Policies to avoid cost overruns: Critical evaluation and recommendations

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Abstract

Many infrastructural projects have cost overruns and there has been a lot of research both on why these cost overruns occur and what can be done to reduce cost overruns. Bent Flyvbjerg is the leading researcher in the area and in this article his proposals are also the starting point. Beside a literature review a questionnaire was also sent out to experienced Swedish project managers to find out what they thought could reduce cost overruns. This has been the foundation for the proposals formulated in this article. Proposals concerns three areas 1. Organizational macro-structure, e.g. using more PPP-projects but also decentralization of budgets where cost-overruns in one project in a region leads to less other projects in the specific region. 2. Organizational quality: It should be easy to see when and where cost overruns occur and who was responsible. There should be an well-developed knowledge management system in the organization and an organization culture of openness and a focus on improvements. 3. Organizational processes, e.g. a systematic use of external reviewers in different stages of a project.

Keywords:
Cost-overruns, infrastructural projects, policy measures,

Introduction

Cost overruns have been a regular problem in large infrastructural projects. Flyvbjerg, Skamris Holm, and Buhl (2003) presents results from a database with over 250 large infrastructural projects from different countries and different time periods. The result can be summarized as follows:
- 86% of the projects had cost overruns compared to forecasted costs. The average overrun was 28%.
- The overruns were highest in rail projects with cost overruns of 45%. For roads it was 20%.
- Cost overruns were somewhat lower in Europe compared to North America and "Other geographical areas".
- There was no historical trend. Cost overruns in recent periods have the same magnitude as in earlier periods. A recent Swedish dissertation showed that there were large cost-overruns in almost all major infrastructural projects in Sweden during the last decade (Lundman 2011).

This raises two main questions: Why is this case and what can be done about it? The leading researcher in this area – Bent Flyvbjerg – presents three major explanations: Technological factors (unforeseen technical complications), psychological factors (optimism bias, "an inside view" of the project and political factors (conscious underestimation in early stages in order to get project started. The different explanations and possible policies against cost-overruns suggested by Flyvbjerg can be found in e.g. Flyvbjerg, Skamris Holm, and Buhl (2003), Flyvbjerg (2005), Flyvbjerg (2007), Flyvbjerg (2008), Flyvbjerg, Garbuio, and Lovallo, (2009) and Cantarelli, Flyvbjerg, Molin, and van Wee (2010)). Brunes and Lind (2013) propose a somewhat modified list that includes Political/strategic factors, psychological factors, competence related factors and then simply bad luck.

The focus in this paper is however on the second issue: Assuming that cost overruns depend on a combination of the factors mentioned above – what can be done to reduce cost overruns? In order to formulate a credible policy against cost-overruns, a literature review was first carried out. As we are especially interested in policies that might be efficient in Sweden, a questionnaire was sent out to experienced project managers on both the client and contractor side. This material is then used to formulate credible policy package that should be able to lead to a reduction in cost-overruns. This paper is therefore a combination of a review paper, an empirical study and a conceptual policy paper.

Method

The literature review

The literature review starts with the work of Bent Flyvbjerg and then focus on studies published in academic articles in the last 3-4 years. The choice of Flyvbjerg should be uncontroversial given his large number of publications in the area of cost-overruns and how often he is referred to. As there is so much written on cost overruns, it was decided to limit the analysis of other literature to the most recent studies. The idea is of course that if new ideas have come up it should be found in the most recent literature.

The empirical study about Sweden

Beside the view from researchers covered in the literature review we also want to find out the view of experienced project managers concerning what could be done to reduce cost-overruns. A questionnaire was therefore sent out to two groups: project managers working for the Swedish Traffic Administration (STA, Trafikverket) and to senior staff in three leading contractor companies. The first group was found by going through current projects on the STA website. The experienced project managers on the contractor side was found by asking leading staff in each company to recommend suitable persons that could participate in a questionnaire about cost over-runs in infrastructure projects. It is therefore a strategic sample and not a stochastic sample, and this has limitations when generalizing. The advantage with this strategic sample is however that it was possible to choose competent and experienced project managers where many had worked on both contractor and client side. Almost all of them had worked more than 10 years in the industry.

