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Quality Management in Practice: Tailoring Formal Systems to Project Execution in Construction

Master's thesis in Design and Construction Project Management

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CHALMERS UNIVERSITY OF TECHNOLOGY

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Quality Management in Practice: Tailoring Formal Systems to Project Execution in Construction

*Master's Thesis in the Master's Programme Design and Construction Project
Management*

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ABSTRACT

Quality management systems such as the ISO9001:2015 is a framework that is used in many sectors, not just the construction industry. However, a formal quality management system does not imply that it is used as intended or that it is tailored towards actual practices. This thesis aims to examine how quality management and inspection practices are applied in construction projects and how they align with a company's formal quality management system. The study is particularly relevant for both academic research within construction management, but also for practitioners seeking to improve quality management processes in project-based organizations.

A qualitative case study approach was adopted, focusing on a Swedish construction company, Tornstaden, and three of their projects. Data was collected through a literature review, document study, dyadic and single respondent interviews, site observations, and respondent validation workshops. The analysis was conducted using thematic analysis in an iterative process. The theoretical framework is based on quality management systems, inspection practices, and organizational learning within project-based organizations.

Based on the findings, a set of improvement proposals was developed and refined through validation workshops. The proposed improvements focus on improving structure, continuity, and accountability, particularly through updates to key documents, improved handover, and increased digitalization.

The study contributes by providing a practical framework for aligning formal systems with everyday project practices, highlighting the importance of adapting quality management systems to the realities of project-based organizations.

Key words: Quality management, Construction projects, Inspection, Project-based organizations, Knowledge transfer, Internal quality systems

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List of Acronyms

Below are all acronyms used in this thesis listed.

AI	Artificial Intelligence
BCS	Building Control Surveyor
CI	Continuous Improvement
KA	Kontrollansvarig (Third-party inspector in PBL)
KMA	Kvalitet, Miljö, Arbetsmiljö
OL	Organizational Learning
PBL	Plan- och Bygglagen (The Planning and Building Act)
PBO	Project-Based Organization
PDCA	Plan-Do-Check-Act
RISE	Research Institute of Sweden
TQM	Total Quality Management
VLS	Verksamhetsledningssystem (Internal strategy system)
VSM	Value-Stream-Mapping
QA	Quality Assurance
QC	Quality Control
QHSE	Quality, Health, Safety, Environment

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1 Introduction

This chapter will provide some background for this thesis, concluding in a specified aim and research question. Further, limitations and ethical, societal, and ecological considerations will also be discussed.

1.1 Background

Quality management and inspection practices have long been central to construction projects, particularly following the introduction of ISO-based quality systems in the Swedish construction sector during the 1990s (Landin, 2000). Within construction projects, quality management systems are intended to provide a structured framework for planning, controlling, and improving quality-related processes. However, the implementation of such systems in practice remains challenging, particularly in project-based environments where work is carried out under time pressure and varying project conditions.

A key component of quality management in construction is inspection, which is commonly used as a method to monitor and verify that work meets specified requirements. Inspection practices in construction are typically associated with quality control (QC), focusing on the detection and correction of defects after they occur (Hussamadin et al., 2023; Winch, 2010). While such approaches can ensure compliance, they are inherently reactive and may limit the potential for preventing defects and improving underlying processes (Lundkvist et al., 2014). This creates a situation where quality work is oriented towards correcting errors rather than systematically learning from or preventing them.

Previous research has shown that the presence of formal quality management systems and inspection requirements does not necessarily lead to consistent quality outcomes in construction projects. Instead, quality work often varies between projects, which limits organizational learning, contributes to recurring defects, hindering the development of shared practices across project-based organizations (Almaian & Bu-Qammaz, 2023; Eriksson & Leiringer, 2015). This issue is particularly noticeable in construction, where projects are temporary and fragmented, making it difficult to transfer knowledge and establish continuous improvement practices.

As a result, a gap exists between the intended function of quality management systems and how they are applied in everyday project practice. While existing literature provides insight into the structure of quality systems and inspection practices, there is limited understanding in the literature of how these systems are interpreted, adapted, and used by practitioners within specific project contexts. In particular, there is a need to better understand how formal quality frameworks support, or fail to support, practical quality work and learning across projects.

This study addresses this gap by examining how quality management and inspection practices are applied in a Swedish construction company, Tornstaden. By analyzing both formal documentation and the experiences of project actors across multiple projects, the study aims to explore the alignment between formal quality management systems and their practical application, and to identify opportunities for improving quality management practices within a project-based organization.

1.2 Aim and Research questions

The aim of this thesis is to investigate how quality management and inspection practices are applied in construction projects, and to analyze the alignment between formal quality management systems and how their interpretation and implementation are carried out in practice. The purpose is to identify opportunities for improving quality management frameworks within the case organization.

To support the aim, the following objectives are identified:

- To analyze the existing literature on quality management, inspection practice, and organizational learning, primarily in the construction sector.
- To examine the case company's formal quality management systems, including templates, guidelines, and project-specific documentation.
- To explore how quality management and inspection practices are carried out in practice, based on the experience and perspective of project actors.
- To compare project-specific documentation based on the formal quality management systems, and to suggest improvement to the current quality management system to better support practical application and consistency across project.

Further, this thesis aims to provide support and improvement suggestions to the case organization and others who intend to evaluate their quality management systems. Therefore, the main research question for this thesis is:

How are quality management and inspection practices applied in construction projects, and how do they align with a company's formal quality management system?

To answer the main research question, the following sub-questions are addressed:

- How do project actors carry out quality and inspection work in practice?
- How are quality management systems intended to support quality work and inspections?
- What differences exist between formal quality management processes and their practical application across projects?
- How can the quality management framework be improved to better support practical application?

1.3 Limitations and Delimitations

This study is subject to several limitations and delimitations related to scope, context, and methodology. The study is conducted within a Swedish construction context and is limited to a single case organization, Tornstaden. Furthermore, the empirical analysis is based on three construction projects, which represent a cross-case comparison within the same organizational setting.

These delimitations restrict the general applicability of the findings, as construction projects in other organizations or contexts may operate under different organizational structures, regulations, or quality management practices. In particular, the Swedish context and the use of a single organization mean that the findings should be understood as context-specific rather than directly generalizable to the construction

sector as a whole. However, since the purpose of the study is to develop improvement suggestions for this specific case company, the selected scope is considered sufficient to evaluate the current quality management system of Tornstaden.

Furthermore, the 20-week time frame of the master's thesis constitutes a methodological limitation, as it restricts the scope of data collection, including both the number of interviews conducted and the selection of case projects. The limited number of projects within the same organization may result in similar practices and challenges being observed, which reduces the variation of empirical data. In addition, the use of dyadic interviews, where participants are familiar with one another, may influence how openly certain issues are discussed, potentially introducing response bias. The limiting time frame also prevents the inclusion of implementation and proper evaluation of the proposed improvements, meaning that the findings are based on the current state of practices rather than on validated changes. Since a full evaluation from procurement to finished project could take several years, such an assessment is not feasible within the scope of this study.

Lastly, this thesis is based on a qualitative research approach utilizing dyadic interviews, observations and internal documents as its main data source. The analysis therefore relies on the interpretations and experiences of the participants, which introduces subjectivity and may limit the transferability of the findings. While the findings provide in-depth insights into how quality management is applied in practice within the case organization, they should not be interpreted as universally applicable. Instead, they can be seen as indicative of how similar challenges may manifest in comparable project-based organizations.

1.4 Societal, ethical, and ecological considerations

The findings of this study have several implications from a societal, ethical, and ecological perspective. From a societal perspective, improved quality management and clearer project processes may contribute to more consistent project outcomes and reduced risk of errors in construction projects. Since construction projects directly affect the built environment, improvements in documentation, risk management, and communication can support better decision-making and potentially reduce costly rework and delays. This contributes not only to increased efficiency but also to a more reliable use of societal resources.

From an ethical perspective, the study highlights the importance of how quality management systems are used in practice. The empirical findings indicated that certain control mechanisms, such as checklists, may not always reflect actual project progress. This raises ethical considerations related to transparency and accuracy, as decisions may be based on incomplete or misleading information. Additionally, the study required careful consideration of ethical aspects related to data collection, including informed consent, confidentiality of participants, and awareness of potential power imbalances in dyadic interviews. This is further discussed in Chapter 3.6.

Ecologically, the study indirectly relates to sustainability through its focus on efficiency and waste reduction in project processes. Improved continuity of information and structured quality management can reduce rework, which in turn lowers unnecessary material use and resource consumption. Furthermore, increased digitalization of documentation may reduce reliance on paper-based processes. While

ecological impacts were not the primary focus of the study, these aspects highlight how improved management practices may contribute to more sustainable construction projects.

2 Theory

The theory chapter will introduce the theoretical frameworks and tools used in the evaluation of the current quality management system, and define relevant concepts used to describe practices and actions observed in the case organization.

2.1 Quality management in construction projects

Quality management is defined as “the degree to which a set of inherent characteristics fulfils requirements” Winch (2010). He categorizes four main components of quality management systems as inspection, quality control (QC), quality assurance (QA), and total quality management (TQM) (Winch, 2010). The components are interrelated, and Winch (2010) illustrates in Figure 1 how for example TQM includes all four components, but QC doesn’t require QA or TQM.

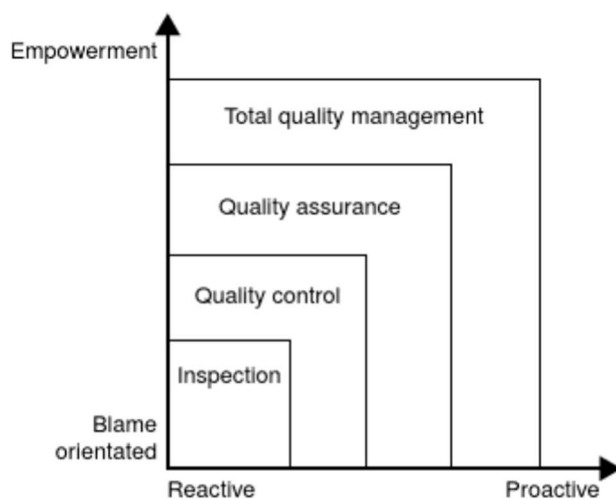


Figure 1 Approaches to conformance quality management (Winch, 2010, p. 318)

Winch (2010) argues that inspection is a conformity evaluation carried out through observation and measuring, typically performed by someone who has not carried out the work themselves. Inspection is particularly suitable for physical products, although it can be costly due to the resources required and non-conformance costs generated when defects are identified. Within quality management systems, inspection is often associated with QC, where the purpose is to detect deviations and determine when causes of a problem need to be examined. For this purpose, QC frequently relies on analytical techniques such as Ishikawa’s seven QC tools (Winch, 2010). According to the American Society for Quality (2024), the seven basic quality tools include the cause-and-effect diagram, check sheet, control chart, histogram, Pareto chart, scatter diagram, and stratification or flowchart. Winch (2010), however, identifies not all of them as applicable for management of construction projects, and instead proposes cause-and-effect diagram, performance measurement, statistical process control, and value stream mapping as more suitable tools for construction projects.

The cause-and-effect diagram, also known as the fishbone diagram, is used to analyze relationships between a problem and its possible causes by systematically identifying primary and secondary contributing factors (American Society for Quality, 2024; Winch, 2010). The cause-and-effect diagram is considered user-friendly and supports

both structure and creative problem solving (Doggett, 2005). The author does however also identify drawbacks such as the need for well identified and documented characteristics of the problem to be able to find the root cause of the problem. Abbasi et al. (2020) explored the causes of delays in construction projects in Iran by utilizing the cause-and-effect diagram by structuring identified causes into hierarchical categories. Based on interviews with industry experts and managers, the main causes of delays were grouped into eight primary categories, which formed to main branches of the diagram. The most significant causes were then further decomposed into multiple levels, enabling identification of underlying root causes across as many as five levels (Abbasi et al., 2020). Using this diagram is not only listing the main causes of delays, but categorizing and displaying them visually, tracing the root cause of the most important causes of delays. This facilitates a deeper understanding of complex issues and supports the development of targeted mitigation strategies to reduce the risk of similar problems in future projects.

Winch (2010) described performance measurement as output data that is measured and analyzed and often ranked using histograms or pareto charts to display outputs based on frequency. Nassar et al. (2005) use a Pareto chart to rank the causes of cost overruns according to their frequency across multiple projects, and the method illustrated the 80/20 principle, suggesting that a small number of causes are responsible for the majority of the observed problems. By using this tool, the most significant causes are identified.

Statistical process control aims to determine whether a process operates within predetermined tolerances or control limits (Winch, 2010). Control charts are one tool that are used to distinguish between normal process variation and deviations that indicate a loss of process control. Nassar et al. (2005) uses this tool to detect whether a process is in or out of control regarding causes for cost overruns. Upper and lower limits were determined based on the standard deviation of the experienced cost overrun, which when using the control chart helps describe when a process exceeds the expected cost overruns.

Lastly, value stream mapping (VSM) is described as visualizing the flow of activities, information, and materials required to deliver a product or service, and allows the organization to detect inefficiencies, improve workflow, and support continuous improvement and process optimization (Winch, 2010). VSM is further described by (Rosenbaum et al., 2014) as a lean technique where the goal is to improve production by optimizing the value-adding activities and create a more efficient system by reducing waste. In their case study which examined the construction of a medical center in Santiago, Chile, they adopted the VSM technique to evaluate the construction of walls. Through their evaluation of the case, the authors mapped sequences of activities, material flows, and information exchanges, enabling identification of both value-adding and non-value-adding activities throughout the production process.

Yu et al. (2009) applied a similar approach when studying the construction of a house, dividing the construction process into five stages. The authors mapped cycle times, lead times, booking times, and percentages started on schedule with a flowchart describing the current-state workflow, and immediate conclusions such as the significant difference in lead time and actual work duration could be made. When

they instead redesigned the workflow into a future-state value stream map, they could demonstrate improvements in productivity and process efficiency through improved task sequencing, allowing for overlapping activities and more precise material deliveries (Yu et al., 2009). The result was better coordination and synchronization of activities and materials, which lead to less idle time on the construction site.

QA is described as another component in quality management, targeting more proactive actions compared to QC (Figure 1), and Winch (2010) describes it as the procedures that ensure quality management within projects. These systems or procedures do not identify non-conformities themselves. Instead, they define how such issues should be identified and specify the criteria that inspections should use when controlling a product. Three types of QA systems are also mentioned, which he describes as first-party, second-party, and third-party systems. These represent increasing levels of independence and accountability, as evaluation is conducted by the organization itself, by clients or partners, or by independent external bodies, respectively (Winch, 2010). In Swedish construction, all three levels are called upon through the standard agreements, AB04 and ABT06, and through the Planning and Building Act (PBL), which will be discussed in chapter 2.1.2.

The final and most proactive component is TQM, which aims to work with both quality improvement and using the most suitable quality standards, which means it is more about managing the business rather than just a quality procedure or techniques (Winch, 2010). He describes how the company culture is an important factor in succeeding with TQM, and the key elements in creating a culture of improvement are empowerment, training, organizational learning, incentive alignment, senior management support, and the use of formal improvement processes.

An example of when TQM is studied is Cheng & Liu (2007) who examines the relationship between organizational culture and the implementation of a TQM system through a survey sent out to contracting firms in Hong Kong. By analyzing the results, the authors concluded that organizational culture influence the implementation of TQM. Factors such as work environment, work attitude, and leadership styles create different culture profiles within an organization, and shared values and levels of commitment from the members of the organization enables smoother integration of such systems (Cheng & Liu, 2007). It is, however, reasonable to assume that the ideal culture differs between contexts, such as country or sector.

The culture in Swedish construction has been evaluated by Bröchner et al. (2002), who describe how both craftsmanship traditions and military engineering tradition have shaped professional behavior in the industry. The Swedish construction sector is characterized by low power distance, relatively non-hierarchical workplaces, and collaborative decision making (Bröchner et al., 2002). This means that instead of relying primarily on formal control mechanisms, collaboration, trust, and professional judgement are often emphasized when solving problems within projects.

Organizational culture can influence how quality management practices are implemented in construction projects, and the collaborative culture described by Bröchner et al. (2002) can encourage knowledge sharing, internal problem solving, and continuous improvement. This aligns with several principles of TQM described by Winch (2010). However, Bröchner et al. (2002) also identify limitation in this

culture, particularly the reliance on information routines and the relatively weak enforcement of formal systems, for example through tendencies to resolve disputed internally rather than involving neutral third-party actors.

