Efficiency analysis of Public Private Partnership

Public Private Partnership (PPP) projects offer realisation and life cycle services for real estate by a fixed charge. By procurement of real estate as PPP the bids are complex due to real estate specifics, different kinds of offered services (planning, construction and facility management), output specifying tenders and long term contracts based on assumptions of future developments. Nevertheless awarding of PPP contracts has to follow public procurement rules. Awarding of contract has to be transparent, the bidders have to be treated equally and the most efficient tender has to be accepted. Therefore the most efficient bid has to be recognized to ensure an economical efficient application of tax money corresponding to public procurement rules. Up to now there are several uncertainties for the determination of economical efficiency of PPP bids. As a result there are caveats against contract awarding in several public real estate projects. A solution for an equal and transparent treating of all bidders through a newly developed method is presented below. The method enables the equal and transparent determination of the efficiency of PPP bids. The public client and the bidding companies achieve legal certainty and avoid future caveat by usage of the method and the defined terms.

1 Purpose

The difficulties to find out which PPP bid offers the best economical efficiency start by the definition of the term: “efficiency”. For public procurement efficiency is defined as benefit-cost-ratio [Krems 2010], see section 2: “Public procurement”. By usage of that definition, benefit and cost of PPP bids have to be evaluated resp. calculated. For the benefit evaluation criteria have to be developed. These criteria have to be weighted, because of differences in importance of the single criteria. Both, development and weighting of criteria has to be transparent for bidding companies to be able to optimize their bids for the public client. In the third section “Quality evaluation” a method is presented to develop the criteria in such a comprehensible way by the Quality Function Deployment (QFD) method. Evaluation of the content of a PPP bid through criteria has also to be transparent and carried out in an equal way for all bids. Therefore a newly developed procedure to set up evaluation schemes for the single criteria is presented. Costs, as second parameter beneath the benefit for determination of efficiency, are calculated in a comparable way through the

standardised PPP calculation scheme, see section 4: “Cost calculation”. All these single issues are integrated in a newly developed efficiency analysis method which is presented as result in section 5: “Efficiency analysis method”. Finally in section 6 the conclusions are drawn.

2 Public procurement

Real estate is used by public administration to assure prosperity and to provide public services. Therefore the public administration has to procure real estate according to existing law. Public administration comprises different departments for real estate procurement and handling, therefore in the following the term public client is used, which also includes the user of public real estate. The need of a public client for real estate and services is expressed by requirements for procurement. These requirements are the base for an effective (“doing right things”) and efficient (“doing things right”) procurement. For a reasonable handling of tax money the most efficient bid has to be awarded the contract by a public client according to German law. Efficiency can be increased by consideration of life cycle aspects of real estate, which leads to the procurement alternative of PPP. Efficiency itself shall be reached by competition of bidding companies on the market. A fair competition is result of equal treatment of all bidding companies and secured by a transparent procedure for awarding of contract. This transparency is achieved by an equal understanding of public client requirements and an equal method to evaluate the offered features of the bidders to concern these requirements.

Benefit for the public client comes up, if the features of a product or service match his needs resp. requirements. Therefore a comparison of requirements and features, as characteristics of a product or service, is necessary. The comparison is described by the term quality, see fig. 1, as required characteristics to realised characteristics [Geiger 2008]. In short:
quality = realized characteristics concerning required characteristics.

