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Feeble Project Mandate equal higher cost?

Christian Bakke^{a,*}, Agnar Johansen^b, Kozhen M. Mahmood^c, Steffen Grenland^a

^aStatsbygg, P.O. Box 8106 Dep., NO-0032 Oslo, Norway

^bSINTEF, SP Andersens v. 5, NO-7030 Trondheim, Norway

^cNorwegian University of Life Science, P.O. Box 5003, NO-1432 Ås, Norway

Abstract

This Study presents an analytical assessment of each of the Project Mandates and compares the results with the first estimates and final cost of governmental construction projects. The purpose of the study was to find out whether projects executed by a Governmental Agency (Statsbygg) under a less rigid Quality Assurance System behaves or delivers differently than a project that has undergone the national QA system.

This paper presents the findings of a study where 19 Norwegian governmental construction projects were examined with the intent to analyze the correlation between the relative strength or weakness of the Project Mandate and the development of cost estimates through a project's phases. The study examined projects with estimates below the threshold for the Norwegian government's Quality Assurance system (QA). The project samples, consisting of projects between approx. €7m and €75m, has allowed the authors to examine whether the execution of government construction projects under a less rigid quality assurance system differs from projects that have undergone the national QA system. The relative strength of each Project Mandate was subjectively assessed against parameters related to the project's scope, assumptions and constraints. On average, the Project Mandates were found to be weak, often with poorly defined scopes and unrealistic constraints. The cost development from the estimated pre-design to completion phase showed an increase of 30%. While the lack of strong Project Mandates prevented the discovery of any conclusive findings in the study of correlation between the strength of the project mandate and cost, we believe that this paper presents novel insight into how smaller projects that have not gone through a rigid QA system behave.

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1. Introduction

It is easy to assume that a project that does not have a good and well-defined Project Mandate will run longer and cost more, but is this true? In 1996 the World Bank assessed 1000 projects, Samset et al. (2015) [1]. This assessment showed that 80% of the well-defined projects in the initiation phase were successful compared to only 65% of the less defined projects. The World Bank study showed that a well-defined project in the initiation phase is not equal to a successful project, but it increases the probability for of a successful project.

* Corresponding author.

E-mail address: christian.bakke@statsbygg.no

Since 2001 Norway has had a Quality Assurance system for large governmental projects and a research project that follows up on the results of the QA system - the Concept program. All governmental projects with an estimated cost over €75m (750 MNok) must undergo two quality checks named Quality Assurance 1 (QA1) and Quality Assurance 2 (QA2). QA1 occurs at the approval of the concept and QA2 occurs prior to approval of financing from the Parliament. This study looks into the Project Mandate issued for 19 construction projects between approx. €7m and €75m that have not been part of the governmental Quality Assurance system. All of the examined projects were initiated and completed between 2003 and 2016. The Project Mandate was sent by a Norwegian governmental institution to the Norwegian Directorate of Public Construction and Property Management (Statsbygg). This Study presents an analytical assessment of each of the Project Mandates and compares the results with the first estimates and final cost of each project. The purpose of the study was to find out whether projects executed by a Governmental Agency (Statsbygg) under a less rigid Quality Assurance System behaves or delivers differently than a project that has undergone the national QA system. Finally, the study explores causes that could explain the deviations in the results that have been subject to examination.

The following research questions has guided this study:

Research question 1: Does a weak Project Mandate correlate with increased construction costs?

Research question 2: Are there any differences between smaller projects that have not gone through the Quality Assurance System for larger Governmental Projects in regard to construction cost?