The number of questionnaires sent out was in total 230 and the completed questionnaires was 97, which gives at total response rate of 42%. As presented in table 1 the number of started questionnaires was 106 and some respondents did not answer every question.

	Sent out	Totally started surved	Completed	Response rate
STA-staff	190	81	74	39%
Conractor staff	40	25	23	58%
Total	230	106	97	42%

Table 1. The number of survey participants and the response rate.

We have checked the difference between respondents and non-respondents and could not find any systematic difference.

The survey was constructed following some general principles. There were five possible answers concerning to what extent they agreed with the statements made. It was believed that it would be difficult for the respondents to distinguish between more alternatives. We used a neutral "maybe" and added a "don't know" option in order to have an exhaustive list of possible answers. The complete questionnaires are presented in appendix 1.

Limitations

As with all research methods there are limitations with questionnaires. A questionnaire is based on communication between the researcher and the observer. The first problem concerns definitions as a questionnaire does not make it possible for the respondent to ask questions to the researcher on things that seem unclear.. One such thing in this paper might be the definition of cost overruns. To reduce this problem a definition of cost overruns was presented in the beginning of the questionnaire. Another problem that is discussed in the method literature is how respondents answer a questions depending in which order it is given. It could be the case that claims asked first are given a higher positive response rate than claims asked later in the questionnaire.

Another limitation is of course the external validity; can the results be generalized to construction projects in general? The questionnaire was sent out to, by us, project managers found on the Swedish Traffic Authorities website and even though it is not a random sample they should be representative of the population of project managers working for the STA The project managers on the contractor side was chosen for their experience and even though they are not representative for the project managers in general they should be the best informants concerning cost overruns. There might be some risk for bias on some questions and this will be returned to when the results are presented below.

As the number of respondents is rather small the comparisons between the answers from the client and contractor side should be seen more as indications than statistically established differences.

3. The measures proposed in the literature

The measures proposed by Flyvbjerg

In the works of Flyvbjerg (see references below) two main ideas can be found about how the risk of cost-overruns can be reduced: The first is *reference class forecasting* and the second is *increased public sector accountability through more involvement by private parties*.

In several of the articles (e.g Flyvbjerg 2007, 2008, Cantarelli et al. (2012) "Reference class forecasting" is proposed as one curb against cost overruns. The method has also been endorsed by the American Planning Association:

> "The new method achieves accuracy in projections by basing them on actual performance in a reference class of comparable actions." (Flybjerg 2008, p 3).

The idea is that instead of (only) doing an "inside" view prediction of the cost of a project, one should also take an outside view and compare with earlier similar projects.

There seem to be two somewhat different interpretations of Reference class forecasting. One is that *cost from earlier projects (adjusted with a price index) should be used* to estimate the cost for the current project. One can read:

> "A reference class forecast of a given planned action is based on knowledge about actual performance in a reference class of comparable actions already carried out." (p4)
> "More specifically, reference class forecasting for a particular project requires the following three steps:
> (1) Identification of a relevant reference class of past, similar projects. The class must be broad enough to be statistically meaningful but narrow enough to be truly comparable with the specific project.
> (2) Establishing a probability distribution for the selected reference class. This requires access to credible, empirical data for a sufficient number of projects within the reference class to make statistically meaningful conclusions.
> (3) Comparing the specific project with the reference class distribution, in order to establish the most likely outcome for the specific project." (p 8)

The other interpretation is that one should look at *average cost overruns in earlier projects and then make adjustments of the initial predictions based on these historical figures*. Flyvjerg (2008, p 11) quotes a British report:

> "There is a demonstrated, systematic, tendency for project appraisers to be overly optimistic. To redress this tendency appraisers should make explicit, empirically based adjustments to the estimates of a project's costs, benefits, and duration . . .[I]t is recommended that these adjustments be based on data from past projects or similar projects elsewhere. (HM Treasury, 2003b, p 1)"

In this context Flyvbjerg talks about providing

> "empirically based optimism bias uplifts for selected reference classes of transportation infrastructure projects, and, second, to provide guidance on using the established uplifts to produce more realistic forecasts of capital expenditures in individual projects" (p 11)

Data about such uplifts are presented in the articles.