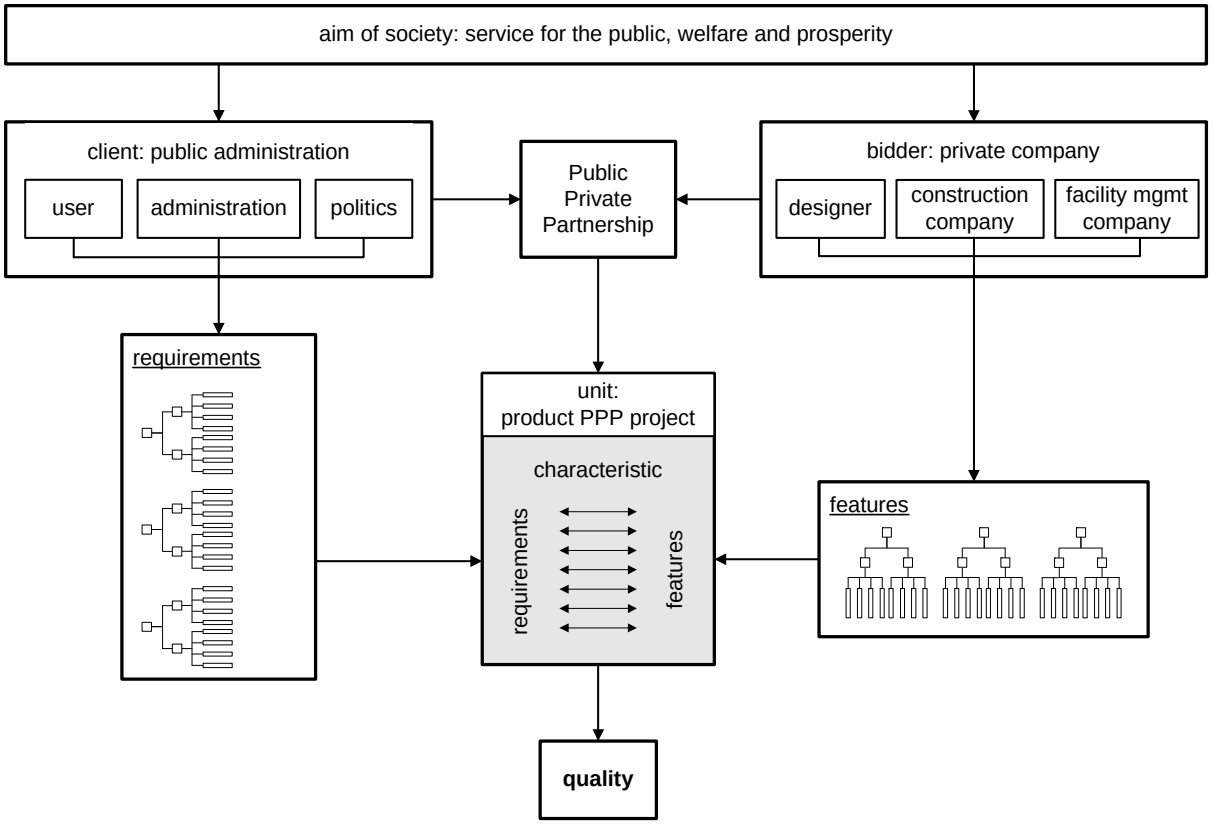

Fig. 1: Quality of PPP projects

Because the benefit of a bid is based on client requirements, the fulfilment of the requirements is an expression of the benefit. By comparison of requirement and fulfilments the benefit becomes measureable by substitution through the term quality. The efficiency of a PPP bid is then determined by the quality-cost-ratio:

$$\text{efficiency} = \frac{\text{benefit}}{\text{costs}} = \frac{\text{quality}}{\text{costs}} \qquad \text{in short:} \quad E = \frac{B}{C} = \frac{Q}{C}.$$

More easily than the benefit is quality measurable by comparison of required character and realized character. In the following section the approved method of Quality Function Deployment is adapted for the measurement of quality in PPP bids.

3 Quality evaluation

The comparison of requirements and offered characteristics of real estate and related services by the bidding companies can be structured by a modification of the Quality Function Deployment (QFD) method of Prof. Akao [Saatweber 2007]. In general QFD

is described as an instrument for planning and developing of adequate functions to client requirements. It is a tool for systematic planning of quality. With its help the functions, which are required by the user, can be systematically detected and translated in quality characteristics. The aim is to develop a product with that method, which consists only of user required functions and not of technical possible, expensive and complicated functions without use for the client. The central element of Akao's QFD is a matrix, in which clients requirements ("*what* the client wants") are combined with the functions of a product ("*how* it is reached"). The client requirements are therefore arranged vertical. Functions to fulfil them are arranged horizontal as quality characteristics, see fig. 2. The combination of both is effected through the answer of the question: "How far is a function helpful to fulfil the requirement?". The answers are the correlation between requirement and quality functions. Below the matrix the results are summed up.