2. Theoretical background

When a project is initiated it is normally based on specified needs or demands from important stakeholders. Every project is undertaken for a specific purpose. Typically, the project owner has a goal that should be satisfied through the results of the project. In a classic project delivery process, the owner identifies the business need and develops it to a level of detail where a separate organization can take over and deliver the results. A contract or a mandate is subsequently entered between the owner and the project delivery organization, deliverables shall be described as precise as possible. With an agreed deadline and cost constraints. The project organization executes the project and delivers the results to the owner. The owner then enters an operational phase where the results are exploited to his benefit and to fulfill his business goals [2.] According to PRINCE2 [3] it is vital for a successful project start-up to start with a Business Case (BC) where there is a strong connection between the BC, the Project Mandate and the Project Brief. Moreover, the BC should provide a description of how the project supports the business strategy, plans or programs. The reasons behind this is to state the customer's quality expectations, to describe the most important acceptance criteria and to highlight the largest risk factors. The Project Mandate can start as a verbal request or a formal document in the beginning. These shall define a high-level context behind the project and what outcomes are sought. According to PRINCE2 the initiation phase is built around the following elements: developing the Project Brief, designing, appointing the project management team and creating the initiation stage plan.

According to PRINCE2 [3] a Project Mandate can simply be a verbal instruction to start a project. Still it should include a minimum of information as shown in Table 1 – PRINCE2 Project Mandate.

Table 1 – PRINCE2 Project Mandate.

Typical Content	Description
The Scope of the project	Expressed in terms what the project shall deliver and what it shall not deliver
Assumptions	If any, what kind of assumptions has been made
Known risk or issues	Any risks or issues that the project team should know about prior to start
Constrains	Typically, budget or time constrains for the projects

The project brief must include high-level information on WHAT the needs are, WHY they are needed, WHO should be involved in the process, HOW and WHEN it should be completed. The aim of the Project Brief is to allow the Project Board to decide if there is sufficient justification to warrant the expenditure proposed by the initiation stage plan. The Project Brief should be tailored to the requirements and environment of each project. It will typically cover the project definition and explain what the project needs to achieve. It shall contain background, project objectives, project scope, outline project deliverables and /or desired outcomes. In addition, the Project Brief should describe exclusions, constraints and interfaces.

The uncertainty assessments at the start of a project is different from the uncertainty debate that goes on during the project by the Project Management. In addition, uncertainty management at the project owner and top management level will often have a different focus than the Project Management. The focus at the start of a project is typically based on finding the best concept that satisfies the stakeholders' needs and that will give the best benefit to the owners and society. For example, when deciding on the best way to cross a fjord, it may be necessary to decide whether a bridge or a new tunnel should be constructed or whether ferry

services should continue to run. In this phase, the project management team is typically more concerned with the uncertainty related to the project's objective on the different solutions and in finding the best and preferred solutions. At the start, the focus is on finding the best concept. Based on limited knowledge of how the concept should be constructed or executed and how easy or hard it will be to execute the different concepts in practice. The cost and time analysis are typically at an aggregated level with high uncertainty, since the concept is not described or planned in detail at this stage. The mutual relation between different concepts and uncertainty on a more conceptual and aggregate level are often more important than estimating the true expected value of the different concepts in the early stages of the process. [2]

Construction costs in governmental projects are estimated by stochastic cost estimations based on the Monte Carlo Simulation (Lichtenberg, 2016) [4]. This produces probability-based estimates that identify the main risk drivers and which includes project-specific contingencies. The formal approved budget for governmental projects such as large public buildings (Museums, Opera houses, University buildings), road and railroad projects is set at the P85 level. This means that the risk of cost overrun is estimated at 15 per cent and that max 3 out of 20 projects should exceed their approved budgets. The budget for the responsible Contractor is usually set to the 50 percentile (P50). The difference between P50 and P85 is set aside as a contingency reserve for the project. Compared to a single-point deterministic estimate in which all elements are treated as if they were certain, the P85 would normally be between 20-30% higher while the P50 is about one standard deviation higher [5],[6].

The maximum cost approved by the Norwegian Parliament is normally slightly lower than the P85 value. The implementing party will however, have to manage the project within a lower budget, which generally corresponds to the P50 value. The proposed maximum cost estimate is normally proposed with deductions for possible simplifications and cuts (cut list) that can be used during the project if the costs are in danger to exceed the maximum budget. The Contractor's maximum cost is lower to avoid incentives of the use of contingency reserves [8]. According to (Welde 2017) [7] the average cost increase for large project from QA1 to QA2 are 40%.