Swedish quality culture is further analyzed by Koch & Buser (2020) through a qualitative approach with interviews, observations, and internal document analysis from five different projects. Through analysis of the empirical data, they found that the quality culture often was characterized by a “good enough mindset”, something that could imply a sense of impossibility to reach higher level quality. They further point out an ambiguous relationship to formal quality control routines, where they are viewed as necessary in their formal aspect, but rather something that needs to be carried out in practice.

Quality is important in many industries, not least in the construction sector. The ISO certification system is used world-wide and having an ISO 9001 certification aims to ensure that the organization uses a quality management system focusing on customer satisfaction, process improvement, and ongoing optimization (International Organization for Standardization, 2015). According to the Swedish Institute for Standards (2015), the intended benefits of implementing a quality system is to consistently provide services or products that meet customer requirements, facilitates opportunities to increase customer satisfaction, address both risks and opportunities associated with the context and objectives of the organization, and demonstrate conformity with specified requirements of the quality management system. The standard further mentions some quality management principles such as customer focus, leadership, process approach, and improvement, and that when implemented could improve an organizations performance. The concept of process approach refers to the ability to identify their processes, understand how processes interact, and manage them systematically (Swedish Institute for Standards, 2015), which is very relevant in the construction sector where projects consist of multiple processes.

The use of quality management systems, such as ISO 9001, is discussed by Landin (2000) who examined the relationship between the standard and the Swedish construction sector. The integration of ISO-based quality systems has partly been driven by regulatory requirements and increasing competition within the construction sector, something that has encouraged companies to implement structured quality management systems. However, the fragmented and project-based nature of construction projects makes the application of standardized quality systems challenging since multiple actors are involved, and responsibility varies throughout the project (Landin, 2000). The author further highlights the importance of well-established quality management systems, in which quality goals and their continuous evaluation are incorporated into organizational quality strategies. In construction projects, quality management is often carried out through project-specific plans which translate the company's general quality system and adapts the routines into important instruments for employees working within the project (Landin, 2000).

2.2 Inspection in the construction industry

An inspection is defined as physically checking that something has been completed satisfactory (Winch, 2010), and in the construction industry, inspection regarding work environment and different types of quality inspections can be carried out (Hussamadin et al., 2023; Kifokeris et al., 2024; Landin, 1995; Lundkvist et al., 2010;

Murtagh et al., 2018; Nielsen, 2017). In this section, work environment inspections and the difference between coercive and autonomy-supportive strategies, third-party inspections, and self-inspections will be described.

For the purpose of this thesis, self-inspection refers to inspections carried out within the project organization by actors involved in the execution of the work, such as contractors, subcontractors, or site managers verifying that work has been carried out according to relevant requirements. These inspections therefore form part of the internal quality control processes of the project. Third-party inspection, on the other hand, refers to inspections carried out by independent actors who are not responsible for the work being inspected. This means legally required inspections, often carried out by certified inspectors, checking the work towards contracts or regulations. Despite differences between inspection types, inspection processes in construction projects generally follow a similar structure consisting of preparation, inspection, and documentation of findings (Hussamadin et al., 2023; Lundkvist et al., 2014).

Different strategies can be used when performing an inspection, and Nielsen (2017) discusses how a coercive or an autonomy-supportive strategy results in different outcomes. The coercive strategy builds on observation, interrogation and enforcement and can be referred to as the punishment strategy, and the autonomy-supportive strategy is based on compliance through encouragement persuasion and advice (Nielsen, 2017). In his study, Nielsen (2017) describes how work environment inspections in Sweden and Denmark are carried out with three different perspectives: the controller, the expert, and the sounding board. The role of the controller is to check that rules and regulations were followed, both overtly and covertly, and for both the work site and regarding paperwork. The role of the expert is for workers on site to get an opportunity to ask questions regarding the working site or rules and regulations in general. The sounding board role is noticed primarily on Swedish constructions sites and took place as a dialogue between worker and inspector, working together to understand the reason behind the faulty situation. In the discussion, Nielsen (2017) describes how, in the Danish construction companies, the coercive behavior was shown in the controller role by using threats of fines, which increased the power gap between the inspector and the workers, and in the end resulted in less trust and collaboration. In contrast, Swedish inspectors enacted the controller role in a more autonomy-supportive manner, explaining the rationale behind regulations and encouraging voluntary correction rather than immediately invoking sanctions. This approach reduced the hierarchical distance between inspectors and site personnel and fostered more cooperative interactions (Nielsen, 2017). Overall, the relationship between the inspector and the workers is described as more mature at the Swedish construction site, which aligns more with the autonomy-supportive behavior and enforcement strategy.

As mentioned, different types of self-inspections are used. According to the standard contracts often used in Sweden, AB04 and ABT06, a final inspection of the work is compulsory (Svensk Byggtjänst & Byggandets kontraktskommitté, 2018). Chapter 7 in both AB04 and ABT06 describes the different types of inspections that can be invoked by either the client or the contractor, and the ones that should be carried out are final inspection (Chapter 7, Section 2) and guarantee inspection (Chapter 7, Section 3). Even though different types of inspections are mentioned, there are no directly recommended frameworks describing what the inspector should control, or

how the inspection should be carried out. There is, however, an inspection guide “*BKKs Handledning för Entreprenadbesiktning*” which provides both legal and methodological guidance for how inspections should be carried out, and what should be included (Byggandets kontraktsskommitté, 2009). It is directly suitable to use when carrying out inspections mentioned in AB04 and ABT06. The inspector carrying out the inspections are hired by the client and should be carried out by a competent person according to Chapter 7, Section 7. Although AB04 and ABT06 do not formally require certification, inspectors are commonly certified as Construction Contract Inspectors (Sw. *entreprenadbesiktningsman*) by RISE Research Institutes of Sweden, with certification valid for five years (RISE Research Institutes of Sweden, 2024a). The qualifications required for certification includes secondary education or a minimum of 10 years of qualified work experience, practical work experience, certificate of suitability from former employer or client, and insurance. It is also required to pass a written examination in connection with the application to get approved.

In addition to the inspections mentioned in the standard agreements, the PBL states that an inspection plan is required for projects requiring a building permit or notification to the municipality (Chapter 10, Section 5) (Plan- Och Bygglag (2010:900), 2010). The inspection plan specifies whether the checkpoints should be controlled by a third-party inspector or by self-inspection, also how the inspection should be carried out, when, and against which criteria. The law does, however, not specify exactly what should be included in the inspection plan, but rather adapted to the project-specific circumstances while including relevant technical aspects from Chapter 8, Sector 4, see Figure 2.

Byggnadsverks tekniska egenskaper

4 § Ett byggnadsverk ska ha de tekniska egenskaper som är vä- sentliga i fråga om

1. bärförmåga, stadga och beständighet,
2. säkerhet i händelse av brand,
3. skydd med hänsyn till hygien, hälsa och miljön,
4. säkerhet vid användning,
5. skydd mot buller,
6. energihushållning och värmeisolering,
7. lämplighet för det avsedda ändamålet,
8. tillgänglighet och användbarhet för personer med nedsatt rörelse- eller orienteringsförmåga,
9. hushållning med vatten och avfall,
10. bredbandsanslutning, och
11. laddning av elfordon.

Vad som krävs för att ett byggnadsverk ska anses uppfylla första stycket framgår av föreskrifter som har meddelats med stöd av 16 kap. 2 §. *Lag (2020:239)*.

Figure 2 Technical aspects for a building, PBL (Chapter 8, Section 4)

It is further mentioned in chapter 10 9§ in PBL that the person responsible for making sure that everything complies with the inspection plan (sw. *kontrollansvarig*, KA),

should be independent from the project organization and have a certification ensuring competence and sufficient knowledge (Plan- Och Bygglag (2010:900), 2010). The certification process is similar as for the Construction Contract Inspectors, also carried out by RISE Research Institutes of Sweden since the certification requires at least secondary education, 3 years of practical work experience and to pass a written examination (RISE Research Institutes of Sweden, 2024b). The certification document from RISE Research Institutes of Sweden also describes the daily tasks of the KA as being a support towards the client when making the inspection plan, be present at other inspection, and to write a final verdict, which should be handed over to the municipality at the end of the project for approval.

The Swedish construction sector has according to Boverket (2021) fallen behind in their digital development the last 15 years, and the goal is to have a seamless digital planning and construction process, reducing fragmented and inefficient processes. Lundkvist et al. (2010) evaluated already 16 years ago if digitalizing inspection data could enhance continuous improvement. Through a survey sent out to 66 managers at mid-sized construction companies in Sweden, they found that contractors recognize that there is valuable information in the inspection data, but that they lack systems or processes that support feedback and learning from information provided by the inspections.

(Hussamadin et al., 2023) build on the findings from (Lundkvist et al., 2010, 2014), and discusses the benefits of using digital quality control processes as a tool for inspection and documentation on construction sites. The study was carried out through semi-structured interviews and internal document study at one Swedish construction company. The self-inspection process before digitalization is described as supervisors gathering quality requirements to create checklists for the inspection, and instructions for how they should be carried out. However, the interviews revealed that this structure had low adherence, which often resulted in incomplete documentation and incompatible documentation. When a centralized data approach was used instead, a group separate from the site supervisors could analyze quality requirements, and thereafter provide checklists based on more structured information. This ensured consistency across the entire organization, and the data collection with updates and revisions was stored in the same place, always up to date. The new digital process also included a mobile application, allowing supervisors to follow inspection instructions, photograph defects directly in the application, and describe the deviation all in one place. Hussamadin et al. (2023) concluded that a transition to a digitalized system enabled the quality control system to provide more reliable documentation, improving data accuracy and usability, which supports a shift towards a prevention-based system.

When self-inspection is specified in the inspection plan according to PBL, Kifokeris et al. (2024) describes that project actors are typically responsible for carrying out the required controls, ensuring that regulatory requirements and project specifications are met, as well as documenting the performed control activities. In practice, these inspections are often performed by site managers or craftsmen during the production phase and are commonly documented through checklist-based procedures (Kifokeris et al., 2024). However, previous studies have shown that self-inspection practices in Swedish construction projects can be difficult to implement effectively as a quality management tool, as they are sometimes reduced to checklist routines rather than

systematic quality work. To address these challenges, (Kifokeris et al., 2024) propose the development of a cloud-based quality control system supported by generative artificial intelligence (AI). The proposed system aims to utilize legal requirements, construction standards, and internal quality documentation to generate project-specific inspection plans and self-inspection checklists, thereby supporting actors in planning and performing quality controls.

As described, the most common type of inspection on site is the self-inspection, where actors within the project organization carry out the inspection themselves. However, independent inspectors may also be involved when carrying out the inspections specified in the inspection plan according to PBL. A similar regulatory function is described by Murtagh et al. (2018) in the construction sector in the UK through the role of the building control surveyor (BCS). The BCS is responsible for assessing compliance with building regulations through several inspections during the construction phase. Together, these inspections are intended to cover the 16 parts of the building regulations for construction in the UK, which means that multiple inspections are required in order to verify components that will later become concealed within the structure (Murtagh et al., 2018). While both the BCS and the KA aim to ensure that regulatory and project requirements are met, an important difference is that the BCS typically performs the inspections directly, rather than primarily reviewing documentation from self-inspections. This difference illustrates a fundamental distinction between regulatory systems. In the Swedish construction sector, where inspections rely more heavily on self-inspection carried out by project actors, the effectiveness of inspection planning, execution, and documentation becomes an important aspect of quality management and continuous improvement within the project organization.

Despite the extensive use of inspection systems in construction projects, previous studies have shown that inspections do not necessarily lead to continuous quality improvement.

2.3 Inspection as a reactive quality control mechanism

As mentioned by (Winch, 2010), quality management can take a reactive or a proactive approach, and when discussing TQM, the Plan-Do-Check-act (PDCA) method is described as a formal process of improvement working towards the proactive end. A case analysis using the PDCA cycle as a framework was conducted by (Lundkvist et al., 2014), where they through interviews and observation analyzed if continuous improvement (CI) were achieved when a third-party inspection was carried out. The inspection process was described, where they initiated the process with a planning meeting controlling the project documentation, contracts, and inspection plans and prior self-inspection records. Then, a systematic walkthrough of the building was done, where digital notes were taken throughout the tour, noting defects with a reference number of where the defect occurred, a serial number of the defect, who is responsible for the part, and a defect description. Lundkvist et al. (2014), however, described that this can be done differently depending on the inspector. Due to the use of a computer to take digital notes during the tour, it allowed the inspector to deliver a final report during the closing meeting where a declaration of whether the building passed or failed the inspection was announced. The final report was also handed over to the contractor for them to use as a guide when correcting the defects found during the tour. The authors found that the Act-step in the

PDCA cycle seemed to be missing, and that CI through their inspection process wasn't achieved. This conclusion was made after getting handed the final report, they didn't utilize the information to learn, but rather just fix the defect to get the building approved for handover. Instead, they proposed a proactive framework for CI, utilizing some of the steps they had observed, building on the final report as a centralized quality database, see Figure 3.

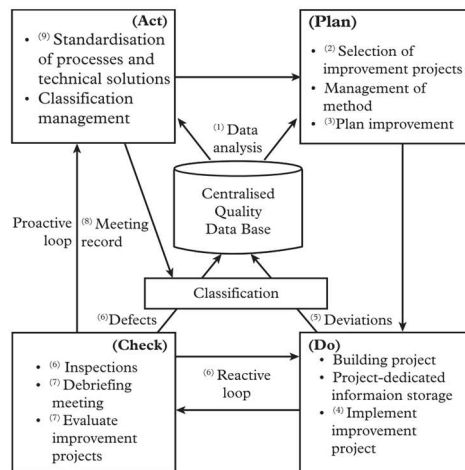


Figure 3 Proactive proposed framework for CI (Lundkvist et al., 2014, p. 1060)

Although the PDCA framework supports CI, Lundkvist et al. (2014) show that inspections in construction projects often remain reactive, where identified defects are corrected but the underlying processes are rarely analyzed. Hussamadin et al. (2023) similarly describe this as they describe inspection-based quality control systems as detection-oriented, focusing on identifying errors after they have occurred rather than preventing them. They evaluated, through a single-case study, how digitalization of quality control systems can increase reliable documentation, supporting the potential shift towards a more prevention-oriented quality management system. The authors found that a combination of a standardized inspection and data structuring process, and centralization of data from construction sites, led to a more optimized quality control process. This shift allows for organizational learning which further promotes a more proactive approach in quality management.

2.4 Learning challenges in project-based construction

Project-based organizations (PBOs) are commonly used to describe construction projects, where the temporary and unique nature of each project increases the risk of repeating problems when organizational learning (OL) practices are not effectively implemented (Almaian & Bu-Qammaz, 2023). Through a literature review, the authors identified several categories of challenges to OL, including the temporary and fragmented nature of PBOs, limited knowledge transfer between projects, and lack of structured processes and support for capturing and reusing experiences. Together, these factors hinder organizational learning and limit continuous improvement across projects. The empirical findings further reinforce these challenges, showing that individual and cultural barriers, organizational and structural barriers, and managerial constraints are key factors explaining why learning is not effectively realized in practice. This suggest that, although knowledge is generated within projects, it is often not systematically transferred or utilized at the organizational level (Almaian &

Bu-Qammaz, 2023). This is particularly relevant in the context of inspection and quality management, where large amounts of information are generated but not systematically used for learning and improvement.

To further explore this topic, Eriksson & Leiringer (2015) examined the difference between explorative and exploitative learning in PBOs. Explorative learning refers to the generation of new knowledge through experimentation and problem solving within projects, while exploitative learning focuses on the refinement and reuse of existing knowledge across projects. In project-based industries such as construction, explorative learning is common because projects often require unique solutions, while exploitative learning is more difficult due to the temporary nature of project organizations and limited mechanisms for transferring knowledge between projects. Within this, the authors elaborated on three organizational learning processes that support learning in project-based organizations: experience accumulation, knowledge articulation, and knowledge codification. The first involves gaining experience from repeating similar tasks, also known as “learn by doing”. This is the most common way of organizational learning in PBOs, and exploitative learning like this can in construction project be beneficial if team members work together over multiple projects. The second learning process, knowledge articulation, involves collective learning due to sharing of individual experience and constructive confrontation of other’s viewpoints and understandings, also called “learn by reflecting and discussing”. This process is highly explorative and important in complex projects, but also exploitative when knowledge is accumulated as beneficial information for future projects. The third learning process, knowledge codification, occurs when articulated and accumulated knowledge are transformed into standards and procedures. This process allows for a systematic understanding of the project among the team members during uncertain conditions, which may strengthen the explorative learnings. However, the written manuals and guides, which also is an outcome of codification, may contribute to exploitative learning due to implementation of these standards. It is therefore reasonable to conclude that construction projects support exploration, but make exploitation difficult, which in the end is one reason that project-based organizations may struggle with knowledge transfer between projects.

