., 2011) network of numerous organizations (i.e., clients/owners, designers, general contractors, subcontractors, and suppliers, and relationships, connected through the flows of information, the flows of materials, services and products, and the flows of funds (Fulford et.al., 2014). Behra et al. (2015) point out that a typical CSC for any given project would include architects, engineers, main contractors, specialty subcontractors, and material suppliers that come together to build the project for a specific owner. The entire supply value chain is affected by tight collaborations with end customers, main contractors, subcontractors, and intermediary stakeholders (Oessteriech et al., 2016). The common phases in a construction process are Concept development, Procurement, Production, Installation, and Winding up (Behra et al., 2015). Figure 6 shows the makeup of a typical construction supply chain.

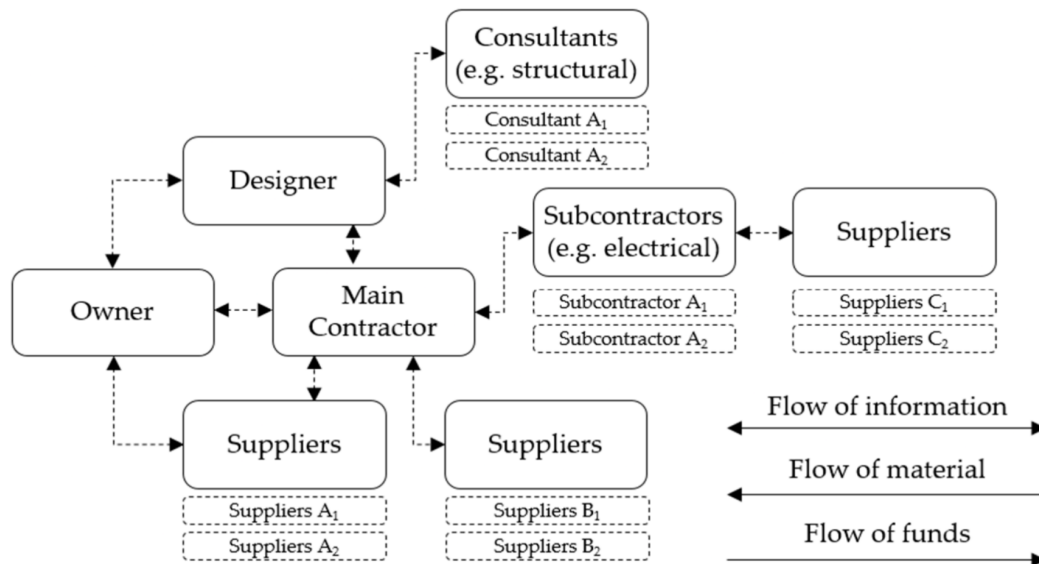


Figure 6: Construction Supply Chain (Adapted from Studer and Mello, 2021)

Thus, a typical construction supply chain is not straightforward, since different players work together as well as work individually at the same time on the same given project. In other words, CSC can be characterized as a converging supply chain or a fragmented temporary supply chain (Al-Weikat, 2017). The most differentiating feature of a construction supply chain is the amount of subcontracting that is being done at different levels of a project. The principal or main contractors execute only a small part of the project, like high-level decision making, while the subcontractors carry out almost 75% (Dubois, A., et al., 2002) to as high as 90% of the construction work (Karim, K., et al., 2006). The subcontractors are involved from supplying drawings to transforming order specifications into actual components (Segendelt, A., et al., 2010).

3.1.1 Challenges of Construction Supply Chain

The CSC is quite different from a manufacturing supply chain. In the manufacturing sector, the customer generally lies at the end of the cycle, whereas in construction, the entire process starts depending on the customer's order. From a widely used supply chain point of view, we can claim construction projects as make-to-order (MTO), making every project unique. There are certain common themes that different researchers talk about as challenges of a construction supply chain. Behra et al. (2015) say CSC is laced by adversarial short-term relationships driven by competitive bidding processes, with very little information sharing and little motivation for continuous learning. The other challenges in CSC are structural problems like complexity, uncertainty, fragmented supply chain, short-term thinking, and resistance to change (Oessteriech et al., 2016). Since construction is about the coordination of specialized and different tasks at the site level, the need for quick problem-solving capacity is perceived as a formidable challenge (Dubois, A., et al., 2002).

3.2 Innovation

The term innovation takes different perspectives and definitions throughout the literature. They can lie in the spectrum from groundbreaking technological advancements to small ideas improving a day-to-day business process. Slaughter (1998) defines innovation as the ‘actual use of a non-trivial change and improvement in a process, product, or system that is novel to the institution developing the change. The concept of innovation is different from invention. Invention refers to the creation of a novel design or a physical artifact that differs from existing ones, regardless of its implementation. But innovation encompasses both creation and its practical implementation. This application may not be completely new to the industry in the broader sense, but it could be something novel to the organization that adopts the idea. The nature of a problem can influence an innovation (Rosenberg, N., 1984). Ardit (1982) describes innovation as the translation of knowledge into production at all levels within an organization. Innovation is a process where experience learned and adaptation of technology contribute to a successful creative thinking culture (Tangkar, M., et al., 2000). In simpler words, innovation is a

positive change resulting from a new idea (Gambatese, J, A., et al., 2011). For this study, innovation is defined as any idea, regardless of its scale, that introduces an incremental change to an existing process or provides a solution to a specific problem, thus enhancing the effectiveness and efficiency in overall performance. Bossink (2004) identified and classified environmental pressure, technological capability, knowledge exchange, and boundary spanning as drivers of innovation.

3.2.1 Role of Subcontractors in Innovation

Innovation has its impact both at an organizational level and at a wider industry level. At an organizational level, it enhances competitiveness, reduces operating costs, and improves quality and market share. Trends in the industry and overall working culture can be modified through constant innovation (Rankin, J.H., et al., 2006). Innovation is not a linear process, meaning it does not have a proper sequence of origin. Generally, most innovations are intuitive in the beginning (Rosenberg, N., 1994). This initiation can be from either the top management or from the non-managerial employee sector. This non-managerial sector comprises the subcontractors in case of the construction industry. In a project-oriented industry model, the different stakeholders involved play a significant role in the adoption of innovation (Tangkar, M., et al., 2000) and in creating new goods, services, and solutions (Lindberg, 2018). Employee-driven innovation (EDI) can be seen as a way to explore varied sources and catalysts of innovation (Hoyrup, S., 2012; Kesting, P., et al., 2010). Knowledge is widely recognized as one of the most valuable resources within an organization as it consists of best practices, routines, lessons learned, problem-solving methods, and creative processes that are difficult to replicate (Ma et al., 2008; Grant, 1996; Liebowitz and Wright, 1999; Renzel, 2008). The non-managerial employees, in this case the subcontractors, are the main drivers of EDI, thus playing an important role in bringing up innovation in the projects.

3.3 Project Management

Project management is about managing entities in a way that allows project objectives to be completed within set limitations (Bansal, 2024). These limitations are often time, money, quality, or other constraints that are predetermined parameters. Furthermore, it is about managing objectives to make them manageable and easier to comprehend. It demands a wide range of skills, techniques, and knowledge to be done effectively. Time, cost, and quality are the cornerstones of project management and thus make it a balancing act between these three; see Figure 7 for a visual presentation of this (Bansal, 2024; Alafeef, 2024).

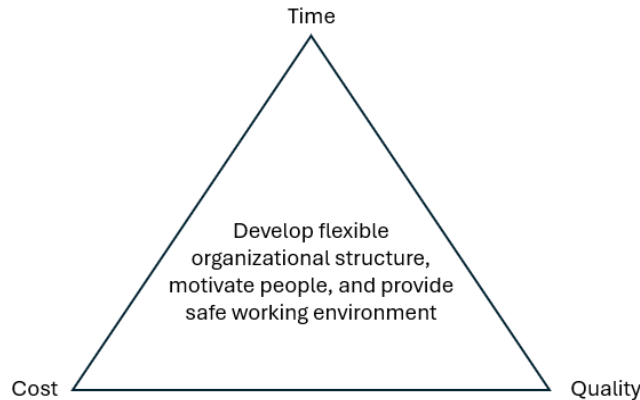


Figure 7: Project management triangle (Bansal, 2024)

3.3.1 Project Phases

To simplify the steps in project management, there are usually seven steps with different objectives (Bansal, 2024). The first step is to define the activities that are involved in the project. Usually explained as a work breakdown structure (WBS) where all activities are listed and grouped with different filters. A project can contain hundreds of activities, and the need for WBS is therefore apparent. Then, there is an iterative process of estimating the time of each activity described in the WBS. This step usually involves the estimation of resources needed for activities as well. This step demands a skilled planner with experience in the field due to the conflicting nature of time and resources. Activities can be shortened with an increased resource, and conversely, longer with a lack of resources. To safeguard from this, upper and lower limits can be set for both, to give it some wiggle room. The execution sequence is where it is decided in what order activities are to be performed. This step involves input from personnel on-site with experience, who know what should be done in what order. Time durations and execution sequences are then analyzed to build the project schedule. This project calendar outlines all activities, including their durations, predecessors, and successors. These three steps follow an iterative process, allowing for adjustments to variables to achieve a schedule that meets the project requirements. Lastly, there is another iterative process with schedule refinements, executing and controlling the project accordingly. These steps are introduced to make the projects more manageable and easily understood (Bansal, 2024). See Figure 8 for all the steps in a project that are usually involved.

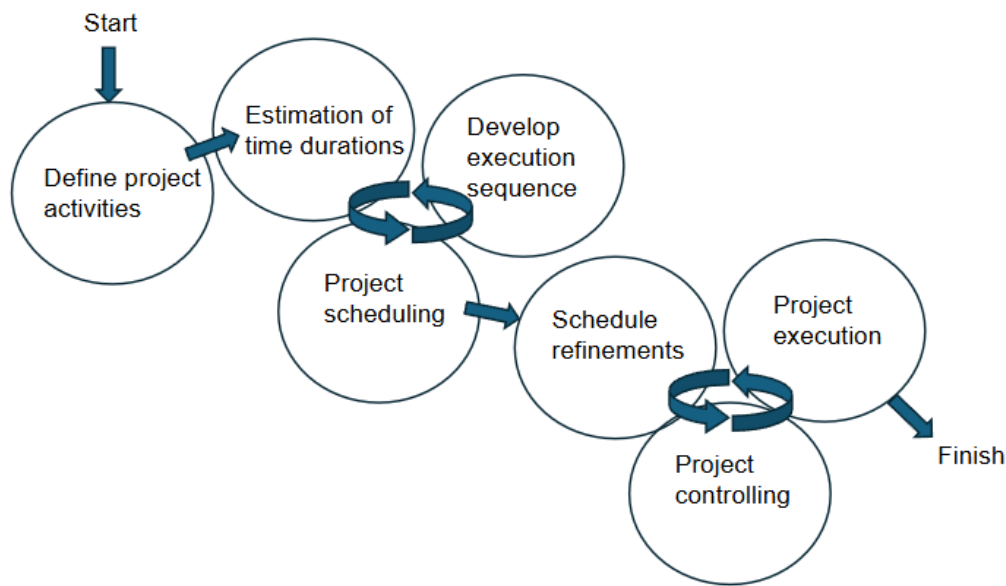


Figure 8: Basic steps of project management (Bansal, 2024)

Due to the nature of the industry, construction is closely related to project management (De Marco, 2018). Many stakeholders are involved in construction projects and must meet the limitations that are set. The construction supply chain involves procurement, site management, and the coordination of materials and subcontractors to ensure timely availability. Effective project execution requires careful planning, continuous monitoring, and strict control of these elements (De Marco, 2018).

3.3.2 Challenges in Construction Project Management

In construction projects, the owners of the projects and contractors are hired to conduct a service of some sort (De Marco, 2018). These develop a framework for the project and what is needed to complete it. Subcontractors are hired by contractors to perform specialized services that the contractor does not offer, excluding them from the direct agreement between the owner and the contractor. The exclusion is not always clear-cut, where the reasoning for it can be that subcontractors simply lack the resources to have a project procurement department. The amount of work designated to the subcontractor varies heavily from project to project, but usually, it can range from 20 to 90%. This, in turn, can lead to some implications between the contractor and their subcontractors. A significant power imbalance between the two can be noted, where the contractor holds stronger negotiation power. This can lead to difficulties with contract conditions and in some cases, delayed payments. Subcontractors are often the entity that gets overlooked due to their inferior position in the hierarchy. Coordination between the contractors and subcontractors is also an issue to be noted within project management. This can lead to delays and miscommunication, which results in ineffective projects. Lastly, subcontractors are also limited by their position, thus making innovation opportunities limited for them. Furthermore,

this also makes it difficult for them to influence the project they are working on, thus missing out on potential ideas and expertise that could excel in the project (De Marco, 2018).

Critical success factors (CSF) in construction projects are especially important due to the delicate nature of the field (Alafeef, 2024). As previously mentioned, quality, time, and cost are constantly considered and under review by the owner. This demands a more careful approach to projects where CSFs are reviewed continuously to have a successful project. Alafeef (2024) states 10 CSFs for contractors to implement to have successful projects. One of these CSFs was to foster a strong relationship between the contractor and the subcontractors. This was because subcontractors were a major reason for projects resulting in delays.

Project management as a concept is something that both directly and indirectly affects the performance of a project (Demirkesen & Ozorhon, 2017). Directly through communication, cost management, and indirectly through time management and the scope of a project. Therefore, there is a strong emphasis on improving the area by applying new technologies, strategies, and other relevant methods. To be able to monitor performance, there must first be a clear and universal way of understanding how to measure performance.

3.4 Key Performance Indicators

KPIs are used to assess performance across various aspects using metrics (Hedler Staudt et al., 2015). These metrics can vary significantly and are often categorized into subgroups for better differentiation. The two primary subgroups are direct, or "hard" measurements, and indirect, often referred to as "soft" measurements (Hedler Staudt et al., 2015; Fugate & Stank, 2010). This report will use the terms direct and indirect KPIs to minimize the risk of confusion.

Direct KPIs have in common that they often include the use of simpler mathematical expressions to measure performance (Hedler Staudt et al., 2015). Direct KPIs are also bound by dimensions and can not be applied to more than one at a time. These dimensions are time, quality, cost, and productivity. Time-based metrics include order lead time, receiving time, and order picking time. Quality metrics include on-time delivery, customer satisfaction, and order fill rate. Cost-related metrics include inventory cost, order processing cost, and labor cost. Productivity metrics measure factors such as labor productivity, throughput, and shipping productivity (Hedler Staudt et al., 2015). Direct KPIs are often related to efficiency rather than effectiveness due to their correlation with the utilization of resources (Fugate & Stank, 2010).

Indirect KPIs differentiate themselves from direct KPIs with the distinct difference between being easy to measure and quantify (Hedler Staudt et al., 2015). Indirect KPIs instead demand more challenging ways of measuring, which often include statistical modeling and qualitative assessment. These affect performance as well, but the focus is rather on long-term trends and broader than what direct KPIs offer. Indirect KPIs focus on effectiveness rather than efficiency,

differentiating themselves further from direct KPIs, which, as established, are oriented toward efficiency (Hedler Staudt et al., 2015).