3. Method and research design

In this paper, the development of costs and time estimates through a project's life cycle, from the initiation phase to project completion, is studied and analysed. We started with a sample consisting of 23 small to medium sized Norwegian public civil sector construction projects, completed between 2003 and 2015. During the Study period we had to reduce the number of projects to 19 due to lack of complete datasets. The projects were selected based on the cost at completion between €3,5m (40MNok) and €75m (750MNok). The study follows a quantitative approach. Data was collected from each Project Mandate, the management documents at each phase and various data collected in a database owned and run by the Statsbygg. The final project budget and funding limit for each project were also collected from the database. Earlier cost estimates were collected from each of the project documents together with the date of progression to the next phase.

For each project, the Project Mandate was collected. An assessment of the subjective quality and maturity of each Project Mandate was made to test whether projects with better defined mandates were less susceptible to cost and time overruns. Statsbygg has issued an outline for Project Mandate to be used as a guideline by other state directorates and ministries. This outline, which in short guides the issuer of the Project Mandate to address the need which has triggered the project, the project scope, in time, in substance and in cost, and finally the project's objectives provides the structure from which our assessment of the mandate's quality and maturity is made. The outline provides us with 13 parameters, see Table 2. For each initiation letter a score between 0-5 is given against each parameter. The assessment is subjective and a score of zero means the parameter is unaddressed in the mandate. For a score of 5 the parameter is covered in great detail. All costs have been index regulated to 2018 equivalents.

Table 2 – Description of Parameters.

Name	Description of Parameter
Purpose	The purpose of the project, with description of usage, number of people working / visiting and so on.
Anchored	Is the project tied up to a Master Plan
Ambition	What is the level of ambition with the regard to the quality of materials
Environmental Ambition	What is the environmental ambition for the project
Timeframe	When shall the project or phase be completed
Area	The total gross area of the project
GFA/GIA factor	The factor for Gross Floor Area / Gross Internal Area
Type of Project	New building, rehabilitation of an old build or a combination
Cost	The maximum lease
Finance	How is the project financed, for example by the National Budget or by the lease

Societal goals	Describes the benefit or value the project should contribute to society in the longer term
Business goals	Describes the Project results sought by the end-users
Project goals	Describes the project’s final delivery

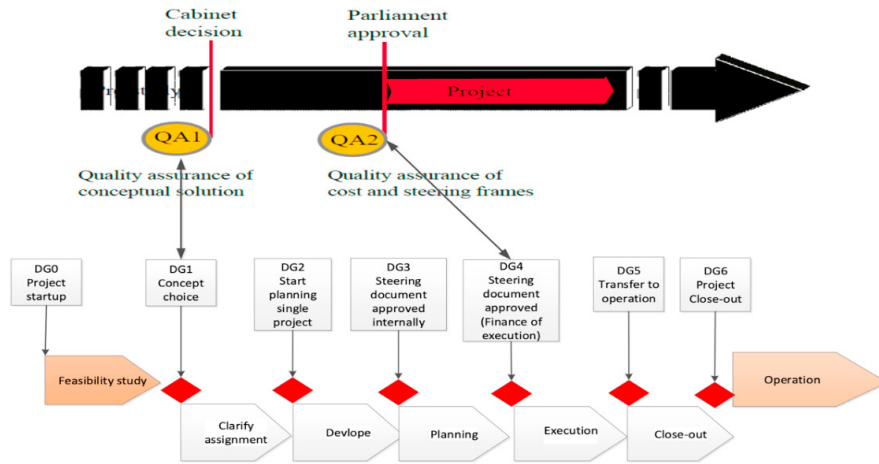


Figure 1 – Statsbygg Project Model together with the Norwegian Quality Assurance regime for major public investment projects.

All the projects followed the Statsbygg Project Model shown above.

Figure 1 – Statsbygg Project Model shows Statsbygg model with the governmental QA model. QA1 correlates with DG1, at concept choice, and QA2 correlates to DG4 prior to the execution phase.

4. Results and findings - are there any correlation between week defined mandate and cost growth?

Figure 2 illustrates how many of the 13 parameters each Project Mandate has addressed. None of the projects managed to address all of the parameters.