Our view is that this second form of reference class forecasting is very problematic as it would punish actors who tries to improve the quality of the cost estimations. If these better estimations also are uplifted then these projects would seem to be especially costly and would then be ranked lower. In the rest of the article this form of reference class forecasting will therefore not be discussed.

The second proposed policy measure is increased transparency and use of public-private partnerships. Flyvbjerg (2008, p 593) writes:

> "two basic types of accountability define liberal democracies: (1) public-sector accountability through transparency and public control, and (2) private-sector accountability via competition and market control. Both types of accountability may be effective tools to curb planners' misrepresentation in forecasting and to promote a culture which acknowledges and deals effectively with risk."

On the first point he e.g. mentions that central governments should not use project specific grants, that they should demand that predictions of costs and benefits should be peer-reviewed and that everything should be open to public debate before decisions are taken.

On the second point he mentions that economic risks should be shared between the public and the private sector and also with e.g. a local government if they have taken the initiative to the project even though most of the financing comes from higher levels. Private investors should be willing to supply at least part of the capital and should have a return that is related to the outcome of the predictions of costs and benefits.

In the rest of the article Public Private Partnerships will not be discussed, not because we have anything against them, but that there always will be a number of projects where this form will not be suitable or not used for political reasons. Currently in Sweden, and many other countries, almost all projects are procured as individual construction projects with either Design-Bid-Build contracts or Design-Build contracts and that is the situation that this paper focus on.

Proposals in recent studies of cost overruns

There is a continuous flow of studies concerning cost overruns and in this section proposals in a number of recent studies are presented.

Rahman et al. (2013) use a statistical method to identify causes and from that they come to the conclusion that site management factors are of major importance and therefore the suggest (p 1970) that ”improved site management and supervision of contractors can .. result in control of cost overruns.”

Most other studies however point out other factors as more important, and that most cost overruns occur in the design and planning stage (see e.g Brunes and Lind 2014 for an analysis of causes of cost overruns). Therefore this kind of measures, though important, should not be expected to be efficient against most cost overruns.

Doloi (2013) makes a similar statistical analysis and in the concluding section he writes

> ”the finding of this research highlight a new emphasis on well-developed technical skills as the key in controlling cost overruns in modern projects.”

Measures that focus on competence development will be returned to below.

Two recent studies focus more directly on methods for predicting costs and risks by statistical analysis of earlier projects. Berechman and Chen (2011) develops a combination of reference class forecasting and decision tree analysis where more or less risky alternatives are included. The probabilities in the decision tree analysis are derived from a set of observed projects. They write (p 103):

> ”The main conclusion from this paper is that the risk of cost overruns can, and should be, incorporated in transportation project evaluation and decision making.”

Love et al. (2013) argues for a similar approach and tries to fit a statistical distribution to a set of actual projects with different characteristics that then can be used to predict cost overruns. The results are however rather disappointing and they write:

> ”No significant differences for cost overruns were found among procurement method, project type and contract size.” (p 329)

Chevroulet et al. (2012) analyze six projects in order to find a pattern that could be used to predict cost-overruns. This is also a version of reference class forecasting. They also find a large divergence and write (p 301):

> ”The study also highlights the lack of reliable data for carrying out useful reference class forecasting or scenario analysis as recommended by Flyvbjerg..”

At the end they make a list of suggestions under three headings:
- Before construction: Improvement in decision support.
- During construction: Management and monitoring.
- After construction: Feedback and consolidation of knowledge.