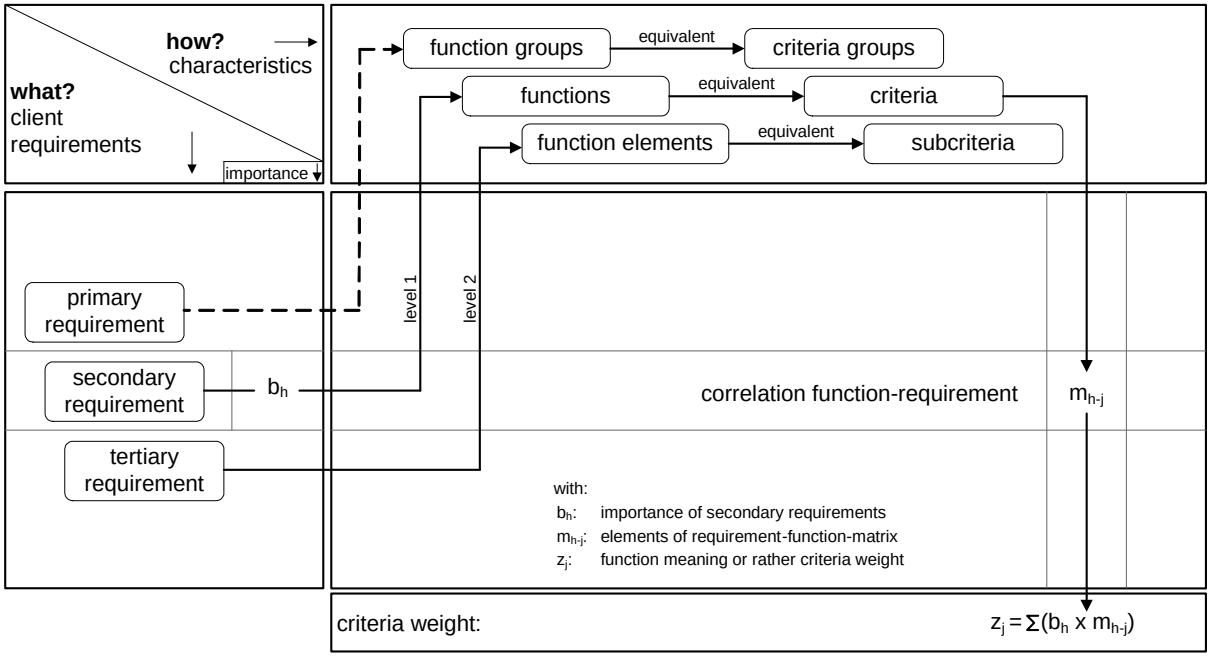

Fig. 2: Quality matrix connecting requirements and criteria

For a transparent evaluation of PPP bids it is necessary to illustrate the relation between client requirements and criteria for evaluation of the contented characteristics of a PPP bid. Through the QFD method, based on client requirements, quality attributes can be developed as functions of a product or service. These quality attributes are used as criteria to evaluate the content of a bid. By a quality matrix the relationship of client requirements and functions is

comprehensible illustrated. The determination of criteria weight, out of the correlation of function and requirement, is in addition achieved by the quality matrix. The criteria weights are as results summed up below the matrix. For the conceptual relations of requirements, functions and criteria see fig. 2. The calculation of the weight of criteria is schematically shown in the bottom line in fig. 2.

The single characteristics are different distinct as content of competing PPP bids. Through subcriteria the weighted criteria out of the modified QFD method become measureable in a quantitative or qualitative way. Preferred is a quantitative way because of the given objectivity of the measurable numbers. Through a combination of the clients requirements with the subcriteria a rating aspect can be developed by the client, see fig. 3.