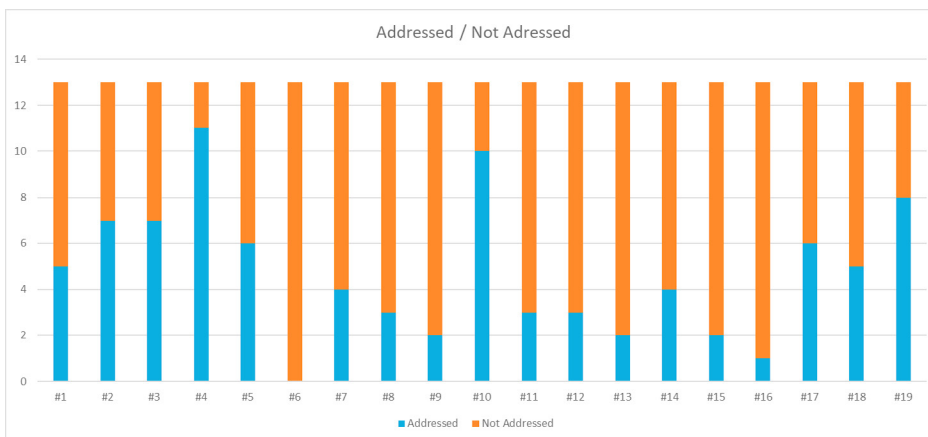


Figure 2 – Project Mandate Parameters.

On average, the Project Mandates only addressed less than half of the parameters.

Project #5 addressed 11 out of 13 parameters shown in Figure 3. The diagram shows the scores from the initial Project Mandate and a updated Project Mandate prior to construction start (DG4 prior to construction). The initial Project Mandate is shown in light blue colour and the updated Project Mandate is shown in dark blue colour. Figure 4 illustrates the average score for all 20 projects

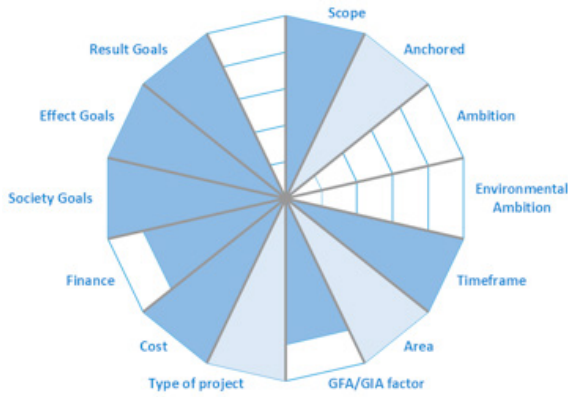


Figure 3 – Spider Diagram Project Mandate for project #5.

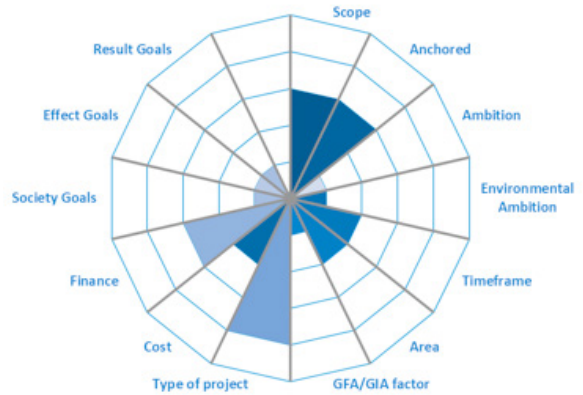


Figure 4 – Average Score, Project Mandate.

Most of the Project Mandates lacked information about Goals and Targets, with a few exceptions. Even the project scopes were poorly defined in the Project Mandate. Timeline established in the Project Mandate was often misleading and not realistic. In general, our assessment is that the Type of Project is defined, to a certain extent the Purpose and that the Project is connected to a masterplan. According to PRINCE2 the Project Mandate shall include as a minimum the Scope of the Project and constrains. Even these basic parameters are not covered in all of the projects. About half the projects did not address the scope or had inadequate descriptions of the scope. Furthermore most project does not state any constrains.