In a recent Swedish report (Nilsson 2013) presents the following conclusions and recommendations concerning the Swedish Transport Administration:
- Data on budgets and costs are not collected in a systematic way and this has to be changed in order to make some version of reference class forecasting possible (p 26).
- He further recommends the use of the Norwegian system where independent external reviews are made for projects above a certain size (p 27).

What Swedish project managers think would reduce cost overruns

Background questions

It was statistically significant[1] that the population of project managers had experienced cost overruns. The general view was that the prevalence of cost overruns were large. See Table 2. 89% of the project managers from STA and 96% of the project managers on the contractor side had experience from participating in contracts where there had been cost overruns.

	Q1 (Client staff)	**Q2 (Contractor staff)**	**Q1 + Q2**
Occurs often	41 (52%)	13 (52%)	54 (52%)
Occurs sometimes	34 (43%)	12 (48%)	46 (44%)
Occurs rarely	3 (4%)	0	3 (3%)
Do not know	1 (1%)	0	1 (1%)
Number of answers	79	25	104

Table 2. Question: What is your view on the prevalence of cost overruns in infrastructure projects?

The role of procurement form

The respondents were presented with a number of statements and asked to choose among a number of alternative answers. The first question related to a current debate in Sweden about the role of the procurement forms Design Bid Build versus Design Build. Among the STA-staff changing from Design Bid Build was not expected to reduce cost overruns, while the Contractor´s had a more positive view of the effects of changing procurement type. There might however be some bias in the answers on this question as a number of contractor companies have argued strongly for an increased use of Design Build contracts (see e.g. www.ncc.se).

	Q1	**Q2**	**Q1+Q2**
Yes, definitely	0	3 (12%)	3 (3%)
Yes, probably	8 (10%)	9 (38%)	17 (17%)
Maybe	21 (27%)	6 (25%)	27 (27%)
No, probably not	28 (36%)	5 (21%)	33 (33%)
No, definitely not	14 (18%)	1 (4%)	19 (19%)
Don´t know	6 (8%)	0	6 (6%)
Number of answers	77	24	101

Table 3. Statement: Cost-overruns would be considerably less if Design Build would be used instead of Design Bid Build?

The role of external reviewers

As was reported in the literature review above, several researchers recommends the use of external reviewers to reduce both psychological and political/strategic bias. This idea do not get strong general support, but there are large differences between the groups as 50% of the respondents from the contractor side supports the statement while the share is 28% on the client side. Also here there might be some bias in the answers, especially from the client side as the use of external reviewers can be seen as a criticism of their work.

[1] Hypothesis testing at a 95% confidence level showed the populations opinion difference between the sum of answers “often” and ”sometimes” from the answer “rarely”.

	Q1	Q2	Q1+Q2
Yes, definitely	4 (5%)	3 (12%)	7 (7%)
Yes, probably	18 (23%)	9 (38%)	27 (27%)
Maybe	30 (39%)	7 (29%)	37 (37%)
No, probably not	24 (31%)	4 (17%)	28 (28%)
No, definitely not	1 (1%)	1 (4%)	2 (2%)
Don´t know	0	0	
Number of answers	77	24	101

Table 4. Statement: Cost-overruns would be considerably less if the client let external reviewers evaluate the project and calculation in advance

Resources spent in early stages and risk analysis

The technological explanation of cost overruns suggests that if more resources was spent on technical investigations in the early stages then there would be fewer surprises and less cost overruns later in the project. The answers are presented in Table 5 below. The statement gets considerable more support than the questions above, especially on the contractor side where 50% strongly agree with the statements.

	Q1	Q2	Q1 + Q2
Yes, definitely	19 (25%)	12 (50%)	31 (31%)
Yes, probably	36 (47%)	11 (46%)	47 (47%)
Maybe	13 (17%)	1 (4%)	14 (14%)
No, probably not	9 (12%)	0	9 (9%)
No, definitely not	0	0	
Don´t know	0	0	
Number of answers	77	24	101

Table 5. Statement: Cost-overruns would be considerably less if the client put more resources into technical investigations early in the project

The fourth question was similar and dealt with risk analysis, see table 6. This is also seen as a measure that will reduce cost overruns, and also here the contractors are more positive.