In the construction industry, there is a wide variation in the use of KPIs (Ibrahim, 2024). Identifying KPIs that are specific to subcontractors is more challenging. One key difference is that contractors often use more holistic KPIs, while subcontractors tend to focus on metrics directly related to their specific tasks. For example, a contractor might use an indirect KPI like “subcontractor competency” to evaluate the overall performance and skill level of subcontractors. Generally, contractor KPIs are geared toward assessing the broader project, rather than focusing on isolated aspects within a subcontractor’s scope of work (Ibrahim, 2024).

3.5 Leadership

Leadership in construction, along with project management, is a vital part and closely related to whether the project is successful or not. Leadership is not only concerned with the project managers but expands to more levels in the hierarchy (Pradip, 2016). Continuously evolving with new technologies, etc, it is therefore interesting to expand on what skills are preferred by leaders in the construction industry today. Along with what leadership styles are preferred by the subcontractors (Lantz, 2024). Chapter 3.5 discusses leadership in the construction industry as a whole and presents how subcontractors are affected by it.

3.5.1 Leadership Styles

Leadership as a concept has evolved over the past decades and received attention from many industries (Bass et al., 2006; Odumeru & Ogbonna, 2013). In 1978, James MacGregor Burns presented leadership styles in two ways: transformational and transactional. A transformational leader's main focus is to inspire and motivate employees to transform beyond expectations, along with encouraging personal and professional growth. This is done by trying to align individuals' goals and ambitions with the organization to the best of their ability. Transformational leadership styles are commonly used in military settings but have spread to other industries due to their positive effect on long-term stability and success (Bass et al., 2006). Transactional leadership is harsher and relies on transactions, as the leadership style name indicates. It operates by motivating by offering rewards and, conversely, by withholding rewards if there is poor performance. This is a common leadership style in industries and can, for example, involve incentives such as monetary bonuses if individuals exceed expectations. Transactional leadership is more traditional within corporations and has been the preferred way to lead in corporate settings (Bass et al., 2006).

Transformational leadership is preferred when discussing organizational readiness and the ability to drive change and adapt long-term improvements, as it fosters employee motivation and engagement (Mekonnen & Bayissa, 2023). In addition, transformational leadership has also been

shown to be more effective in shaping positive attitudes toward innovation, while transactional leadership plays a key role in maintaining structure and order (Aarons, 2006). This means that transformational leadership is often the preferred approach for fostering innovation, while transactional leadership is more effective in ensuring stability and maintaining current operations (Al Qaradaghi & Ahmad, 2024; Lane, 2009). However, while both leadership styles have their strengths and weaknesses, research suggests that balancing the two is often the most effective approach. Transformational leadership can drive innovation and inspire employees to exceed expectations, but transactional leadership provides clear structures, defined roles, and performance-based rewards, which are also crucial for organizational success (Al Qaradaghi & Ahmad, 2024; Lane, 2009).

There are more leadership styles beyond transformational and transactional leadership, which could be further explored in this report. Two notable examples are servant leadership and situational leadership. Servant leadership primarily focuses on serving others, particularly the leader's followers (Greenleaf, 1977). It is more closely aligned with transformational leadership than transactional leadership, as both emphasize the growth and development of followers. However, they differ in their core approach, while transformational leadership aims to inspire and motivate followers toward a shared vision, servant leadership instead focuses on nurturing, supporting, and serving the team to help them achieve their full potential (Greenleaf, 1977; Spears, 2004).

Situational leadership, introduced by Hersey and Blanchard (1969), suggests that leadership should be adapted to the specific circumstances of a given situation. It consists of four primary styles: directing, coaching, supporting, and delegating. Depending on the capability and readiness of their followers, leaders should apply the most appropriate style (Blanchard & Hersey, 1982). Situational leadership shares similarities with both transformational and transactional leadership. Like transformational leadership, it encourages development, but it is more pragmatic and adaptable to immediate circumstances. At the same time, it resembles transactional leadership in its structured approach; however, it differs by being more flexible and dependent on the specific situation (Blanchard, 2008).

3.5.2 Leadership impact on subcontractors

CSF was previously mentioned in Chapter 3.3, where the relationship between contractor and subcontractor was discussed. However, another CSF that was presented was to consider the personality and capabilities of the project manager in a project within the construction industry (Alafeef, 2024). Leadership is therefore noted as an area of importance within the construction industry. Attributes like strong charisma and leading by example are described as essential qualities in construction leadership (Liu et al., 2016).

It has been noted that project owners often have direct communication with contractors but not always with subcontractors (Liu et al., 2016). Furthermore, there is a misalignment between the

leadership's vision for practical activities and the impression that subcontractors have (Kirby et al., 2025). This indicates that there is a difference in how, for example, quality standards should be implemented. This can hinder the project's course and affect the overall result of the project at hand. The discrepancy between these can be correlated with different levels of academic degrees. Furthermore, there is also a mismatch between what strategies are best suited for increased productivity between subcontractors and managers (Kirby et al., 2025).

3.6 Contracts

The construction industry encounters daily disputes among various stakeholders, including project owners, contractors, and subcontractors. The primary causes of these conflicts stem from misinterpretation and non-compliance with contractual agreements (Smith & Debnam, 2020). The most important relationship is between subcontractors and contractors since subcontractors can perform up to 90% of all work in construction projects (Hartmann & Caerteling, 2010; Smith & Debnam, 2020; Hinze & Tracey 1994; Law et al, 2012). Which is a number expected to rise in the future. The research on this topic is neglected by many, although it is highlighted as a subject that needs to be addressed and studied (Hartmann & Caerteling, 2010; Smith & Debnam, 2020).

3.6.1 Contract Types in Construction

The construction industry employs a variety of contract types, each with unique characteristics and distinct risk allocations among stakeholders (Murdoch & Hughes, 2008). These contracts vary in how responsibilities are distributed and the degree to which each party assumes financial risk (Murdoch & Hughes, 2008). While the range of contract types is broad and definitions can vary, this thesis focuses on several key contract types that are most relevant to the study. The goal is to provide an overview of these contracts and their implications. It is important to note that this thesis is not solely focused on contracts, therefore, the discussion will remain concise and not dive into excessive details about contracts.

As previously mentioned, different contracts define the level of responsibility held by both the owner and the contractor (Bowmans, 2020). This division of responsibility directly correlates with the level of risk each party assumes, which often impacts the price as well. One such contract is the construction-only contract, also known as a pure construction contract, where the contractor is solely responsible for the construction of the project (Van Weele & van der Puil, 2014; Bowmans, 2020). In this case, the contractor assumes minimal responsibility and, consequently, bears little risk. This type of contract is financially less risky for the contractor, as they are paid based on the work completed, with prices adjusting if the project scope changes. However, this often means that the contractor has less potential for significant profit, as lower risk is typically associated with lower financial rewards, less risky, but also less profitable.

Contract types also differ in their monetary objectives. Construction contracts are typically well-defined, making it easier for the contractor to estimate costs accurately (Murdoch &

Hughes, 2008; Van Weele & van der Puil, 2014). Because of this, construction-only contracts are often paired with fixed-price contracts, one of the most commonly used contract types when project specifications are clearly defined. Under this arrangement, the contractor assumes most of the financial risk, as they must complete the project within the agreed price, regardless of unforeseen costs. This benefits the project owner by ensuring cost predictability while also incentivizing the contractor to manage expenses efficiently. However, the rigidity of this contract can be a drawback, as it limits flexibility for design modifications. Additionally, unexpected events or cost increases may significantly impact the contractor's financial stability. Lastly, fixed-price contracts require extensive planning and precise cost estimation, demanding significant preparation and time to ensure accuracy. (Murdoch & Hughes, 2008; Van Weele & van der Puil, 2014).

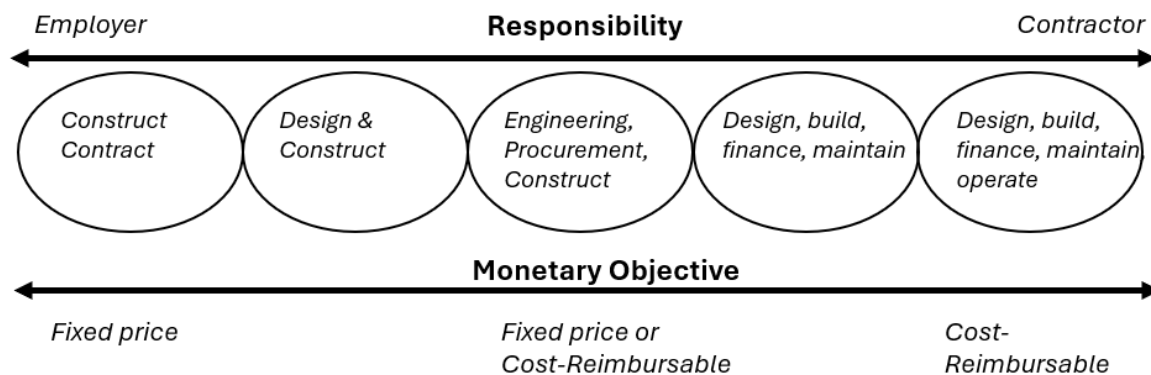


Figure 9: Illustration of contracts in the construction industry

The construct contract is furthest to the left in Figure 9, which indicates that the responsibility lies primarily on the employer (Van Weele & van der Puil, 2014). Design and build (D&B), in some cases described as design and construct (D&C), is instead a contract where the contractor is responsible for both design and construction, as the name suggests. This will reduce the risk for the employer and increase the risk for the contractor's end. Furthermore, engineering, procurement, and construction (EPC), a so-called turn-key solution, is one step further toward where the contractor bears more responsibility. Here, the contractor delivers a fully functional installation or project. Thus, making them responsible for the design and execution of the project at hand. D & C and EPC contracts are most likely to include a fixed price for project completion within the contract. However, EPC could also use other pricing mechanisms like cost reimbursement and unit rate instead, where the scope might be uncertain. Therefore, responsibility in an EPC contract can shift toward either the employer or the contractor, depending on the pricing mechanism used. Cost reimbursable as a pricing mechanism relieves responsibility from the contractor, but includes both pros and cons for a project that affects the employer and contractor. It allows for early project starts since no preparation and calculations

for a fixed price are needed. It is also rather flexible and adaptable to changes in projects. The apparent drawbacks are the uncertainty in the final cost for a project, along with the demand for well-designed incentives to prevent inefficiencies. Lastly, there is a unit rate pricing mechanism as well, which is rather predictable. It is often used in repetitive work for which it is easy to calculate a unit rate. Therefore, it suits maintenance and standardized work activities well. Important to note, is that often, there is a mix of pricing mechanisms involved in a construction project (Van Weele & van der Puil, 2014).

The last two contracts that are expanded upon in this thesis are design, build, finance, and maintain (DBFM), along with design, build, finance, maintain, and operate(DBFMO) (Van Weele & van der Puil, 2014). The two contracts are very similar, with the only difference being that the latter also includes the operations of the complete facility. DBFM contracts are usually adapted when the employer lacks the technical knowledge to design and manage the project. It is also used when the financial resources are not necessarily available in full for the project. Since these contracts often involve a cost-reimbursable pricing mechanism with milestone-based payments rather than a fixed-price strategy, DBFM (Design, Build, Finance, and Maintain) and DBFMO (Design, Build, Finance, Maintain, and Operate) contracts are typically used for long-term, high-complexity projects. These contracts often require the involvement of multiple subcontractors to ensure successful project completion. Among all contract types, DBFM and DBFMO place the highest level of responsibility on the contractor rather than the employer. However, while the contractor assumes significant risk, the payment mechanism serves as a tool to balance risk (Van Weele & van der Puil, 2014).

Important to note is that contracts in construction can take many different forms and are explained differently by different sources. This chapter gives a brief overview of construction contracts so that the reader can get a general overview.

3.7 Work Description

Work descriptions are an essential part of any construction project. Work descriptions are often documents that highlight the scope of work along with the technical details required for the work that is set out to be done (Chappell & Dunn, 2016). Work descriptions are sometimes used as another word for job descriptions, which specifically detail the tasks and responsibilities included in a person's role. Job descriptions are not within the scope of this thesis and will therefore be disregarded. Work descriptions can take many different forms and include different amounts of objectives. Work descriptions can be drawings that detail how the work should be conducted, along with specifications that state both what brand to use and what quality level is expected. Work descriptions help to reduce ambiguity, along with ensuring that the contractor's expectations are met (Chappell & Dunn, 2016).

Subcontractors are affected by work descriptions to a great extent, due to the already established high presence of subcontractors in construction projects. Subcontractors tend to be involved in projects rather late, and often when the work descriptions are already decided by the contractors (Chappell & Dunn, 2016). Subcontractors' part in work descriptions is generally just to name a price for the work detailed in the description. This creates a gap between the contractor and subcontractors where the one who is set to do the work is not involved in planning the work itself. Innovation can take place in all stages of the project, but tends to have the biggest impact at the earliest stages of a project. The involvement of subcontractors differs from project to project, and their involvement could, for example, be higher in the early stages of a project when working in a DBFM contract rather than just a construct contract (Chappell & Dunn, 2016; Brook, 2016).

Since the main purpose of a work description is to as described reduce ambiguity, this could impact subcontractors' ability to innovate during a project as well. The more detailed a work description is, the fewer variations are present. Furthermore, it also makes it easier for a subcontractor to estimate the cost of the project at hand, which, of course, is positive (Chappell & Dunn, 2016; Winch, 2010). Although this is the case, a more detailed work description also limits the ability of a subcontractor to be innovative. The incentive to be innovative as a subcontractor, therefore, disappears when work descriptions are too tightly controlled. This encourages subcontractors to stick to the highly detailed work descriptions regardless of their thoughts on them to avoid liability (Winch, 2010).

4. EMPIRICAL STUDY

Chapter 4 introduces the findings of the study, which are derived from the conducted interviews. The study included six interviews in total, where the goal was to include both the perspective of the contractor and the subcontractors. The interview questions are different for the contractors and subcontractors, but the questions are designed in a way that aligns with the theoretical propositions, trying their best to answer the research questions.

4.1 Contractors

There are four interviews carried out to capture the views of the contractors. All four contractors are vastly experienced, with two of them being predominantly site managers. Thus, the four cases represent both the contractor and the site manager, enabling us to get a holistic view of the current processes. The interview questions can be found in the appendices.

4.1.1 Interview 1

The first interview for the group of contractors is with Mr. Shanmugam A.L. of ALS Constructions. He runs the firm, which specializes in government project undertakings. He has been in the construction business for more than a decade, making him a viable candidate to get a contractor's perspective. He is also involved in housing development projects, from small-scale homes to big apartment-style community buildings.

Since the firm is involved with two types of projects, they have a slightly different setup depending on the project. They do not employ in-house architects, designers, or structural engineers. For a government project, the project plan comes pre-approved, and they cannot make changes to the core design. For housing construction on a small scale, they make the design through outsourcing. For both projects, the purchasing and procurement is done by the firm. Almost the entire construction is carried out through subcontracting. Different subcontractors are being employed at different stages of construction. Sometimes, for a singular purpose, two or three different subcontractors can also be employed. They have site engineers in their firm's setup who oversee the ongoing projects. He feels that supply chain management as a separate concept is not widely practiced in this field. Especially if the project is small, they are happy to handle the different aspects on their own. Further, he thinks personnel management is the most important area in construction rather than purchasing or customer management. Hence, we can see from this interaction that the relevancy is low when it comes to SCM in the construction industry. Time management is the biggest challenge that his firm faces. Since they are completely dependent on subcontractors, deadline management and completing a certain goal become tedious. He further says this delay is not only due to subcontracting but also due to delays in supply, natural hazards, and funding issues. He accepts that the entire CSC is very fragmented, and it is the essence of this industry. When asked about whether he feels this

challenge can be overcome with less subcontracting, he denies it and iterates that subcontracting is beneficial, and without it, this time management will be even worse.