Figure 5 illustrates the cost development for medium sized projects that had an estimated higher construction cost than €14m Figure 6 shows the cost development for smaller projects that had an estimated lower construction cost than €14m. For the projects in this Study we generally see a lower increase compared to projects gone through the QA system. Still it shows a significant increase, on average 30%. This indicates that while the lack of a good Project Mandate is still important for smaller projects the consequences are higher for the larger mega projects. Some of the projects below €30m have been designed to cost so we don't see a significant increase in costs between the earlier phases and the completed project.

This is a lower cost increase compared to Welde [7], at a later stage in the project, but still a significant increase of cost between DG4 and DG5, between the commencement of construction and project closeout.

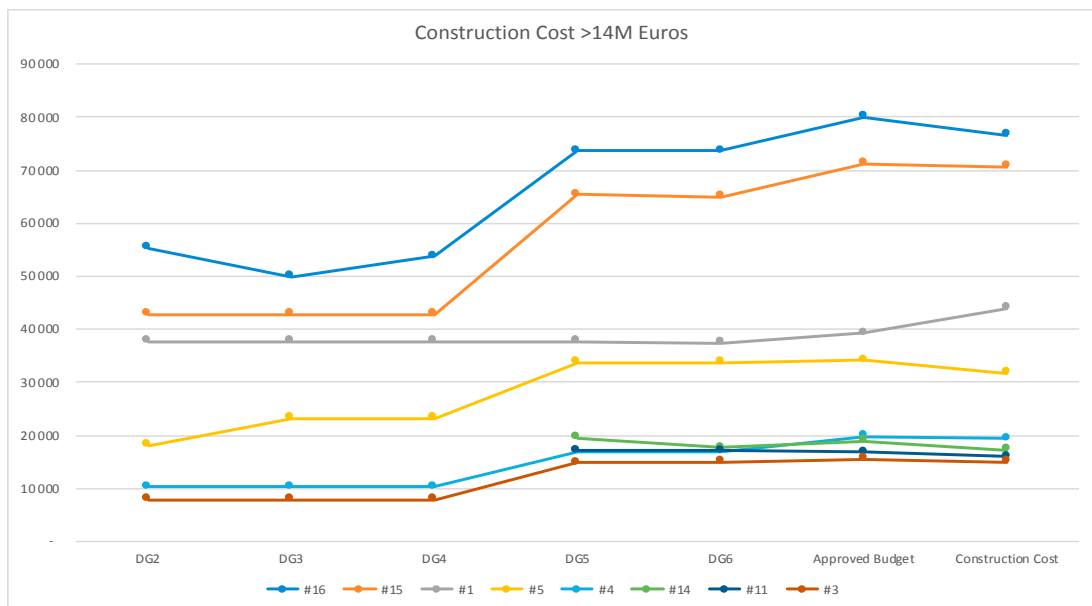


Figure 5 – Cost Development for projects higher than 14M Euros.

Project #3, #4, #5, #15 and #16, illustrates an increase in cost between DG4 and DG5, which indicates lack of a clear definition

of project mandate which we also see in our findings from the project mandate review. Project #4 had the best score according to Table 2 – Description of Parameters and Project #3 had a decent score still we see an increase between DG4 and DG5. Project #15 and #16 only addressed 1 and 2 of the 13 Project Mandate parameters. The cost increase was 34% between DG4 and DG5. All projects show a decrease in actual construction cost towards the approved budget.

Project #1, the numbers from this project indicates that the project has not gone through the internal process for cost control and the project has used a design-to-cost philosophy. According to the Project Mandate review the project addressed 5 of 13 parameters. The Project Mandate did not address the size, cost and finance or any of the Objectives / Goals. Project #14 - had no formal accept of financing before entering the construction phase, indicating that the project did not comply with internal procedures and that the project was designed to cost. For the smaller projects, we see a similar trend as illustrated on the larger projects.