	Q1	Q2	Q1 + Q2
Yes, definitely	9 (12%)	8 (33%)	17 (17%)
Yes, probably	38(49%)	13 (54%)	51 (51%)
Maybe	25 (32%)	2 (8%)	27 (27%)
No, probably not	5 (6%)	1 (4%)	6 (6%)
No, definitely not	0	0	
Don´t know	0	0	
Number of answers	77	24	101

Table 6. Statement: Cost-overruns would be considerably less if the client put more resources into evaluation of risks early in the project

Incentives

The fifth question dealt with consequences for those responsible for the cost overruns, see table 7. The idea behind the question is that if the persons directly involved in the design and the cost calculations would e.g. risk being fired if there were cost overruns that would affect the quality of their work. As can be seen below this idea do not get much support and the difference between the groups is small..

	Q1	**Q2**	**Q1 + Q2**
Yes, definitely	7 (9%)	3 (12%)	10 (10%)
Yes, probably	17 (22%)	3 (12%)	20 (20%)
Maybe	17 (22%)	4 (17%)	21 (21%)
No, probably not	29 (38%)	9 (38%)	38 (38%)
No, definitely not	3 (4%)	3 (12%)	6 (6%)
Don´t know	4 (5%)	2 (8%)	6 (6%)
Number of answers	77	24	101

Table 7. Statement: Cost-overruns would be considerably less if it hard larger consequences for those responsible

Overview of the policies

Simplifying the answers in to "Yes", "No", "Maybe" and "Do not know" the result from the survey can be summarized as in table 8. Project managers in Sweden regard better technical investigation and better risk analysis as good policies against cost-overruns. The results are statistically significant[2]. They do not regard procurement form as a cure for cost overruns. The result is statistically significant[3]. Finally there were no statistically significant results concerning the project manager's view on external reviewers and stronger consequences for those responsible as cure for cost overrun.

Factor	**Yes**	**No**	**Maybe**	**Do not know**	**Amount of respondent**
Use Design Bid Build	20%	47%	27%	6%	101
Use external reviewers	34%	30%	36%	0	101
More resources to technical investigation	77%	9%	14%	0	101
More resources on risk evaluation	67%	6%	27%	0	101
Stronger consequences for those involved	30%	43%	21%	6%	101

Table 8. Simplified overview of the results

Other policy measures

At the end of the questionnaire there was also an open question concerning what they would view as efficient policies against cost-overruns- see table 9. Some of the factors mentioned actually overlap with the questions and have therefore been excluded. It is interesting to note that competence related factors are mentioned by both sides.

[2] Hypothesis testing at a 95% confidence level showed the population of project managers answered yes to the question compared to no answers.

[3] Hypothesis testing at a 95% confidence level showed the population of project managers answered no to the question compared to yes answers.

Factors mentioned by Transport Authority staff	Factors mentions by Contractor Staff
Better educated politicians that think more in long term	Better documents, better control of documents
Budgets should not be set before design is determined	Higher margins for unpredicted costs in the budgets
Increased quality of design documents, more controls of implementability	Increase client competence
Higher client competence concerning calculation	More contacts between client and contractor in the early stages
More continuous monitoring of projects, more centrally controller internal reviews,faster reaction when signs of cost overruns	
More feedback, less prestige	
More cooperation between client and contractor (partnering)	
Bonus systems for those involved	
Change the procurement process, less on lowest price, more on documented competence	

Table 9. Other measures that can reduce cost overruns (except repetition of factors already mentioned

A policy package against cost overruns

The aim of this section is to give a systematic overview of what could be recommended as a structured policy package against cost-overruns from a public sector perspective. The list is based on both the measures recommended in the earlier literature and on the results from the questionnaire, both also on more general views about what drives an organization. The measures will be grouped in three broad categories: *Organizational macro structure*, *Organizational quality* and *Organizations processes*.