They do not have any comprehensive project management processes. They follow basic methods like schedule charts and timelines with milestones. When asked whether the subcontractors are involved in project scheduling, he says it is not in their business model to involve them in the initial planning stages. They have a policy where they bring in subcontractors who comply with their vision. The project scope and timeline are explained well in advance before signing the contract. They also have an understanding of payment terms in a way that funds are paid out based on the completion of promised goals. Site engineers are in daily contact with subcontractors, overseeing the progress and updating it continuously on the progress. Time management is their biggest challenge. Most of their subcontractors hire temporary labourers. This causes some issues as they are not predictable. When there is a shortage of workforce, they cannot move to another subcontractor in the middle of an ongoing work. Thus, labour management, which in turn determines the project timeline, is their biggest challenge. They do not involve subcontractors in their planning or decision-making processes. They are more or less treated as contracted labour. They are expected to carry out the predefined work without much delay or alteration. They are not sure about innovation, but they are confident that they plan every project in a way that they can accommodate any unforeseen challenges. Flexibility is given more consideration than innovation. But they believe this flexibility provides them with the opportunity to innovate, too. As of right now, they do not follow any documentation procedure. They update regularly through chat groups if which can be considered as digital documenting to a small extent.

According to him, leadership plays a key role in the outcome of a project. He further explains that the decision makers should have technical knowledge about the work carried out. Without that knowledge, they can be overwhelmed by the challenges, and there might be a shift in power towards the subcontractors. By shift in power, he means the site engineers could lose the respect and the managing capacity, which can lead to a clash between the contractors and subcontractors, impacting the project. When it comes to the type of leadership, from a wider perspective, he feels that in construction, it should be a balance of both transactional and transformational. He leans towards transactional as it suits the type of projects his firm deals with. They demand the exact output from the subcontractors that was agreed upon, thus not compromising their promise to the customers.

There are no fixed KPIs that they work with currently. Usually, a project's success is mainly determined by the level of customer satisfaction. The other indicators are time management and quality of the deliverables. Their profit margin takes up less importance when it comes to the success factors. Also for knowledge transfers, they do not have any KPI, and they feel they are not aware that there are such possibilities. And for tracking the innovation during a project, there

are no specific documentation processes, rather, just using the experience gained from previous work.

The contract type that they enter with the client is generally engineering, procurement, and construction. But with the subcontractors, they always only construct contracts at a fixed price per square foot. All the required materials are supplied by them to the different subcontractors. Thus, subcontractors have very minimal financial responsibility other than the timeline commitment. Their contracts also have penalty clauses if they are not able to stick to the promises of the contract. The delays caused by unforeseen circumstances are not considered a contract violation. These contracts do not have any provisions regarding innovation and knowledge transfer. There are neither incentives given to subcontractors nor are they withheld from sharing their gained knowledge from a current project.

Before signing the contract with both the clients as well as the subcontractors, a detailed work description is created and approved. Both contractors and subcontractors must stick to this description as it is legally binding. Any changes to the initial work description are carried out only after approval from the clients and the structural design team, if present. The subcontractors have no discretion to move away from the work description. They are allowed to give suggestions if any changes can be made, but the implementation decision lies with the contractors. The good and bad experiences gained from a previous project are always kept in mind before drafting a work description or contract. This includes the insights from the subcontractors as well. They have not given thought to structuring the work description flexibly enough for innovation in the middle of the project.

Table 2: Mr. Shanmugam's ranking

<i>Please rank the following in order of which area has the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>1 = Low impact, 5 = Very High Impact</i>
Leadership	3
KPI	1
Contracts	2
Work Description	2

Table 3: Key Takeaways - Mr.Shanmugam

<i>Key Takeaways Mr.Shanmugam</i>	<i>Relevance to RQs</i>
Subcontractors lack autonomy - expected to follow work descriptions to the point	RQ 2
Innovation and knowledge sharing has no documentation or traceability process	RQ 3
Leadership is very important but leans towards transactional style	RQ 1
Contracts contain penalties but no incentives for innovation	RQ 3

4.1.2 Interview 2

The second interview is with Mr.Ramesh from Mayan Constructions. The firm works in a housing developer model, where they help the clients from plot acquisition to the construction of the housing. They do both individual houses as well as apartments. Currently, they are also venturing into commercial buildings. Mr.Ramesh comes from a non-construction background but has twenty-five years of experience in this field, making him a candidate who fits in the usage of sticky knowledge to the fullest.

Since they are a housing developer, they have their value chain set up in a way that they have separate teams that work on land acquisition, design, and procurement. They outsource structural engineers for plan approval. Once a plan is accepted by all concerned parties, they enter into a working contract and move on to the next phase. They also depend heavily on subcontracting, starting from brickwork to completion.

Again, when it comes to project management, they do not have special tools or a dedicated team that oversees the planning. The subcontractors are involved in the early planning stages. They sketch out the project timelines after discussing the scope of the project with their different subcontractors. Work schedule and availability of the subcontractors are first collected, and then based on it, the project is planned. This gives them a cushion to overcome minor setbacks when it comes to time management. The biggest challenge they face is labour management. They feel there is a surging shortage of local manual labour, forcing them to recruit workers from the northern and western parts of the country. They outsource this from a labour contracting company. Inflation is another challenge their procurement team faces constantly. The fluctuation in prices is not well accounted for in the contract. Hence, any surplus charges are borne by the firm, removing the liability from both the subcontractors and the customers. They ensure there is

enough flexibility in the initial planning to accommodate the unexpected challenges. They don't see that they have exclusive scope for innovation in their project management process. If there are any new ideas shared, they are discussed, but the subcontractors do not have any power to implement those changes without their approval. If there are any problems, the subcontractors generally come up with the easiest solution. If it is not possible to implement it at that time, the idea is used during the planning of the next project. There are no exclusive documentation processes for innovation, but it is noted down casually, and a review meeting is carried out after the end of a project to talk about the challenges and the solutions that were discussed.

Both transactional and transformational leadership are necessary to make any project successful. They believe a leader should inspire their co-workers and make them feel an active part of the project. Though the leadership style might vary across their different site engineers and managers, overall, they want to create a strong bond between the subcontractors and contractors, and customers. When it comes to hearing out ideas from the subcontractors, if there is an ongoing issue, the subcontractors are first asked for their opinion. These ideas are then discussed for their pros and cons among the design and structural teams before implementation. They strongly believe that practical experience is more valuable and at times accurate than theory. To quote from the interview

“I come from a non construction background. Being successful in this field for more than twenty years, I can confidently say only a bad businessman would underestimate the value of practical experience and knowledge”.

He is a hands-on type of leader, but sometimes one can be overwhelmed by trying to be part of every little detail. A leader should have faith in their subordinates to execute the needs.

They are not sure if any standard KPIs are being used in the construction sector. Again, customer satisfaction is their metric of success. Sometimes, they are ready to incur a loss to deliver the promised outcomes to their customers. Since innovation is a dynamic part, they have no idea how to measure it or help in documenting the innovation rate. If the issues faced in the previous project do not occur in the upcoming project, they see that as a success or a way to keep track of potential innovation. Same goes for knowledge sharing, it is more like a working concept rather than a measurable entity.

Contracts entered with the clients vary from EPC, DBFM, and DBFMO depending on the scale of the project. DBFMO contracts are rare, but generally they operate on a fixed price. Inflation is accounted for to some extent, but anything more than the agreed value is borne by the firm. Thus, they take up financial responsibility. With the subcontractors, they draw up construct contracts. This gives them the flexibility to employ three or more subcontractors at the same time under a fixed cost ceiling. Incentives and penalties are part of the contract, but they are more

focused on time rather than on innovation. Work descriptions are taken seriously, and all subcontractors are expected to work within the guidelines. This is because this work description is the one that is agreed upon with the clients and is legally binding. Any deviations from the work description occur if there are only in unforeseen situations. He agrees that work descriptions and contracts might hinder the freedom of potential innovations of both contractors and subcontractors, but the industry is rigid in such a way that it demands that to act within set boundaries.

Table 4: Mr.Ramesh's ranking

<i>Please rank the following in order of which area has the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>1= Low impact, 5= Very High Impact</i>
Leadership	4
KPI	1
Contracts	1
Work Description	4

Table 5: Key Takeaways - Mr.Ramesh

<i>Key Takeaways Mr.Ramesh</i>	<i>Relevance to RQs</i>
Subcontractors are involved in planning to a slight extent	RQ 1, RQ 3
Ideas generation are through informal communication but no proper documentation. No use of standard KPIs.	RQ 3
Leadership is crucial and preference is for a balanced approach	RQ 1
Contracts contain penalties but no incentives for innovation	RQ 3

4.1.3 Interview 3

This interview was conducted with Mr.Neelakandan from Sri Narayani Construction, India. They undertake both housing projects and commercial buildings, like schools, complexes. Mr.Neelakandan has worked previously as a site engineer for fifteen-plus years in a big corporate firm before starting his own firm six years ago. He gives valuable insights from both a site manager's and a contractor's point of view.

His firm's supply chain setup is similar to the other. They design the projects themselves and outsource structural help. They further hire manual labour for masonry work. Subcontractors are involved only for finishing work like electrical, plumbing, and carpentry. Procurement is done by themselves. When asked about the relevance of supply chain management in construction, he feels it depends on the scale of the project. In his current projects and setup, he has not felt the need to implement separate supply chain management techniques. According to him, the biggest challenges in a construction value chain are tackling the inflation of materials and workforce management.

Regarding the project management area, they feel a separate project management team is not required for their business model. But if the project is big, having more than thirty subcontractors, then a dedicated team will be beneficial. Their current project planning is done by internal discussions after a contract is finalised. Excel sheets are used primarily for the planning phase and to keep track of their purchases and inventory. This data is not shared with the subcontractors. Typically, they have fixed timelines for various projects based on their previous experiences. They employ subcontractors who can assure to work within their planned time frame. There is little to no involvement of subcontractors in any decision-making or project planning processes. Further, he says they do have some flexibility in their planning since all construction projects are bound to face interruptions. They do have a few second-tier subcontractors that they hire when such situations occur. He isn't sure if there are exclusive scopes for innovation and knowledge sharing aspects in their initial planning process. They do have constant communication with the subcontractors, getting to know about any problems in resource availability, labour shortage, working hours issues, and other such things. Ideas and suggestions from them are most welcome and heard, but the subcontractors cannot implement any changes according to their discretion. There is also no documentation process present to translate these ideas and solutions into documented briefings. But the experience is carried over in the upcoming projects. It is more vocal than in writing.

When it comes to leadership, he believes leadership makes or breaks any project. Regarding the leadership style, he likes to apply both depending on the situation. For a role of site manager, one should be more transformational, whereas a managing contractor should lie more towards a transactional leader type. The balance is important to extract the desired output from a subcontractor. He adds that, since subcontracting is about forging long-term relationships, it is important that they feel comfortable with the working environment, but at the same time, they should be aware of their promises. He believes that such a leadership style will help in promoting innovation that uplifts not only the firm but also the entire industry in the future.

The talk about KPIs is very brief since he thinks there are no industry standards that are currently used to measure success other than customer satisfaction and return on investment. This applies

to innovation and knowledge management also, as they do not have the means to quantify those parameters.

The contracts they enter with clients are mostly EPC and, in some cases, DBFM. Costs are fixed per square area. There may be a slight tolerance level accounting for inflation. With subcontracts, they do a construct-only contract at a fixed rate. Penalty clauses are present but are not triggered in most cases. Work descriptions are shared with the subcontractors, and they are strongly advised to stick to the specifications. In extreme circumstances, if the subcontractors feel there is a need for alteration in the current specs, they have the freedom to address it. After discussion with all parties, a final decision on the problem will be made from the contractor's side. He shares the thought that the lack of incentives in contracts and the strict work descriptions may not drive innovation and be a hurdle to potential improvements that can be made to the results. He is not sure how this situation can be tailored, but thinks there should be a change in the overall outlook of the industry and industry leaders.

Table 6: Mr. Neelakandan's ranking

<i>Please rank the following in order of which area has the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>1 = Low impact, 5 = Very High Impact</i>
Leadership	4
KPI	1
Contracts	2
Work Description	4

Table 7: Key Takeaways Neelakandan

<i>Key Takeaways Mr. Neelakandan</i>	<i>Relevance to RQs</i>
Subcontractors lack autonomy, little to no involvement in planning process	RQ 1, RQ 2
No KPI tracking or innovation documentation process	RQ 3
Prefers transformational on site, but transactional when it comes to management	RQ 1
Contracts contain penalties but no incentives for innovation	RQ 3

4.1.4 Interview 4

Fredrik has worked in construction for more than 20 years. He worked for 10 years at Skanska as a site manager, the largest construction company in Sweden.

Fredrik explained that every supply chain in construction differs from each other, where some are complex and others are more streamlined. He also describes the supply chain as ever changing, depending on what phase the project is currently in. Some projects involve only a few subcontractors, while some include over a hundred of them, which testifies that the complexity differs. Challenges connected to the supply chain are generally just to ensure that all entities are on the same page and up to date about the project. Fredrik explained that site managers often have preferred subcontractors they like to work with because of how well they collaborate. While these subcontractors might not always offer the lowest prices upfront, they often end up being more cost-effective in the long run thanks to smoother and more efficient supply chain processes.

When asked about project management, Fredrik explained that they do not follow a specific framework when carrying out a project. It differs from project to project, just like how their supply chain adapts. Regarding how and to what extent subcontractors are involved, he stresses that it might not be to the degree they should. The contractor often decides on what, when, and how a project should be conducted. When everything is pretty much set, the subcontractors are contacted. Fredrik points out that this might not be an optimal way to do it, though, as he says the subcontractor's knowledge about their specific area often is much better than the contractor's. He adds that, in some cases, the subcontractor is allowed to modify the project plan if they have a valid reason. This largely depends on the site manager, he continues, noting that a more open and flexible site manager is generally the approach he tries to take. Fredrik thinks that this area has room for improvement, where subcontractors should be introduced to the projects at a much earlier stage than they are.

When discussing innovation and whether it is included in the scope of the project plan, he emphasized that it heavily depends on the site manager in charge. He supports innovation and sees it as a way to help the construction industry grow and evolve. However, he also reflected on the broader industry culture, explaining that many people are set in their old ways and rely on methods that “work” rather than try to innovate and utilize new knowledge. He noted that, as a project leader, it's important to be open to new ideas and to encourage subcontractors to contribute to the development of the project. However, he also acknowledged that many subcontractors can feel discouraged in the industry, especially when site managers are not supportive or open to their input.

Leadership was something Fredrik considered very important, and he explained that a leader's approach and style can significantly influence both projects and the people involved. He shared

that this had a strong impact on him over the years, especially in situations where his supervisors were not particularly supportive. This, he explained, affects not only how you feel on a personal level but also how encouraged you are to be innovative in your work. Thus, stressing the importance of good communication as a leader. He also emphasized that he, as a leader, is nothing without the people in his team and the subcontractors who are doing most of the work. His goal is to inspire and motivate all these people and try to be as open as he possibly can be to new, innovative ideas that are shared across the project.

Regarding what style of leadership he as a leader prefers himself he explains that it is difficult to give a simple answer to. He also adds that as a leader, you are a human like everyone else, with good and bad days, which also affect others when you are a leader. Fredrik has seen many cases of both transformational and transactional leadership styles that work, but often sees a mix of both depending on what personal trait the leader possesses. As for himself, Fredrik sees his approach as leaning more toward the transformational side. He especially enjoys getting out of the office to support and motivate others, finding satisfaction in encouraging people directly in their work.

As a leader, you also have a responsibility to share newly acquired knowledge and innovative ideas across projects. Fredrik explained that how this is done can vary depending on the company. At Skanska, being a large organization, they often used tools like newsletters and an internal platform where new ideas and knowledge were shared and made accessible to employees across different projects.

When asked which KPIs are most important to him and whether any are related to knowledge sharing or innovation, Fredrik explained that there is currently no clear KPI that effectively captures how well knowledge is being shared or the pace at which innovation occurs. They are very complex to measure in terms of KPIs. The most important KPI within construction, he explained, is time. Fredrik explains that construction projects are very focused on time due to their relation to cost. A project that is delayed often becomes more expensive for the contractor, which he explained is generally the most central objective for him as a site manager. However, he also emphasized a clear correlation between tight deadlines and the ability to innovate. He explained that there is a sweet spot. Having too much time is not ideal, but having too little creates stress and discourages innovation.

Due to Fredrik's experience, he has worked within many different contract types tied to different monetary objectives. From his experience, contracts did not affect innovation and knowledge sharing to a high degree. He explained that subcontractors often worked best when they knew that they got paid regardless of the outcome, which, he continued to explain, enhanced innovation. In Sweden, this is rarely a problem thanks to well-established and clearly defined working conditions that provide subcontractors with a sense of security. He also continued to

explain that he feels like this is heavily dependent on the person in question, where some might prefer cost reimbursement and some a fixed price contract.

Knowledge sharing is not considered when writing contracts, Fredrik explained, not explicitly at least. Although some knowledge sharing takes place toward the end of a project, it usually happens during final inspections. At that stage, subcontractors are often brought together to go through the project step by step, discussing any accidents, challenges, or innovative solutions that came up along the way. This could be noted as some kind of knowledge sharing because Fredrik, as a site manager, will, of course, learn from this and later on share it with other employees in the company.

Another aspect that could impact innovation is the work descriptions. Fredrik had considered this to a high extent, considering whether it is ideal that the contractor models and designs the blueprints, which will later be given to the subcontractors. He explained that he feels like this hinders the subcontractor's ability to be innovative and think freely, especially when the work descriptions are very detailed. Furthermore, he discussed an alternative idea where he, as a contractor, delivers a set of specifications that are to be met by the subcontractors, but no exact drawings. This approach would allow subcontractors to design the work descriptions themselves while still meeting the objectives set by the contractor. Although he acknowledged that implementing this in practice could be challenging, he believes a combination of the two approaches is possible.

During the ranking, Fredrik explained that he sees leadership as central to everything in construction projects, noting that many aspects of a project are closely connected to the type of leader in charge. Thereafter, he ranked work description as the most important and later on left KPI and contracts at the same ranking, which he did not consider as connected to innovation and knowledge sharing.

Table 8: Fredrik's ranking

<i>Please rank the following in order of which area has the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>1= Low impact, 5= Very High Impact</i>
Leadership	4
KPI	2
Contracts	2
Work Description	3

Table 9: Key Takeaways - Fredrik

<i>Key Takeaways Fredrik</i>	<i>Relevance to RQs</i>
Strong support for early collaboration, but has practical implications	RQ 2, RQ 3
Site managers and their leadership influences innovation significantly	RQ 1, RQ 2
Too rigid descriptions can affect subcontractor's creativity	RQ 2

4.2 Subcontractor

Chapter 4.2 introduces the interviews of the subcontractors included in the study. The subcontractors included are primarily electricians, who are present in most construction projects. This makes them highly relevant for the thesis and provides rich insight into the construction industry from a perspective different from what the contractor offers. The questions can be found in the appendices and share similarities with those asked actors. The structure of the subcontractor interviews mirrors that of the contractor. The theme remains central to project management, leadership, KPIs, contracts, and work descriptions. Thus keeping it aligned with Figure 4 presented in the theory.

4.2.1 Interview 1

The first interviewed subcontractor is Anton, who has 10 years of experience in the electrical field. Anton has worked on many projects throughout the years, each with a different style and characteristics. In addition, he has been working at two different electrical firms to further expand his knowledge about the field he is being interviewed for. He currently works at one of the largest electrical firms in Sweden, with a revenue of close to 10 billion SEK.

Project management as a concept was fairly novel to Anton when first introduced. As he is rather far from the executives at the top of the decision-making chain, Anton explained that depending on the size of the project, he was more or less involved in the planning phase. Smaller projects could allow for some insight into how larger projects were planned by executives at his electrical firm, along with the main contractor. Regarding sticky knowledge, the impression was that the site manager seldom considered it, while his manager within the electrical firm strongly encouraged it and wanted to utilize the knowledge he had. This became a clear pattern during the interview. Anton had very little contact with the site manager but a much closer relationship with his manager at his company. This highlights that his sticky knowledge could transfer from his manager to the contractor manager, but it does not guarantee that either.

Delays due to project mismanagement are a recurring issue within the construction industry, Anton explained. It even happened in the last project he was involved in. He explained that the complexity of any project lies in the coordination of involved entities. All construction projects

often include multiple subcontractors and at least one main contractor. All these entities have to plan and estimate time consumption together. One subcontractor can't finish if the other subcontractors fall behind, and vice versa. This creates a complex challenge where all subcontractors have to be synchronized with each other and the contractor at all times. In the last project, one subcontractor fell behind schedule, which delayed the whole project, including Anton's part. Although this did not impact him negatively in any way. He explained that the delay gave him more time to work carefully and achieve a better result than he otherwise would have been able to if he were under time pressure. However, this could have been different if he had not been hired by a subcontractor who was paying his salary regardless of the project outcome.

Areas for improvement in project management were clear for Anton as he proceeded to explain them directly as the question was asked. The improvement he proposed was very much aligned with the previous questions that involved managing entities. Anton explained that the main issue he faces is that the blueprints given to subcontractors often differ from each other. This leads to problems on the construction site, where one subcontractor's work can interfere with another's. Lastly, this leads to delays and misalignment for the whole project. A possible solution, which Anton mentions might already exist without his knowledge, is to use a program that allows real-time updates and a layered structure, so all subcontractors can view each other's "live" blueprints.

In addition, Anton also notes that there is a notable gap between the writers and CAD artists who construct blueprints and the actual electricians. He often needs to use his expertise to address problems in the blueprints. These problem sizes in the blueprints range from minor to large. Both of these changes would improve the efficiency of project management, even though they might be considered small adjustments.

As discussed during the project, which was delayed, the ability to innovate and work freely increases when time constraints allow for it. Tight schedules could, on the contrary, result in less than ideal results due to factors such as stress. Anton emphasizes that having too much time isn't a solution either, there needs to be a balance, a sweet spot between too little and too much time. Where projects can finish in a reasonable time, along with allowing for innovation and proper work, resulting in high quality.

When asked "How does leadership from project managers or site managers affect the sharing of knowledge and new ideas on-site?", Anton explained that, as previously mentioned, he has limited contact with the site manager, thus making it difficult to answer the question fully. His impression, however, is that the site managers' focus is not on sharing knowledge but rather on getting the project finished in time. Time is a recurring theme throughout the interview as well, often mentioned as something that the site manager frequently worries about.

Although Anton explained that it has happened that he has given input about things that will be a challenge later on in the project that should be addressed directly, this has been ignored. He circles back to it being connected to the blueprints again, stressing the importance of the need for a solution there.

The leadership characteristics he has encountered throughout his years have varied a lot. Anton's impression is that the mode of the site manager is again heavily influenced by the success of the project, where they are more positive toward innovation when time allows for it, and harsher when time is scarce. The different styles have also been noted, where some leaders have been transactional and not very interested in innovation and the sharing of ideas. While some have been transformational and very positive toward personal development, and aligning their interests with the projects. In general, he explained that site managers are more transactional, and the managers at his firm are more transformational. This makes sense because the site manager might only be Anton's supervisor on this project, while the manager at his firm will be around for several projects. Regardless, Anton explained that he prefers a mix of the two styles, where the structure of transactional leadership is appreciated, along with the transformational attributes of trying to align interests and motivate personal development.

In response to how leaders facilitate knowledge sharing between team members or across different projects, Anton noted that site managers rarely play a role in this, as they typically don't have direct control over the subcontractors. Instead, it's within the electrical firm that leadership plays a bigger part. He shared that his managers often rely on his experience for complex projects, and there have been several occasions where his input has been crucial to a project's success. He also mentioned that ideas he's come up with, especially related to design, have been passed through his managers and later applied to other projects via communication with the contractor's site manager.

KPIs as a subject is quite a novel subject for subcontractors like Anton. It was not a concept that he was aware of or had ever talked about explicitly. When discussed further, some areas were noted where performance metrics could be established. However, these were quite focused on time rather than innovation and knowledge sharing. As previously mentioned, most of the constraints are tied to time and managing it in the best way possible. There could be noted some KPIs with some connection to knowledge sharing and learning, though. Once or twice a year, Anton has a discussion with his manager at Bravida where they discuss what he wants to improve at, and so forth. These do not transfer to a site manager at a construction site directly, perhaps. However, some elements connected to learning and knowledge sharing are here, which later transfer to the construction site.

Once again, a performance metric that has high influence on Anton is time, and performance metrics connected to it in general. It also depends on the work that is being done. Some activities in Anton's field only have one solution and one correct way of doing things, while other

activities allow for more innovation. Performance metrics can therefore have a different impact regarding what kind of activities are being conducted. Tight time constraints where only one solution exists will not impact innovation since there is no other solution to be found. However, time constraints where the work description is more open will heavily impact Anton's ability to innovate.

He continues to explain that cost saving is very important when it comes to projects that individuals pay for themselves, referred to as service work within the electrical field. While it is not important at all in a construction project, here time is the number one priority rather than cost.

When asked how contract terms affect his ability to be flexible or try innovative solutions during a project, Anton admitted it's not always easy for subcontractors to grasp the full scope of responsibility. Unlike contractors, they're rarely involved in things like financing, maintenance, or long-term operations. That said, he pointed out that subcontractors can be brought into projects in different ways and for varying durations. In his experience, most subcontractors work under simple construct contracts, though some occasionally get involved in EPC-type projects. He explained that longer-term contracts tend to allow for a bit more flexibility and room to think creatively, mostly because there's an understanding that the collaboration will continue over time. With basic construct contracts, on the other hand, the focus is very much on doing the job that's assigned—nothing more. In those cases, there's not much opportunity or incentive to innovate or exchange ideas with the site manager.

Although he is more experienced with the monetary objective, which often varies between fixed price and cost-reimbursable contracts. He explained that cost reimbursable contracts should, in theory, help with innovation and knowledge sharing, but don't translate that well in practice. Anton proceeds to explain that with a fixed price, it creates an illusion that he is not under time pressure, which allows for innovation and knowledge sharing, while if he works with cost reimbursable contracts, he frequently reflects over time, and completes objectives as fast as possible. Time becomes more abstract under a fixed-price contract, where its value feels less tangible. In contrast, a cost-reimbursable contract makes time highly tangible, which can lead to increased stress and potentially hinder innovation.

From Anton's perspective, knowledge sharing is not given enough attention and should be prioritized more than it currently is when negotiating contracts. He explained that strict contractual frameworks sometimes hinder the sharing of valuable insights, even when those insights represent the best way to carry out a task. As a result, subcontractors may follow the contract's work descriptions despite knowing they are not optimal, only to revise the work later.

When asked how detailed work descriptions influence his ability to innovate or adjust methods on-site, Anton said that work descriptions are closely tied to the blueprints, which he had

touched on earlier when discussing project management. He noted that the level of detail can vary a lot. Some descriptions are quite strict, while others are much more open. In his experience, many are left open to interpretation, especially in electrical work, where there are often several ways to approach a task. This flexibility, he said, allows for a good amount of innovation and makes it easier to adapt methods on-site when needed. Furthermore, Anton feels that many work descriptions are written in a way that demands his experience to be completed.

When asked what happens if he wants to do something differently based on experience that isn't included in the work description, Anton said it largely depends on how detailed the description is. As mentioned earlier in the discussion on contracts, some elements in the blueprint or work specification are highly prescriptive, leaving little room for deviation. In those cases, even small changes might not be accepted without approval. But when the descriptions are more open, there's usually more freedom to apply practical experience and make adjustments on-site. For example, when a specific brand or product is explicitly stated, there is little to no room for deviation. In contrast, when the description is more open to interpretation, there is greater flexibility, which allows for innovation and the application of Anton's experience and professional judgment. Anton explained that if the work description is very strict, he often contacts the site manager to ask for clarification and the ability to change it if necessary. He emphasizes that communication is key in this area and that it is very important to have a clear understanding with the site manager of what is ok to change and not.

As stated, the work descriptions are quite open for knowledge sharing and innovation as they stand. With the exception being that if something explicit is stated. Many construction projects are quite loose and rely heavily on experience from subcontractors. He reflects again on the blueprints being more accessible between contractors and subcontractors. In addition, Anton also discusses the ability to change work descriptions and blueprints as he works to get everyone in a project up to speed, if a change is deemed necessary.

At the end of the interview, the interviewee was asked to do the following ranking. Here, Anton ranks what he feels is closest related to what impacts innovation and knowledge sharing the most within projects in construction. He deemed that leadership has the highest impact, while KPI is not that important for his field of work. Contracts and work descriptions are deemed somewhat important to enhance innovation and knowledge sharing.

Table 10: Anton's ranking

<i>Please rank the following in order of which area has the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>1= Low impact, 5= Very High Impact</i>
Leadership	5
KPI	1
Contracts	2
Work Description	3

Table 11: Key Takeaways - Anton

<i>Key Takeaways Anton</i>	<i>Relevance to RQs</i>
Limited interaction with site managers and contractors directly	RQ 1
Calls for digital solutions in areas like blueprint and plan sharing can promote innovation	RQ 2, RQ 3
Transformational leadership style can foster healthier environment for communication and idea sharing	RQ 1
Project delays can sometimes spark innovation, but thinks it is not sustainable	RQ 2

4.2.1 Interview 2

The second interviewed subcontractor is Vincent. Vincent has around 5 years of experience working with electrical work within construction. Vincent has worked at several different firms in Stockholm, Sweden, attending many large construction projects during his years. The main difference between Anton and Vincent is that Vincent has primarily worked in construction projects, while Anton has worked in construction projects and service. Service work is more focused on private properties and doing smaller projects without a contractor involved, thus making the two kinds of work environments very different. As of today, Vincent has transitioned from the Electrical field toward academia and has become an environmental inspector.

Regarding project management, Vincent explained that he wasn't involved in the early stages of project planning, things like looking at drawings/blueprints or talking directly with the site manager. Even so, he felt that his own hands-on experience, or "sticky knowledge," was useful in certain situations, depending on what his supervisor thought was best. As a newer electrician, he knew some decisions were out of his hands. He pointed out that how much say you get probably depends on the company and the context, but in his case, the people around him were

open to hearing his ideas, whether they were “correct” or not, and there was a good level of communication about what made the most sense for each task. Vincent experienced delays of all sorts, he explained. Some of which were communication with staff, the incorrect type of blueprint/drawing, a lack of knowledge, and materials not arriving in time. There could have been several more, but these were explained to be the most common ones. Delays affected his work greatly, maybe sometimes unconsciously, he explained further. He could become stressed due to seeing many flaws that were neglected. In practice, these delays often lead to longer working hours, leading to a worn-out body and mind, which greatly affects the way you work. He adds that this could increase the innovative thinking, to try to improve it to the best of his ability, though. Which might not be the best or healthiest way to improve innovation.