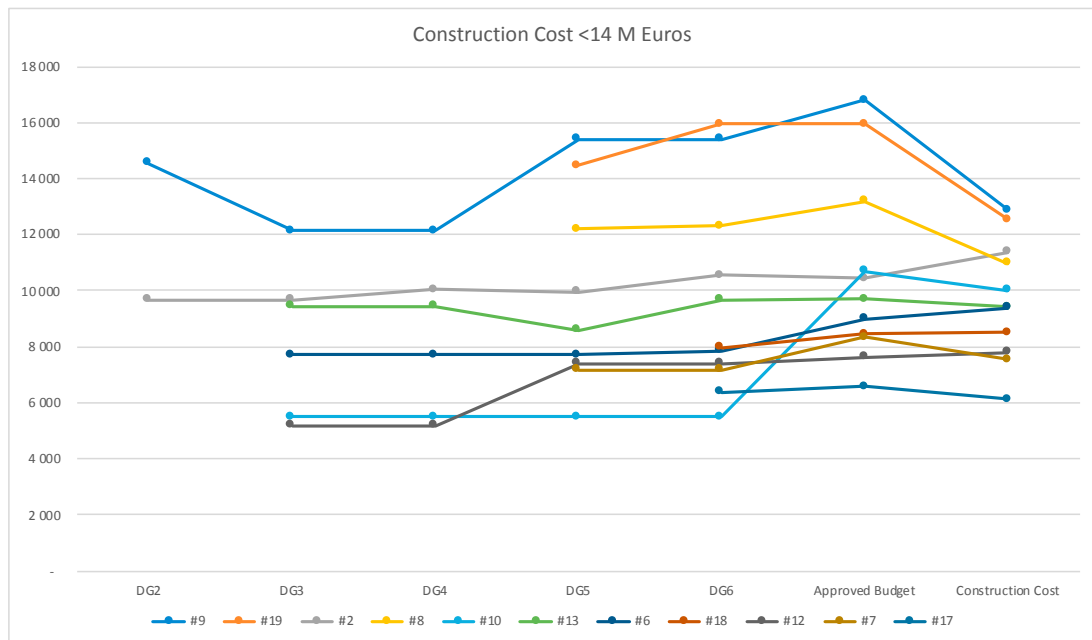


Figure 6 – Cost Development for projects lower than 14M Euros.

Project #9 and #12 illustrates an increase in costs between DG4 and DG5, which indicates a lack of a clear definition of project mandate. Project #9 had 2 updates of the Project Mandate and still came out with an unclear mandate. Project #12 had a decent mandate, however with unclear Goals and Ambitions.

The average cost increase was 54% between DG4 and DG5. All projects show a decrease in actual construction cost towards the approved budget. Project #9 shows a decrease of 23% between the approved budget and the construction cost. Furthermore, all of these projects had a decrease between the approved budget and final construction cost

Project #2, #6 and #13; indicates it has been a strict design to cost. Project #2 had a good project mandate. Project #6 did not address any of the parameters and project #13 addressed only 2 of the 13 parameters.

Project #10, had an unrealistic initial internal estimate, the project was supposed to be “design to cost”, but due to lack of understanding of the complexity of the project, the cost estimate was too low. No contractors were interested in bidding and therefore the budget increased with more than 50% between DG5 and DG6.

Project #8, #17, #18 and #19; had no formal accept of financing before entering the construction phase this indicates that the Statsbygg project model was not followed.

Most of the Project Mandates were vague, had multiple versions and these versions were not updated with new information. Even where the projects have good Project Mandates the estimate between DG4 and DG5 increased. There is no correlation between this increase and the quality of the Project Mandate. About half the projects have a significant increase between DG4 and DG5. The total increase for all project is in excess of 30%. Between DG4 and DG5 the detailed engineering occurs and the customers’ demands and needs are specified to a higher degree. At this stage the budget is approved. Statsbygg takes over the risk after DG5 from the customer. Therefore, Statsbygg has an incitement to increase the cost at DG5. Statsbygg is carrying all

the risk after DG6 and has to cover overruns. The difference between DG6 and the final approved budget are usually price and currency adjustments.