It should however be underlined that reducing cost overruns in not the only important target. Mandell and Brunes (2014) shows that there might be a rational and efficient procurement process that as a side-effect has that cost overruns might occur. As argued in Warsame et al. (2013) the quality of the final product is of course also important.

Organizational macro-structure

One example of measures on this level is Flyvbjerg´s proposal to carry out more projects as *PPP-projects*. A more radical solution would be to go in the direction of more complete *privatization* of infrastructural facilities where the private sector both invest and are free to charge the customer as in any other market.

Organizational changes *within* the public sector can also affect the incentives to reduce cost overruns. Hasselgren (2013) discusses different ways to approach decision making and budgeting in the public sector and contrasts two alternatives. The first is based on welfare economics where projects are evaluated with a social cost benefit analysis and then paid with general taxes. The second is based on Coase´s criticism of this model and argues that e.g. each sector should pay its own costs. Roads are paid with e.g. car taxes. This means that if there are cost overruns in one road project, these taxes have to be raised or other projects postponed, while in the welfare theory based model the cost is spread over the whole population. The incentives to reduce cost-overruns would therefore be weaker in the welfare-economics model. The same argument can be used for delegating resources for public investment budgets to e.g. an infrastructure investment grant to a region on a per capita bases and then let the regions decide. In that way cost-overruns in one project in the region means that other projects in the same region would have to be postponed. The common idea behind these two proposals is to move the consequences of the cost-overruns closer to the decision maker and thereby strengthen

incentives to avoid cost overruns and thereby reduce the risk for primarily strategic/political manipulations.

Organizational quality

What can be seen in both our questionnaire and in other studies is that procurement does not seem to be a very important issue in the context of cost-overruns: Both Design-Build and Design-Bid-Build can lead to cost overruns, and this is not surprising from the perspective of the next group of factors: Organizational quality. This can be subdivided into a number of interrelated aspects (see e.g. Warsame et al. 2013 for a similar approach but where the focus is on quality problem and not cost-overuns):

"Order in the bookkeeping." Several Swedish studies e.g. Riksrevisionen (2010,2011 a,b) and Nilsson (2013) show that it is not easy to find out how much projects really cost and during what stage cost overruns occur. Without this basic data any kind of reference class forecasting would e.g. be impossible and a minimum demand of an organization is to be able to present what various things have cost in the past and why there has been cost overruns in earlier projects. Brunes and Lind (2014) present a framework that can be used for this purpose.

"Knowing who did what". If it is not possible to know who was responsible for carrying out certain tasks, or approving certain calculations, it is neither possible to know who has a good track record and who has a bad track record. Even if the questionnaire did not give strong support for idea of increasing the individual consequences, this aspect seems important from a more general transaction cost theory where individual utility maximizing based on expected consequences is a fundamental idea.

"Knowledge management": This is a growing area in many sectors in the economy t, see e.g. Ilina (2011) for an overview. If we look at knowledge management from the perspective of cost-overruns, this concerns:
- Systematic evaluation of earlier projects and finding patterns that can make it easier to see what can lead to cost-overruns in specific projects and what can be done to avoid this in coming projects. This is of course the core in reference class forecasting.
- Collecting information about other organizations experiences, e.g. traffic agencies in other countries.
- Recruitment of staff with the right combination of training and experience.
- Policies to develop the competence of the staff. Increased competence was seen an important by many respondents in the questionnaire.

*"Organization culture ":*Ravasi and Schultz (2006) defines organizational culture as a set of shared mental assumptions that guide interpretation and action in organizations by defining appropriate behavior for various situations. Without an organizational culture that promotes openness and a continuous focus on improvements it will be difficult to implement the more specific measures that have cost-overruns as their target. There has to be clear signals and behavior consistent with these signals from the top management and – in government authorities – from leading politicians.

Organizational processes

Here the focus is on processes directly focusing on reducing the risk of cost-overruns and one proposal that are discussed in the literature, and that also seem logical given the different theories about the causes of cost-overruns, is the *use of external reviews*. Some countries (see Nilsson 2013) already use this for large projects but our view is that this can be used in all kinds of projects and in all stages.