A challenge when working with inspections for improved quality in project-based organizations is that feedback-loops often are broken before the stage of learning (Lundkvist et al., 2010). Identifying challenges related to PBOs is crucial when trying to understand the construction industry since all individual construction projects consists of smaller, temporary organizations connected to a specific project. (Hussamadin et al., 2023) follow up with describing that the lack of standardization on construction sites creates a challenge of identifying the root causes of an issue or defect. Even though neither of these cases show direct connection to the act of inspection, they call out the struggles with utilizing the information gathered before, during, and after an inspection, and making use of the work beside clearing the project for handover. Lundkvist et al. (2010) concluded that despite there being mandatory inspections due to contractual agreements, the information is solely handed over to the client after the inspection, and then stored away instead of being used to understand and learn about the most common defects.

2.5 Inspection practices in Swedish construction

Inspections in Swedish construction projects are typically performed by site managers and are based on preparatory work such as reviewing drawings, project documentation, and experience from previous projects (Hussamadin et al., 2023). Defects and deviations are searched for at the construction site, and the inspection results are documented into a spreadsheet which can be a time-consuming and error-prone activity. A key characteristic of construction projects is their high variability, as each project differs in design, technical solutions, involved actors, and site conditions. The quality work therefore needs to be project-specific to suit the characteristics of each project. This places significant responsibility on site managers whose experience and judgement influences how inspections are planned, executed and documented in practice.

Since subcontractors and consultancy firms are common actors in construction projects, and the quality management processes within their organizations may differ from those of the client. Landin (1995) evaluates how specialist contractors (“all contractors who are involved in the construction process, apart from the general contractor”) work with quality management, where self-inspection is the preferred method mentioned. The author carried out interviews where they were asked to give detailed descriptions of the quality demands from clients and/or other quality work performed. The results showed that the main form of quality work was self-inspections carried out by the subcontractors themselves. However, there seem to be somewhat unclear communication between the client and the contractor regarding which quality work should be done.

Previous research shows that quality work in Swedish construction projects is also often seen as checklist-based procedures used to validate the quality of the project, to verify compliance with requirements, and to facilitate project handover (Kifokeris et al., 2024). While an approach like this can support control and documentation, it can also limit opportunities for deeper analysis and learning. Lundkvist et al. (2010) similarly describes how inspection protocols are frequently treated as formal requirements rather than a tool for organizational learning, as the collected information is primarily used to correct defects rather than to identify recurring problems or improve processes. Debriefing meetings have been mentioned as a quality feedback activity if time allows (Lundkvist et al., 2014). However, this was also identified as a challenge, as scheduling meetings with all relevant parties can be difficult.

Although inspection plans and quality management systems provide a formal structure for quality work, they do not fully prescribe how inspections should be carried out in practice. Consequently, inspection practices are often shaped by project-specific conditions, available time, and individual experience rather than standardized procedures. This context-dependent execution of inspections reflects the challenges of transferring knowledge and establishing consistent practices in project-based organizations.

3 Method

This chapter aims to describe the methods used when gathering and analyzing the data used in this thesis.

3.1 Research approach

This thesis adopts a qualitative research approach to analyze how inspections and quality work are carried out in everyday practice at Tornstaden. Qualitative research is suitable for studies aiming to understand processes, meanings, and interpretations within natural contexts (Bell et al., 2022). This study is based on data collected through a literature review, internal quality documents, observations, both individual and dyadic interviews, and a group discussion. This combination of data sources enables an in-depth understanding of how quality work is performed in practice and how these processes influence outcomes across projects. For example, differences in how inspection documentation is completed and followed up influenced how risks were identified and communicated through project phases. The research design developed iteratively, allowing early empirical findings to guide subsequent data collection and deepen the analytical focus.

Building on the qualitative research approach, a case study design was adopted as it is suitable for investigating how and why processes occur within a real-life context (Yin, 2018). Case studies are particularly appropriate when the boundaries between the phenomenon and its context are not clear, which is relevant for examining inspection and quality practices in construction projects. In this study, quality management and inspection practices are closely influenced by project-specific conditions, organizational structures, and the experiences of project actors, making it difficult to separate the practices from their context. This makes a case study approach suitable for this thesis, as it allows practices to be examined within their project-specific contexts instead of as individual procedures.

3.2 Literature review

To establish an understanding of existing research on inspection and quality work in the construction industry, a literature review was conducted. Relevant academic articles were identified using databases such as Scopus, Taylor & Francis Online, ASCE Library, Google Scholar, and Chalmers Library. The search strategy was based on keywords derived from the scope of the study, prior knowledge, and insights from an initial screening. The keywords used included combinations of inspection, inspection plan/planning, construction, Sweden, organizational learning, project-based organizations, quality, and reactive/proactive quality control.

Different variants of inspection and planning were used to gather information about how such activities are carried out in practice, and to identify sources that had examined inspection and/or planning in a construction context. Sweden was further added as a search word, trying to narrow the scope to a more local context, but since the results were few, this was used sparingly. Organizational learning and project-based organizations were used to identify how knowledge transfer and internal development are being handled related to quality practices. Since a project-based organization often operates differently compared to a long-term organization, this becomes relevant when discussing how to improve and learn within a quality management system. Organizational learning was therefore used as an interpretative

lens to understand how documented practices, informal workarounds, and project-specific adaptations influence the potential for learning across projects within the organization, rather than just on an individual level. Lastly, reactive and proactive quality control were used to distinguish how and when quality management systems are applied in practice and differentiate between measures aimed at detecting deficiencies and those intended to prevent them.

The search initially resulted in a broad set of articles, which were screened based on titles and abstracts to assess their relevance to the research topic. Articles not directly related to inspection and quality work in construction were excluded. However, the scope was not strictly limited to these topics, and literature on related areas such as organizational learning, project-based organizations, and quality management was also included to provide a broader theoretical understanding. The remaining studies were then reviewed in full, and relevant sections were identified and used to support the theoretical framework.

In addition, references from key articles were used to identify further relevant studies. The final selection of literature was based on its relevance to the research topic and its contribution to understanding inspection practices, quality management, and organizational learning in construction projects.

3.3 Case study

The primary case selected for this study is the construction project Båken, selected in consultation with the supervisor at the company. The project presents several challenging conditions compared to standard residential construction, including its location on an island in the Gothenburg archipelago and its sloped façade design. These characteristics introduce increased complexity, particularly regarding moisture safety and other technical solutions, which place higher demands on inspection planning and quality management processes. Due to its complexity, Båken is therefore considered an information-rich case as it highlights how quality and inspection practices are applied under complex and uncertain conditions. In addition to the main case, two other cases with other characteristics were included to provide a broader perspective and enable comparison of practices across different projects in the case organization. A more detailed description of the cases is provided in Chapter 4. The utilization of three case projects aligns with the concept of cross-case synthesis in case study research, where patterns across cases are analyzed to strengthen the robustness of the findings (Yin, 2018). A comparison supports an understanding of how inspection and quality work vary between projects and to what extent practices are transferable within the organization. Transferability was examined by comparing documentation practices and interview accounts across three projects with differing characteristics. Furthermore, the ongoing construction process of Båken serves as the primary empirical context for the study, while comparative insights from other projects contribute to strengthening the analytical generalizability of the findings.

3.4 Data collection

When using a case study design, multiple data sources can be used, such as documents, interviews, observations, and physical artefacts (Yin, 2018). The author further notes that multiple sources in a case study often results in higher quality compared to those who use single source information. Bowen (2009) also suggest using multiple sources for qualitative studies as a form of triangulation, where the

combination of sources stating the same thing validates them both. In this case, multiple data sources will cover what the framework looks like, descriptions of how the frameworks are used, how they are interpreted by practitioners, and what actually happens on site.

3.4.1 Document study

Qualitative research often relies on analysis of written documents as a source of information in combination with interviews and/or observations (Bell et al., 2022). The authors differentiate between personal, official, and organizational documentation when used in qualitative research. For example, diaries and blogs are referred to as personal documentation, and quantitative data and official reports or legislations are referred to as official documentation. For this thesis, organizational documentation such as minutes of meetings and company regulations and frameworks were requested by the author of this thesis in collaboration with the company supervisor. Internal documents connected to risk analysis, quality control, and inspection planning are extracted from the relevant cases, trying to understand the common practice used at Tornstaden.

Organizational documents are a common data source when working with qualitative research, and in case studies they are often combined with other data sources as well (Bell et al., 2022; Bowen, 2009). The internal documents will in this case offer context and a foundation to further strengthen the analysis and understand the intended practice in the daily operations.

3.4.2 Interviews

To gather direct insights from practitioners at Tornstaden, two types of interviews were used. This allowed for different settings with different participants supporting a collaborative and reflective setting for the interviewees in the case project, and a more traditional interview setting for the head of Tendering & Estimating department.

Individual interviews could have been used to collect experiences from all project actors. However, this approach would primarily capture individual perspectives without interaction between participants. Since this study aims to understand how practices are interpreted, discussed, and reflected upon in a shared project context, the interaction between participants is considered valuable providing more nuanced and deliberative insights.

All interviews were conducted in Swedish. Quotations presented in Chapter 5 have been translated into English by the author, and the translations aim to preserve the original meaning and intent of the interviewee rather than provide a word-for-word equivalence. To ensure anonymity, all interviewees are referred to using neutral identifiers based on role, such as “Site Manager” or “Project Engineer”. All interviews with their corresponding respondents can be seen in Table 1.

Table 1 Interviews and respondents

INTERVIEW	RESPONDENTS
Dyadic interview - Primary case	Project engineer & site manager

Dyadic interview - Comparative case 1	Project engineer & site manager
Dyadic interview - Comparative case 2	Project engineer & site manager
Individual interview	Head of Tendering & Estimating

This setup ensured insights from seven people with experience across different departments, allowing for a more generous picture of the challenges in the quality management system.

3.4.2.1 Dyadic interviews

While internal document analysis provides direct comparability between the selected cases, dyadic interviews are used to understand the experience of working with these documents. Szulc & King (2022) describe this method as “two participants who simultaneously interact in response to open-ended questions” (p. 1). Further, they explain that dyadic interviews can be beneficial in qualitative studies, and that they can provide insight both from the interaction between participants, but also from answering the questions. Some benefits of using dyadic interviews are gaining richer insights through participant interaction and co-construction of meaning, reducing socially desirable responses by allowing participants to challenge each other, and leveraging shared context or relationships to deepen and enrich the discussion (Szulc & King, 2022). However, some challenges include the possibility of participants going off topic or one person dominating the interview, something that require careful moderation from the interviewer.

Despite the similarities between focus groups and dyadic interviews, Morgan et al. (2013) explains that dyadic interviews shouldn’t be seen as miniature focus groups but rather its own method of providing useful information. Compared to both individual interviews and focus groups, dyadic interviews provide both co-creation of interpretations and ideas, and a more natural, conversational setting (Morgan et al., 2013).

While focus groups could have been used, they typically involve a larger number of participants, which may limit the depth of individual contributions and make it more difficult to explore project-specific experiences in detail. Furthermore, organizing larger group interviews can be challenging in a construction context due to participants’ varying roles, schedules, and project commitments, which may affect the feasibility of gathering all relevant actors at the same time. In contrast, dyadic interviews allow for deeper discussion between participants who share a common project context, while still capturing interaction and reflection between them. This makes dyadic interviews more suitable for exploring how quality management practices are experienced and interpreted in practice.

When performing dyadic interviews, Szulc & King (2022) recognize the importance of carefully recruiting and pairing participant, as well as taking ethical issues in consideration. For this thesis, participants were selected based on relationship and relevance to the selected cases, which mean that the pairing was done by the interviewer in discussion with the supervisor at the case organization. This further meant that participants were already familiar with each other, as they had worked together on the selected case project. As a result, it was considered less likely that their responses would be constrained by discomfort during the interviews. The existing relationship was further expected to support open and natural discussion.

However, as noted by Szulc & King (2022), the lack of anonymity between participants in dyadic interviews may introduce ethical considerations, such as the possibility of restrained responses. They stress the potential impact of issues related to imbalance in power, gender, or ethnicity. However, since the participants in the interviews in this study are coworkers and familiar with collaborating, this isn't considered an issue.

As mentioned, open-ended questions are preferred for dyadic interviews. Although Bell et al. (2022) doesn't mention dyadic interviews, they discuss the concept of unstructured, conversational interviews. This concept has many similarities with doing dyadic interviews, such as the interviewee being able to answer freely, and the use of an interview guide with open-ended questions. When constructing the interview guide used in this thesis, an initial understanding of which types of documents were available, both as templates and project specific documentation, were used as a foundation. Since the aim of the interviews was to gain insights regarding the experience of working with the internal strategy documents, specifically regarding inspection and quality control, questions regarding interpretations, workflow, feelings, and experience were conducted. A complete view of the interview guide can be found in Appendix I.

To prepare the participant for the interviews, a pre-meeting was held with the intention to gather relevant documentation, collect some background information about the case projects, and to give them an opportunity to refresh their memories about experiences from the project. The list of requested documents will be further discussed in Chapter 4. The participants for this meeting were the same as for the dyadic interviews, consisting of the author of this thesis, the supervisor of Tornstaden, the site manager, and the projects engineer (sw. *entreprenadingenjör*). However, only the site manager and the project engineer should be seen as interviewees.

To facilitate scheduling of the dyadic interviews and the pre-meeting, both digital and in-person meetings were conducted. Heiselberg & Stępińska (2023) describes one of the main advantages of meeting online is the possibility to take the meeting from wherever you are, which in this case makes it possible to conduct interviews with people not located in Gothenburg. Bell et al. (2022), however, states that something to be aware of is the risk of interruption or overlapping in the audio recording due to bad quality or connection. When performing digital interviews, Microsoft Teams was used since it is the software used at Tornstaden, and since recording of the meeting is possible seamlessly within the software.

As mentioned earlier, the dyadic interviews were recorded using the built-in application Voice Memo on the author's phone. Therefore, before the interviews, consent forms were sent out stating which personal data was going to be collected, a brief description of the thesis, and how the personal data would be handled. The form was drawn up based on a template provided by Chalmers, and the Swedish version was used to ensure complete understanding of the content, see Appendix II. This form is being stored at Chalmers, as well as with the participants. Since most of the useful information was gathered from the dyadic interviews, a decision was made to only record and transcribe those, while relying on memory and notes for the pre-meeting. To transcribe the recording, Klang.ai was used due to its capabilities to recognize multiple voices using the same microphone, and the sufficient security standards

stated on their website. The use of this software was discussed with the IT department at the company, and verbal consent was given to use this method.

To summarize, three dyadic interviews were held, one for each case project. The project engineer and site manager were the respondents, and the company supervisor supported as a company representative, making small comments and sometimes asking follow-up questions.

3.4.2.2 Complementary interview

To both challenge and confirm the findings from the dyadic interviews, a decision was made to also conduct a complementary interview with the head of Estimating & Tendering. The purpose was to gain a deeper understanding of their processes, and to broaden the perspective on the identified challenges related to risk management and handover during projects.

The interview was carried out in an unstructured way, using similar open-ended question tailored towards the Estimating & Tendering department and based on prior empirical findings. An interview guide was written and sent out to the interviewee a few days before the interview to facilitate time for reflection about their process, and interpretations of the work process guided by the internal strategy documentation.

This interview was also recorded using the author of this thesis' phone, and transcribed using the software Klang.ai, similarly to the dyadic interviews. To ensure consent, the interviewee also signed the same consent form based on the template found on Chalmers website.

3.4.3 Observations

To contextualize and further anchor the findings from the interviews and the document study, observations were conducted at the construction site of the primary case project, Båken. In this study, observational data were used to support interpretation of interview findings rather than as a standalone data source, enabling comparison between internal strategies and actual practices on site.

Two observations were carried out. The first took place during a start-up meeting with subcontractors, where relevant practitioners were present and raised comments and concerns related to the façade work. The second observation was conducted a few weeks later, once the façade work had been initiated. This allowed for informal questions to be asked to carpenters regarding their work procedures and practical execution.

Observation is often described as a long-term data collection method, typically conducted over an extended period of time (Bell et al., 2022). Given the limitations of a master's thesis, prolonged observation was not feasible. Instead, field notes were used to document observations made during these occasions. Notes were taken as soon as possible after each observation, reviewed regularly, and written clearly to avoid ambiguity, following general principles described by Bell et al. (2022). During the observations, jotted (scratch) notes were used when appropriate, and these were subsequently expanded into full field notes afterwards.

