

# concept

Morten Welde, Roy Endre Dahl,  
Olav Torp and Torbjørn Aass

## Cost performance in construction contracts

Concept report no. 55



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Morten Welde

*Norwegian University of Science and Technology*

Roy Endre Dahl

*University of Stavanger*

Olav Torp

*Norwegian University of Science and Technology*

Torbjørn Aass

*ÅF Advansia Norway*

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## English summary

This is a study of cost performance in construction contracts in the road sector. Large projects often consist of several contracts. As the contracts account for the biggest costs in a project, the cost performance in these is important for the results of the project.

Overruns in contracts can lead to cost overruns at the project level. Cost increases in contracts may have different causes. They may be due to insufficient assumptions or deficiencies in the description of the works which may result in changes and additions to what was originally agreed. Increases may also be a result of unforeseen external circumstances that need to be considered and compensated, or that the client wants changes in the agreed scope to achieve an intended function. Increased costs in contracts are usually handled by the project's contingency. It is therefore possible that the final cost of the contracts will be higher than originally agreed and that an acceptable result at the project level will be achieved.

The purpose of the study is to investigate the extent to which the original contractual amount differs from the final cost in construction contracts. We use data from road construction contracts, and we do different quantitative analyses. We also conduct interviews with representatives of various industry actors in order to gain a deeper understanding of causes of overruns. The aim is to measure cost performance and to point to measures that can improve the planning and management of future projects.

Cost overruns in projects are a challenge in most countries and in most industries, and are documented in a wide range of studies. There are different theories about why the final cost in many projects end up being higher than budgeted. In Chapter 2 we discuss some previous studies of the topic. Several of these studies point to changes in contract volume as an important source of uncertainty and overruns in projects. The way contracts are designed and how the contracting processes take place, may make project management more difficult. Several authors suggest that using the lowest price as the award criterion can give the bidders an incentive to place bids that are unprofitable without additional payment. If the original contract value in such projects is

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used to estimate the cost of new projects, we risk underestimating the actual cost.

The literature on cost performance in construction contracts corresponds to the more comprehensive literature on cost performance in projects. Overruns are a challenge, but the range varies. Most studies have shown that the final contract amount in most cases exceeds the agreed price. Fierce competition and price pressure, insufficiencies in the contractual basis, and poor capacity and competence in the client organisation are considered to be the main reasons for the deviations.

The contract strategy is a central part of the plans in a construction project. In Chapter 3, we look at different elements of the contract strategy, and we discuss various construction contract formats.

Although the goal of the project is to finalise the project within agreed performance targets for time, cost and quality, and although a certain volume of additional requirements and quantities is something that may be expected, major additions to the contract can also indicate lack of good management. Many additional requirements and quantity deviations often indicate that the contractual basis has been inadequate and that the management of the project and the costs have been imperfect. Major changes from the client may also pose challenges with regard to manning, progress and costs, for both the client and the contractor. This may result in lower cost-effectiveness, and there is a broad agreement in the industry that this is something one wishes to avoid.

In Chapter 4, we describe the dataset and formulate some hypotheses that provide the basis for further analysis in Chapter 5. The data for the study are collected from the Norwegian Public Roads Administration and include 712 different contracts agreed between 2009 and 2014 and concluded between 2012 and 2016. We have also had access to the bids of the individual contractors as well as the selected bid 303 of the contracts. In order to analyse which factors that affect the likelihood and size of overruns, we use both project-specific (endogenous) factors and factors beyond the control of both client and contractor (exogenous factors) as explanatory variables.

The most important results from Chapter 5 can be summarized as follows:

- On average, the final cost in the contracts that the Norwegian Public Roads Administration is responsible for end up about 17 per cent

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higher than the original contract amount. This includes both payment for work on adjustable items, and payment for additional requirements and scope changes.

- 72 per cent of the contracts end up with final cost higher than the original contract amount.
- The range is large with variations from -46 per cent to 185 per cent over the agreed contract amount. Only 37 percent have deviations within +/- 10 per cent of the original contract.
- There is great uncertainty about quantity control, i.e., the difference between used and agreed amounts. Although the contracts on average experience a small deviation from projected costs (1 per cent on average), the standard deviation (uncertainty) is high.
- Additional requirements and scope changes account for an average of 18 per cent in addition to the contract. The total contract overrun can thus be explained to a greater extent by scope changes than volume changes.
- There is a correlation between the complexity of the contract and the probability and volume of overruns.
- Construction contracts in urban projects experience more frequent and larger overruns.
- There are only small differences between the regions, but the overrun in the north region are significantly larger than in other regions.
- The probability that a contract will overrun increases with the contract size. At the same time, it is the smallest contracts that experience the largest percentage overruns.
- Contracts with a large difference between the highest and lowest bids, have significantly higher overruns.
- Macro variables have no significant impact on the probability and volume of overruns.

Chapter 5 also summarizes the results of interviews with 14 representatives of the Norwegian Public Roads Administration, consulting engineers and contractors.

The following factors were highlighted in the interviews as important underlying factors for overruns:

- Large price pressure in the competition for construction contracts challenges the entrepreneurs' profitability, which requires additional

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funding to ensure a sufficient margins. Price pressure is also claimed to lead to tactical pricing, where profitability in the contracts is planned to be achieved through additions to the contracts. This gives entrepreneurs strong incentives to promote change orders, and increases the level of conflict with the client.

- The technical expertise of the client and the consulting engineer, and knowledge of practical construction is in some cases too low. This is assumed to be caused by a high activity in the construction market with subsequent scarcity of competent resources. Lack of continuity as a result of a lot of use of hired staff is also referred to as an explanation.
- The ability and willingness of the client and the contractor to collaborate on the implementation of the contracts is a general topic in the interviews. The parties' personality, communication and personal chemistry are highlighted as decisive factors for the division of responsibilities, solutions and compensation, with subsequent inefficient operations, delays, escalation of the amount of change orders and counterclaims.
- The handling of costly unforeseen circumstances during the implementation of which no party directly has a "fault" can in many cases result in conflict. Here, there is both disagreement about what compensation the contractor is entitled to, but also how the situation should be handled to reduce the cost impact.
- The client is entering into contracts despite the fact that there are unclear conditions related to needs, solutions or the environment, with construction-related changes in the implementation phase as a consequence.

Lack of cost-effectiveness and cost performance in construction contracts may have complex causes. In Chapter 6, we summarize and conclude the report with some success factors that may be relevant to avoiding or reducing unnecessary additional requirements and for better management of construction contracts.

Among other things, we point out the following factors:

- Provide for good cooperation between the contractor and the client.

- Incentives in procurement processes and contracts should be designed to ensure the best possible quality, solutions and implementation, rather than the lowest possible bid.
- The responsibility and risk should be appropriately placed in the contract and the allocation of risk must be well understood between the parties.
- Adequate skills in the various organisational levels from the client to the contractor.
- A mature and clearly described contractual basis.

Finally, we mention realistic budgeting. The client should have a large enough contingency to handle remaining uncertainty after contracting and in the contract execution. This study shows that the reserves must be of a certain size and adapted to the uncertainty of the individual project.



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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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