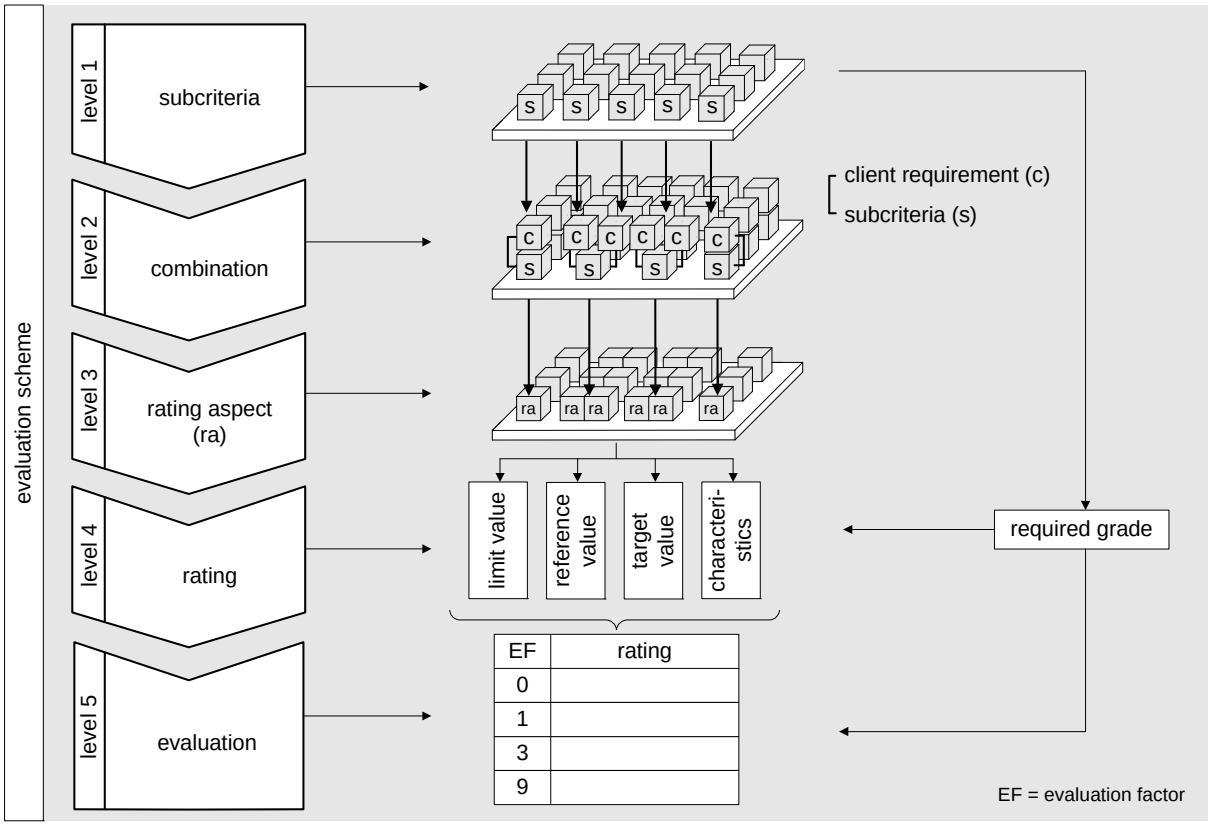

Fig. 3: Evaluation scheme for PPP bid contents

The rating aspect is measurable through limit-, reference- or target values or clear characteristics. The content of a PPP bid is rated with that rating aspect and leads to an evaluation. The evaluation results are given with numbers: 0 for non sufficient, 1 for sufficient, 3 for good fulfilled, 9 for excellent fulfilled. For the rated characteristics

as output of a product or service and content of a PPP bid, necessary costs have to be calculated. The calculation scheme for total project cost identification of PPP projects is presented in following section 4.

4 Cost calculation

Life cycle costs of PPP projects have to consider all the output which causes expenses for the determination of the economical efficiency of PPP bids as second parameter beneath the benefit. To be able to compare the results of the cost calculations of different bidding companies, the calculation has to be carried out in an equal way. To make sure that all cost effective output is considered comparable, the output has to follow a structure, which is appropriate for PPP projects. In particular the structure must be customizable for individual output in single PPP projects. Therefore an output structure with different levels, the so called “standardised German PPP output structure”, has been developed; see fig. 4 [Berner et al. 2009].