In smaller projects the use of experienced persons within the organization in a more informal review process concerning both design, technical investigations and cost calculations is one way or reducing risks related to lack of competence, cognitive biases and strategic manipulation. One can think of a hierarchy of projects related to size and technical complexity and where different types of experts – from the consultancy sector, from the academic world both nationally and internationally – can be

involved to give second opinions in more or less formalized ways. More information in all stages of the projects can also be made publicly available on the organizations website.

6. Concluding comments

Proposing certain policies is based on a prediction of the effects of various actions, and it is well known that predictions in complex environments always are uncertain. There can always be complex interactions and unexpected consequences. Our belief, based on the arguments and studies presented above, is that the proposed system of methods presented above would be efficient. But is important to continuously evaluate what really happens when a policy is introduced. An experimental approach where different methods are tested in different projects can also a rational strategy when there is uncertainty about effects of a policy. This is course also related to the organizational culture and maybe this is the most important issue.

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Appendix – The questionnaire

At present there is a research project at the Royal Institute of Technology (KTH) concerning causes of cost overruns on infrastructure projects are performed and possible arrangements to lower cost overruns. As a part of the project a questionnaire is sent out to agents in the field to catch their experience and view about the case. All answers will be treated confidentially.

With cost overruns in the text is meant a essential difference (10% or more above inflation) between the clients final and budget cost early in the project. It can also be seen from a contractors perspective when cost overruns means actual cost is higher than budget witch was as base for the offer.

If you want to know more about the project or other questions contact XX

Put a cross in the square that agrees with your judgment.

Part 1 General

1. I work with or have worked with infrastructure projects (road, railway)
□ Yes
□ No

2. I work for
□ Client organization such as Swedish Transport Administration, municipality etc.
□ Contractor company such as NCC, PEAB etc.
□ Consultant company such as ÅF. WSP, Swecot
□ Other
Comment:

3. My working experience is (several alternatives possible)
□ I have worked both for clients and contractors/consultants.
□ I have substantial experience of employment in other sectors than the construction sector.
Comment:

4. Your experience/worked years within the business is
□ Less than three years
□ Four to 10 years
□ More than 10 years
Comment:

5. I have participated in projects that have experienced cost overruns!
□ Yes
□ No
□ Do not know
Comment:

6. What is your opinion of the occurrence of cost overruns in infrastructure projects?
□ Occur often
□ Occur sometimes
□ Occur seldom
□ Do not know
Comment:

Part 2 Causation for cost overruns (NOT RELEVANT FOR THIS PAPER AND THEREFORE EXCLUDED HERE)

Part 3 Possible solutions

Below are a couple of statements about possible solutions to counteract cost overruns. Mark the alternative which best fits your opinion.

16. ”Cost overruns for the client would be considerably lower if, instead of Design-Bid-Build contract, other contracts were used such as Design-Build”
□ Yes, absolutely
□ Yes, probably
□ Maybe
□ No, probably not
□ No, absolutely not
□ Do not know
Comment:

17. ”Cost overruns would be considerably lower if the client offered an independent part to review the project and the calculations in advance”
□ Yes, absolutely
□ Yes, probably
□ Maybe
□ No, probably not
□ No, absolutely not
□ Do not know
Comment:

18. ”Cost overruns would be considerably lower if the client put more resources into the technical investigation in the early stage of the project”
□ Yes, absolutely
□ Yes, probably
□ Maybe
□ No, probably not
□ No, absolutely not
□ Do not know
Comment:

19. ”Cost overruns would be considerably lower if more resources were put into risk judgments in the early stage of the project”
□ Yes, absolutely
□ Yes, probably
□ Maybe
□ No, probably not
□ No, absolutely not
□ Do not know
Comment:

20. ”Cost overruns would be considerably lower if the overruns would have larger consequences for those responsible”

 Yes, absolutely
 Yes, probably
 Maybe
 No, probably not
 No, absolutely not
 Do not know

Comment: