

Forschungsprojekt "Ermittlung von Lebenszykluskosten und Vergleich verschiedener Beschaffungs-varianten im Hochbau unter Berücksichtigung institutionenökonomischer Erkenntnisse (LV-bau)"

Kurzfassung des Endberichts

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Das Forschungsvorhaben LV-bau ist mit Mitteln aus der Forschungsinitiative „Zukunft Bau“ des Bundesministeriums für Verkehr, Bau und Stadtentwicklung (BMVBS) gefördert worden (Aktenzeichen: SF – 10.08.18.7-10.21 / II 3 – F20-10-1-050). Die fachliche Betreuung ist durch das Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) im Bundesamt für Bauwesen und Raumordnung (BBR) erfolgt.

Die Verantwortung für den Inhalt des Berichtes liegt bei den Autoren.

28. Februar 2014



Bundesministerium
für Verkehr, Bau
und Stadtentwicklung



Bundesamt
für Bauwesen und
Raumordnung

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1 Research objective

OUTLINE OF RESEARCH TOPIC

This is the final report of the research project “Evaluation of life cycle costs and comparison of procurement options in building construction with regard to Institutional Economics“. The project was being funded by the “Zukunft Bau” (“Future Building”) research initiative of the Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit.

Its main research focus is the (quantitative and qualitative) methodology used for economic efficiency studies between traditional public procurement and public private partnerships (PPP) in building construction as well as approaches to reduce potentially related problems. It is also examined if and how additional effects, which are not directly related to life cycle costs, should be considered in the economic efficiency analysis. Moreover, the complexity of the procurement decision is discussed with regards to potential false incentives of involved parties and means to reduce resulting opportunism are derived.

This report is divided into two volumes. The first volume (“Eine (institutionen-)ökonomische Analyse der Kalkulation von Lebenszykluskosten und der Erstellung von Wirtschaftlichkeitsuntersuchungen bei PPP-Vorhaben“) covers the principal research topics, which will be briefly presented in the following. The second volume (“Bauteilorientierte Lebenszykluskosten – Methodische Grundlagen für Nachhaltiges Bauen in Langzeit-Immobilienprojekten“) includes additional topics, recommendations and reflections, some of which are going beyond the central research questions.

MOTIVATION AND RELEVANCE

Public building construction funding makes up a significant share of public expenditures. In the past, public building projects were mainly realized through traditional public procurement, but since 2002, PPP has become an important alternative for realizing infrastructure projects in Germany.

Generally, the decision for a procurement option should be grounded on the economic efficiency of each option, which is to be validated through an economic efficiency study. However, there are indications that these economic efficiency studies have methodological deficits seen both in the various guidelines as well as in the actual practice.

To some extent, these deficits are related to the fact that insights from the new institutional economics are currently not sufficiently reflected in economic efficiency studies. This applies especially to the effects of different procurement options on the related production and transaction costs. Due to these deficits, the validity and robustness of the results of economic efficiency studies can be impaired. This is especially relevant as these deficits can be exacerbated by potential false incentives of the parties involved in the procurement decision.

2 Methods

The analysis in this report is based in insights from the new institutional economics. These insights are applied both to the analysis of the (relative) efficiency of the procurement options as well as on the practice of life cycle cost estimations. Moreover, the new institutional economics will be used to analyze the process of conducting economic efficiency studies and the actual procurement decision.

Engineering knowledge with regards to planning, construction, and operational costs are also included into the analysis. Notably on this but also on further topics in the report, expertise of Prof. Dr. Kochendörfer and John-Albert Giebelhausen (both KVL Bauconsult GmbH) and Prof. Henning Balck (IPS Institut für Projektmethodik und Systemdienstleistungen) has been included into the report as part of an interdisciplinary cooperation. This report is also supported by an empirical study about the practice of economic efficiency studies in Germany and to limited extends in Great Britain.

3 Summary of the results

The results of this report indicate towards several deficits regarding to the methodology of economic efficiency studies. In particular, only a limited degree of consensus exists with regards to the actual methods and input data to be applied in the analyses. When contracting-out economic efficiency analyses to third party-providers, this lack of consensus results can result in problems regarding quality of the results.

3.1 Revision of the economic efficiency analysis methodology

A central mean to reduce the problems with the poor quality of the results of the economic efficiency analysesof is the codification of knowledge related to this topic. Particularly in the context of the insufficient consensus on methods, an improvement of the guidelines is desirable. The following aspects should be considered:

SYSTEMATISATION OF THE DISCUSSION ON COST EFFECTS

The guidelines should provide a thorough and systematic discussion on relative cost effects of the procurement options. This discussion should take into account basic knowledge on consequences of characteristics of transactions, of the involved parties and of the market, as well as effects of the conditions of the institutional framework and with particular reference to cost-increasing and cost-decreasing effects based on the procurement option. Especially the significance of transactions cost should not be disregarded.