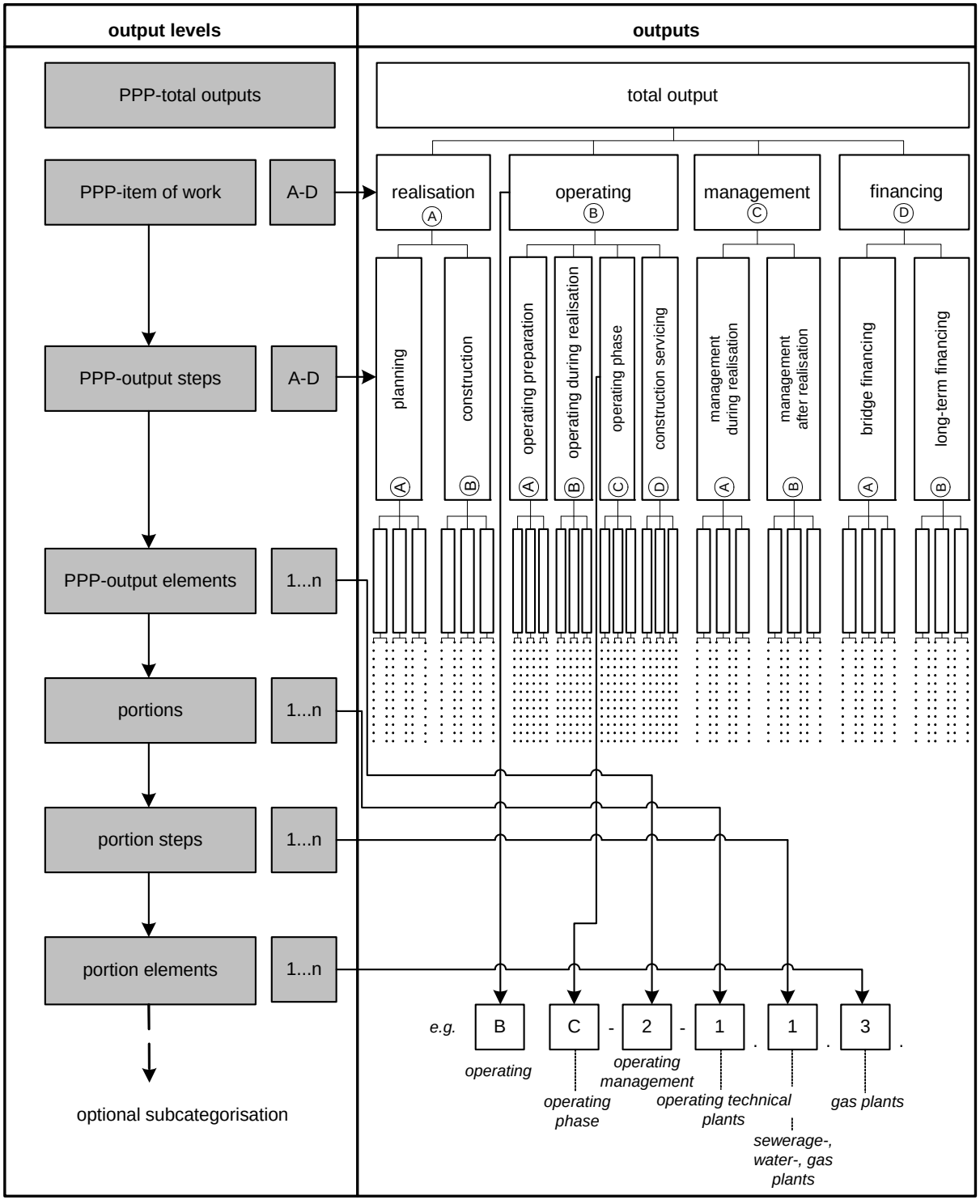

Fig. 4: PPP output structure

Through the different levels of the output structure it is possible to compare different levels of detail. On all levels it is possible to add or delete certain outputs which are in single projects necessary resp. unnecessary. The outputs, and after calculation the costs are summarized and allocated in defined terms, see fig. 7. In the terms the

output structure is represented. Through those terms become costs of different PPP bids directly comparable.

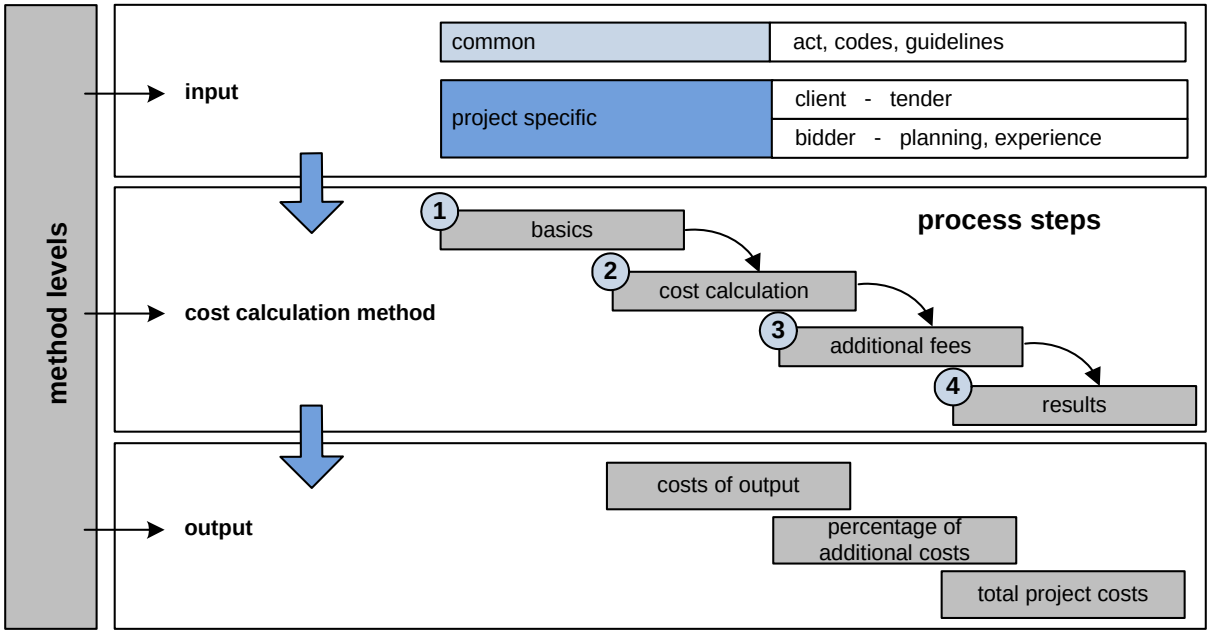

Fig. 5: Scheme of PPP total cost calculation method

The cost calculation process itself is structured in four steps: basics, calculation, additional fees and results, see fig. 5. In the basic step, the output which has to be calculated in a certain PPP project is adjusted by adding output to the given standardised German PPP output structure or by deleting unnecessary output of the catalogue. In the second step “calculation” all the outputs have to be integrated in their interdependencies and therefore it is an iterative process, see fig. 6.

