



Morten Welde

# Cost performance in large government investment projects that have been subjected to external quality assurance

Concept report no. 51



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## **Cost performance in large government investment projects that have been subjected to external quality assurance**

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## English Summary

This study examines cost performance in large government investment projects. The issue is whether projects that have been subject to external quality assurance of their cost estimates – a process known as QA2 – have managed to avoid cost overruns. The aim is to ensure that no more than 15% of the projects exceed their budget (commonly set at the estimated P85 value). We also consider whether systematic causes can explain the deviations from the agreed budgets.

A number of studies have demonstrated that cost overrun is a challenge in most countries and industries. The majority of these studies have focused on the transport sector, most of them on road projects. Chapter 2 contains a review of international literature. With two exceptions, all of the studies reviewed showed that the average cost was higher than budgeted. The variation was considerable. About one-third of the studies showed overruns of less than 10%, while one-third showed overruns of more than 50% above budget.

Previous studies have shown that Norwegian projects perform better in this respect than those from other countries. It would thus be tempting to conclude that Norwegian practice is better than elsewhere. However, as discussed in Chapter 3, features such as differences in governance frameworks, time of the formal decision to build, estimation methods, and price conversion practices typically make cross-country comparisons problematic, and could explain the apparent major differences between studies.

The challenge posed by overruns is well documented, but the underlying causes are less well documented. Some of the most common explanations suggested in the literature are discussed in Chapter 4. Some researchers suggest the main reason for overruns is that planners and decision-makers deliberately underestimate costs to present projects in as positive a light as possible. Although there are examples of this practice, not least in the phase before the final investment decision, the support for what is termed ‘strategic misrepresentation’ is limited in academic literature so far.

Instead, the majority of studies have suggested that scope changes, rework and contract omissions are the main causes of overruns. For example, contracts in which the client retained the scope and quantity risk, may have given contractors and suppliers an incentive to provide unrealistically low bids and instead increase their profit margins through change orders.

The past few decades have seen considerable progress in estimation methods in Norway and in other countries. Through applying quantitative uncertainty analysis, we have improved our ability to identify the main uncertainty drivers in projects, and quantify the needed contingencies to account for these uncertainties. Nevertheless, a number of studies have shown that the degree of uncertainty is generally underestimated.

Chapter 5 describes the data and the issues under investigation. We have had access to cost data from 78 projects. Most of these projects have been through QA2 and have been completed, but not all. In some projects, the final accounts have not yet been closed. In a very few projects, the scope has changed significantly, which means that meaningful comparisons with the original budgets cannot be made. Just over half of the projects are road projects, and the remainder are rail, defence, building projects, and ICT projects.

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The essential issue in this study is the case projects' ability to keep within budgets. We look at whether uncertainty has been properly estimated and whether systematic reasons can explain deviations from the budgets. We do not look at project-specific issues that can only be revealed through thorough evaluation of individual projects.

The results are presented in Chapter 6. The key finding is that cost performance in large Norwegian public investment projects is good. On average, the final cost is 7% below the formal budget. Just over 20% of the projects have had final costs over the budget. Still, this is somewhat weaker than expected. If the Norwegian Parliament's budget is equal to the P85 estimate (which is not always the case), we should expect that a higher proportion of projects would keep within budget. Nevertheless, our findings are considerably better than reported in the international studies referred to in Chapter 2.

Converted to the 2016 value, the total budget of the 78 projects is NOK 124.5 billion. The total for the final costs is NOK 117 billion. In other words, the portfolio of projects turned out to be NOK 7.5 billion (6%) cheaper than budgeted. The results confirm those of previous studies of government projects based on smaller samples. The uncertainty analyses before and during quality assurance (QA2) provide estimates of the standard deviation. A high standard deviation reflects greater uncertainty, which would require a higher contingency. We find that the estimated uncertainty has been too low, especially in road projects. The variation around the P50 in completed projects is higher than what was estimated at the time of the investment decision.

Nevertheless, the risk of large cost overruns seems to be limited. An estimated probability distribution for deviations from the budget shows that the risk of cost overruns above 30% is only 1%. However, the performance of previously completed projects is not a guarantee of how projects will perform in the future. For the state as a self-insurer, and which in principle can diversify between a large number of projects, the results are nevertheless reassuring.

Finally, we look at whether deviations from the P50 estimate can be explained by the size of the standard deviation, year of the investment decision, completion time, number of contracts, time between the investment decision and the start-up, project size, and geography. The spread around the P50 seems to be random, with two exceptions. Projects approved in the years before the financial crisis, i.e. 2004–2008, have had a greater proportion of overruns than projects approved before and after that period. Furthermore, cost performance in urban projects is significantly weaker than in projects carried out elsewhere.

In Chapter 7, we present some conclusions. Although this study does not reveal the clear causal relationships we might have hoped for, the results are reassuring in that they show that the cost estimation and uncertainty analyses include the relevant issues. Hence, when Parliament decides to grant money, it can be reasonably sure that the budget is sufficient.

However, some issues could be improved to enhance future cost estimates. First, estimates of the real uncertainty, especially in urban projects, could be improved. Second, both the governance and management of projects may have potential for improvement; the potential for cost savings may not have been sufficiently explored. Lastly and perhaps most importantly, is the effect of market conditions. Cost fluctuations in the market are usually the dominant systematic uncertainty factor for most construction projects. The projects will typically be shielded from this risk through price adjustments to the budgets with a sector-specific index. However, the actual market prices may vary considerably in relation to this index. Although projects will continue to be exposed to the price

conditions in national and international markets, unsystematic market uncertainty is more controllable at the level of the agency and the project. Experience from completed projects and studies such as ours needs to be transferred to new ones.

We are currently experiencing a boom in Norwegian government investments. During the next decade, there will be a number of large acquisitions and construction projects. It is therefore reassuring that during the past 15 years of practice we have developed methods and systems that contribute to good cost performance.

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Forskningsprogrammet Concept skal utvikle kunnskap som sikrer bedre ressursutnytting og effekt av store, statlige investeringer. Programmet driver følgeforskning knyttet til de største statlige investeringsprosjektene over en rekke år. En skal trekke erfaringer fra disse som kan bedre utformingen og kvalitetssikringen av nye investeringsprosjekter før de settes i gang.

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*The Concept research program aims to develop know-how to help make more efficient use of resources and improve the effect of major public investments. The Program is designed to follow up on the largest public projects over a period of several years, and help improve design and quality assurance of future public projects before they are formally approved.*

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