MORE DETAILED METHODS OF COST ESTIMATION AND COST COMPARISON

Furthermore the methods to use for cost estimation and cost comparison should be described more detailed in the guidelines with regards to the following:

- Basic procedure of the input-orientated and output-orientated cost estimation approach as well as implications with respect to data availability and inevitable assumptions,

- Discussion of the relative cost estimation in conjunction with a consideration of cost positions with high shares of total costs as well as cost positions implying most significant differences between procurement options (core cost consideration), whereas this approach seems to be particular suitable for an assessment of cost effects between procurement options, and
- Approaches to an improvement of cost estimation, in particular stronger links and mutual plausibility checks between the input- and output-orientated cost estimation, correction of estimation errors due to differences in the technical complexity and optimism bias.

REVIEW THE USE OF THE NOTION RISK AND OF THE METHODOLOGICAL IMPLICATIONS

A more differentiated denomination of “risk” (in the meaning of a variance) and “(expected) cost overruns” seems to be appropriate, because both aspects have different implications. The concept of risk is relevant within the comparison of procurement options for the assessment of the risk allocation between the public and private sector. Hence the (expected) cost overruns arising during the planning process have to be considered separately. Basically the *expected* costs have to be calculated and compared. The already existing approaches to the correction of cost underestimations are reasonable, but should be clearly described as such. At this point a clarification is desirable and therefore also the use of the notion “risk workshop” should be rethought. Generally it is important for the correction of the (expected) cost underestimation within a relative cost estimation framework that first the expected costs of the traditional procurement option are determined and subsequently from that point the costs for PPP are conducted via the relative approach.

MORE INTENSE APPLICATION TO (ELEMENTS OF) QUALITATIVE ANALYSES

Moreover, elements of qualitative analysis and/or purely qualitative analyses should be employed with higher intensity. Elements of qualitative analyses serve especially for the justification and enhanced explanations of the quantitative comparison of costs as well as for the generation and the plausibility check of the assumptions. Purely qualitative analyses are used particularly when the quantification is not possible in a reasonable way, which could be the case in very early stages of the project for example. It should be considered that the guidelines do not limit the application to (elements of) qualitative analyses only to the early phase, where it is tested if the project is suitable for the PPP approach (PPP suitability test). Instead it should be emphasized that they can and should be used in all stages of the economic efficiency analysis in order to face possible lack of data appropriately and to justify assumptions. In addition it could be reasonable to develop a set of questions with respect to specific characteristics of sectors and project types, so that users of guidelines have a first orientation for their own project-specific thoughts. Such a set of questions should be thereby closely linked to the systematic discussion of cost-increasing and cost-reducing effects.

METHOD OF MAKING ASSUMPTIONS AS WELL AS TRANSPARENCY AND COMPREHENSIBILITY OF ASSUMPTIONS

Basically the relevance of assumptions and the following implications should be pointed out more extensively. Assumptions will always be necessary for economic efficiency analyses. This aspect should be explicitly on the agenda of guidelines to avoid the potential misunderstanding of the economic efficiency analysis as an “automated decision making tool”. In order to support the user at this central

task, guidelines should cover the process of making assumptions more detailed and also the importance of the systematic documentation should be stressed. The above mentioned set of questions can also help to structure the assumptions in a better way. Further, there should be stricter rules concerning transparency and comprehensibility of assumptions that can be implemented by more intense application of the already mentioned elements of qualitative analysis and more appropriate presentation of input data and results.

DEALING WITH THE UNCERTAINTY OF RESULTS IN AN ADEQUATE WAY

Furthermore the guidelines should reflect the uncertainty of the results more detailed, especially due to numerous assumptions that have to be made. The mostly recommended sensitivity and scenario analyses are a reasonable approach to show the possible variety of the results. Though with the findings generated by such analyses should not be described in a separate section (often appendix), but should be integrated with higher intension into the main part. So it seems for example reasonable that the estimated costs of the procurement options are presented with band widths instead of point values in the final results of the economic efficiency analysis.

REVIEW OF THE STAGE-SPECIFIC PROCESS

The more detailed methods should also include a review of the stage-specific process in the overall economic efficiency analysis. Thus the following insights should be regarded:

- ***In all stages of the*** economic efficiency analysis: Closer link between (elements of) qualitative analyses and the quantification of costs.
- ***In the "PPP-Eignungstest" and the "vorläufige WU":*** Stronger focus on the quantification of relevant cost effects applying a core cost consideration in connection with the (predominantly) relative approach to estimate PPP costs.
- ***In the "abschließende WU":*** Calculation of the final PSC (especially adjustment and more further detailing) and the corresponding (internal) PPP costs-estimate as well as adjustments of the private bids for an plausibility check between PSC, (internal) PPP cost-estimate and private bids.

CONSIDERATION OF FURTHER OVERALL ECONOMIC EFFECTS AND / OR EFFECTS REFERRING TO THE PROGRAMME LEVEL

It would be advisable that guidelines also provide recommendations, in which cases and how such further effects should be considered in economic efficiency studies. The additional consideration of such effects can lead to a broader assessment of the procurement options and beyond that it can improve the generation of know-how at the programme level. Basically such effects should be described in an additional section or in an appendix of the economic efficiency study.

3.2 Improvement of data and information basis

Aside from methods, data and information basis need to be improved to increase the quality of cost calculations. On programme level, empirical data regarding procurement options should be collected and provided. Considering traditional procurement, the data availability of follow-up costs and of costs of life cycle management should be increased. Especially a stronger connection between investment

and follow-up costs is desirable, i.e. to better quantify interdependences with regard to the choice of quality when calculating life cycle costs. Moreover a systematic periodic evaluation of the planned costs and the actual costs should help to recognize variations of the cost estimates. Additionally, the improvement of data should take into account the PPP alternative. For this, empirical data has to include the underlying institutional solution of the project, in order to empirically prove assumptions regarding implementation costs. However it is known, that reducing problems of data availability will be at great expense and only procurable to a limited extent. This is due to several reasons. First of all, the development of data basis of this sort require great effort, notably if all relevant costs should be collected during the full duration of contract or even beyond that. Thus improving data availability will take a long time period. Likewise the recording and evaluation is impeded by complex contractual relationships, especially when realising PPP. In this context it should be mentioned, that the existing data basis of investments costs in traditional procurement projects permit no robust analysis of the different contract types of traditional procurement; even though these contract types have been used for decades and have a short period of duration compared to PPP projects. Altogether it can be summarized that an improvement of data availability is desirable, but this can be attained only to a limited extent, especially in PPP projects.¹ In this connection one has to remain realistic when discussing possible potentials of increasing data availability.

3.3 Process of conducting economic efficiency studies and reduction of political-economic false incentives

It should be underlined, that certain problems with respect to transparency of economic efficiency studies will always remain due to the limits of increased know-how codification and improved data provision. Hence it should be taken into consideration to organise the economic efficiency study process in a way, which reduces deficits arising from problems with transparency and contracting out the economic efficiency study. In the following the key insights of this topic are summarised.

PROVISION OF IMPLICIT KNOW-HOW

Beside the provision of explicit knowledge like methods and data / information it also necessary, that implicit know-how is sufficiently available. This is required at the programme level for the codification of knowledge as well as at the project level for making proper economic efficiency studies. It seems to be reasonable to provide this implicit know-how in a sufficient scale at a central level. In connection with a central provision there should be strived after organisational solutions, which reduce opportunism potentials in the context of significant know-how contracting problems. Public organisations working on cross-project level can be reasonable organisation models due to inefficiencies based on con-

¹ There are new approaches, not yet widely used, which have the potential of reducing problems of data availability in the long term. For instance the idea of life cycle cost management presented in BALCK (2014). In this context it should be mentioned, that there is a current research project of the research initiative “Zukunft Bau” studying recording and evaluation of existing data for cost calculations in VFM (title “Description and evaluation of data sources for VFM”).

tracting problems and economies of scale as well as benefits of specialisation in generating implicit know-how.

USE OF AN ADDITIONAL EXTERNAL VIEW DURING THE ECONOMIC EFFICIENCY STUDY PROCESS

Further it should be considered that the internal project team dealing directly with economic efficiency study is accompanied by an external second opinion. The external view can help to limit optimism bias problems when performing plausibility checks of the assumptions and hence can improve overall the cost estimation and cost comparison. Beyond that the use of the external view (in the meaning of an active accompanying examination) can reduce opportunism problems in the context of the economic efficiency study process. The external view can be implemented by different organisational models. But this approach needs additional resources and that's why the decision to use the external view depends on project characteristics. In this context the criterion "cost efficiency of the economic efficiency study (process) itself" should be taken into account. For example especially large projects, where in the consequence of their specific characteristics a lot of assumptions have to be made, the use of the external view can be seen as a reasonable add-on.

INCREASING TRANSPARENCY AND (EXTERNAL) CONTROL INTENSITY

In addition more powerful control systems should be established at the programme level to limit opportunism because of transparency and contracting problems. Beside the already mentioned increase of transparency and comprehensibility as necessary conditions for effective control, especially approaches to improve governance of the whole procurement decision process should be considered:

- Examination organisations that are not directly involved in the procurement decision, in particular the strict and mandatory separation of actors, who make the economic efficiency study and examine the results of the economic efficiency study.
- Publish economic efficiency study documents, so that the interested public can impose control pressure. But in connection with certain publications the trade-offs between advantages and disadvantages (e.g. negative impacts on competition) of transparency should be taken into account.

REDUCTION OF POLITICAL-ECONOMIC FALSE INCENTIVES

Going beyond all the methodical and organisational approaches it is worth (to try) to reduce existing political-economic false incentives related to each procurement option in order to improve the governance of procurement decisions. In this context it can be mentioned that the PPP approach can provide a false incentive as it provides possibilities to get around certain budgetary constraints to realise projects earlier than otherwise possible.