3.4.4 Respondent validation workshop

As a final step in the research process, two respondent validation workshops were held. One workshop with the interview participants, and one with top management at the case organization. The purpose of this discussion was to reflect on and validate the preliminary improvement proposals developed from the empirical findings. Rather than serving as an additional data collection method, the group discussion functioned as a reflexive and confirmatory step aimed at assessing the practical relevance and perceived feasibility of the proposed changes.

Respondent validation is described by (Bell et al., 2022) as a method for validating qualitative research, where the researcher provides the participants with the findings to seek verification. This can be done through workshops where the participants gather and get the opportunity to confirm or argue against the researcher's findings and impressions of the empirical data. For this thesis, the discussion was structured to facilitate reflection and dialogue. A PowerPoint presentation was used to guide the session, starting with the purpose of the study, followed by a summary of the main identified challenges, and finally the proposed solutions and suggested improvements. In addition, a written summary of the identified challenges and improvement suggestions was distributed to the participants in advance to allow time for preparation prior to the meeting.

Although this thesis is based on a cross-case synthesis of three projects, the proposed improvements would ideally benefit from evaluation over time. (Yin, 2018) describes longitudinal case studies as an approach for examining how conditions or processes develop before and after critical events such as changes in organizational strategies or practices. In context of quality management, such an approach would allow assessment of how proposed changes are enacted and stabilized over the course of an entire project cycle.

For the present study, a suitable evaluation period would therefore extend beyond a single project phase and ideally cover a full project duration, which in construction projects typically spans approximately 1.5–2 years (Byggstart, n.d.). Given the timeframe of a master's thesis, such longitudinal follow-up was not feasible. Instead, the respondent validation workshop was used as an alternative evaluation measure, providing an opportunity for practitioners to reflect on the proposed improvements prior to implementation. As the participants are directly affected by the suggested changes and have contributed to identifying limitations in the current system, the discussion enabled informed feedback on perceived feasibility, anticipated implementation challenges, and realistic paths forward for implementation.

The group discussion did not generate new empirical material for analysis. Instead, reflections from the discussion were used to contextualize and nuance the interpretation of the findings, particularly in relation to practical constraints and implementation considerations. In this way, the discussion supported the credibility and practical grounding of the proposed improvements without altering the empirical basis of the study. The outcome of the respondent validation workshop informed the refinement from the initial improvement proposal to the final proposed solution, which is evaluated in the third stage of the discussion chapter.

3.5 Data analysis

To be able to analyze the empirical data, coding was used as a primary method. For qualitative research, coding is described as “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data.” (Saldaña, 2013, p. 3). The coding process is often done in cycles, where the codes get more and more narrowed down in each iteration. After the coding is done, Saldaña (2013) recommends categorizing the codes to further divide the data. For this thesis, codes will be determined along the analyzing process to ensure the best categories.

Since multiple cases are included in this study, cross-case analysis was conducted to compare findings across projects (Miles et al., 2013). After the coding process, the identified themes were compared between cases to identify similarities and differences in how the internal strategy documents were used and interpreted during the project work. The comparison was carried out by structuring the data into matrices, where each case project was analyzed based on key themes derived from the coding process. This enabled a systematic comparison of how different projects applied the internal quality management system and its related documentation. In addition, matrices were used to compare findings from the dyadic interviews, allowing for identification of patterns and variations in how participants experienced and interpreted the documentation connected to quality work in practice.

Networks were also used to visualize relationships between different documents and their connection to specific processes within the internal strategy documentation. This supported an understanding of how documents are structured and interrelated within the organization.

Through this approach, similarities, differences, and recurring patterns across cases were identified, contributing to a deeper understanding of how formal quality management systems are implemented in practice.

3.5.1 Document analysis

The document analysis focused on comparing both the presence and level of completion of mandatory documents across three case projects. Particular attention was paid to whether documents were merely marked as completed or contained project-specific content, as well as whether referenced documents could be located within the VLS (the Internal Strategy system) structure.

As stated before, document analysis is preferred in combination with interviews or observations to validate the data from each source (Bowen, 2009). The author further describes document analysis as an efficient method since it requires data selection instead of data collection, and therefore gives more time for analysis and interpretation. For this thesis, both template documents and real project specific documents were used. This made the process of retrieving the document easy and time efficient. One limitation of document analysis mentioned by (Bowen, 2009) was biased selectivity, suggesting that the retrieved documents are more likely to present the organization in favorable light rather than displaying the reality. In this case, full access was given to the template documentation, while project specific documentation was gathered by the site manager and project engineer. This could indicate that some

project specific documentation was withheld from this study. However, it seems unlikely since this study is called upon by Tornstaden.

When analyzing the internal documents provided by Tornstaden, the coding method suggested by (Saldaña, 2013) was applied. To support the analysis, a matrix inspired by Miles et al. (2013) was used, where equivalent documents from each project were placed side by side. This enabled a structured comparison of similarities and differences in both content and use.

Codes were developed based on how the documents were used and adapted in practice. For example, documents that closely followed the original template without modification were coded as *template-based use*, while documents that had been revised or expanded based on project-specific needs were coded as *adapted use*. Similarly, documents where checklist items were consistently completed were coded *high completion*, where incomplete or partially filled documents were coded *low completion*. These codes were then used to identify patterns across projects regarding how internal documentation supported quality work. The findings from the document analysis will be presented in Chapter 5.

3.5.2 Interview analysis

The interview material was analyzed using a qualitative content analysis approach. As suggested by Saldaña (2013), data is structured in columns with the raw data in the left-most column, initial codes in the middle column, and more refined coding in the right column. This structure is similar to the matrix approach described by Miles et al. (2013), which was used to organize and analyze the data. An initial coding cycle was conducted where recurring statements related to quality management, handover between phases, documentation practices, and use of the VLS were identified. These codes were subsequently grouped into higher-level content categories based on similarities in meaning and emphasis. One example is how statements related to checklist completion, unclear status definition, and missing documentation were initially coded separately, but later grouped under the category “Criticism” due to their shared focus on perceived shortcomings of the VLS in practice. The identified themes and categories were compared across cases using a cross-case approach, supported by the matrix structure to enable systematic comparison.

The transcriptions were coded based on both content of the responses and the interaction between participants in the interview. The final categories used to structure the interview findings based on content were *positive feedback*, *criticism*, *improvement suggestion*, and *practical example*. In addition, interaction-based codes such as *agreement*, *disagreement*, and *explanation* were used to capture how participants responded to and built on each other’s statements. This coding approach enabled a structured analysis of both individual perspective and shared reflections, supporting the identification of patterns across cases. These categories further form the basis for the presentation of the empirical findings in Chapter 5.

The combination of document analysis and unstructured interviews enabled triangulation between formally documented practices and experienced use of the VLS in everyday project work.

3.6 Ethical methodological considerations

When conducting research, there are four main ethical principles to consider: avoidance of harm, informed consent, protection of privacy through confidentiality, and preventing deception (Bell et al., 2022). They describe that harm could imply physical harm, but also harm to the participants self-esteem, career prospects, or stress levels. Participants in this case are both the company as an organization, but also individuals who contribute with their opinions, reflections, or experience. To avoid any harm to either the company or the participants, the case project and the participant for the interviews will remain anonymous. Furthermore, (Bell et al., 2022) discuss informed consent as ensuring that the participants have enough information about the study to make an informed decision of if they want to participate or not. For this thesis, the case company Tornstaden want this thesis to be carried out and are therefore well informed about the research. The participants of the dyadic interviews signed before any information was gathered a consent form, as stated above, which informed them about the aim of this thesis, what information was going to be used, and how it was going to be handled. Next, the prevention of privacy through confidentiality, which is closely related to the principles above. However, this also connects to the right to refuse to answer as a participant, if the question may feel too private. Lastly, preventing deception regards when researchers try to present their research as something it isn't. In this study, all participants have been clearly informed about the aim of this thesis, and there have been no intent to deceive from the author.

3.7 Use of AI

During the work with this thesis, Open AI's ChatGPT 5.3 and Microsoft Copilot have been used. The primary use has been to improve grammar, spelling, and translation. These tools have also been used to quickly identify key topics of articles to filter out irrelevant articles or to deepen the understanding of relevant topics. However, all analysis and conclusions are the authors own, and all referenced work have been read entirely to ensure suitability and correctness.

Furthermore, the transcription service Klang.ai was used to transcribe the dyadic interviews. The recordings were uploaded to get the conversation divided by participants. To ensure correctness, the final transcriptions were proofread together with the recording before the analysis took place.

Lastly, some the visuals in this thesis are generated using ChatGPT 5.3. A self-made sketch was used as a reference picture for the generated image that was either based on a visual provided in the VLS, e.g. Figure 4, or completely made up from scratch, e.g. Figure 5 or Figure 7.

4 Case study

This chapter describes the case company, the internal strategic documentation used by them, and the three case projects used in the cross-case analysis.

4.1 Company overview of Tornstaden

This thesis is carried out in close collaboration with Tornstaden, a construction and real estate company founded and primarily based in Gothenburg. The company has three divisions: Project development, Construction, and Real Estate (Tornstaden, n.d.-a). The Project Development division is on the client side of the construction process and is responsible for acquiring properties, managing planning processes, and designing various construction projects. They are also the client regarding the case project Båken. The Construction division primarily works with design-build projects, being included during the entire building process, and utilizing the in-house carpenters in some projects. This division is the primary target for this thesis since they are the main users of the guiding framework and templates evaluated during this study. Furthermore, the Construction division is the main contractor as well for the case project Båken. Lastly, the Real Estate division manages both the commercial and residential buildings that are owned by Tornstaden. However, none of the projects mentioned in this thesis are rental properties managed by Tornstaden.

4.2 Internal strategic documents

To guide the work being done at Tornstaden, the manager for Quality, Health, Safety, and Environment (QHSE) has developed a framework which acts as a guide for which steps should be included in each process. This framework is known as the VLS (sw. VerksamhetsLedningsSystem) and will further on in this report be called the VLS. These documents include a flowchart of how the design and construction process takes place, and which sub-process that are included, see Figure 4.

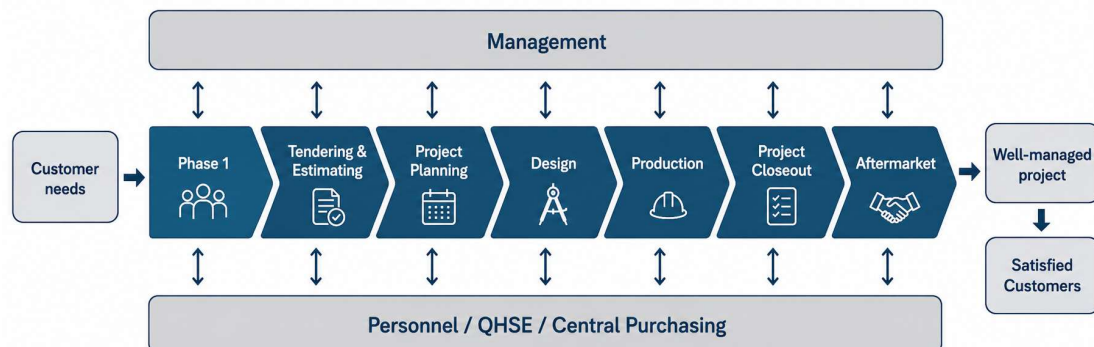


Figure 4 Flowchart of the design and construction processes (AI generated)

Furthermore, for each sub-process, there is documentation specifying what should be included in these steps, together with which documents should support these steps. The aim of these documents is to act as a guide to make sure that everyone works similarly in every project, and to make sure that all the required documentation is being included in each step. All employees have access to these documents and can see how everyone else is supposed to work as well.

4.2.1 Case related documentation

To determine which documents should be included in this study, the VLS has been carefully examined to understand which documents are related to quality work in the design and construction process. This examination was completed in close

collaboration with the supervisor at Tornstaden who has experience of working both with the design and construction process. The identified documentation requested from the site managers and the project engineer can be seen in Table 2. Further, the templates for the requested documents were also collected to enable evaluation of whether the document had been altered according to project-specific needs or not.

Table 2 Requested documents from each case project

REQUESTED DOCUMENT	INCLUDED IN PROCESS
Risk Assessment	Tendering & Estimating
Critical Issues Checklist	Project planning
Project Management tool	Design
Design Management plan	Design
Design Management meeting	Design
Moisture Control plan	Production
Internal Kick-off meeting	Production
Project Kick-off meeting	Production
Subcontractor Kick-off meeting	Production
Method Statement	Production
Internal Inspection plan	Production
Internal Lessons Learned meeting	Project closeout

Before the pre-meeting, this list was distributed to the participants together with references to where each document could be accessed within the standardized project folders. This made it possible for participants to locate the relevant documents directly, without having to search for them.

Some documents are established in the early project phases such as the Risk Assessment document from the Tendering & Estimating phase, and others are just used throughout one phase such as the Design Management plan or the Moisture Control plan. A flowchart of how the documents are utilized through the project phases and who is responsible for each phase can be seen in Figure 5.

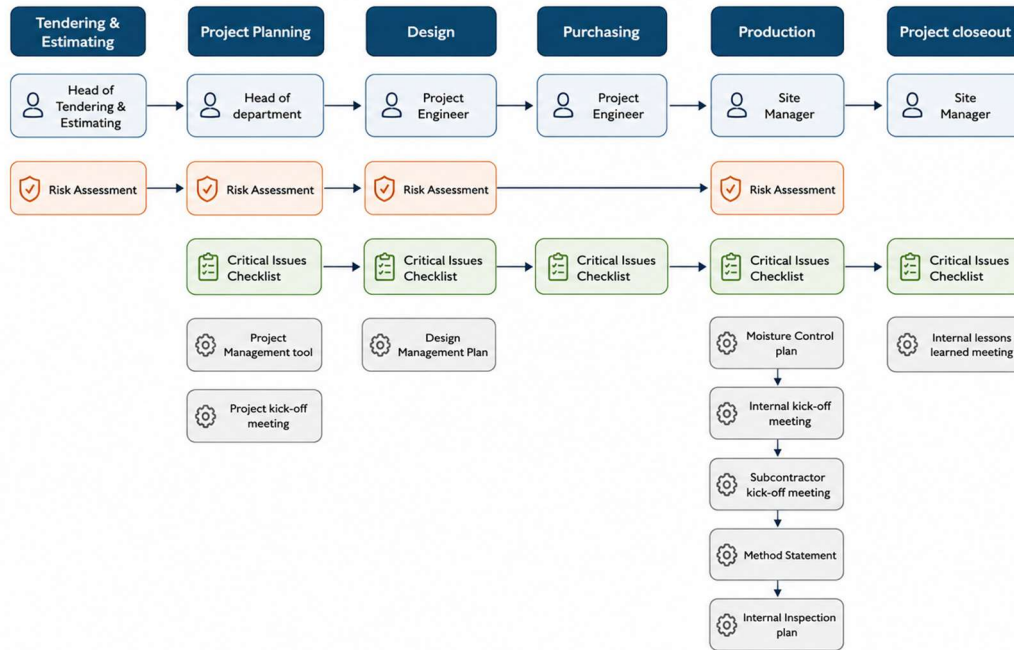


Figure 5 Flowchart of internal strategy documents in different project phases (AI generated)

Based on the description of these documents in the VLS, this structure should be followed for every project, ensuring consistency in work procedures.

4.3 Case projects

Three case projects have been evaluated during the work with this thesis. This was to ensure generalizability throughout the company, to get the possibility to compare daily practices, and to gather experiences from more people within the organization. The comparative cases were chosen due to the differences in characteristics compared to the primary case. On the one hand, they are in different stages in their project life cycles making different challenges more evident as they are more or less current. On the other hand, the project organizations belong to different departments at the case organization, deepening the insights and making the findings grounded in a larger part of the company. Third, each project was subjected to different technical challenges making the risk assessments and quality work especially different from each other. Further, each case will be described below.

4.3.1 Primary case – Båken

The primary case for this study is the project Båken, which is one of the buildings in the area of Skärhamnsås on Öckerö in the Gothenburg archipelago. This project is characterized by its unique design, symbolizing a lighthouse with a two-colored façade consisting of curtainwalls and red steel plates forming a grid-pattern. The building will house 58 apartments, one guest apartment, and a community room which can be used by the residents (Tornstaden, n.d.-b). On the technical side, the main challenge is the angle of which the facades are placed at, forming the traditional appearance of this type of lighthouse. A rendered picture of the building can be seen in Figure 6.