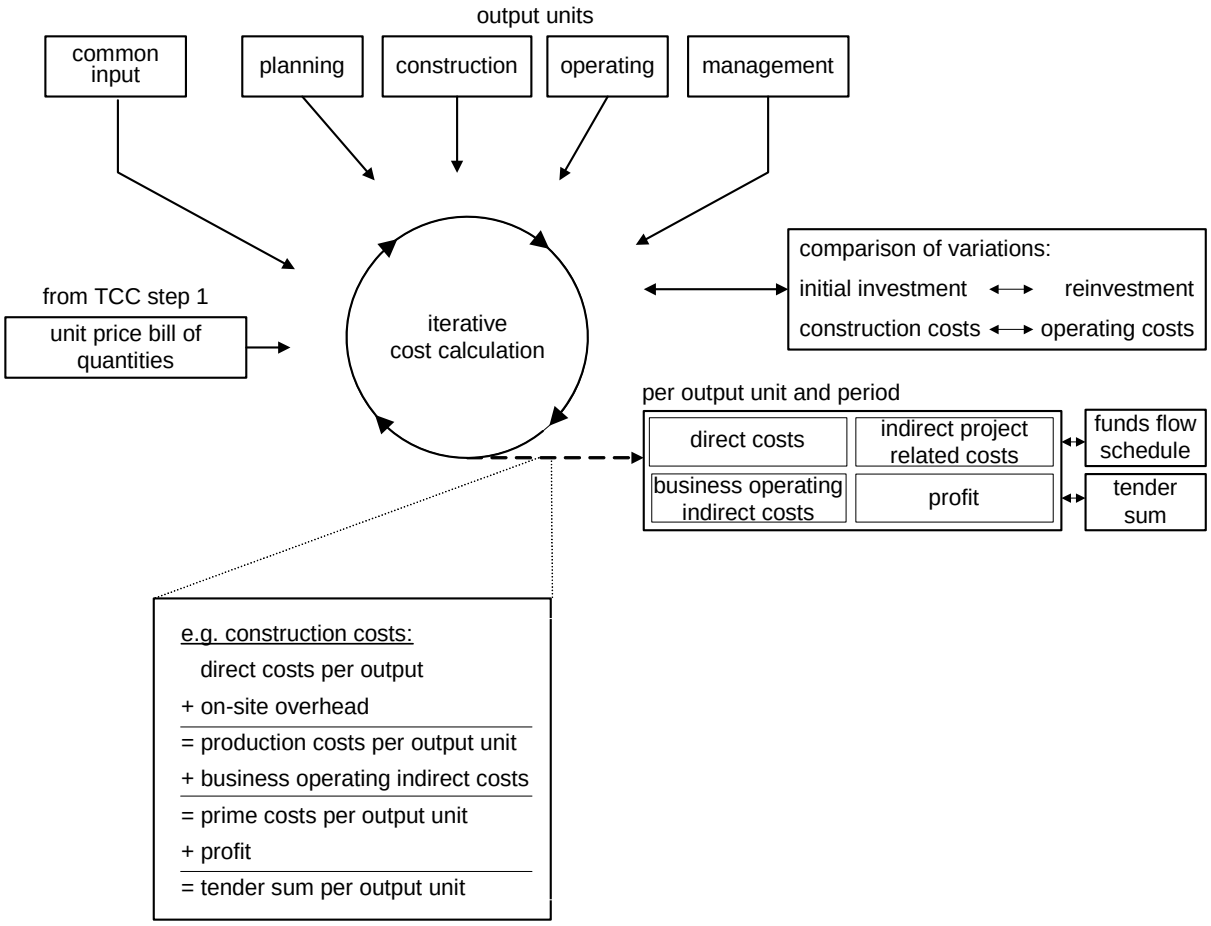

Fig. 6: Schematic calculation of tender sum per output unit

The results of that calculation are the basis for the third step, wherein the additional fees are added. Additional fees are caused by indirect expenses and superior risks, which are not resulting from single output or direct costs.

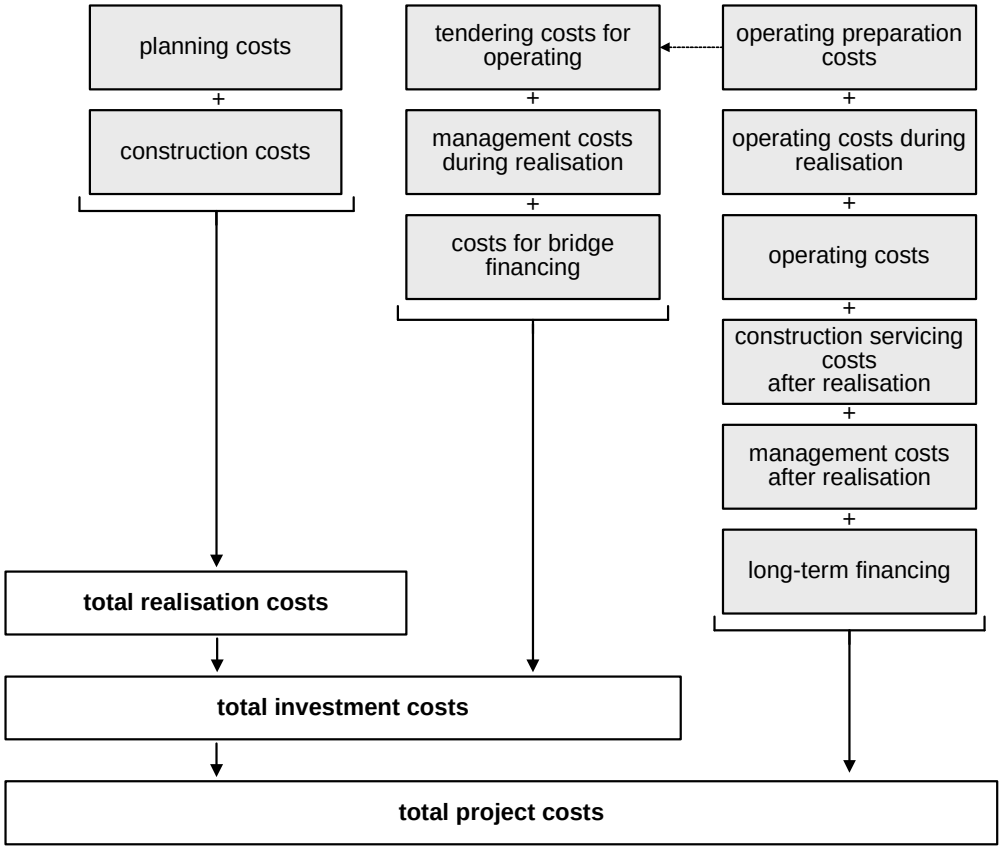

Fig. 7: Allocation of costs to total cost terms

The allocation of the costs to comparable terms, see fig. 7, is accomplished in the fourth step as result of the cost calculation process. With the total project costs as second parameter, it is possible to calculate the efficiency of a PPP project.

5 Efficiency analysis method

For the transparent determination of the most efficient PPP bid are four superordinated process steps necessary. The process steps are structured as follows:

- process step I: criteria,
- process step II: evaluation,
- process step III: calculation,
- process step IV: efficiency.

The first process step has to be passed through to prepare the tender documents for the private bidders. As baseline for bids which match the client requirements. With

process steps II till IV bids the determination of quality and analysis of costs follows after submission of to determine the most efficient bid, see fig. 8.

