

Swedish National Audit Office

Presentation to the European Court of Auditors

ERIK TROLLIUS, SHERZOD YARMUKHAMEDOV

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RIKSREVISIONEN

Mandate

- › Focus on circumstances related to the central government budget and the implementation and results of state activities
- › Focus on financial management, use of resources, achievement of objectives and public benefit, how the state receives an effective return on its investments
- › State agencies shall on request provide the Swedish National Audit Office with the assistance, data and information needed for the audit
- › As part of the performance audit, proposals may be made for alternative measures to achieve the intended results



Reporting

- › Around 35 performance audit-reports are published yearly
- › The reports are submitted to the Riksdag, which in turn submits them to the Government for statements.
- › The relevant parliamentary committee considers the document, and the Riksdag makes a decision on the matter.



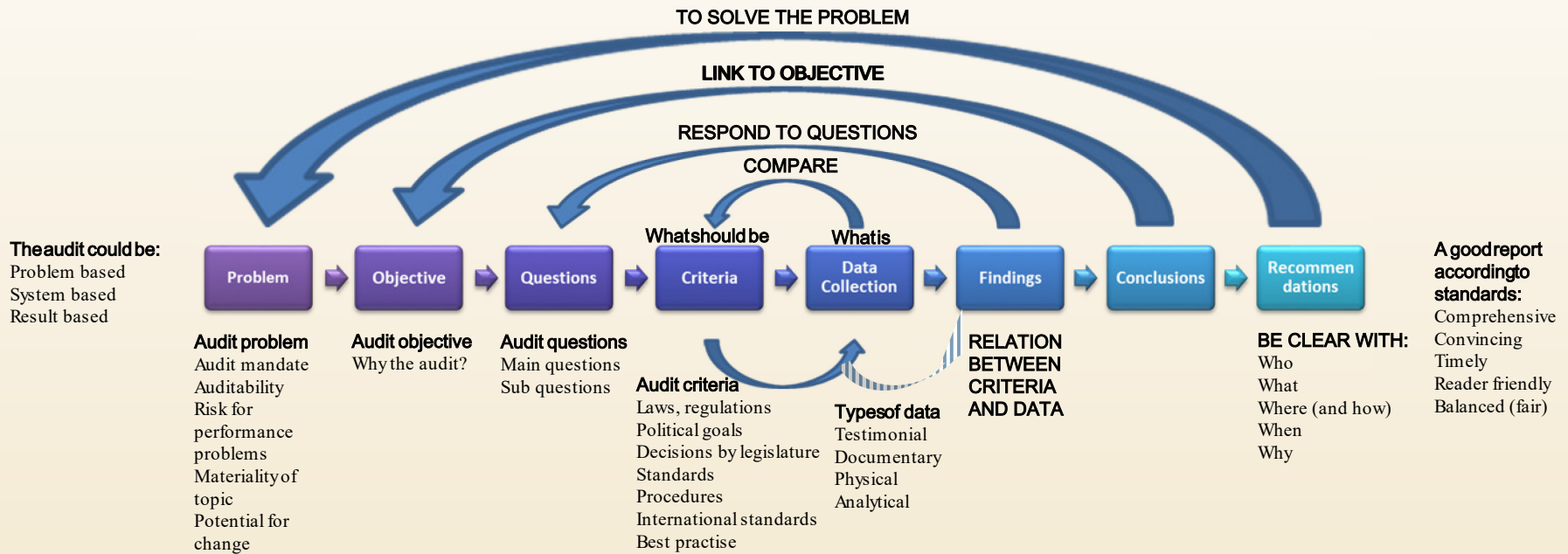
Resources

- › Average of 2500 hours per audit, 1 year from start to finish
- › Audits are carried out in projects with 2 or 3 members
- › Internal specialists on different methods, law etc. will assist
- › External specialists from the relevant field are recruited as part of the quality assurance process





The process of performance audit



Methodology

- › Mainly focus on economy, efficiency, effectiveness (the so-called 3E)
- › A variety of methods are used, often they need to be combined in order to meet the audit objective
- › Effectiveness is the most common aim of the audits. Results can be measured on different levels.
- › Some audits focus on the internal conditions and processes of the audited organization rather than on input/output
- › Advanced methods can be used to increase the value of audits
 - But they need to be integrated with existing guidelines and purpose of performance auditing



Procurement of road maintenance

Discrepancy between the initial and final costs in the contract

ERIK TROLLIUS, SHERZOD YARMUKHAMEDOV

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1. Introduction

- › Periodic and routine road maintenance costs were EUR 1 billion in 2017, the focus of this project is on the latter (EUR 0.3 billion).
- › To increase the cost efficiency of road maintenance a competitive tendering is introduced so that all maintenance work is put out on tender and contracted out to the winning company
- › Tender award criteria (after prequalification criteria met): the lowest price
- › There were indications of cost overruns in road maintenance contracts, i.e. the final costs for road maintenance contracts often exceeded the initial costs stipulated in the contract.
- › **OBJECTIVE:** Analyze the cost deviations in road maintenance contracts

1. Introduction (cont.)

Analysis consists of 3 questions:

1. Are cost deviations comprehensive?
2. Are there systematic factors that impact cost deviations?
3. Has a road authority undertaken effective measures to minimize cost deviations?
 - 3a. Does a road authority follow-up works performed during the contract period?
 - 3b. Does a road authority possess sufficient knowledge about road condition and needs in preparing the tender request documentation?
 - 3c. Are maintenance contracts designed to facilitate the socio-economic efficiency?



2. Method

Question 1 is answered with descriptive analysis of tender contract data

Question 2 is answered with the regression methods using tender contract data to determine the systematic factors that impact cost deviations

Question 3 (with subquestions) is answered with analysis of decisions, steering documents, reports and interviews with the representatives from the road authority

2. Method (cont.)

Maintenance contract costs consists of the costs for the *winterservice* and the *othermaintenance* work. The cost for the winter service is difficult to predict due to the stochastic nature of the weather, therefore these cost categories (i.e. winter service and other maintenance) are treated separately.

We estimate a cost deviation (CD) model per cost category for maintenance area i and contract period t :

$$CD_{it} = \alpha_0 + K'_{it}\beta + DO'_{it}\gamma + V'_{it}\delta + T'_{it}\theta + \mu_i + \varepsilon_{it} \text{ (Eq.1)}$$

where

$$CD_{it} = \left(\frac{FinalCost_{it} - InitialCost_{it}}{InitialCost_{it}} \right) * 100\%$$



2. Method (cont.)

$$CD_{it} = \alpha_0 + K'_{it}\beta + DO'_{it}\gamma + V'_{it}\delta + T'_{it}\theta + \mu_i + \varepsilon_{it} \text{ (Eq.1)}$$

where

- › ***K*** contract specific characteristics such as a winning bidder and indicator variables for: competitiveness level (three and more amount of bidders), contract period, standard contract length (without options), same project manager (from start to end), responsibility for other maintenance areas, contract with extra parts that are non-recurring and maintenance unrelated, minor investment projects (MASA), previous entrepreneur.
- › ***DO*** maintenance area specific characteristics (road length, vehicle kilometers, region, amount of bridges and tunnels, a road length with low buoyancy).



2. Method (cont.)

$$CD_{it} = \alpha_0 + K'_{it}\beta + DO'_{it}\gamma + V'_{it}\delta + T'_{it}\theta + \mu_i + \varepsilon_{it} \text{ (Eq.1)}$$

where

V - weather conditions such as the number of days with slippery road and snowfall

T - procurement year

μ - unobserved maintenance area heterogeneity (e.g. quality of the road network, quality of the construction)

ε - error term

Model specification tests suggest the estimation of the CD models for *Other maintenance* and *Winter service* with the random effects model and the hybrid model (respecified Eq.1 with Mundlak (1978) transformation) respectively.



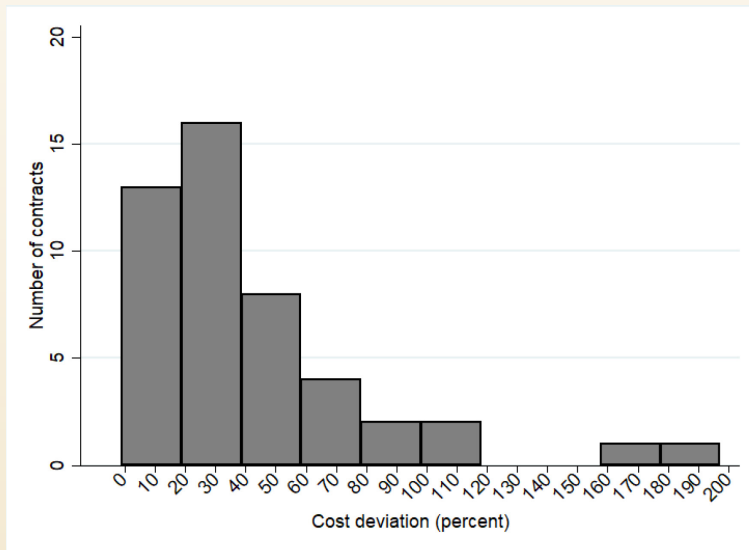
3. Data

- › Swedish road maintenance data on 47 maintenance contracts (out of 109) that are finished 2017 & 2018.
- › Contracts are procured 2011 (18), 2012 (19), 2013 (8) and 2014 (2).
- › Contract length is from 4 to 7 years (options are from 1 to 3 years)
- › Each contract is observed annually/periodically (a contract period is 12 months from september to august the following year)
- › 4 entrepreneurs dominate in road maintenance market (97%)
- › The period of observation is 2011-2018 and the number of observations is 259.