Figure 6 Båken & Fyrvaktarbostaden (Tornstaden, n.d.-b)

The angle of the façade, which is the main challenge identified, is the critical point which narrows down the documentation for this process, where the goal is to investigate how quality has been assured for this specific part of the construction process. This means that tender documents, moisture control plan, meeting protocols with subcontractors, and method statements are included when connected to this part of the building.

4.3.2 Comparative case 1 – BonTop

This project was completed in 2022 for a real estate company specializing in senior residential buildings. The building is located outside the city of Gothenburg, and Tornstaden was the main contractor with a design-build contract for this project. The greatest technical challenge with this project was the glass roof having the shape of an arch above the atrium. This brought issues both regarding moisture safety but also structural integrity.

4.3.3 Comparative case 2 – Kv. Atlas

Kv. Atlas was completed during the work with this thesis, where the residents started moving in during spring of 2026. The project resulted in 181 rental apartments. This project didn't have any major technical challenges and will therefore act more as a normal case in the comparison process.

5 Empirical findings

This chapter will summarize the findings from the document study, the interviews, the two observations, and the respondent validation workshop.

5.1 Document study

When comparing the documents across the evaluated projects, significant differences were observed in both availability and use. None of the case projects were able to provide all requested documents, and even when the same document was available across cases, variations in design and content were identified. The two ongoing projects, Båken and Kv. Atlas provided 9/13 and 7/13 documents respectively, while the completed project BonTop provided 5/13 documents. However, four documents were available across from all case projects, allowing for direct comparison. A summary of the documents received can be seen in Table 3.

Table 3 Received documents from each case project

REQUESTED DOCUMENT	BÅKEN	BONTOP	KV. ATLAS
Risk assessment	X		X
Critical issues checklist	X	X	X
Project management tool	X	X	X
Design management plan	X		X
Design management meeting	X	X	X
Moisture control plan	X	X	X
Internal kick-off meeting	X		
Project kick-off meeting			
Subcontractor kick-off meeting		X	
Methods statement	X		
Internal inspection plan	X		X
Internal lessons learned meeting			

As seen in Table 3, all case projects did not deliver every requested document. This, however, does not mean that the work hasn't been carried out by the project organization, but that they did not adequately document or store their documentation of such work.

The documents received are designed with different characteristics since they carry different purposes. The Tender document is received from the customer and is therefore not included in the template library. Further, the Risk Assessment, Critical Issues Checklist, and Internal Inspection Plan are matrices drawn up in excel. The Project Management Tool is a descriptive document describing how Tornstaden aims to work at all their work sites together with a short description of their project phases, and with space for contact information for both the contractor organization and the client organization. Power Project is used to create the Design Management Plan which serves as a time plan for the design phase in the projects, and therefore also lacks a template in the library. The Design Management Meeting, Internal Kick-off Meeting, Project Kick-off Meeting, Subcontractor Kick-off Meeting, and Internal Lessons Learned Meeting are all structured the same with headings to support the structure of the meetings and with place for minutes for each topic. Another document often provided by a consultant is the Moisture Control Plan, which based on the

documents received looks similar regardless of the consultancy firm. Finally, the Method Statement carries characteristics from both the matrix and meeting templates, where areas both for text and checklists are used to sort information and describe project specific challenges. However, the documents don't only vary in content, but also in function and intended use. This perspective will influence the interpretation of the analysis throughout this chapter.

Together with the variation in characteristics of the documents, they can also be classified based on whether they are governing, supporting, verifying, or coordinating the work connected to each document. One document can fulfil multiple functions simultaneously, for example, it can both describe who should do something and check that the work has been carried out and that the requirements are met. One example is the Critical Issues Checklist which can be classified as both governing by determining which tasks should be performed in each project phase but also verifying since the tasks are checked off when they are finished to track status and progress. Further, the Method Statement can function as governing, supporting, and coordinating. It governs by describing what needs to be done in the description of the work, supporting by describing how the work should be carried out and what they need to consider, and lastly coordinating by informing about which subcontractors need to be involved in the work, together with contact information to involved parties. By acknowledging that the documents can be classified based on their characteristics, and carry multiple classifications at once, it is therefore understood that the aim of the documents differs between and should therefore be analyzed based on function rather than content. This mindset will support the rest of the document analysis in this chapter by investigating the function of the document rather than the content itself.

Several documents were identified as *template-based use*, meaning that they closely followed the original template with minimal or no adaptation. For example, the Project Management Tool document showed little variation across all cases, with only the basic information as contact details being completed. Similarly, the Method Statement for Båken and the Internal Inspection Plan for Kv. Atlas showed limited modification and contained minimal project-specific adjustment. This suggests that some documents are used more as formal requirements rather than as actively adapted tools in project work.

In contrast, other documents showed clear signs of *adapted use*, where templates had been revised or expanded to reflect project-specific needs. The Design Management Meeting document was consistently adapted across projects, with headings being actively used throughout the design process. Similarly, the Risk Assessment documents for Båken and Kv. Atlas included contributions from subcontractors, indicating integration of external input into the documentation. The Internal Kick-off Meeting document (Båken) and the Subcontractor Kick-off Meeting (BonTop) were also used actively, with content filled across all sections during the meeting. Lastly, the Design Management Plan for Båken and Kv. Atlas had been filled out with project specific information as well as been altered beyond the template, showing awareness of the document. These examples indicate that certain documents function as active tools supporting communication and coordination during the project.

The meeting protocols illustrate the ambiguity between *template-based use* and *adapted use*, as the headings remain the same regardless of which project is

examined. However, the content beneath the headings varies depending on what was discussed during the meeting. One could argue that, since the headings are consistent across projects for the same template, the documents should be coded as *template-based use*. However, because the primary purpose of the document is to govern the meetings, they can be considered appropriately adapted and used.

For the checklist-based documentation, i.e Critical issues checklist, all case projects showed a high or partially high level of completion. None of the documents were coded as *low completion*, as more than half of the checklist items had been completed in all cases. However, it should be noted that two of the projects, Båken and Kv. Atlas was still ongoing at the time of data collection. This may have influenced the level of completion observed in these cases.

While analyzing the documents, it becomes clear that *template-based use* and *adapted use* should not be understood as either good or bad forms of execution. Rather, they are neutral codes that describe how a document is implemented in relation to the specific setting and characteristics of its use. Some documents, for example the Project Management Tool, were coded as *template-based use* with small adaptation from the template, and with added contact information to relevant people in the project organization. However, since the document also is considered a supporting document, the low adaptation could be considered satisfactory. Furthermore, the *high completion* code for the Critical Issues Checklist should not be seen as a guarantee for executed work, since it lacks the burden of proof within the document, which makes it easy to check a box without completing the task. This indicates the need for further data sources to deepen the analysis of how the documents are used in practice.

Across the documents it is generally unclear who in the project organization is responsible for the document. When examining the descriptive documents for each process, no individual is responsible for establishment of the required documents, and in the template for the Critical Issues Checklist, there is only a blank column for the person responsible for each task. However, when examining the project specific documents and cross-referencing the ones provided from all three projects, there is a possibility to understand who is generally responsible for the document. An example is the Design Management Meeting protocol where the project engineer seems to be the one responsible for all three case projects. However, the responsibility is not stated anywhere in the VLS. The lack of ownership over the document may contribute to the lack of use and adaptation of some of the documents that are coded as *template-based use* and classified as coordinating. The Internal Inspection Plan is an example of where they for the project Kv. Atlas has started the document, distributed responsibility among the site manager and two supervisors, and filled out the cover sheet, but then just left most of the document untouched for the rest of the project. This indicates that even if someone is responsible for initiating a document, the continuous use and updating of the document can still be missed. Over time, this could potentially cause confusion and misunderstanding regarding what work has been carried out and who should be held accountable.

5.2 Interviews

Based on the coding mentioned in the method chapter, the findings will be presented divided into the codes for the content. The codes for interactions will further be

mentioned within the analysis to support the findings and strengthen the weight of the answers from the interviewees.

5.2.1 Positive feedback

A common theme during the interviews was the positive feedback that the Critical Issues Checklist received. The participants agreed that it has a good structure, and when used correctly, it can be used as a strong support for both quality and regulatory compliance.

“But overall, very, very good, and as I said, I think the Critical Issues Checklist could be very valuable. In other words, if you work according to it and do it properly, you will end up with a better project, I would say.” – Site Manager

This indicates that the checklist is primarily perceived as a structuring support rather than a controlling instrument. Another participant mentioned is that it provides an overall picture of the status of the project when filled out correctly. This aligns well with the level of completion when looking at the document for the three case projects, which all were filled out to at least 50%.

Another thing that was mentioned in two of the interviews was that the structure of the VLS is good, and that the system of folders and template makes it easy to find what you are looking for. Furthermore, all four interviewees agreed that the system has good potential, but that the execution is the part lacking in this case.

“I think the VLS is much clearer now compared to the older version.” – Project Engineer

“There is a good structure and good templates to use as a starting point. However, they can rarely be used as is and need tailoring towards a specific project, but since we have done that for a while now, we are pretty good at it.” – Project Manager

The head of Tendering & Estimations further agreed that the VLS itself often is considered sufficient, but that the use in practice is where it often fails.

Furthermore, the work environment risks were also pointed out as something that the VLS functions well to capture. For example, one of the site managers explained that it is rare that a work moment gets delayed due to unsafe work environment, which indicates that the risks have been considered and measures have been taken if needed. When examining the Risk Assessment documentation provided for the document study, it was clear that the vast majority of the identified risks were connected to safety of the work environment.

5.2.2 Criticism

The Critical Issues Checklist is also a topic of criticism. All participants mention that the Tendering & Estimation process (phase 2) gets left out, leading to the Risk Assessment document being insufficient when trying to capture all risks during the entire project.

“We never receive the Risk Assessment filled out.” – Project Engineer

The VLS states that the Tendering & Estimation team should set up the document, and then hand over to the next phase, however it's still not included in the Critical Issues Checklist which makes sure that everything gets done correctly. The Head of Tender & Estimation agrees that their department often lacks compliance with the VLS when documenting the identified risks, and that the section of the Risk Assessment documentation for the Tendering & Estimation often only gets filled out by the head of department. Furthermore, he states that most of the quality work done by his department is done outside the VLS documentation, limiting the possibility to share acknowledged risks throughout the estimation process with the rest of the project organization. This indicates that the main issue isn't the method of how they work with risk assessment, but rather lack of integration in the formal quality system, leading to misunderstandings in later processes.

All participants agree that this critique is closely connected to the lack of a structured handover between the phases which may be causing the frustration sensed by the interviewees. In one interview, they mention that there aren't any requirements for documented handover, which implied a lack of routine. In another interview, they discuss how the handover got missed completely, leaving them to fully interpret the documents without any guidance. And again, when examining the Risk Assessment documents provided, the Tendering & Estimation team aren't included as contributors.

The interviewees further critique how tasks get checked off in the Critical Issues Checklist without completing or sometimes starting the task. They agree that it most likely happens since it is motivating to see the percentage approach 100% which makes them feel accomplished. However, in two of the interviews, they also discussed the lack of status options for evaluating the tasks in the checklist. One interviewee explains that sometimes they mark the task as done when they have started it, which often results in the task being overlooked the next time an evaluation of the progress is happening.

“Done can mean different things. It doesn't have to be completely done; it can also be done when the process is started or established” – Site Manager

This highlights how formal completion in the checklist does not necessarily reflect actual progress or execution, which risks creating a misleading sense of control. The pursuit for 100% completion aligns with the high level of completion acknowledged when studying the documents from the three case projects. No further cross-referencing between documents or tasks mentioned in the Critical Issues Checklist have been done, which means that the interviewees' reflection about the dishonest use of the checklist can be interpreted as likely.

One interviewee strongly criticizes the preparatory work with the Method Statements. An example is made describing how the Method Statement for the most critical part of the building in the primary case project isn't altered beyond the template, and even the template is barely filled out. The interviewee describes a frustration for the laziness that occurs even though “everyone” knows that the more prepared you are the better the work. The same interviewee describes another example where the Method Statement was carefully prepared by supervisors and subcontractors, and how the

work was carried out without any unforeseen events or mistakes. This indicates that the Method Statements actually are useful for the work carried out on site.

5.2.3 Improvement suggestion

In all interviews, suggestions for improvement of the VLS were made based on what they were positive about and what they critiqued. Everyone agreed that the status for the tasks in the Critical Issues Checklist should be developed and/or expanded to further accommodate the actual status of a task or documents. Furthermore, in one interview, they discuss the possibility to add a column for the date when the document had been last revised, which makes it possible to highlight tasks that need to be updated or redone multiple times during the project.

“Once a cell has been marked as completed and a revision date has been added, it is displayed in green. Some form of coding could then be added to indicate whether more than a specified period of time, such as one month or six months, has passed since the revision date.” – Site Manager

One example mentioned was the Work Environment Plan, which often needs to be revisited once a month to avoid fines from the government. Both improvements align with the raised criticism mentioned earlier about tasks being marked as completed and therefore not included in the next progress meeting.

Further, the inclusion of the Tender & Estimation process within the Critical Issues Checklist was also proposed by all interviewees.

“The Critical Issues Checklist template should include a sheet for Tendering & Estimating to make the document active from the Tendering & Estimating phase.” – Project Engineer

Some of the interviewees motivated this by pointing out that the Risk Assessment documentation would be more included in the process if it was a critical point in the project, and others stated that it would provide a more comprehensive picture of the entire project if all processes were included. This is agreed upon by the head of Tendering & Estimation, which identifies the benefits of being included in the Critical Issues Checklist as the responsibility for tasks and documents would get displayed which could limit frustration and confusion aired by the other interviewees regarding missing or incomplete documentation. Furthermore, one interviewee explicitly stated that it also would be interesting to see what risks they acknowledged early in the process, which could nuance their understanding of the entire process. By including the Tendering & Estimation process in the Critical Issues Checklist, their sheet in the Risk Assessment document would both make the work more structured with the need complete tasks on a checklist and make their contributions more visible to the rest of the organization without adding more work to their daily practice.

Connected to handover between processes, the head of Tendering & Estimation suggests dividing the intended handover meeting between them and the design process into two separate meetings. The initial one would then allow for a briefer walk through of the Estimation document that allows the project engineer to start hiring the major subcontractors. Then, the second meeting could go into more detail, relevant for the smaller subcontractors working with more detailed work. An example is made where he describes a case where they made an unusual solution for the roof

trusses, resulting in the need for one less concrete floor, saving money on expensive materials such as concrete. However, if this isn't communicated well to the design team, this finding and economical risk/opportunity might get lost during a shorter, more brief handover meeting. Furthermore, a suggestion for a more developed meeting template for handover, as discussed with the head of Tendering & Estimations, aligns with the critique mentioned earlier from other interviewees about missed or poorly executed handover meetings.

Other suggestions mentioned in the interviews were developing a template to send out to the contractors when gathering their Risk Assessments, making it easier to fill out into the internal Risk Assessment document found in the VLS without increasing the workload. The organizational choice of refusing to use physical folders to store documents and instead work with digital platforms such as Teams or Dalux, as well as standardizing the names of the templates to make the VLS easier and more foolproof to work with was also suggested. However, one interviewee disagreed with the need for standardized name, and instead pointed out the importance of teaching the employees to work within the folders and how to search for documents, both within and across projects. Lastly, altering some of the tasks in the Critical Issues Checklist to make sure that the user either only is presented with one way of doing something, or a specified choice, which would force everyone to follow a stricter routine of their projects.

During the interviews, company culture was discussed in relation to where employees primarily focus their efforts beyond minimum requirements. Participants consistently described a strong economic focus, where purchases and decisions are carefully evaluated to ensure cost-efficiency and optimal resource use. However, different perspectives emerged regarding how this cultural focus influences quality work. One pair of interviewees suggested that a shift in focus toward quality could encourage greater effort in quality-related activities. In contrast, another pair emphasized the potential of leveraging the existing economic mindset by framing quality improvements in terms of financial benefits.

As an example, they described how more thorough risk assessments could lead to better-prepared method statements, which in turn enable more accurate planning of materials and labor. This reduces uncertainties and inefficiencies, ultimately contributing to cost savings for the organization. This suggests that quality management practices may need to be aligned with existing organizational values, rather than introduced as separate priorities, in order to be effectively adopted in practice.

5.2.4 Practical example

Another practical example mentioned in the interviews beyond the once already mentioned above is how some of the interviewees have solved the lack of documentation for a specific task by creating a template of their own.