Vincent highlighted several things that could improve the way projects are run. For one, ordering materials with better foresight would save time and reduce stress later on. He also mentioned the need for clearer communication between the leadership and the people doing the work on-site. Having easier access to updated documents, like new products on the market or modern methods, would make a big difference too. He emphasized involving subcontractors earlier in the planning phase, saying it could open up new perspectives and help avoid issues down the line. And finally, he stressed the importance of including more buffer time in project schedules. “Right now, it’s all about building as fast as possible,” he said. “But if you give projects a bit more breathing room, you get fewer mistakes, better communication, and a less stressful work environment, which could lead to more effective projects down the line.”

Interestingly enough, he felt that on some occasions, project management could hinder his ability to innovate due to the strict guidelines present during a project. These could, for example, be very strict blueprints that limited his ability to use his sticky knowledge. He explained that electricians might be subcontractors who are freer than others, allowing for innovation to a great extent. Vincent stresses that even though the blueprints are strict and that you have to follow the project management directions, it doesn't necessarily mean that you should turn off the innovative mindset. Everything you see and do could apply to something down the line, which means that you should always have an innovative approach to your work.

According to Vincent, site leaders have a big influence on how knowledge and new ideas are shared on a construction project. They do have the power to encourage that kind of exchange, but he also acknowledged that they’re often juggling a lot of other responsibilities. “*A lot of the time, they have their vision of how the project should turn out,*” he said. “*Some are more open to input, others just want to stick to the plan.*” He emphasized how important communication is, especially from those in leadership roles. Site leaders usually attend meetings with the top-level management, but the information discussed there doesn’t always make it back to the workers. This creates a disconnect, where key updates and insights aren’t always passed down, which makes it harder to share knowledge or come up with better ways of doing things on-site.

Leadership has both supported and limited Vincent, he explained, although it is harder to come up with concrete examples. On many occasions, it has supported the ability to innovate when leaders have remained open-minded and open to discussing different things. He further explained that he thinks it supports innovation when they are very transparent in general, not withholding information about the project.

On the contrary, Vincent shared that innovation can be hindered when site leaders are narrow-minded and unwilling to consider alternatives to their ideas. “It can feel a bit like a dictatorship at times,” he said. “Even though I understand they are the ones with the final say, it becomes a problem when they shut down discussion completely.” He pointed out that sometimes, even if a suggestion is not perfect, the act of listening and engaging with the team can lead to better outcomes overall. “It’s not about always having the right answer, it is about being open to the conversation.”

Vincent explained that the two discussed leadership styles are very much present and that he has encountered both of them on several occasions. He very much prefers a transformational leadership style over a transactional style. He thinks transactional leadership, where people are rewarded or punished based on their performance, can work for some, but it often adds stress, especially for newer team members. If you’re constantly worried about making a mistake, it’s hard to feel comfortable taking initiative or trying new approaches. This hinders innovation and the sharing of practical knowledge.

On the other hand, he believes transformational leadership works better for encouraging growth and innovation. A good leader should inspire the team, give positive feedback, and support people when they’re struggling to find meaning in their work. When that happens, Vincent explained that people feel more motivated to do their best and share their ideas.

Vincent explained that he didn’t have much direct insight into how leaders facilitate knowledge sharing between team members or across different projects, but he emphasized that communication between project managers is crucial. He believes that when leaders share experiences and perspectives, they can learn from one another and discover new ways of working. This kind of exchange supports innovation and helps spread practical knowledge across projects.

KPIs related to learning and knowledge sharing were present, but not as explicit as they might have been. He had personal goals related to his learning, while general goals were more focused on being open-minded and learning to receive and give feedback to each other.

Vincent explained that KPIs influence decision making in the way that if something is at a stable state, it is rarely changed, even though it could be enhanced further. He continues to note that trying new things and being innovative often comes with a risk of being uncomfortable and doing something wrong. Vincent felt it was important that the whole team had a shared idea of

when it made sense to try something new, and when the usual way of doing things was working fine. He described himself as someone who's always been curious and eager to learn, always looking for ways to improve. What frustrated him, though, was when people seemed stuck in the mindset that there's only one way to do the job. That kind of thinking, he said, can get in the way of trying out new ideas.

Performance metrics can both discourage and encourage innovations, Vincent believes. It heavily depends on the metrics themselves. If the metrics are oriented toward personal learning and growth, they encourage innovation to a great extent. Performance metrics can also pressure you mentally and, therefore, hold back innovation if used incorrectly.

In the early days of Vincent's career, he explained that KPIs related to time and performance affected him to a high degree. Often affects his mental state and personal life as well. He would think, "If I don't complete this in time, I will get fired," etc. Later in his life, he concluded that stress related to performance is not necessarily a bad thing. He instead has switched focus and tried to focus on being transparent with his supervisors and realised that it is not a life and death scenario. If he falls behind on metrics, he will instead explain to supervisors what has happened and see it as a learning opportunity. He stresses the importance of your mental health and not letting work affect your personal life, since the two have to work in symbiosis.

Vincent has only worked under construct contracts with fixed-price objectives, which makes it hard for him to compare different types of contracts or reflect on how they might influence flexibility or innovation.

He proceeds to try and imagine how innovation ties to the contract types regardless and explains that all contracts can encourage innovation in their own way. Although he hasn't worked with them himself, Vincent feels that EPC and DBFMO contracts might support innovation the most, since they often require creative thinking and problem-solving already in the early planning stages, before any actual work has started. He stresses the importance of innovation in an early stage, which can lead to a smoother project as a whole. He also believes that involving subcontractors in these early stages of EPC and DBFMO allows for better collaboration and understanding of each other when the work begins. Since Vincent lacks the experience of cost-reimbursement contracts, it is difficult for him to give an accurate answer for the monetary objective differences.

Vincent does not think knowledge sharing is regarded as an important thing to consider when writing contracts. He believes that the constructor assumes that the subcontractors they hire have the same understanding as themselves of knowledge sharing, and that it is neglected in negotiations of contracts.

The work description influences the ability to innovate a lot, Vincent believes. If it is very strict and "step-by-step," you assume that the designer of the description is aware of the optimal way

of doing a task and does not question it. This hinders innovation greatly and creates an “auto-pilot” mindset, Vincent explained. More open work descriptions allow for more innovation, but he also notes that they are also more risky and dependent on people's sticky knowledge. The work descriptions vary in terms of how exactly they are written, as described earlier. It also differs depending on who has formulated the work description. Vincent has seen many subcontractors who complain about the work description or the blueprint they are handed. Saying that they have been done by someone without practical knowledge that are unaware of how it is supposed to be done in reality. In these cases, experience-based knowledge is very much utilized by the subcontractors.

If a subcontractor wants to adjust the method based on experience, good communication with the main contractor is crucial. It heavily depends on what it is about and how explicit it is in the blueprint. Is it something small that won't affect the result very much? It is often ok to do it. If it is a major change, you have to be more careful. Vincent thinks work descriptions should be more open and focused on encouraging entities to work together. He feels that sharing knowledge and encouraging new ideas shouldn't be seen as extra, they should just be part of how the job is done. When that's the case, collaboration becomes smoother and can help avoid the usual tensions between subcontractors and contractors. As he put it, there's a reason people keep saying “communication is key”, because it makes a big difference.

When asked to rank the four focus areas of this report, Vincent admitted it might sound a bit cliché. Still, he genuinely believes all of these aspects play an important role in creating an open environment where sticky knowledge can flow and innovation has a chance to grow. He found it hard to rank one factor above the others, since a lot of it comes down to individual mindset.

Table 12: Vincent's ranking

<i>Please rank the following in order of which area has the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>1= Low impact, 5= Very High Impact</i>
Leadership	3
KPI	3
Contracts	3
Work Description	3

Table 13: Key Takeaways - Vincent

<i>Key Takeaways Vincent</i>	<i>Relevance to RQs</i>
Limited planning involvement and knowledge sharing is informal	RQ 2, RQ 1
Delays cause stress and reduces innovating capacity	RQ 2
Leadership quality affects innovation drastically	RQ 1
Contracts can be improved including innovation and knowledge sharing clauses	RQ 3

5. ANALYSIS

The analysis chapter digests the findings from chapter 5, tying them and comparing them to the theory presented in chapter 3. The chapter focuses on highlighting the relationship between contractor and subcontractor, with illustrations of what both entities feel is most important regarding innovations and sticky knowledge in construction projects.

The analysis aims to answer the two research questions of the thesis, which were presented in Chapter 1. The interviews showed that project management, sticky knowledge, and innovation have a strong correlation with each other. During the interviews, questions were asked explicitly about project management, but also regarding leadership, KPIs, contracts, along work description. These are regarded as components within project management and provide more depth to the research rather than only focusing on the concept of project management.

5.1 Contractor

The study has four interviews to capture the contractor's perspective. All four interviews talk about the pointers in a similar way. Interviewees 1 and 2 are mainly contractors, while interviewees 3 and 4 are site managers. This allows the problem to be analyzed from varied points of view. All four are vastly experienced in this field, which helps understand how the industry has operated for the past ten to fifteen years. We can see a pattern in how their value chain works and how they maximize subcontracting. Table 14 compares the rankings from the interview, showing the trend in how a contractor perceives the relationship between a contractor and a subcontractor.

Table 14: Comparison of Contractors' ranking

<i>Area having the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>Interview 1</i> <i>1= Low impact, 5= Very High Impact</i>	<i>Interview 2</i> <i>1= Low impact, 5= Very High Impact</i>	<i>Interview 3</i> <i>1= Low impact, 5= Very High Impact</i>	<i>Interview 4</i> <i>1= Low impact, 5= Very High Impact</i>
Leadership	3	4	4	4
KPI	1	1	1	2
Contracts	2	1	2	2
Work Description	2	4	4	3

From Table 14, we can see that though the level of impact differs, the ranking order is similar across all cases. All four feel leadership has the highest impact, followed by work description, which affects innovation and knowledge sharing. The relevance of the concept of construction supply chain management is based only on the scale and value of a project. The more complex the project becomes, with many subcontractors, there arises the need for a dedicated supply chain management system.

Project management is treated in a similar manner to supply chain management. There are no fixed frameworks that they work with. No special software or exclusive personnel are employed for project management. Also, the way they plan differs from one project to another. All four cases are heavily dependent on subcontractors. They all agreed that almost 70% to 95% of their work is carried out through subcontracting. This confers the theoretical concept of 75% (Dubois, A., et al.) to 90% (Karim, K., et al., 2006). In spite of such high subcontractors' involvement in a project, they are not actively invited to the initial planning phase. This can be seen as a common theme among all four interviews. The main challenge that they all face is workforce management. The workforce mentioned here is the different subcontractors. All four perceive subcontractors mainly as a labour force to execute their plans. If there are any problems with the worker's availability, it directly impacts their timeline. Thus, time management is their next big challenge. Coordination and communication can become a challenge when multiple subcontractors work on a project. It is to our understanding that they plan in a cyclic way that when a subcontracting work is done, another should start, and at times it goes simultaneously. Hence, a delay by one of the subcontractors can make them shift their entire timeline. A unanimous suggestion to tackle this issue is to create a better environment that drives communication. Some of them are also open to the idea of involving the subcontractors at an earlier stage. It might help them to get familiar with the project from the beginning and find potential problems that might occur at later stages. Innovation is not considered a separate entity and is not factored into planning. All are aware that they will face setbacks and will find solutions through discussions as a team. But the act of documenting these ideas and converting them into innovations for future projects is not considered a necessary step.

Leadership is considered the most defining factor for the success of a construction firm. They all agree that leadership is not just about a firm owner's attributes but also about all other employees in the system (Pradip, 2016). They all have different personal preferences when it comes to leadership style. But they also talk about what leadership style better suits the industry as a whole. We presented the different leadership styles present in theory, like transactional and transformational (Bass et al., 2006; Odumeru & Ogbonna, 2013), servant leadership (Greenleaf, 1977), and situational leadership (Hersey and Blanchard, 1969). While in case 1 transactional leadership is preferred more, in case 2 transformational leadership is preferred. When we analyse the answers from a wider perspective, we can see that they believe that situational leadership is more practical. This conclusion is drawn from their thought process that a leader in construction

should have both transactional and transformational styles based on what the circumstances demand. A site manager is preferred to be on the transformational side, since they are in constant contact with the subcontractors. Such a leadership style will encourage communication, which in turn will give rise to more innovative ideas. This inference can be corroborated from their choice of ranking. Though these are statements based on their field knowledge, in reality, they think there is a communication gap between contractors and subcontractors. Kirby et al. (2025) also talk about this misalignment between the leadership vision for practical activities and the impression that subcontractors have. Their leadership stress is evident from the fact that all four are working with the same subcontractors for a substantial amount of time. On the topic of which leadership style suits innovation and knowledge sharing, there is no one clear answer. Despite this difference, they all agreed that leaders play a major role in knowledge sharing. They want the usage of sticky knowledge of the subcontractors to be maximized, but at the same time, they want to be in control of the decisions. The site managers play a crucial part in how an idea is received and implemented. Documentation is not followed by all four. They strongly point out that the ideas and experience gained are carried on to the next projects.

KPIs is a section where all four have the same outlook. As per the current industry practices, there are no standardized KPIs that determine the performance of a firm or give an overview of the success of a project. From theory, we have two major types of KPI, which are direct and indirect or hard and soft (Hedler Staudt et al., 2015; Fugate & Stank, 2010). From the interviews, we can see that customer satisfaction is an important criterion to determine the success of a project. This can be considered as an indirect KPI, since satisfaction is a quality that cannot be quantified. There are not many direct KPIs that are being continuously measured. Time can be considered as a direct KPI that they lay stress on. Profit margins are vital, but they all feel it is not the primary goal of any good construction firm. The same trend applies to knowledge sharing and innovation. They are not aware if there are any KPIs present or if there is any way that this aspect can be captured and measured. According to them, if a problem that they encountered in a previous project is not repeated in a current one, then it can be considered a success in terms of innovation and knowledge transfer.

Contracts are common among all contractors. They usually enter into either EPC or DBFM with the clients and construct contracts with the subcontractors. Prices are fixed at the beginning of the contract. They ensure that subcontractors have a sense of financial security. From their words, we understood that the contracts are standard throughout the industry, and these do not have much impact on how a project pans out and have little effect on the relationship between contractors and subcontractors. They agree that adding incentives and accounting for innovation might enhance the culture of innovating, knowledge sharing across the industry, but implementing this might take time and a lot of coordinated efforts.

Work descriptions, on the other hand, are taken very seriously. This is confirmed by all parties in the study. The work descriptions are very detailed and are drawn up after client confirmation. Subcontractors are not involved in the drafting of these particulars. They further concur that subcontractors are expected to abide by the work description. Any suggestions for improvement are welcomed by them, but it is implemented only after exhaustive rounds of discussions. They think work descriptions influence the innovation part of the industry. If subcontractors are given more freedom to work around the boundaries or be more involved in determining the specifications, then there can be growth in overall innovation. Communication between contractors and subcontractors is mainly through the site managers. When there is a serious problem, all concerned parties are involved in discussions. They have practices of regular updates, but this can be understood as more informal rather than any standardized procedures.