According Statsbygg mandate they shall have a balanced portfolio budget. In light of these results, we can see that “the smaller projects pay for the larger projects”. In these projects Statsbygg had a surplus of €20M/4% of the total construction cost compared to the approved budget.

5. Discussion and concluding remarks

It is easy to assume that a project without a good and well-defined project mandate will run longer and cost more, but is this true? According to this study, most of the projects had a vague Project Mandate and most of the projects had a small increase in the cost estimate between the start of engineering and end of construction. Still there were some that had a well-defined project mandate and still had the same increase between the early phase estimate and cost estimate just prior to the construction. For the projects that have not gone through the QA system, we can see an increase after detailed engineering. Projects that have gone through the QA system, seem to have an increase at an earlier stage in the project (prior to detailed engineering) than those who have not. This indicates that the projects gone through the QA system knows the final cost earlier. For the smallest projects (approx. <€10M) the project strategy has been “design-to-cost”. Therefore, we do not see a significant increase or decrease in the estimates.

This study has the following conclusions:

1. The project mandates are of varying quality and often do not include essential information that should be present at the start of the Project

The studied project mandates showed varying qualities and did not include the basic information that Statsbygg ask for. The Project Managers had to clarify the Project Mandate through dialog and meetings with the client prior to the project startup. The Project Mandate was seldom updated, but changes were tracked through meetings and correspondences. During the interviews, the project managers stated it was a great deal of trust between the clients and Statsbygg for these projects. Since Statsbygg is not supposed to have a profit on these projects, the clients have genuine trust that Statsbygg is not trying to be unreasonable.

2. All projects are underestimated in earlier phases compared to the final cost

All the projects are underestimated in the earlier phases, the same can be seen in large projects that have gone through the public QA-system. During interviews, it was identified that the main reason for underestimating is lack of project goals and that the future needs are not properly identified in the project mandate.

3. A well-defined project mandate gives the opportunity to get a good first cost estimate

This study shows that most of the project had a too low first cost estimate. According to the project managers, this could be prevented with good project mandate that defined the needs and goals of the projects. Still a concern is that the clients does not have the know-how to define these needs and goals, therefore some corroboration between the client and Statsbygg is still required. According to the interviews, most of the changes to the first cost estimate is due to a lack of project goals and increased demands from the clients.

4. Projects gone through the public QA-system, show an increase in their cost estimates earlier in the timeline compared to the projects that have not gone through the QA system

There is a clear indication that projects that have undergone public QA, show a better cost estimate at an earlier stage in the process compared to smaller projects. However, the length of the programming phase is often significantly longer, which is an indicator that the Project Mandates are better developed at that stage compared to those of the smaller projects.

5. Project goals are usually not included in the Project Mandate

Most of the projects in this study did not have any goals in their Project Mandate. The Project Managers blamed the client’s ability to describe the future needs when they wrote the Project Mandate. This easily led to misunderstandings between the Client and Statsbygg when it came to the project needs and goals.

6. There is no indication that an unclear Project Mandate gives cost increase and budget overruns

According to this study, there is a weak to no correlation between an unclear Project Mandate and cost increase and overruns. According to the Project Managers, there has been some misunderstanding about the scope and the final lease due to unclear

Project Mandates. This has introduced friction between the client and Statsbygg, perhaps especially when the final lease is to be negotiated.

It is also important to mention that Statsbygg takes over the cost risk for the project at DG5, which gives Statsbygg an incentive to increase the budget at DG5. Usually, the client is paying for the project through their lease over 20-25 years. Still, a good and clear project mandate will give the correct cost estimates earlier in the process and can also ensure fewer misunderstandings between the clients and Statsbygg.

We believe this paper contributes to the theory with novel insight on how smaller projects that have not undergone a rigid QA system behaves. Consequently, smaller projects may benefit from a QA system if there is a need to see more realistic estimates earlier on in the process. This study indicates that there is no correlation between unclear project mandates and budgeting during the different phases. Still there are indications that when a project with a weak Project Mandate goes wrong, it has larger consequences compared to a project with a clear defined Project Mandate.

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