“But I get the risk assessment in many different formats, like PDFs, Word files, and Excel files. So to avoid this have I prepared a template and an email where I have written what I want back from them and why, and that they can fill out the template from which I

then can copy and paste the information back into my Risk Assessment document. “ – Site Manager

This had both saved time when transferring the data, and made it clearer to the subcontractors about which data was interesting and needed from them before they could start their work on site. The results from the prepared email and template sent out to the subcontractors could be witnessed in the Risk Assessment document, which was adequately filled out, both with the risk evaluated for probability and severity, and actions to minimize the risk, for almost all of the subcontractors. Another site manager described an excel template, also tracking all the subcontractors, but mainly related to the billing process. The columns included information about guarantee-time, insurance documentation, and other contractual information that was required. This matrix made it easy to check if the subcontractors had completed their end of the agreement before they got their first payment. These examples illustrate how practitioners actively develop workarounds to compensate for perceived limitations in the formal VLS structure.

Lastly, in two interviews, they mentioned the use of moisture round to ensure quality and regulatory compliance connected to risks with moisture. A moisture round is the activity when a consultant visits the work site measuring the moisture levels in different parts of the building to ensure it is dry enough before final inspection. In both cases, they had hired a consultant who a few times during the project came on site, evaluating the construction based on the Moisture Control Plan to make sure that the contractors had built according to standard. This method of continuously checking the work is mentioned as a part of the subcontractors work as well. However, many of the interviewees agreed that this practice was insufficient.

5.3 Observations

Two observations took place at the primary case, Båken, during the work with this thesis. The first visit took place during a startup meeting between the site managers, the internal supervisor, and subcontractors early in the production phase. The meeting was meant to start dialogue between the parties involved for assembling and mounting the façade pieces. Each party got a chance to brief the rest of the group on the concerns or risks that they had identified when starting to prepare for the work. As mentioned in Chapter 3, scratch notes were taken during the meeting, making sure to capture the interaction between the participants, but also questions that arose during the meeting.

A key observation from the meeting was the high need for collaboration between subcontractors, which required continuous coordination and adaptation. Scheduling was the main topic for the meeting since actors were dependent on each other to be able to carry out their work. One concrete example is how the sheet metal worker needs to finish their work in the façade before the carpenters can place the window frames on the façades. However, they also need the scaffolding to be in place to be able to place the window frames on the floors higher up. The glazer needs the window frames to be put in place before the glass can be mounted, but the scaffolders need to place bracers and stabilizers within the building to make sure that the scaffolding stays in place. To make sure that the work can continue, careful scheduling is therefore required to ensure all subcontractors can work simultaneously, which saves both time and money. Based on the documents provided from the primary case

project, there weren't any minutes taken during this meeting. That aligns with the observations made during the meeting itself.

The other observation took place a month later, when the main structure had been placed, and the scaffolding and mounting of window frames and glass partitions had begun. There was a possibility of asking questions to the carpenters placing the window frames, but also a time to look at how the work actually had been carried out. Questions about how they had prepared for this work and if they had to think about other risks during the placements got asked, and they answered even if the bigger context with a sloped façade with different from how they usually work, it is still a window frame that is going to be place in a hole in the façade which is the same as they usually do. They further described the most critical part as the scheduling between contractors, but that compared to what they discussed in the beginning, the actual workflow in the end was completely different. One example they mentioned was how they had planned to mount the window frames into the concrete walls, where they later found out that their planned way wasn't possible, and that they needed to find a new solution right on site. This suggests that even if you carefully prepare before a critical moment, unexpected challenges can still occur which you need to solve on the spot.

Despite them answering that they had planned how to carry out the work, the Method Statement delivered for the document study was, as discussed earlier, not satisfactory. These findings contradict each other where on one hand, the carpenters describe how they had planned to work beforehand, and on the other hand, the Method Statement is barely filled out.

5.4 Responses from respondent validation workshop

As mentioned, two respondent validation workshops were held. The first one with the interview respondents guided the refinement of the primary improvement proposal, and the second workshop with the HSQE and top management primary validated the final proposal. The findings will therefore be presented separately.

5.4.1 Workshop with interview respondents

During the first respondent validation workshop, the interviewees from the study participated, as well as the supervisor from the Tornstaden. The aim of the workshop was presented to the participants as an opportunity to review the initial identified challenges based on the document study, interviews, and observations. Together with the main identified challenges, a first set of proposed improvement suggestions were also presented. The respondent asked questions throughout the presentation to better understand the reasoning behind improvements suggestions. After the presentation, their initial response was that the suggested improvements proposed had captured their comments and concerns from the interviews well. Furthermore, feedback was received regarding how the improvements suggestions should be presented to better understand the core of the suggestion, and to not make it feel heavy and overwhelming.

After some general discussion about the work for this thesis, a few other comments arose regarding more specific improvement suggestions. For example, if standardized file names really were necessary and not just nitpicking. Another example was whether the Method Statement is the right document to serve as a notebook for

comments and concerns during the design process. These comments concerned specific improvements suggestions rather than the overall structure of the VLS.

A comment related to one of the main challenges was that some more work was needed regarding handover practice. The primary suggested improvements regarded a recommendation for including handover meeting as an item on the Critical Issues Checklist, and the possibility of using a standardized meeting template to make sure everything gets included during handover. However, the comments suggested that that setup might need reconsidering regarding how, when, and with whom the handover meetings should occur.

Before the meeting ended, one participant said that the suggestions needed to be less academic and easier to understand. That would make them feel more achievable and easier to implement if they were written more for them and less as a formal statement.

To summarize, the general perception of the improvement suggestions was that they had captured their main concerns regarding the VLS and quality management system. However, the presentation of the findings and the suggestions needed some alterations to better appeal to the intended audience at Tornstaden.

5.4.2 Workshop with top management

During the second respondent validation workshop, representatives from the company's top management participated together with the company supervisor. Since this was their first direct involvement in the study, the aim of the thesis and the refined improvement proposals were presented to them.

Overall, the participant expressed agreement with the identified challenges and described them as familiar within the organization. Several of the issues raised in the study were already part of ongoing discussion at management level. For example, increased digitalization was mentioned as an area currently being evaluated, where the organization is working towards identifying a suitable implementation plan. At the same time, some of the improvement proposals were new to the participants. In particular, the suggested updates to the Critical Issues Checklist, including the integration of the Tendering & Estimating phase and revised status options, which were described as relevant and potentially feasible to implement.

The discussion regarding the Risk Assessment reflected similar patterns as in earlier findings. Participants stated that quality and risk-related work is often carried out in practice, but that documentation of these activities is inconsistent. In this context, the company culture was highlighted as an important factor, where quality-related work can be connected to economic efficiency. This is already a well-established focus in the organization.

The handover between phases was also discussed. Participants described this as a challenging process to standardize due to variations across projects. However, the suggestion to involve department heads in further development of handover routines was described as relevant, given their responsibility for different project phases.

In summary, the refined improvement proposals were generally perceived as relevant and aligned with the current organizational challenges. Some proposals were already

under discussion, while others introduced new perspectives that were considered applicable for future development.

5.5 Summary of empirical findings

When reviewing the findings from the data sources, a few consistent patterns were identified regarding how quality management and inspection practices are applied in three construction projects.

First, lack of continuity between project phases was identified. Important documents such as the Risk Assessment were not consistently transferred or updated, which limited the visibility of quality-related information throughout the project lifecycle.

Second, the use of quality documents was found to be inconsistent. While tools such as the Critical Issues Checklist were frequently completed, interview findings indicated that this did not always reflect that the underlying tasks had been carried out. In several cases, checklist items were treated as status indicators rather than as verification of completed work.

Third, responsibility for key documents and tasks were described as unclear. This resulted in variation in how quality work was performed and followed up, which contributed to missed updates and gaps in the documentation.

Fourth, informal workarounds were commonly used across projects to compensate for limitations in the formal system. These included project-specific templates and alternative communication routines, which supported local work but were not consistently shared across projects.

Finally, challenges related to knowledge transfer between project phases were identified in both interviews and workshops. Participants described handover processes as informal or insufficient, and highlighted the difficulty of ensuring that knowledge and documentation were passed on in a structured and consistent manner. Together, these findings illustrate how the VLS is applied differently in practices across projects, and highlight recurring challenges related to continuity, responsibility, and the use of quality-related documentation.

6 Discussion

The discussion is presented in three sections, reflecting the iterative development of this study. First, the current system is evaluated against relevant theory to establish the basis for improvement. Second, an initial improvement proposal is evaluated from a theoretical perspective. Finally, a refined proposal is discussed, incorporating insights from the respondent validation workshop.

6.1 Evaluation of the current quality management system

When revisiting the theoretical framework in the light of the empirical findings, several clear connections emerge that help explain how quality management and inspection practices are enacted in practice. The theoretical concepts presented in Chapter 2 are used to interpret the empirical findings, enabling the identification of underlying mechanisms and explanations for the observed practices. Together, these perspectives provide an understanding of how quality management and inspection are carried out in practice in relation to how they are intended to function within the formal system. A central theme concerns the use of inspection and other quality control (QC) tools as primarily reactive mechanisms within the quality management system.

Both the interview data and the document analysis indicate that the Critical Issues Checklist is consistently filled out to a higher degree, yet often without clear evidence that the underlying tasks have been fully completed. This pattern aligns with Koch & Buser's (2020) description of formal quality systems being perceived as obligations that must be fulfilled rather than as tools for learning or improving, reinforcing a "tick-the-box" behavior. Although the checklist is intended to function as a progress-tracking and control instrument, the findings suggest that it often becomes another administrative document to be completed, rather than an effective means of ensuring that critical work is actually being carried out. This aligns with the description of a weak enforcement culture of formal systems by Bröchner et al. (2002) as well.

A second theme relates to the gap between formal strategy systems and everyday project practices. Interviewees generally describe the VLS (the Internal Strategy system) as a well-structured management system, supported by clear templates that provide a useful starting point for project work. This aligns with Winch's (2010) view of quality management systems as frameworks intended to describe and guide how work should be carried out. However, Winch also emphasizes that routines and practices are shaped over time through experience and local project conditions. The findings indicate that the main challenge is therefore not the absence of formal systems, but how well the systems align with daily work practices. The Risk Assessment document illustrates this gap clearly: while formally embedded in the quality management system, it was described as rarely fully completed, with risk assessments often being carried out outside the formal documentation. This reflects previously identified difficulties in implementing formal quality systems within the fragmented and practice-driven context of construction projects (Landin, 2000).

In response to these misalignments, project actors frequently developed local workarounds to compensate for limitations in the VLS. Such practices are consistent with Winch's (2010) argument that formal quality management systems rarely prescribe work practices in full. Construction projects are characterized by

uncertainty, time pressure and situational constraints, which encourage reliance on experience-based judgement and locally adapted solutions. In this study, workarounds, such as creating project-specific templates or alternative communication routes, should not be interpreted as negligence. Instead, they highlight points where the formal system fails to adequately support practical needs.

These workarounds can also be understood through the lens of organizational learning in project-based organizations. Eriksson & Leiringer (2015) describe how learning in such contexts often takes an explorative form, where existing knowledge is refined and reused rather than fundamentally transformed. The development of Excel templates and standardized email drafts across different projects illustrate how practitioners draw on experience from previous projects to improve current practice. While this shows effective learning at the project level through knowledge codification, the learning largely remains local and informal.

The literature further highlights the challenges project-based organizations face in structuring handover and knowledge transfer between projects (Eriksson & Leiringer, 2015). This challenge is evident across all three case projects, and interviewees consistently pointed to the lack of integration of the Tendering & Estimating phase into the Critical Issues Checklist, as well as the absence of standardized templates for collecting self-inspection documentation from subcontractors. These recurring issues indicate fragmented communication between project phases and suggest missed opportunities to identify and address systemic problems earlier.

Unclear responsibility and ownership for key documents further intensify these challenges. Interviewees commonly describe uncertainty regarding responsibility for documents such as the Risk Assessment and the Critical Issues Checklist. Winch (2010) emphasizes the importance of clearly defined responsibility for achieving and maintaining quality. When ownership is unclear, tasks risk being overlooked, updates are missed, and the effectiveness of the quality management system deteriorates.

Despite these issues, the document analysis showed that the Critical Issues Checklist exceeded a 50% completion rate across all case projects. On the surface, this suggests consistent task completion and follow-up. However, the interviews indicate that these figures were often perceived as optimistic, as tasks were sometimes checked off to maintain high completion rather than to reflect actual execution. As a QC instrument, the checklist therefore primarily measures activity rather than process quality. Consequently, high completion rates may create a false sense of security, masking underlying quality risks. One example observed for one of the cases was when the Risk Assessment document was checked off in the Critical Issues Checklist, but the Risk Assessment document itself didn't exist. This clearly demonstrates that high checklist completion does not necessarily equate to high quality outcomes.

Together, these findings indicate that while the VLS provides a structured framework for quality management, its current implementation primarily supports control and compliance rather than integration, learning, and continuous improvement across projects. This suggests a gap between the formal systems and how quality management is carried out in practice. Fragmented responsibility and localized learning further reinforce this gap. These findings form the foundation for the suggested improvements discussed in the subsequent sections.

6.2 Evaluation of primary improvement proposal

The improvement proposals presented in this section are based on the empirical findings and the theoretical analysis discussed in the previous section. Rather than addressing isolated shortcomings, the proposals primarily target a set of recurring challenges identified across the case projects. These challenges include fragmented responsibility between project phases, limited continuity of documentation and handover practices, and a predominance of control-oriented quality routines that emphasize formal completion over actual execution.

As discussed in Chapter 6.1, these issues are closely related to the characteristics of project-based organization and the way quality management systems are implemented in practice. Prior research highlights how fragmented organizational structures, unclear ownership of quality-related documents, and weak feedback-loops constrain learning and continuous improvement in construction projects (Eriksson & Leiringer, 2015; Koch & Buser, 2020; Winch, 2010).

Consequently, many of the proposed improvements focus on strengthening the structure and clarity of the existing quality management framework, particularly in relation to identified issues such as unclear responsibilities, inconsistent documentation practices, and weak handover routines. Importantly, these improvements are not intended to increase control for their own sake, but to address these underlying issues by improving coordination, accountability, and knowledge transfer across project phases. The proposal should therefore be understood as interconnected measures aimed at addressing the root causes of the identified challenges, rather than isolated solutions.

In the following subsections, each improvement proposal is evaluated in relation to the empirical findings and discussed through the theoretical lens established in Chapter 6.1.

6.2.1 Demand increased digitalization

The first improvement suggestion is the demand for exclusively working digitally with the VLS and quality management system. This suggestion solves invisible risk assessments, insufficient or missed handovers, or the lack of continuity in documentation over project phases. The benefit of a digitalized system further aligns with Hussamadin et al. (2023) who argues that performance increases with digital quality control systems. For Tornstaden, this would simplify the process of storing documents and put pressure on the subcontractors to hand over digital copies on their self-inspections. Further, working with digital quality control measures increase continuous improvement within the organization (Lundkvist et al., 2010), simplifying the process of utilizing already collected information for future projects or processes.

By enforcing a fully digital quality management system, several challenges identified in the empirical findings such as invisible risk assessment, insufficient or missed handovers, and lack of continuity on documentation of project phases are directly addressed. Complete digital documentation would provide a practical way of ensuring visibility and continuity of quality-related information throughout the project life cycle, reducing the risk of paper products being stored locally in personal folders or remaining inaccessible to other project actors. These benefits align with Hussamadin

et al. (2023) who argues that performance increases with digital quality control systems. Further, working with digital quality control measures increases continuous improvement within the organization (Lundkvist et al., 2010), simplifying the process of utilizing already collected information for future projects or processes.

6.2.2 Update and expand Critical Issues Checklist

The second improvement proposal concerns updating and expanding the Critical Issues Checklist by revisiting both its structure and content. The empirical findings showed that the Tendering & Estimating phase is insufficiently integrated into the checklist, which limits continuity of risk information and quality-related decisions across project phases. The solution to include the Tendering & Estimating department as a separate section in the checklist provides a way of linking early project decisions to later stages of design and production. It also introduces clearly defined tasks and checkpoints for the tendering phase, creating continuity and a more consistent structure across all project phases.