4. Results

Descriptive analysis

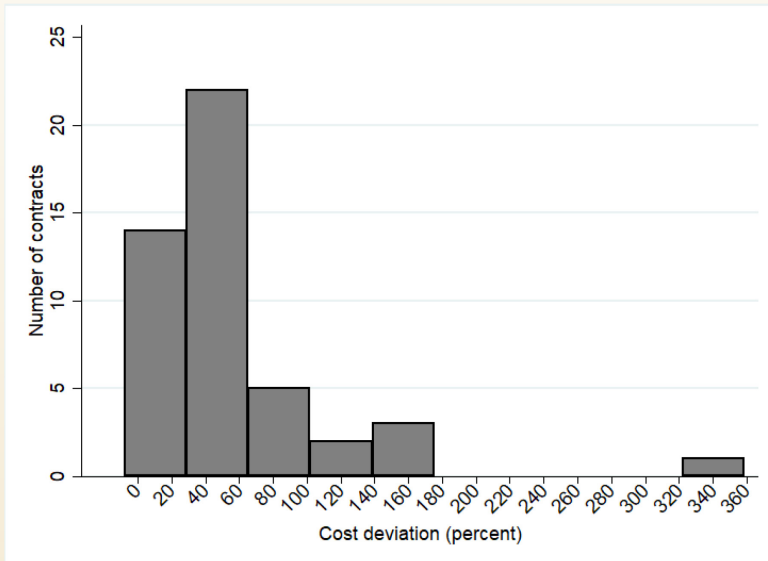
Fig. 1. Distribution of cost deviations: entire contract



- › 45 out of 47 contracts (95.7%) are finished with the cost deviations larger than 0
- › Cost deviations range from 0 to 200%
- › Mean cost deviation: 41%
- › Median cost deviation: 31%

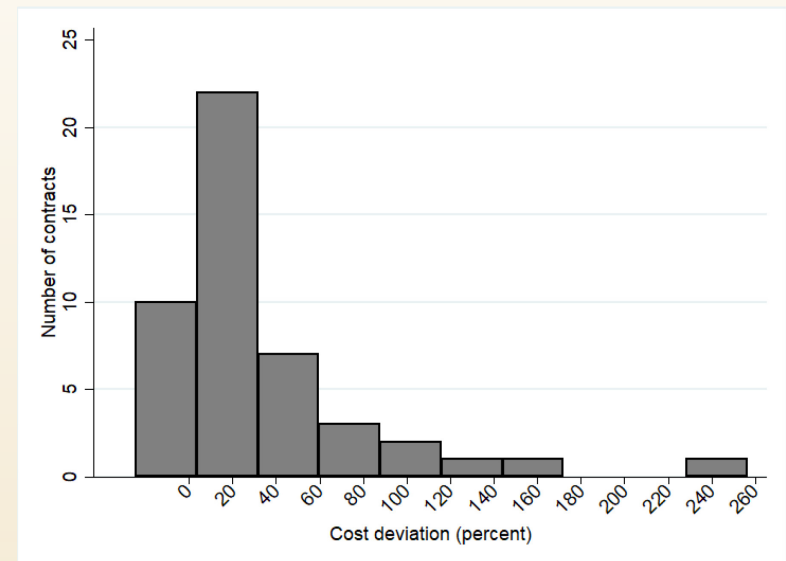
4. Results (cont.)

**Fig. 2. Distribution of cost deviations:
Other maintenance cost category**



- › Mean cost deviation: 57%
- › Median cost deviation: 46%

**Fig. 3. Distribution of cost deviations:
Winter service cost category**



- › Mean cost deviation: 33%
- › Median cost deviation: 17%



4. Results (cont.)

Regressionanalysis

CostcategoryOthermaintenance

- › Systematic factors that reduce cost deviations: Being a certain entrepreneur (B & C compared to A), being a project leader from the beginning to the end of the contract, regional differences (compared to the region North), contract running within the standard duration period (without using options), a road length and a road length with low buoyancy.
- › Systematic factors that increase cost deviations: A certain procurement year (2013 compared to 2011), minor investment projects, contract periods (compared to the period 1), bridges and tunnels, as well as, the days with slippery roads.



4. Results (cont.)

Costcategory Winter service

- › Systematic factors that reduce cost deviations: Being a certain entrepreneur (D compared to A), being the same entrepreneur (E and F compared to their one-time contracts), being a responsible project leader for other maintenance areas, regional differences (except for the region Center, compared to the region North), a certain procurement year (2012 compared to 2011), and a road with winter standard class 1.
- › Systematic factors that increase cost deviations: Being a certain entrepreneur (C and E compared to A), a certain procurement year (2014 compared to 2011), competitiveness level, contract periods (compared to the period 1), as well as, the days with slippery road and snowfall.



4. Results (cont.)

- › Additional thorough analysis of three contracts with the largest cost deviations reveals:
 - (1) the ranking of bids according to the tender award criteria "the lowest price" does not always hold after changes in the contract during the contract period in two contracts, i.e. the second best bid (in terms of price) would have been a better choice for the road authority after taking into account the actual work ordered during the contract period (excluding add-ons).
 - (2) the risk sharing proportions *initially* stipulated in the contract between a contractor (a road authority) and an entrepreneur might change *afterwards* during the contract period.