5.2 Subcontractor

This thesis includes two different subcontractors, which were interviewed to receive information about the ability to innovate, as well as how and to what extent sticky knowledge is shared in project management. Anton and Vincent, who were interviewed, had similar roles as electricians, where Anton has more general knowledge and experience, while Vincent has more experience within large construction projects. The results from the interviews reflect many similarities and, of course, differences. A recurring theme is that, despite clear differences between the two, many aspects appear to be linked to their personality traits. Table 15 displays the rankings from the interviews, where Vincent ranked the areas more evenly, while Anton leaned more towards Leadership and less towards KPIs.

Table 15: Comparison of rankings between Subcontractors

<i>Area having the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>Interview 1</i> <i>1= Low impact,</i> <i>5= Very High Impact</i>	<i>Interview 2</i> <i>1= Low impact,</i> <i>5= Very High Impact</i>
Leadership	5	3
KPI	1	3
Contracts	2	3
Work Description	3	3

Project management is explained in the theory as a balancing act between time, cost and quality (Bansal, 2024; Alafeef, 2024). Project management is typically overseen by contractors, positioning subcontractors as the parties that need to be managed efficiently. As noted, the level of subcontractor involvement can vary significantly, often accounting for anywhere from 20% to 90% of a project. This creates a somewhat complex issue where subcontractors account for most

of the workforce while also not being the ones controlling and planning the project directly. Vincent and Anton both explained that project management as a concept was new to them. They both continued to explain that they were not involved in the project planning process in any way. This could be explained by the fact that both are reasonably new at being electricians, thus lacking the experience to contribute to the planning, perhaps. Anton explained that his supervisor at the electrical firm had been involved somewhat in the project planning stages, which strengthened this theory. Both testified that the relationship between them and the site leader was limited and that they seldom had direct contact with the person in charge. However, both explained that when they had the opportunity for it, they raised concerns or improvements. Which were derived from their sticky knowledge of the area they were working in. Both continued to stress that the projects and their site managers differed a lot, where some were more open to ideas than others.

Anton and Vincent have experienced delays in several projects in which they have worked, which largely affect the ability to innovate and utilize their sticky knowledge. Anton explained that due to the complex network of subcontractors it often arose challenges with coordination, which later resulted in delays. Anton's view on this was that delays often affected him positively, where a delay allowed him to be more careful and innovative than he otherwise would have been. Vincents' view differed, where he noted that delays often occurred as a result of incorrect blueprints, materials not arriving on time, etc. A big difference between the two was that delays affected Vincent negatively, which often led to stress and longer working hours. However, Vincent also explained that this could lead to him trying to innovate to do things quicker. To conclude, both thought delays helped them innovate for different reasons. Figure 8 explains the steps of project management and introduces a reiterative process including steps 2-4, which should result in the correct estimation of time consumption (De Marco, 2018). Theory and practice are therefore somewhat disconnected, where delays should not be occurring as it is. This disconnect could be due to the inferior position of the subcontractors, which De Marco (2018) notes. Alafeef (2024) noted that the relationship between contractor and subcontractor is considered a CSF, therefore, the project planning stage must work effectively between these two, reducing the risk of delays. Even though the subcontractors explained that delays had a positive impact, it is not a sustainable solution to become more innovative in the long run.

Both Anton and Vincent were clear on a path forward with improvements. Both shared a concern with the blueprints given to them in projects. Anton proposed an idea where the blueprints are digitally shared between subcontractors, where updates can be seen in real-time. This would streamline the coordination between subcontractors and reduce the risk of delays while also providing an arena for knowledge sharing. Vincent also noted challenges with blueprints, noting that they needed to be updated more regularly. Furthermore, Vincent also added the need for enhanced communication between subcontractors and contractors, along with better planning

when it comes to buying materials. Lastly, Vincent explained that contractors should include subcontractors to a higher degree at the planning stage for better coordination later in the project.

Both Anton and Vincent expressed that project management affects innovation. Anton explained that if time for innovation was taken into consideration, the outcome of a project could be better than it otherwise would have been. Also, noting that too much time for innovation is not optimal either, because it could become excessive and drawn out time-wise. Vincent was more concerned with strict blueprints, which could hinder the ability to be innovative. In addition, Vincent added that even though he was limited by a strict blueprint, the ability to see things from an innovative perspective should not be neglected because everything can be a lesson for future projects.

Leadership proved to be an important area both for Anton and Vincent, where Anton ranked it the highest out of the available areas given to him. This is not surprising considering that Alafeef (2024) displayed it as another CSF. Alafeef (2024) states that the personality and capabilities of a site manager played a major role in the success of a project. Even though Anton and Vincent both considered it important, their opinions differed somewhat on what they preferred in a leader, such as the site manager.

Both described the relationship between themselves and the site manager as limited. Although both explained that it occurs that they raise concerns or improvements to the site managers, and that their answers differ depending on the person and their unique traits. The theory suggests that there exist many different leadership styles, such as transformational and transactional, which this report has focused on primarily (Bass et al., 2006; Odumeru & Ogbonna, 2013). Anton states that he has encountered both styles, but that transactional leaders were more frequent among site managers. This could be because a site manager does not have any incentives to encourage subcontractors' personal growth and long-term development. After all, often they are only a team during one or a few projects. Vincent also states that this and further develop to express that the leaders have strong influence over how knowledge is shared within the projects, while also highlighting that the site managers' workload could affect this area. Anton does not necessarily prefer a certain style of leadership, instead, he would like to see a combination of the two presented here. This might not be too surprising since theory suggests that this is the most optimal style of leadership (Al Qaradaghi & Ahmad, 2024; Lane, 2009). Anton prefers the structure of a transactional leader, while also emphasizing the need for personal development, which transformational leaders contribute to, etc. Vincent was more geared towards transformational leadership, where he is not too fond of having rewards or “punishments” based on performance. Vincent expressed that a leader should inspire and strive for personal growth at all times. Furthermore, he also stated that this helped with innovation and created a less stressful environment.

Knowledge sharing across projects was a topic of discussion, during which both Anton and Vincent noted that the site manager rarely plays an active role. Since both were employed by

their respective electrical firms, knowledge sharing primarily occurred within the firm and seldom reached the site manager of the project. On a few occasions, Anton mentioned that the input he provided was carried forward to the next project by the site manager, but such instances were rare.

KPIs or performance metrics are very much present in the construction industry, but might not be considered by the subcontractors directly. Anton and Vincent agreed that KPIs connected to innovation and knowledge sharing exist, but not to the extent that they should be. These KPIs were very general and not that important, they both explained. Anton stressed that the one performance metric that is most important in construction is time. Vincent did not state this explicitly, but explained that if something is working at a stable state, it is not altered, which is fairly similar. According to theory, these are direct, also called hard measurements, where it is easy to measure and tied to how well resources are being utilized (Fugate & Stank, 2010). Knowledge sharing would instead be classified as an indirect measure that has an impact on a longer time horizon and is more difficult to measure (Hedler Staudt et al., 2015).

Anton and Vincent both explained that in construction, the main focus is on time and performance metrics. They pointed out that this strong emphasis on reducing time as much as possible often comes at the expense of innovation. When time becomes the primary measure of success, it can limit opportunities to try new or more effective approaches, as the pressure to meet deadlines tends to outweigh the potential benefits of experimenting or improving processes. Neither explains that monetary KPIs are present in construction projects.

Contracts affect innovation and knowledge sharing due to their correlation with responsibility, although not to a high degree. At least not depending on the different contracts that were presented in this thesis. As Bowmans (2020) states, how contracts are written is meant to protect both the contractor and the employer, where if one takes on too much risk, that party should also be protected by a contract where risk is being shared. Anton and Vincent understandably had limited knowledge about contracts and their characteristics, but had some insights on it regardless. Both had primarily worked under construct contracts and reflected on whether EPC or DBFMO would enhance innovation. Since EPC and DBFMO contracts involve subcontractors from an early stage, Anton and Vincent concluded that such contracts make innovation easier. These higher-responsibility agreements also provide subcontractors with greater incentives to improve, as the projects tend to be longer in duration and feel more “personal” compared to traditional construct contracts. Vincent had no insight into the monetary objectives since he had worked solely under fixed price contracts. Anton, on the other hand, preferred fixed-price contracts, as he felt they enhanced his ability to innovate. He explained that this was because he didn’t like tracking hours individually. Instead, he appreciated the flexibility and abstraction that a fixed-price model offered. Both interviewed pointed out that today's contracts lack some important objectives, such as how to improve knowledge sharing among entities. Contracts are a difficult subject to include and primarily affect the relationship between employer and contractor,

as the theory states. Even though this is the case, some relations with subcontractors can still be noted.

The interviewees identified work descriptions as the most influential factor affecting innovation after leadership. Anton explained, for example, that work descriptions can vary a lot in detail, where some are quite loose and others are more exact. Both Anton and Vincent felt that work descriptions can hinder innovation if they are too strict. While also being aware that work descriptions are strict to reduce errors and variations. Vincent explained that too vague work descriptions make the dependency on subcontractors' experience and sticky knowledge too high. These statements are very much aligned with the theory presented, where it is explained that work descriptions need to be exact due to several important reasons (Chappell & Dunn, 2016). The two interviewees differ, where Anton thinks the current work descriptions are often good, while Vincent instead wants to see improvements to them. Noting that collaboration should be enhanced and included within the work descriptions. Both Anton and Vincent emphasized that communication with the other subcontractors, along with the site manager, is key if an alteration of the work description is needed, adding that in many cases it can be solved.

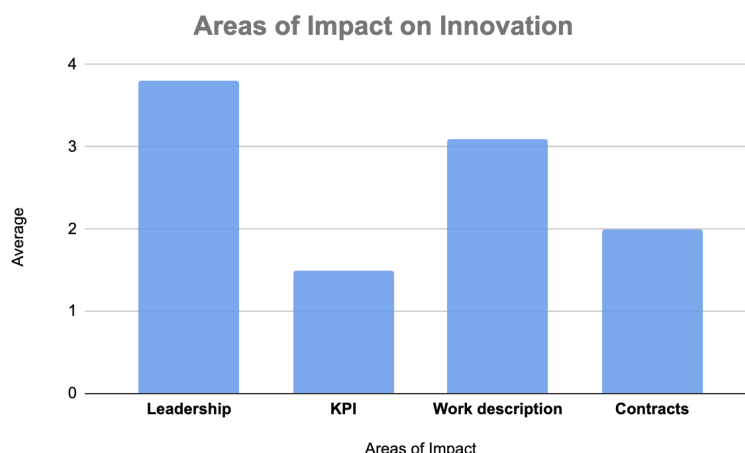
5.3 Summary

Reviewing the views of both contractors (including site managers) and subcontractors shows recurring themes and similar insights, highlighting a strong degree of agreement between the two groups. As mentioned earlier in the theory, project management is the umbrella term influencing the degree of innovation and freedom of subcontractors. The analysis also reveals the interrelationship between leadership, work descriptions, project planning and innovation, knowledge sharing, and freedom. Table 16 displays the overall combined views of both contractors and subcontractors.

Table 16: Subcontractors and contractors' perspective

Area	Subcontractors Perspective	Contractors Perspective
Project Management	Often excluded from planning, value flexibility, and informal problem-solving.	They prefer strict schedules, planning is done top-down, and subcontractors are expected to follow predefined plans.
Leadership	Value hands-on, approachable leaders; rarely experience consistent leadership from site managers.	Emphasize a mix of transactional and transformational leadership; see leadership as crucial for time and quality.
KPIs	KPIs are vague or absent; personal growth and experience are valued more than metrics.	KPIs focused on time, cost, and customer satisfaction; no emphasis on learning or innovation metrics.
Contracts	Usually work under fixed-price construct contracts, which limit innovation and flexibility.	Use EPC or DBFMO contracts with clients; construct-only with subs; focus is on control and risk management.
Work Description	Strict descriptions restrict innovation; open descriptions allow application of sticky knowledge and adjustments.	Rely on detailed work descriptions to ensure consistency; not always aware if they hinder flexibility or innovation.

Both contractors and subcontractors agree that innovation occurs on-site and through regular problem-solving. Sticky knowledge is also recognized as an important and underutilized tool that helps in overcoming these challenges. We can see there is a clear hierarchy in the decision-making processes that is being practiced. The relationship between contractors and subcontractors is not entirely direct, and the innovation aspect in a project is being strained by different factors. Among the factors listed in this study, leadership has been ranked as the one with the most impact. Figure 10 below shows the overall average rankings across all six cases. Work descriptions are the next defining factor, followed by contracts and KPIs.

*Figure 10: Summary of results from ranking areas*

Project management can be considered the primary responsibility of the contractors. The executive decision-making rights also lie with them. From all cases, we can observe that the completion of a project is heavily dependent on subcontracting. Few of them agreed it to be as high as 90% of the total work. Despite these numbers, the contractors rarely involve subcontractors in the initial phases of project planning. Subcontractors confirmed that they are excluded from the planning aspects, and this causes their unfamiliarity with management methodologies, material and labour availability issues, blueprint inaccuracy, and lack of coordination with other subcontractors. This exclusion can lead to missed opportunities for leveraging their sticky knowledge, which in turn can help to reduce delays and efficient time management.

Leadership emerged as the most influential factor in promoting innovation and facilitating knowledge sharing. Both share the same view that leadership style is determinant in shaping the team dynamics and fostering better communication. Contractors have highlighted situational leadership as the practical approach, finding the balance between transactional and transformational styles. Site managers are perceived to be pivotal in the communication chain since they work in parallel with the subcontractors. Subcontractors further point out the variability in leadership styles that currently exists in practice. While Anton leaned toward structured transactional leadership complemented by occasional transformational elements, Vincent preferred transformational leadership that fosters autonomy and personal growth. These statements align with the literature suggesting a mixed leadership is needed to maximize success in a dynamic project environment. Both parties also mutually agree that leadership quality directly affects the flow of knowledge, level of innovation, and communication between all involved stakeholders.

Work description is an area where they have a mixed view. While contractors emphasize its need for precision and planning. They strongly believe they need the exact specifications to mitigate any setbacks at later stages. Also, they see it as a means to keep the subcontractors in check. Subcontractors, while appreciating clarity, felt that rigid work descriptions hinder flexibility and innovation. Vincent, in particular, noted that overly strict descriptions can at times limit adaptive thinking and innovation altogether. Since these agreements are drafted between clients and contractors, subcontractors are not brought in for discussions when setting up the specifications. Contracts are seen to have less impact on the innovation front. Contracts are fairly standard across all projects. The remuneration is fixed price in nature, ensuring there is financial stability for both the contractors and subcontractors. Both parties agree that there are no effective clauses that address innovation or knowledge sharing. Also, there is a lack of incentives when the contracts are drafted. Subcontractors see potential for innovation if contractual arrangements could be modified to include collaborative mechanisms.

KPI is the one area where all respondents have a consensus. They believe KPIs are not well defined in the construction industry. There is no industry standard that they follow or they have limited knowledge on how to incorporate KPIs and document them. This unfamiliarity carries on to other areas, especially in innovation, knowledge management, and collaboration. They both feel that time, cost, and customer satisfaction are the three entities that the current industry focuses on. Subcontractors have concerns over the industry's focus on effectiveness rather than efficiency.

From these case analyses, it is clear that innovation and the freedom to use the subcontractor's sticky knowledge are not considered significant areas that the industry could improve. Their views can be useful in understanding the potential gaps that are currently in this business model.

1. The first gap identified is that contractors look at a project in a top-down manner, while subcontractors feel they can be included more in the planning process. This inclusion will give a better opportunity to use their tacit knowledge early in the project, thus reducing the delays in the long run and providing a more efficient time management routine.
2. The second gap is a lack of a standard documentation process for ideas, innovation, and knowledge shared. There is no effective use of KPIs for indirect performance metrics. Addressing this gap will allow firms to visualize their progress, and the stagnation of innovation can be reduced.
3. The third gap is the rigidity of the work descriptions. Though the work descriptions are necessary to ensure a project is carried out to the client's vision, a more collaborative drafting process can give a platform to identify effective new ways to perform the same task.
4. The final gap to be addressed is leadership. There are some inconsistencies present in how the contractors perform their role. A good leader will ensure there is no miscommunication, build trust, and build a welcoming forum for innovations and collaborations.

6. DISCUSSION

Chapter 6 presents topics that have been frequently reflected upon during the report but have not been addressed explicitly in a chapter. The chapter also includes other relevant topics that in some way or another relate to the thesis that needs to be addressed.

6.1 Limitations of the study

This thesis includes a total of six interviews, four of which are with contractors and two that are with subcontractors. But two out of the four are with site managers. Thus, we can say all three important player groups are covered in our case samples. This sample size is deemed enough to ensure the validity of the report and to gather the information deemed necessary. Although six interviews could be noted as an amount that could have been increased to further strengthen the findings' validity. But we believe a pattern can be captured and a certain level of data saturation is achieved. Two major limitations we feel after our analysis are one being that the subcontractors are from the same field, and the other is that data from subcontractors in India is missing. Though the countries India and Sweden might differ in other industrial setups, when it comes to the construction sector, their work processes are almost identical. The literature also supports this notion that the construction industry is one of the more traditional, and the way it functions is fairly similar across the world.

Other limitations are that the subcontractors that were included in the thesis were two electricians. Electricians are excellent subcontractors with high involvement in construction projects. While this is the case, construction projects are large and include multiple subcontractors that vary in what they work with. Therefore, it could be argued that these subcontractors' perceptions about project management could vary and be perceived differently. Although it would be difficult to examine all the different aspects of the subcontractors, it would be interesting to add one more profession to validate the result further.

6.2 Inclusion of Subcontractors in Early Planning

This report aims to address and highlight gaps along answer the three formulated research questions in Chapter 1. A theme throughout the report has been to include subcontractors at an earlier stage and involve them to a higher degree in work descriptions, etc. This delayed involvement to some extent hinders their ability to contribute ideas and suggest alternate innovative solutions. Early collaboration can allow both contractors and subcontractors to communicate better, identify potential challenges and develop more efficient work processes together. This increases flexibility and puts less pressure on the emphasis of strict work descriptions. This involvement will also give them a sense of ownership, better alignment to project goals and an overall motivation to innovate. Overall, this step might provide a route to

minimize organizational and knowledge transfer silos which is common in a fragmented supply chain like the construction industry.

This inclusion has been the aspiration of both contractors and subcontractors since, in theory, it benefits both parties. Subcontractors have influence and can modify parameters with their expertise, while contractors could note a cost-saving potential by letting subcontractors do more of the planning work. Although it brings with it some loss of control for contractors. The question, therefore, arises: why has it not been done already. There is evidence of this during the contractor interviews, but not to a great extent. If subcontractors were to be involved earlier, it could create challenges connected to who to include and to what extent is suitable. If all subcontractors should be included down to the people doing the work, it would create a logistical nightmare where all wants to influence the project. Therefore, it would have to be considered how this could be done effectively. Furthermore, if electricians were to be included in the planning stage, this would mean that, for example, plumbers would be left out if they too were not included. This is, of course, outside the scope of this thesis, but it is worth highlighting that it might not be as straightforward as this report makes it seem.

7. CONCLUSION

The conclusion brings the thesis to a close by answering the research questions outlined in Chapter 1. In addition, the thesis includes a chapter highlighting the study's main contributions, as well as a chapter discussing potential areas for future research.

7.1 Research Questions

***RQ1:** How does project management affect sticky knowledge and innovation?*

Project management tends to influence how well subcontractors can use their sticky knowledge and how innovative they can be. Specifically, in our case, we can see that transformational leadership or a balanced leadership style that fosters communication and support can have the potential to improve knowledge sharing and encourage problem-solving initiatives among subcontractors. This is in contrast with how subcontractors view a transactional leadership approach. Similarly, rigid work descriptions and solely monetary-based contracts also have a negative effect on the phenomenon studied. From these insights, we are able to conclude that project management tends to hinder their innovating ability rather than facilitate it in many cases. Subcontractors often bring valuable practical insights, but they're rarely included in project planning. As a result, opportunities for learning and innovation are frequently missed. This hinders them from sharing their knowledge and innovative ideas with the project at the point where sticky knowledge and innovation take place the most. Therefore, the scope of where and when to include subcontractors has to be considered to facilitate the lost knowledge that subcontractors possess. This thesis includes subcategories of project management that also affect sticky knowledge and innovation during the project's duration. Here, it is noted that leadership and work descriptions are two areas with especially high impact. A leadership style that combines structure and openness tends to be preferred, where great collaboration and communication skills are valued attributes. Work descriptions vary in strictness, thus making it a factor that influences the ability to facilitate sticky knowledge and innovation as well.

***RQ2:** How much freedom does a subcontractor have to innovate during a project?*

Generally, it is quite limited, although it can differ heavily depending on the project, what kind of leadership present, and which subcontractors are included. As previously stated, leadership and work descriptions are typically the two areas that affect this the most out of the examined areas. Work descriptions are often detailed and allow for little room for innovation and interpretation. Furthermore, Innovation is neither expected nor rewarded, which discourages subcontractors' enthusiasm toward it. Leadership styles also influence the ability to innovate during projects. A leader who is open to discussion and potential improvements tends to encourage subcontractors' enthusiasm, whereas leaders who are not open-minded instead discourage subcontractors from being innovative.

RQ3: What could enhance innovation within construction projects and improve the relationship between contractor and subcontractor?

Improvements that could enhance innovation within construction projects are several. These are the four most apparent ones:

Subcontractors should be brought into the project earlier to make better use of their knowledge and ideas. Since they're responsible for up to 90% of the work in construction projects, it only makes sense to involve them more in the planning phase, where their input can have the biggest impact on innovation and the use of hands-on experience.

Indirect KPIs related to innovation and knowledge sharing should be explored to a greater extent. Indirect KPIs can, for example, be the duration that employees stay within the firm or the number of new ideas that arise during a project. Direct KPIs are prioritized in construction projects due to their straightforwardness and correlation with cost. Although indirect KPIs can have an impact over a longer period if implemented correctly. Documentation of KPIs that span multiple projects should also be considered to ensure a steady improvement.

Work descriptions should be developed and evaluated collaboratively by both contractors and subcontractors to ensure they support high quality while still allowing room for innovation. Different ideas of how this could be done were noted by both the interviewed contractors and subcontractors.

Leadership plays a crucial role in shaping innovation and sets the tone for how it's perceived and encouraged within construction projects. Therefore, it should be considered what leadership attributes and styles are a strategic fit for encouraging people's mindset toward innovation. As established, innovation is often neither expected nor rewarded in construction projects. This makes it important to highlight how innovation can support subcontractors' development, which is something that leadership plays a key role in promoting and encouraging. As mentioned earlier, good leaders know how to balance different styles. They should be able to be structured and organized, while also staying open and communicative, welcoming suggestions, even if they aren't always used.

To illustrate these potential improvements, see Figure 11. It shows how the contractor oversees the project and all its components from the beginning, while subcontractors enter at a later stage. This highlights that subcontractors are not involved early on and, as a result, are limited in their ability to contribute sticky knowledge and drive innovation within the project.

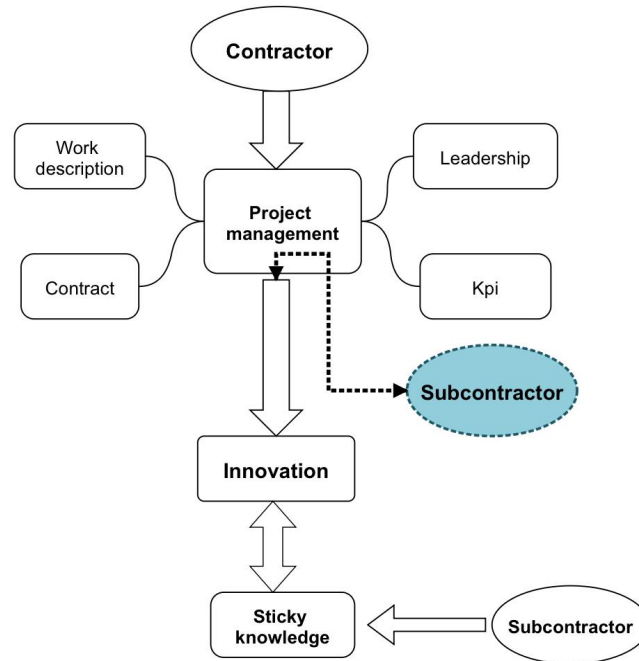


Figure 11: Flowchart of Contractor and Subcontractor Involvement in Project Management

7.2 Contribution to the industry

This thesis makes a valuable contribution to academic research in construction by highlighting key gaps in the relationship between subcontractors and contractors, and by presenting practical solutions based on empirical findings. Given the significant role subcontractors play in construction projects, this is a highly relevant area that deserves closer examination. The report highlights four important gaps that need to be addressed by the industry to enhance innovation. These are within the four researched areas connected to project management, leadership, KPIs, contracts, and work descriptions. Subcontractors should be included earlier in projects to utilize their expertise to a higher degree. A better set of KPI that is expanded further than only being related to time should be considered. Work descriptions should be altered to be rigid enough for contractors while also allowing for subcontractors' input.

7.3 Future research

There are several possible directions for future research on how to enhance innovation and make better use of subcontractors' valuable sticky knowledge. This thesis has a fairly broad scope, as it looks at project management, a field that is already wide and complex on its own. It is established as an exploratory study that aims to explore the subject and highlight possible challenges and hypotheses. Therefore, future research areas within the subject could primarily

focus on more in-depth explanatory research instead which can try to confirm and further develop theories to more established ones. These could, for example, be to dive deeper into the four presented categories within project management, leadership, KPI, contracts, and work descriptions. The highlighted gaps in the analysis chapter are a great base for further research within each of these specific areas.

An especially interesting topic could be to further research how to formulate and develop indirect KPIs should be done in an effective way to facilitate innovation and knowledge sharing. Along with detailing how it can be documented along the way. This could be done by conducting survey research, conducting multiple interviews where people in the field of construction could propose how it could be done. Work descriptions are also an intriguing subject where both contractors and subcontractors had multiple insights and opinions on how it could be enhanced to benefit both parties. For example, requirements could focus on quality standards, while giving subcontractors the freedom to design the solutions they find most appropriate. Work descriptions could be explored further by researching how blueprints can be improved, both in terms of making them more digitized and more accessible to all parties involved in a construction project. Leadership, one of the most discussed topics in this thesis, is an area where future research could explore more specifically how leaders can develop to better facilitate and encourage innovation in projects.

To put things into perspective, a first step can be to study subcontractor innovation among different trades like plumbing, carpentry since we have looked only into electricians. Area specific challenges can bring light into different innovation patterns. A longitudinal case study, like studying about how innovation has happened across multiple projects in a single firm can help in understanding how subcontractor driven innovation evolves over time. Future research can explore how digital tools and platforms can enhance or influence the subcontractor's autonomy or innovating capability. We have not looked into contexts other than project management. This can be traditional values, government laws, local practice and other such areas. A detailed framework on how KPIs can be used to track innovation and knowledge sharing might be developed, thus expanding the area of the research and addressing more pressing gaps that are currently being overlooked in the industry. Finally, a more comprehensive qualitative based study including a larger sample size across different countries and varied projects could validate and improve the generalizability.

To conclude, future research can vary and can take many forms, being both qualitative and quantitative. There is no shortage of areas to explore further within the field. This has been made clear in this report, highlighting many gaps that could be addressed.

REFERENCES

- Aarons, G.A. (2006). Transformational and transactional leadership: Association with attitudes toward evidence-based practice, *Psychiatric Services*, 57(8), pp. 1162–1169. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC1876730> (Accessed: 27 February 2025).
- Ahmad, S., Mazhar, M., Bruland, A., Andersen, B., Langlo, J. and Torp, O. (2018). Labour productivity statistics: a reality check for the Norwegian construction industry, *International Journal of Construction Management*, Vol. 20 No. 1, pp. 39-52.
- Alafeef, D.M. (2024). Critical success factors for successful construction project management: A comprehensive evaluation, *Journal of Lifestyle and SDGs Review*, 5 (e02802), pp. 1–26. DOI: [10.47172/2965-730X.SDGsReview.v5.n02.pe02802](https://doi.org/10.47172/2965-730X.SDGsReview.v5.n02.pe02802).
- Al Qaradaghi, A. and Ahmad, R. (2024). Transactional and transformational leadership styles: A conceptual review, *International Development Planning Review*, 46(1), pp. 45–62. Available at: <https://www.researchgate.net/publication/378233388> (Accessed: 27 February 2025).
- Al-Werikat, G. (2017). Supply Chain Management in Construction; Revealed, *International Journal of Scientific & Technology Research*, Vol. 6, No. 3, pp. 106- 110.
- Andrew, S. D. and Richard, T. (2013). How to Write a Literature Review, *Journal of Criminal Justice Education*, 24:2, pp. 218 - 234,
- Antwi, S.K. and Hamza, K. (2015). Qualitative and Quantitative Research Paradigms in Business Research: A Philosophical Reflection. *European Journal of Business and Management*, Vol.7, No.3.
- Asenahabi B.M. (2019). Basics of Research Design: A Guide to selecting appropriate research design. *International Journal of Contemporary Applied Researches*, Vol. 6, No. 5, pp. 76-89.
- Bansal, V.K. (2024) *Project management: Planning and scheduling techniques*. Abingdon: Routledge. DOI: [10.1201/9781003428992](https://doi.org/10.1201/9781003428992).
- Bass, B. M., & Riggio, R. E. (2006). *Transformational leadership (2nd ed.)*. Lawrence Erlbaum Associates Publishers. <https://doi.org/10.4324/9781410617095>
- Behera, P., Mohanty, R. P. and Prakash, A. (2015). Understanding Construction Supply Chain Management. *Production Planning and Control*, 26:16, pp:1332-1350.

Bell, E., Bryman, A. and Harley, B., (2022). “Business Research Methods”. *Oxford University Press*.

Bell, J., Waters, S. & Nilsson, B. (2016) *Introduktion till forskningsmetodik*. 5., [uppdaterade] uppl. Studentlitteratur. Lund

Blanchard, K. (2008) *Leadership and the one minute manager: Increasing effectiveness through situational leadership*. New York: HarperCollins

Blanchard, K. H. and Hersey, P. (1982) *Management of organizational behavior: Utilizing human resources*. Englewood Cliffs, NJ: Prentice Hall.