By integrating the tendering phase into the same checklist structure, information identified early in the project is not lost between phases but instead becomes part of a continuous process followed throughout the project. This reduces the fragmentation between phases and creates shared visibility of risks and decisions across the project lifecycle. This adjustment directly addresses challenges associated with project-based organizations, where fragmented structures and phase-based handovers often constrain knowledge transfer (Almaian & Bu-Qammaz, 2023). By activating the checklist already in the early project stages, initial risks and critical assumptions become visible to subsequent project actors. This supports knowledge articulation across phases and reduces the risk of broken feedback loops that have previously been identified in fragmented project settings (Eriksson & Leiringer, 2015; Lundkvist et al., 2010).

A further modification involves expanding the checklist with revision dates and references to document storage locations. Interviews and document analysis revealed that checklist items were frequently marked as completed without clear evidence that the underlying work had been carried out. Introducing revision dates and document references therefore increases the burden of proof associated with completion and makes premature status marking more difficult. This shifts the checklist from indicating that a task has been completed to verify that the underlying work has actually been carried out and documented. In this sense, the proposed changes support a more systematic and traceable quality management process, where completed activities can be followed up and validated, which aligns with the principles of ISO 9001:2015 (Swedish Institute for Standards, 2015).

In addition, the introduction of expanded status options, such as *established* alongside *not started*, *ongoing* and *done*, addresses the empirical finding that documents were often treated as final once marked as completed. The *established* status makes it possible to distinguish between documents that have been set up and those that require ongoing updates throughout the project lifecycle. This reduces the risk of quality control systems focusing on reported activity rather than actual outcomes, a limitation previously identified in control-oriented quality management approaches (Winch, 2010).

Finally, updating and clarifying the existing checklist tasks contributes to reducing ambiguity regarding what constitutes task completion. Several checklist items were described as unclear or insufficiently specified, which increased the risk of inconsistent interpretation between project actors. In line with ISO 9011:2015, which highlights the importance of structured governance and clarity in process requirements, more precisely defined tasks reduce uncertainty in execution and limit the occurrence of checked off but uncompleted work (Swedish Institute for Standards, 2015).

6.2.3 Update routine connected to Risk Assessment

The third improvement proposal concerns updating the routine connected to the Risk Assessment document. The document analysis revealed that the Risk Assessment was referred to using different names across project phases, which contributes to uncertainty regarding its scope and purpose. In a project-based setting, where continuity relies on shared understanding and consistent documentation practices, this inconsistency risks undermining the role of the document as a common reference point throughout the project lifecycle. Introducing a single, standardized name for the document therefore provides a low threshold but effective way of reducing ambiguity and strengthening continuity across phases.

In addition to terminology, the empirical findings highlighted recurring uncertainty regarding responsibility for maintaining and updating the Risk Assessment as the project progressed. Clarifying document ownership within the template, by explicitly stating which role is responsible throughout the project phases, offers a practical mean of increasing accountability. When responsibility is clearly assigned, it becomes easier to direct questions, identify gaps, and ensure that updates are carried out as intended. This aligns with Winch's (2010) argument that unclear ownership of quality-related documents weakens their steering function, as responsibility for interpretation and follow-up becomes diffuse across organizational boundaries.

To further support continuity across phases, the Risk Assessment should specify what level of completeness can be expected at handover. By providing examples of expected content when the document is transferred to the next phase, subsequent project actors gain a clearer understanding of what they receive and what they are expected to build upon. This addresses empirical observations of partial or uneven completion and supports a more consistent progression of risk information through the project.

Finally, the proposal to use a standardized template when collecting risk information from contractors and subcontractors directly addresses the administrative burden and variability identified in the interviews. Standardized input templates increase the likelihood of receiving relevant and comparable information, while reducing the need for extensive reformatting and interpretation. From a project-based organization perception, such standardization supports knowledge codification and facilitates the transfer of identified risks between phases, reducing reliance on informal workarounds and individual adaptations (Eriksson & Leiringer, 2015).

6.2.4 Implement handover routine between project processes

The fourth improvement proposal concerns the implementation of a structured handover routine between project phases. The empirical findings showed that

handover between phases was often informal, incomplete, or in some cases entirely missing, resulting in project actors having to interpret documentation without sufficient guidance. Introducing mandatory transition meetings between project phases, supported by standardized meeting protocols, provides a practical way of ensuring that critical project information is transferred in a structured and consistent manner. Including the handover meeting as a required step in the Critical Issues Checklist further increases the likelihood that it is carried out in practice, rather than remaining an informal or optional activity. Together, these measures reduce reliance on verbal communication alone and instead create documented points of transition between phases. From a project-based organization perspective, such structured handover routines are essential for maintaining continuity and accountability, particularly when responsibilities shift between organizational units (Eriksson & Leiringer, 2015; Winch, 2010).

In addition to formalizing the handover, the proposal to divide the transition between the Tendering & Estimating phase and subsequent phase into two meetings addresses the empirical observation that existing handovers are often perceived as rushed and insufficiently detailed. Separating the initial overview of the project actors to first develop a general understanding of the project context before engaging with more complex technical or contractual aspects. This staged approach improves the conditions for meaningful knowledge transfer, as it enables more focused discussion and reduces the risk of important information being overlooked during a single, time-constrained meeting.

From a knowledge transfer perspective, this approach aligns with the concept of knowledge articulation, where experiences and assumptions are made explicit through dialogue and reflection (Eriksson & Leiringer, 2015). By structuring when and how this articulation takes place, the proposed handover routine supports a more effective transition of knowledge between project phases and reduces reliance on individual interpretation and prior experience.

6.2.5 Other suggestions

In addition to the primary improvement proposal, several additional suggestions were identified in the empirical findings. While these are less central to the overall structure of the quality management system, they address smaller but recurring challenges related to information flow and usability of the VLS.

One suggestion concerns the use of Method Statements already during the design phase. The empirical findings indicate that important consideration identified early in the project were not always effectively transferred to the production phase. Using the Method Statement as a continuously updated document from the design phase onward provides a practical way of capturing and communicating such information. It enables project engineers to record early observations directly within the document that will later guide on-site activities, creating a direct communication link to site supervisors and ensuring that the information is available in the context of the specific work task. This creates a more direct link between early project decisions and on-site execution, reducing the risk of relevant knowledge being lost between phases. From a project management perspective, such documentation also supports coordination between project actors, as emphasized by Winch (2010).

Another suggestion involves standardizing file names across the template library. Variations in naming conventions were found to complicate the process of locating documents, both within individual projects and across the organization. Introducing standardized file naming therefore improves accessibility and reduces time spent searching for relevant documentation. In a broader sense, such standardization supports a more structured and consistent use of the VLS. From a project-based organization perspective, this aligns with the concepts of knowledge codification, where consistent documentation practices enable improved reuse and transfer of knowledge between projects (Eriksson & Leiringer, 2015).

Lastly, as discussed in the interviews, the implementation of improvement suggestions should utilize the existing company culture connected to an economy-efficient mindset. Currently, the quality culture is characterized by a collaborative approach where problem solving often occurs with projects, which aligns with the description of Swedish organizational culture by Bröchner et al. (2002). Further, the system of performing good-enough actions in daily quality work matches the observations made by (Koch & Buser, 2020), slowing down the process of reaching higher quality in projects. However, the economy-efficiency culture is more characterized by a strong focus among the employees. By exploiting the momentum of an already working system, the implementation of a high-quality should be easier than introducing the focus as a separate initiative.

Lastly, as highlighted in the interviews, the implementation of improvement proposals should be aligned with the existing company culture, particularly the strong emphasis on economic efficiency. This finding reflects a culture where employees actively seek to optimise costs and resource use, indicating a well-established performance driver within the organization. The collaborative nature of problem-solving within projects, seen in the workarounds mentioned in the interviews, further aligns with the description of Swedish organizational culture by Bröchner et al. (2002), where informal coordination and shared responsibility play a central role. At the same time, the tendency to perform “good-enough” quality work corresponds to the observations by Koch & Buser (2020), suggesting that higher quality levels may not be prioritised unless clearly incentivised.

Rather than attempting to shift this cultural focus, the findings indicate that improvement initiatives should leverage the existing economic mindset. For example, several interviewees emphasised that improved risk assessments and more structured planning could lead to better method statements, enabling more precise procurement of materials and labour. This demonstrates how quality improvements can contribute directly to cost efficiency, rather than being perceived as an additional effort. In this sense, aligning quality management practices with economic incentives may increase the likelihood of successful implementation, as it connects improvement initiatives to an already established and valued aspect of organizational behaviour. This is particularly important in project-based organizations, where formal systems alone are often insufficient to drive behavioural change.

Together, these improvement proposals address the structural causes of the identified challenges, particularly related to fragmented responsibility, limited continuity across project phases, and the dominance of control-oriented quality practices.

6.3 Evaluation of refined improvement proposal

This chapter will discuss and evaluate the refined improvement proposal based on insights from the evaluation of the primary improvement proposal together with comments and concerns from the respondent validation workshop. A summary of the improvement proposals can be seen in Figure 7.

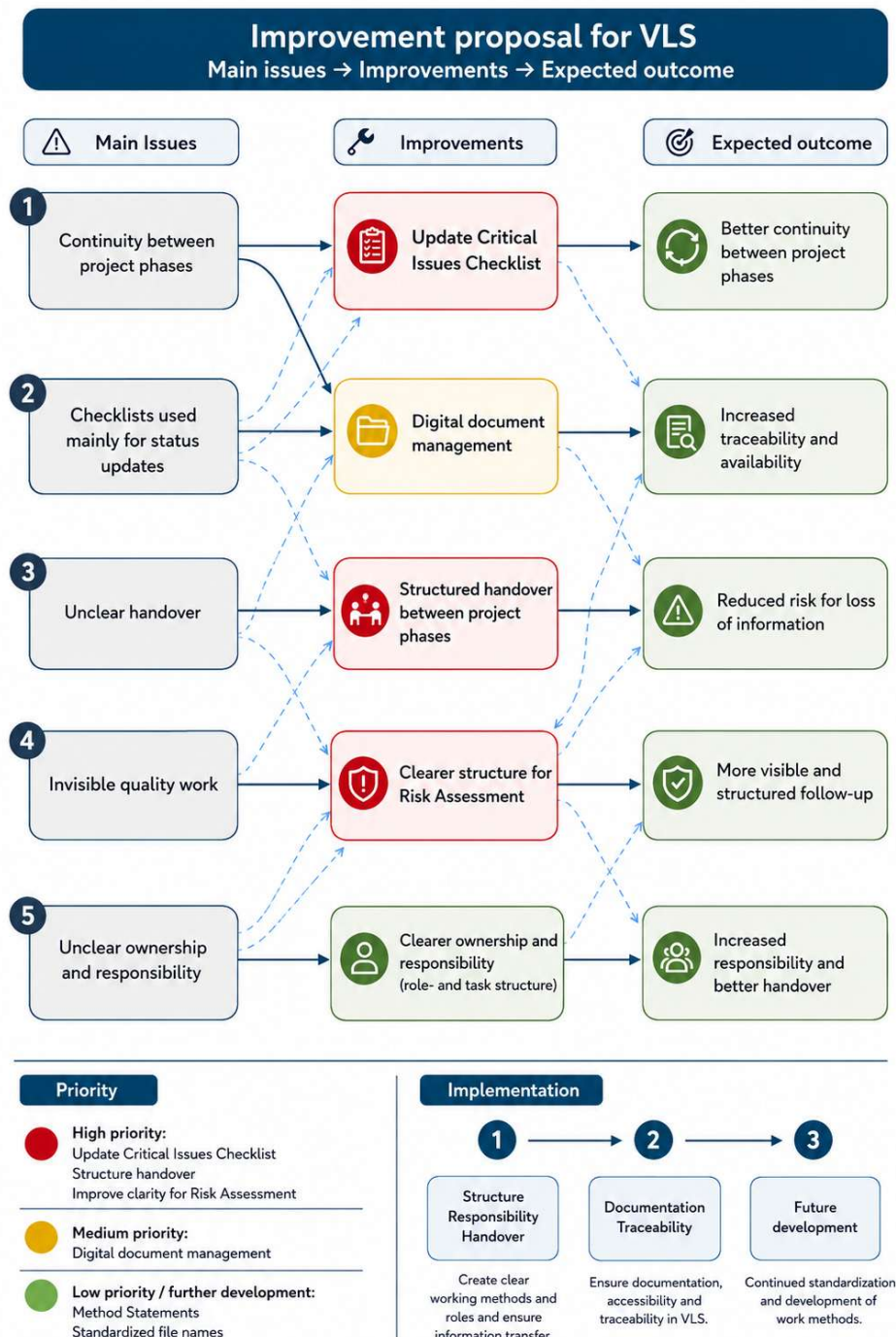


Figure 7 Summary of refined improvement proposals (AI generated)

This summary visually describes the main identified issues, the proposed improvements and the expected outcome from each improvement. Further, the arrows symbolize how issues, improvements, and outcomes are interrelated, either directly or

indirectly. In the left corner, the order of priority can be seen, with which proposals should be implemented first. Lastly, the focus for each implementation step can be seen in the right corner. Each improvement proposal is based on the suggestions mentioned in 6.2, with the alterations described later in this chapter.

6.3.1 Reception of proposals

During the respondent validation workshop, the participants communicated that the presented suggestions seemed to capture their comments and concerns from the interviews. They also said that the proposals were relevant in relation to the scope of the study. This suggests that the scope of the proposals is sufficient and that it has captured the main challenges identified in the empirical findings.

The primary concern raised during the workshop related to the prioritization of the proposed improvements. Participants expressed that implementing multiple changes simultaneously could be perceived as overwhelming, and that a more gradual, step-by-step approach would be easier to manage. This suggests that successful implementation requires alignment across different organizational levels, as the introduction of multiple changes increases the need for coordination and shared understanding. Consequently, relying solely on a bottom-up approach may be insufficient when several changes are introduced at once.

Furthermore, some critiques were raised regarding the formatting and the overall structure of the proposal document. Participants indicated that the formulations were perceived as overly academic and not fully adapted to the intended audience within the organization. This suggests that the level of abstraction and terminology used in the document may affect how accessible and actionable the proposals are for practitioners. In particular, language that is perceived as too formal or academic may create a sense of distance between the content and its intended users. At the same time, there appears to be a balance to strike between maintaining a professional and structured tone and ensuring content remains approachable and relevant for the target audience.

The overall positive from the validation workshop provides credibility for the final improvement proposals since they are based on their comments and concerns from the interviews, but also evaluated and discussed through the respondent validation workshop. This means that the participants of this study had been included multiple times during the work with this thesis where they have had the possibility to raise their concerns and both about the VLS and the proposed suggestion throughout the process.

6.3.2 Need for adjustments

Three concrete adjustments were discussed during the workshop. The first one concerned the handover meetings between project phases, where the suggestion regards having the handover meetings included on the Critical issues checklist together with a meeting protocol template to ensure complete standardization in handover. However, according to the participants, the implementation of this procedure needs to be revisited regarding how, when, and where this handover should take place. It is something that would benefit from a further discussion together with the department heads for the different construction departments since they have overall responsibility for project phases.

Secondly, whether the Method Statements are the right document to act as a direct channel between the project engineer and the supervisors on site. This suggestion would need further evaluation regarding which information should be noted in which document to make sure that allowing this doesn't become a shortcut in using the right documentation.

Third, the use of standardized file names was discussed in relation to its perceived usefulness. Some participants questioned whether this was the most appropriate way to address the identified issues of employees struggling to locate and store documents correctly. Instead, they emphasized that the problem was primarily related to insufficient understanding of the existing folder structure and document management practices. This suggests that improving training and familiarity with current systems may be more effective than introducing additional standardization.

Lastly, the improved status options were discussed in relation to how they should be applied in practice. Participants in the validation workshop emphasized that the main issue was not the number of status options in the Critical Issues Checklist, but rather the lack of clarity regarding when each option should be used. This reflects the empirical finding that documents were often marked as *done* once established, despite requiring continuous updates throughout the project. As a result, there is a need to clearly define the intended use of each status option to ensure consistent application and avoid misinterpretations. This further aligns with the need for well-supported proposals, as too generic improvement proposals easily feel too abstract and irrelevant, making them more difficult to implement or relate to.

6.3.3 Implementation considerations

Considering the feedback from the respondent validation workshop, the second improvement suggestion is tailored to support implementation and reduce challenges in the current situation. A few changes have been made to the improvement proposals, and the overall structure of the document has been updated and adjusted to the intended reader. The final version of the improvement proposal can be seen in Appendix III.

The main challenges identified are still the same in the updated version since no comments on the content were raised during the validation workshop. This section also didn't require much altering in formulation or formatting since the information was structured straight forward and with minimal academic language from the start. The same applies to the introduction chapter which mainly summarizes the aim of the improvement proposal and briefly introduces the method of how the suggestions and challenges have been identified.

Regarding the improvements to the proposals, the handover between project phases has been reconsidered and adjusted according to the feedback. The proposal included the inclusion of the handover meeting as a critical checkpoint together with a standardized meeting protocol, but to better define what the meeting protocol should include would need further discussion among the department heads. The discussion would need to address which headings should be included in the meeting protocol to facilitate sufficient handover and briefing from one project phase to another. The meeting would also need to address if it is reasonable to demand the handover

meeting as a critical checkpoint between all project phases since they sometimes intersect during the project timeline.

One of the non-structural improvement proposals mentioned was the use of the Method Statement as a communication channel for unspecified information from early project phases directly to the supervisors on site. The idea of having this type of channel was praised at the validation workshop, however, the Method Statement might not be the ideal document to use. A workable solution for this might need further discussion, which includes the supervisors on site since they are the recipients of the information and therefore know where and when they are most likely to utilize the information. However, since the Method Statement is the common document that the supervisors use when carrying out work on site, it still might be the best option without implementing another document creating more administration.

The implementation of standardized filenames has been discussed during multiple sessions throughout the interviews and validation workshop. Since this is a minor suggestion, not primarily grounded in one of the main challenges identified, it gets downgraded among the other proposals. While standardized filenames increase uniformity of the VLS, it's not directly related to any of the main issues, and it is easy to work around by using content or name searches in the file manager. Hence, this proposal will have a clear indication that it is highly voluntary and a non-priority.

Lastly, the improved status options require clearer instructions and definitions for when they should be used and what they symbolize. The suggestion therefore also includes clear definitions based on reasonable logic together with the explanation of how the Critical Issues Checklist is used for how each status should be used. Since the checklist also will be updated with revision dates, that column will be used to support the status options mentioned in the definitions of how they should be used.

To facilitate a smoother implementation of any of these improvement suggestions, it is required to have a clear logic for implementation. First, all updates regarding the Critical Issues Checklist have top priority for the suggested improvements since it is connected to multiple identified challenges and is used throughout most of the project timeline. By sorting out the challenges connected to this document, it will clear up how other tasks are carried out and who is responsible for those as well. Ideally, it will create a snowball effect of a more optimized project procedure with less room for error and miscommunication along the way. The second update is the handover meeting, which also is partially related to the Critical Issues Checklist. However, this implementation is likely to go much smoother if the rest of the tasks for each process already is under control. The use of Method Statements as a direct channel for communication between the early project phases and supervisors on site is a clear next step in the improvement of the VLS. However, based on the result from prior improvements, this might not be necessary since a clearer document structure might reduce the need for another communication channel. Lastly, the implementation of standardized filenames may be considered a non-essential improvement, indicating that this might be unnecessary and not solving any of the main challenges. However, there is also no downside to having increased uniformity across the file managers besides the initial work of renaming all templates in the library. To summarize, by utilizing the order of priority in the refined improvement proposal, there might be suggestions that no longer are appropriate or necessary as focal points.

7 Conclusion

This thesis has been examining quality management systems and inspection as a quality control practice in Swedish construction, utilizing Tornstaden as the case company. The work has been guided by the research question:

How are quality management and inspection practices applied in construction projects, and how do they align with the company's formal quality management system?

Throughout the literature, quality management is based on principles that include quality control (QC), quality assurance (QA), and total quality management (TQM), indicating that quality is managed at different levels and with different means. At Tornstaden, the quality management system is based on internal strategic documentations called the VLS, including practices to both support, control and ensure high quality across all construction projects. Their system is set up to track quality and proactively reduce risk from early project phases to final inspections on site. However, through interviews and document analysis, it is clear that the support from the documents isn't enough and that the practitioners don't carry out the work accordingly. Based on the ISO9001 certification and internal quality policy, there is a clear aim for producing high standard buildings through high quality processes, however, empirical findings indicate a divergence between these objectives and actual practices. While the final products are generally completed without remarks, the underlying processes reveal notable deficiencies. It is therefore clear that the quality management system and its supporting documentation need an update to facilitate a better work structure in how quality can be achieved in all aspects of a project, not just the end result.

The main identified issues for the current quality management system at Tornstaden were the fragmentation in project documentation, unclear responsibility for tasks, the use of quality control instead of quality assurance, and lack of continuity for documents across project phases. These issues indicate that the VLS lack anchoring in daily practice and is not adapted to the real situation. Instead, workarounds are being used to solve the lack of adequate document templates, or tasks are being skipped completely. It is without clear responsibility also difficult to hold anyone accountable, leading to misunderstandings and unrealistic expectations of how and when documents should be handed over.

This thesis draws on the quality management literature in construction, inspection as a tool for quality control, and learning in project-based organization to evaluate how quality management is carried out in a Swedish construction company and explains why their system isn't working as intended. Together with the interviews, the theory also supports improvement proposals targeting identified challenges within the current systems that are the main reasons behind the system not working as intended.

7.1 Recommendations

As mentioned, a document with improvement proposals is sent to the case company Tornstaden, describing the main challenges with their current quality management system as well as what could improve and order of priority. The suggestions are related to the documents used in many of the project phases, such as the Risk Assessment and the Critical Issues checklist, targeting solutions that reduce multiple

challenges. Generally, the primary characteristics of a functioning quality management system are a clear structure, obvious responsibility, and good communication which all facilitates less risk of mistakes and undetected errors.

To support an eventual implementation of these improvements, a presentation is also held at the company to utilize the benefits of grounding the proposals in multiple levels of the organization. Further, it is also beneficial to show that the employees have been a part of the work, not making the suggestions feel taken out of nowhere. This could benefit a future implementation and shine light on some of the challenges that they struggle with today, making them more aware of their practices and the consequences that come with them.

7.2 Future research

One of the main limitations of this study is the time frame of which the work is carried out. Therefore, a longitudinal study would be beneficial, capturing the process of implementation and the changes in work procedures for at least one entire project cycle. A longitudinal study would further be able to evaluate the improvement proposals as they are implemented, enabling continuous follow-up of how the organization is responding and reacting to the changes.

Further, it would also be interesting to evaluate the perception of the VLS from more people within the organization. This would provide an even better picture of the current status and allow more people to provide insights into which improvements are the most beneficial. A larger data set would also allow for proper focus group discussion which was rejected as a method for study due to the limited number of respondents. Both a longitudinal study and a broader data set would further result in higher reliability of the results.

Lastly, a deepened analysis from a change management perspective would also be an interesting angle. This analysis would allow for a more thorough evaluation of the implementation process, and drivers and barriers in the organizational culture. For this thesis, it is just something that briefly has been discussed since the topic arose during the discussions. However, by integrating those findings into a change management analysis, the impact of the current organizational culture can be better utilized in the implementation process.

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Appendix I

Interview Guide

The following questions are intended to guide the interview. My hope is that, through discussion, you will reflect on how you approached and conducted your work.

- Can you describe how you worked with documentation and the organizational structure related to quality management within the project?
 - How did you experience this way of working?
- In what ways did you perceive the VLS as a support tool in your work?
 - In which situations were it most useful?
- How intuitive did you find the proposed folder structure to work with?
 - Was there anything that you found unclear or difficult to understand?
- How did you experience the process of ensuring quality and addressing identified risks from the estimation phase through to project completion?
 - What aspects worked well, and what aspects worked less well?
- If you did not use the recommended documents or working methods, how did you instead ensure quality in the project?
 - What were the reasons for choosing that particular approach?
- Do you feel that there is a lack of clarity, guidance, or other supporting information within the VLS?
 - What additions or changes would you like to see?
- How were lessons learned from the quality management work captured and utilized during or after the project?
 - Was this information applied further within the organization, or did it remain within the project?

**Note: This interview guide was sent out in Swedish to the interviewees*

Appendix II

Consent and information about processing of personal data in student thesis

I agree to my personal data in the form of:

first and last name, work title, and personal opinions, thoughts, and reflections

may be treated by Chalmers University of Technology for the study:

Master Thesis at MPDCM – Quality Management in Practice: Tailoring Formal Systems to Project Execution in Construction

The data will be used in a comparative analysis for my master thesis. The purpose is to compare experiences, thoughts and reflection regarding the internal strategy documents available at the company.

The purpose of revealing the first and last name in the recordings is to differentiate the voices during transcription. The work title is relevant to show experience and knowledge about the construction process in the case projects.

Information

Your personal data will be handled as follows:

The sound from the interview will be recorded using Voice memo on my (Ninas) personal phone. After the interview, the recording will be uploaded to the AI service Klang.ai who will transcribe the meeting. When the transcription is done and read through the recording will be deleted from their server and from my (Ninas) phone.

The transcription will be deleted once the thesis is published. Only me (Nina) and the company supervisor will have access to the pure content of the interview.

Your consent is valid until further notice. You have the right to withdraw your consent at any time. You do this through

contacting nina.edofsson@gmail.com or registrator@chalmers.se

If you withdraw your consent, we will cease processing personal data we have collected with the support of your consent. Some information may be saved due to Chalmers obligations under Swedish archive legislation.

Chalmers University of Technology, org. No. 556479-5598 is

personal data controller. You can find Chalmers [privacy policy](https://www.chalmers.se/privacy-policy) at www.chalmers.se.

As a participant you have the right to receive information about how your personal data is processed. You have the right to have incorrect information corrected, redundant data deleted, request that processing shall be restricted, and data transferred to another actor. You also have the right to submit a complaint to the Swedish Authority for Privacy Protection (Integritetsskyddsmyndigheten). Do you have any questions about Chalmers's processing of personal data contact Chalmers's data protection officer at dataskydd@chalmers.se.

I agree that Chalmers University of Technology processes personal data about me in accordance with the above.

Place:	Signature
Date:	Name clarification

**Note: This consent form was sent out in Swedish to the interviewees*

Appendix III

Improvement proposal for the VLS

Improvement proposal

Introduction

This document presents proposals for how the Internal Strategy system (VLS) at Tornstaden can be further developed to better support day-to-day quality management within projects. The proposals are based on a conducted study in which both project-level and organizational-level perspectives were analyzed, with a particular focus on how the VLS is used in practice. The study included analysis of project data, interviews with project actors, and a workshop in which the proposed improvements were discussed and evaluated together with relevant organizational roles.

The study demonstrates that the VLS provides a solid foundation, however, several recurring challenges arise in practice, particularly related to:

- Continuity between project phases
- Responsibility and ownership of documentation
- Follow-up of completed activities
- Handover procedures between different project stages

The purpose of this document is therefore to present concrete and feasible improvement measures that may contribute to:

- Increased clarity in working procedures
- Improved information transfer between project phases
- More active use of the VLS in daily operations

To facilitate implementation, the proposals have been structured and prioritized based on:

- Impact on the identified key issues
- Perceived relevance within the organization
- Practical feasibility

The document is intended to serve as support for the continued development of the VLS, and the proposed measures may be implemented progressively according to organizational needs and conditions.

Identified key issues

The analysis of the VLS and quality management practices within projects reveals several recurring challenges that affect how the system is used in practice. These issues are not limited to individual projects but occur consistently throughout the organization.

1. Insufficient continuity of documentation between project phases

Clear deficiencies exist in how information and documentation are transferred between project phases. For example, the Risk Assessment Template is often perceived as incomplete during handovers, resulting in important risks not being carried forward throughout the project lifecycle.

This leads to:

- Rework being required
- Risks being identified too late
- Important knowledge being lost between phases

2. Unclear distribution of responsibilities within the VLS

There is a lack of a clear structure defining responsibility for specific documents and tasks within the VLS.

In practice, this means that:

- Responsibilities are delegated informally
- Tasks fall between organizational roles
- It becomes unclear who is responsible for follow-up activities

This affects both the quality of documentation and the follow-up of project activities.

3. Checklists functioning primarily as status indicators with limited guidance

The Critical Issues Checklist is widely used to indicate project status, but to a lesser extent as a tool for managing and guiding work processes.

Several issues are associated with this:

- The “Done” status is used even when work has only been initiated
- Tasks are marked as completed without verification
- Follow-up procedures become insufficient

This creates a risk that the system presents a misleading picture of project progress that does not accurately reflect completed work.

4. Risk management activities performed but not visible within the system

Risk management activities are carried out throughout different project stages but are not consistently documented in the VLS.

This results in:

- Identified risks not being communicated throughout the project
- Incomplete or missing documentation
- The system failing to reflect the actual work performed

A particular challenge is that the Risk Assessment template is used differently across project stages, creating ambiguity regarding its purpose, content, and ownership.

5. Unclear and overlooked handovers

Handovers between project phases are often conducted without a clear structure, and in some cases not conducted at all.

In practice, this is experienced as:

- Brief or superficial meetings
- Lack of review of important decisions and risks
- A need for project participants to independently interpret previous work

This leads to:

- Increased uncertainty

- Additional follow-up questions
- Risk of important decisions or solutions being lost

Improvement Potential

Based on the identified key issues and the feedback from the respondent validation workshop, the improvement proposals have been structured and reprioritized. The goal is to facilitate partial implementation where the most critical improvements are implemented first.

High Priority

Update and further develop the Critical Issues Checklist

Problem

The checklist is currently used primarily as a status-tracking tool, which allows tasks to be marked as completed without actually being fully carried out.

Proposal

- Introduce clearer status definitions
- Add:
 - o Revision date
 - o Reference to document storage location
- Create a separate tab for the Estimating/Calculation phase to ensure that the checklist is used throughout the entire project lifecycle

Expected effect

- Increased clarity regarding what has actually been completed
- Improved follow-up of activities
- Greater continuity between project phases

Implementation

- Update the template within the VLS
- Clarify instructions regarding how status categories should be used
- Introduce the updated checklist in pilot projects

Implement structured handovers between project phases

Problem

Handovers are often conducted informally or insufficiently, resulting in loss of information and increased uncertainty.

Proposal

- Introduce mandatory handover meetings between project phases
- Link the meetings to the Critical Issues Checklist
- Develop a simple meeting template

Expected effect

- Improved transfer of information
- Clearer responsibilities during phase transitions
- Reduced risk of misunderstandings

Implementation

- Test the approach in selected pilot projects

- Develop the meeting template together with the project organization
- Establish clear procedures for how handovers should be conducted between phases

Clarify structure and responsibilities related to the Risk Assessment Template Problem

Risk management activities are performed, but the documentation lacks clarity and continuity between project phases.

Proposal

- Standardize the naming convention to: “Risk Assessment – Template”
- Clarify responsibilities for each project phase
- Define what is expected during handovers
- Introduce a standardized template for collecting risks from designers/subcontractors
- Provide clearer descriptions and examples of different types of risks

Expected effect

- Improved visibility of identified risks
- Increased structure in risk management activities
- Better continuity between project phases

Implementation

- Update the template and instructions within the VLS
- Clarify responsibilities within process descriptions
- Introduce an external risk collection template

Medium priority

Ensure digital document management

Problem

Documents are not always accessible, which negatively affects continuity and traceability.

Proposal

- Establish requirements for digital document management
- Ensure that all documentation is stored within shared systems

Expected effect

- Increased accessibility
- Improved traceability
- Better support for future follow-up and organizational learning

Implementation

- Clarify requirements during project initiation
- Communicate requirements to subcontractors
- Ensure compliance throughout projects

Low priority/future development

Use of Method Statement as communication channel

Assessment

The idea of using Method Statement early in the project is considered relevant. However, it remains unclear whether this is the most suitable document for the intended purpose. The objective is to create a channel through which previous project phases can transfer information directly to the construction site.

Recommendation

- Further investigate:
 - o What type of information should be documented
 - o Which document format is most suitable
- Involve site manager and supervisors in the continued development process

Standardization of file names

Assessment

Standardized file naming conventions may improve organizational structure, but their impact on the primary identified issues is considered limited.

Recommendation

- Introduce file naming conventions as a voluntary guideline
- Prioritize training in document management rather than strict standardization

Conclusion and final reflection

The proposed measures are intended to strengthen existing working practices rather than introduce entirely new structures. The VLS already constitutes a stable foundation for quality management and is well established within the organization; however, the analysis demonstrates that several challenges arise in how the system is applied in practice. By clarifying responsibilities, improving handover procedures, and creating greater continuity between project phases, there are strong opportunities to increase the value of the work that is already being carried out.

The proposals have been developed with a focus on practical feasibility and may be implemented progressively based on the organization's needs and priorities. They should therefore be regarded as support for the continued development of the VLS rather than as a finalized solution. Long-term efforts involving continuous follow-up and further development of the VLS are essential to ensure that the system continues to support the project organization effectively.

**Note: This document was sent out in Swedish to the company*



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