Bossnik, B. (2004). Managing drivers of innovation in construction networks. *Journal of Construction Engineering and Management*, 130(3), pp: 337 - 345.

Bowen, A.G. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, Vol. 9, no. 2, pp. 27-40

Bowmans (2016) *Understanding Key Construction Contracts and Their Applications*.

Brook, M., 2017. Estimating and tendering for construction work. 5th ed. Abingdon: Routledge.

Carrillo, P., Ruikar, K, and Fuller, P. (2013), “When will we learn? Improving lessons learned practice in construction”, *International Journal of Project Management*, Vol. 31 No.4, pp. 567-578.

Busetto, L., Wick, W. and Gumbinger, C. (2020). How to use and assess qualitative research methods.

Chappell, D. and Dunn, M., 2016. The architect in practice. 11th ed. Chichester: Wiley-Blackwell.

Council of Supply Chain Management. (2025). *CSCMP Supply Chain Management Definitions and Glossary*. Available at:
https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx

Creswell, J.W. (2009) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 3rd edn. Thousand Oaks, CA: Sage Publications.

Davenport, T. and Prusak, L. (2010), “Working knowledge: How organizations manage what they know. *Harvard Business School Press*.

De Marco, A. (2018) *Project management for facility constructions: A guide for engineers and architects*. 2nd edn. Cham: Springer. DOI: [10.1007/978-3-319-75432-1](https://doi.org/10.1007/978-3-319-75432-1).

Demirkesen Çakır, Sevilay & Ozorhon, Beliz. (2017). Measuring Project Management Performance: Case of Construction Industry. *Engineering Management Journal; EMJ*. 29. 258-277. 10.1080/10429247.2017.1380579.

- Dubois, A. and Gadde, L. (2002). The construction industry as a loosely coupled system: implications for productivity and innovation. *Construction Management & Economics*, 20:7, pp: 621- 631.
- Eisenhardt, K.M. & Graebner, M.E. (2007) 'Theory building from cases: Opportunities and challenges', *Academy of Management Journal*, 50(1), pp. 25-32.
- Ejvegård, R. (2009) *Vetenskaplig metod*. 4. uppl. Studentlitteratur. Lund
- Fitzgerald, L., Dopson, S., (2009) *Comparative case study designs: their utility and development in organizational research*. The Sage Handbook of Organizational Research Methods, Edition: 1st, Publisher: Sage
- Fugate, B., Stank, T., (2010) *Logistics Performance: Efficiency, Effectiveness, and Differentiation*. Journal of Business Logistics. 31. 43 - 62. 10.1002/j.2158-1592.2010.tb00127.x.
- Fulford, R. and Standing, C. (2014). Construction industry productivity and the potential for collaborative practice. *International Journal of Project Management*. Vol. 32, pp: 315–326.
- Gambatese, J.A. and Hallowell, M. (2011). Enabling and measuring innovation in the construction industry. *Construction Management and Economics*, Vol. 29, pp: 553 - 567.
- Gidado, K.I. (1996), "Project Complexity: the focal point of construction production planning". *Construction Management and Economics*, Vol. 14 No.3, pp. 213-225.
- Greenleaf, R. K. (1977) *Servant leadership: A journey into the nature of legitimate power and greatness*. New York: Paulist Press
- Halldórsson, Á. & Arlbjørn, J.S. (2004) 'Research methodologies in supply chain management: What do we know?', *International Journal of Logistics Management*, various issues.
- Hartmann, A., Caerteling, J., (2010). Subcontractor procurement in construction: The interplay of price and trust. *Supply Chain Management: An International Journal*. 15. 354-362. 10.1108/13598541011068288.
- Hedler Staudt, F., Alpan, G., Di Mascolo, M., Rodriguez, C., (2015). *Warehouse performance measurement: A literature review*. *International Journal of Production Research*. 53. 5524-5544. 10.1080/00207543.2015.1030466.
- Hersey, P. and Blanchard, K. H. (1969) 'Life cycle theory of leadership', *Training and Development Journal*, 23(5), pp. 26-34.
- Hinze, J., Tracey, A. (1994). "The Contractor-Subcontractor Relationship: The Subcontractor's View." *Journal of Construction Engineering and Management*, 120(2), 274 287.

Horvath, A. (2004). Construction materials and the environment, *Annual Review of Environment and Resources*, Vol. 29 No. 1, p.183.

Ibrahim, A., Zayed, T. och Lafhaj, Z. (2024) Enhancing Construction Performance: A Critical Review of Performance Measurement Practices at the Project Level. *Buildings*, 14(7), 1988. doi: 10.3390/buildings14071988.

Karim, K., Marosszeky, M. and Davis, S. (2006). Managing subcontractor supply chain for quality in construction. *Engineering, Construction and Architectural Management*. Vol. 13 No. 1, pp: 27-42.

Kirby, M., Rotimi, F.E. and Naismith, N. (2025), "A multidimensional analysis of strategies for improving New Zealand", *Ain Shams Engineering Journal*, Vol. 16, 103274.

Kovács, G. and Spens, K.M. (2005). "Abductive reasoning in logistics research. *International Journal of Physical Distribution & Logistics management*, 35(2), pp. 132-144.

Lane, M.S. (2009) 'The interaction of transactional and transformational leadership', *Online Journal of Workforce Education and Development*, 3(1), pp. 1–11. Available at: <https://opensiuc.lib.siu.edu/cgi/viewcontent.cgi?article=1078&context=ojwed> (Accessed: 27 February 2025).

Lantz, M., Löwstedt, M., Netz, J. (2024) *Leadership and digital transformation in the construction industry: a qualitative exploration of leadership practices*. Association of Researchers in Construction Management, ARCOM 2024- Proceedings of the 50th Annual Conference: 101-110

Law, T. H., Lew, Y.-L., Salihudin, S., & Muniandy, R. (2012). *Review of Subcontracting Practice in Construction Industry*. *International Journal of Engineering and Technology*, 4(4), 406–410. doi: 10.7763/IJET.2012.V4.406

Lindberg, M. (2018). Relating inclusiveness and innovativeness in inclusive innovation. *International Journal of Innovation and Regional Development*, Vol. 8, No. 2, pp. 103-119.

Liu, W.,fellowes, R., and Fang, D. (2016) *How safety leadership works among owners, contractors and subcontractors in construction projects*. Chunlin Wu, Feng Wang, Patrick X.W. *International Journal of Project Management*, Volume 34, Issue 5, 2016, Pages 789-805, ISSN 0263-7863, <https://doi.org/10.1016/j.ijproman.2016.02.013>.

Malhotra, MK., Grover, V., (1998). *As assessment of survey research in POM: from constructs to theory*. *Journal of Operations Management*, 16 (4), 407-425.

Mekonnen, M. and Bayissa, Z. (2023) 'The effect of transformational and transactional leadership styles on organizational readiness for change among health professionals', *SAGE Open Nursing*, 9, pp. 1–13. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC10336755> (Accessed: 27 February 2025).

Meng, X., Sun, M. and Jones, M. (2011). Maturity model for supply chain relationships in construction. *Journal of Management Engineering*, Vol. 27, pp: 97–105

Meredith, J. (1998). *Building operations management theory through case and field research*. *Journal of Operations Management*, 16 (4): 441-454.

Mertz, N.T. and Anfara, V.A. (2014). *Theoretical frameworks in qualitative research*. *Sage Publications*.

Morgan, H. (2022). Conducting a Qualitative Document Analysis. *The Qualitative Report*, 27(1), 64-77.

Morgan, S., Pullon, S., Macdonald, L., Mckinlay, E., Gray, B., (2017). *Case Study Observational Research: A Framework for Conducting Case Study Research Where Observation Data Are the Focus*. *Qualitative Health Research*. 27. 1060-1068. 10.1177/1049732316649160.

Oesterreich, T. D. and Teuteberg, F. (2016) Understanding the implications of digitisation and automation in the context of Industry 4.0: A triangulation approach and elements of a research agenda for the construction industry. *Computers in Industry*. Pp: 121-139.

Olhager, J. (2013) *Produktionsekonomi: principer och metoder för utformning, styrning och utveckling av industriell produktion*. 2., [rev.] uppl. Studentlitteratur. Lund

Olhager, J. (2024) *Research Methodologies: Case, Action & Design Science Research*. MTTN85: Project Management and Research Methodologies in Supply Chain Management, LTH

Oskarsson, B., Ekdahl, B. & Aronsson, H. (2013) *Modern logistik: för ökad lönsamhet*. 4., [omarb. och utök.] uppl. Liber. Stockholm

Paul, J. and Criado, A. R. (2020). The art of writing literature review: What do we know and what do we need to know? *International Business Review*, Vol.29

Rosenberg, N. (1984). *Inside the Black Box, Technology and Economics*. *Cambridge University Press*.

Rowley, J. and Slack, F. (2004). Conducting a literature review. *Management Research News*. Vol. 27, pp: 31-39.

Saunders, M., Lewis, P. and Thornhill, A. (2006). *Research methods for Business students*. *Pearson Prentice Hall*.

Segerstedt, A. and Olofsson, T. (2010). Supply chains in the construction industry. *Supply Chain Management: An International Journal*. Vol. 15 No. 5, pp: 347-353.

Shishodia, A., Verma, P. and Dixit, V. (2019). Supplier evaluation for resilient project driven supply chain. *Computer in Industrial Engineering* 129, 465–478

Slaughter, E.S. (1998). Models of construction Innovation. *ASCE Journal of Construction Engineering and Management*, 124(3), pp: 226-231.

- Smith, J., Debnam, R. (2020). Understanding the sub-contractual relationship for proper management of construction projects. *ResearchGate*. Available at: <https://www.researchgate.net/publication/345867447> (Accessed: 16 March 2025).
- Spears, L. C. (2004). Practicing servant-leadership: Succeeding through trust, bravery, and forgiveness. San Francisco, CA: Wiley.
- Studer, P. W. and Mello, B. C. (2021). Core Elements Underlying Supply Chain Management in the Construction Industry: A Systematic Literature Review. *Buildings* 2021, 11, 569.
- Tah, J. H. (2015). Towards an agent-based construction supply network modelling and simulation platform. *Automation in Construction*, Vol. 14, pp: 353–359.
- Tangkar, M. and Arditi, D. (2000). Innovation in the construction industry. *Dimensi Teknik Sipil*, Vol. 2, No. 2, pp: 96 - 103.
- Tavallaei, M. & Talib, M. A. (2010). A general perspective on the role of theory in qualitative research. *Journal of International Social Research*
- Tracy, S.J. (2010) 'Qualitative quality: Eight "big-tent" criteria for excellent qualitative research', *Qualitative Inquiry*, 16(10), pp. 837–851. Available at: DOI: 10.1177/1077800410383121.
- Van Weele, A. & van der Puil, J., 2014. *International Contracting: Contract Management in Complex Construction Projects*. London: Imperial College Press.
- Voss, C., Tsikriktsis, N., and Frohlich, M. (2002). Case Research in Operations Management. *International Journal of Operations & Production Management*. 22. 195-219. 10.1108/01443570210414329.
- Winch, G.M., (2010). Managing construction projects: an information processing approach. 2nd ed. Chichester: Wiley-Blackwell.
- Winch, G. (1998). Zephyrs og creative destruction: understanding the management of innovation and construction, *Building research and information*, Vol. 26 No. 5, pp. 268-279.
- Yin, R.K. (2018). Case Study Research and Applications, *Sage Publications*, pp. 165

APPENDICES

Interview Guide - Contractors

Construction Supply Chain

What is the current supply chain setup?

Where do you place yourself and your subcontractors in a construction value chain?

How relevant is supply chain management in the construction sector?

What are the current challenges in your supply chain?

- **Follow up:** *Is it a fragmented or continuous cohesive one?*

Project management

How will you describe your project management process?

How do you ensure that subcontractors are aligned with project goals and timelines?

What are the biggest project management challenges when working with subcontractors?

How often do you involve subcontractors in planning and decision-making processes?

Does your style of project management give scope to innovate at any given step during the process?

- **Follow up:** *If yes, who initiates and executes these ideas?*

Is there any documentation procedure followed to keep track of any potential innovations that can help in knowledge sharing?

Leadership

How does leadership from project managers or site managers affect the sharing of knowledge and new ideas on-site?

- **Follow up:** *Can you describe when leadership supported or limited innovation during a project?*

Do you think leadership styles affect how well teams adopt new ideas or share practical knowledge? Transactional, Transformational leadership styles, etc.

How do leaders facilitate knowledge sharing between team members or across different projects?

KPI

What are the general KPIs used during a project?

Do the performance metrics used in your projects encourage or discourage innovation?

How do you track or measure the impact of shared knowledge or innovative practices?

Are there KPIs related to learning, knowledge sharing, or process improvement?

Are there any indicators used to evaluate how well knowledge is transferred between teams or projects?

Contracts

What are the common types of contracts you will be comfortable working with subcontractors and why?

Do contract types support or limit the exchange of experience-based knowledge between subcontractors and main contractors? Construct contract- DBFMO along with monetary objective.

- **Followup:** *Does a contract have any incentive to promote innovative solutions during a project?*

Is knowledge sharing considered when contracts are written or negotiated?

Work description

How do detailed work descriptions influence the ability to innovate or adjust methods on-site?

Are work descriptions written in a way that allows for the use of experience-based knowledge?

How could work descriptions be improved to better support knowledge sharing and innovation? More open etc?

<i>Please rank the following in order of which area has the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>1= Low impact, 5= Very High Impact</i>
Leadership	
KPI	
Contracts	
Work Description	

Interview Guide - Subcontractors

Interview Questions for Subcontractors

Project management

How involved are you in project planning and do you feel your sticky knowledge and innovative ideas are valued?

Have you ever experienced delays due to project mismanagement? If so, how did it affect you?

What improvements would you suggest to make project management more efficient for subcontractors?

Does project management impact your ability to innovate and your ability to work freely on a project?

Leadership

How does leadership from project managers or site managers affect the sharing of knowledge and new ideas on-site?

- **Follow up:** *Can you describe when leadership supported or limited innovation during a project?*

Do you think leadership styles affect how well teams adopt new ideas or share practical knowledge? Transactional, Transformational leadership styles, etc.

How do leaders facilitate knowledge sharing between team members or across different projects?

KPI

Are you aware of and encouraged to work with KPIs related to learning, knowledge sharing, or process improvement?

How do KPIs influence decisions around trying new methods of applying lessons from previous projects?

Do the performance metrics used in your projects encourage or discourage innovation?

- **Follow up:** *Do you ever feel stressed about KPIs? Do something in a specific amount of time etc.*

Contracts

How do contract terms affect your ability to be flexible or try innovative solutions during a project? Depending on the contract. Construct contract- DBFMO along with monetary objective

Which contract type do you feel encourages innovation the most?

- **Follow up:** *Does the monetary objective affect this as well?*

Are there ways in which contracts help or hinder knowledge sharing between projects or organizations?

Do you think knowledge sharing is considered when contracts are written or negotiated?

Work description

How do detailed work descriptions influence your ability to innovate or adjust methods on-site?

Are work descriptions written in a way that allows for the use of experience-based knowledge?

What happens if you want to do something differently based on experience that is not included in the work description?

How could work descriptions be improved to better support knowledge sharing and innovation? More open etc?

<i>Please rank the following in order of which area has the most impact on innovation and knowledge sharing within projects in construction:</i>	<i>1= Low impact, 5= Very High Impact</i>
Leadership	
KPI	
Contracts	
Work Description	