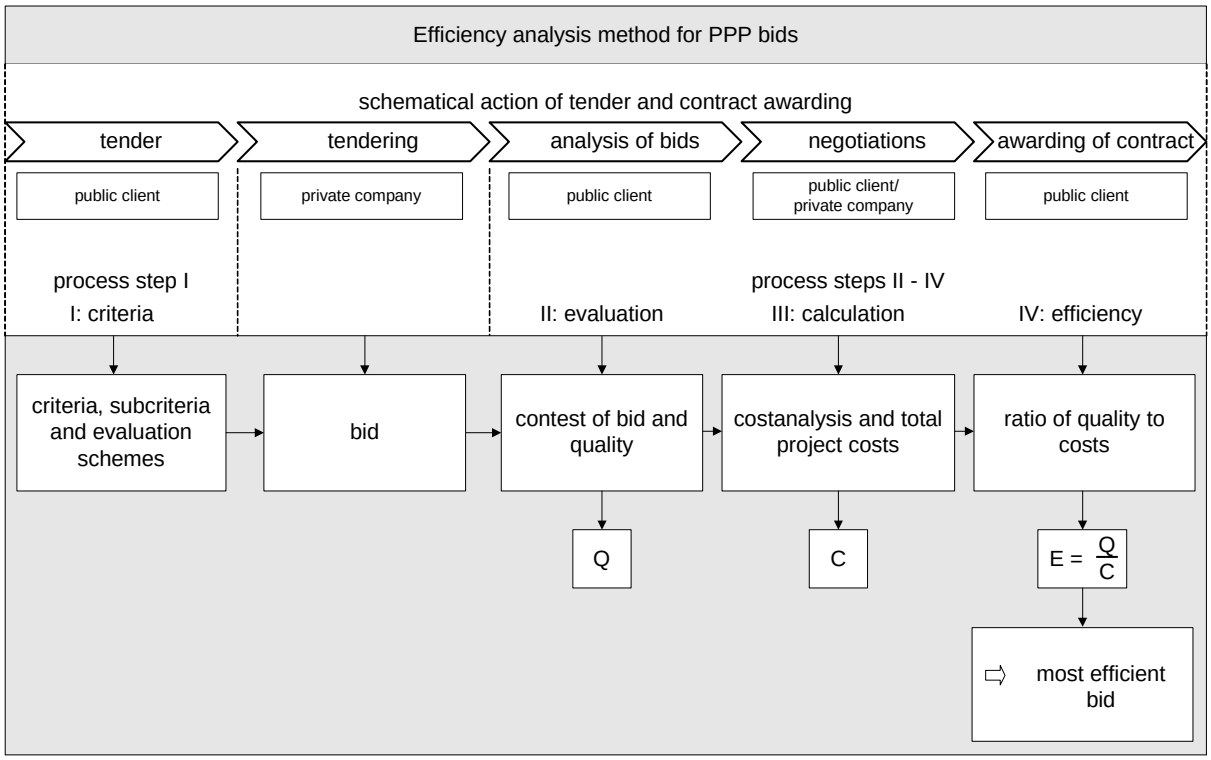

Fig. 8: Process steps for efficiency analysis

The steps are passed through one after another. The criteria for evaluation of bids are developed for the tender documents and weighted. Based on client requirements (e.g. well-being due to clealiness) the characteristics of the PPP project (e.g. pollution degree as result of cleaning service) are worked out in a comprehensible coherence by QFD method. The criteria are superior and therefore an objective evaluation is not directly possible. Due to that fact the definition of subcriteria is necessary to evaluate the contents of the bids. For evaluation the developed schemes as shown in fig. 3 are used. Due to this first process step, the by law required transparency is achieved through continuity from client requirements to evaluation of offered results. After preparation and submission of the bids in process step II, the bids are evaluated concerning the quality with the criteria of step I. Evaluation result is quality Q in measurement unit quality points [QP]. Analysis of costs for the offered characteristics follows in step III. Results of this third process step are the total project costs C of a bid. Finally in process step IV the efficiency E is calculated as ratio of quality to cost.

The bids are then sorted into descending order of efficiency. The bid with the maximum value of quality to cost ratio is the most efficient offer.

With the help of a fictive PPP project example the application of the newly developed process is described as a computer software solution. The results of the comparison of efficiency are illustrated in fig. 9. The calculated efficiency is shown on a straight line of same value which origins in zero. Optimisation potential of quality and costs are clearly pointed out for negotiations of the partners by this illustration. The process is mainly developed for a usage by public clients. Above that it can be used by private companies' as well to proof and optimize alternative offers and solutions.

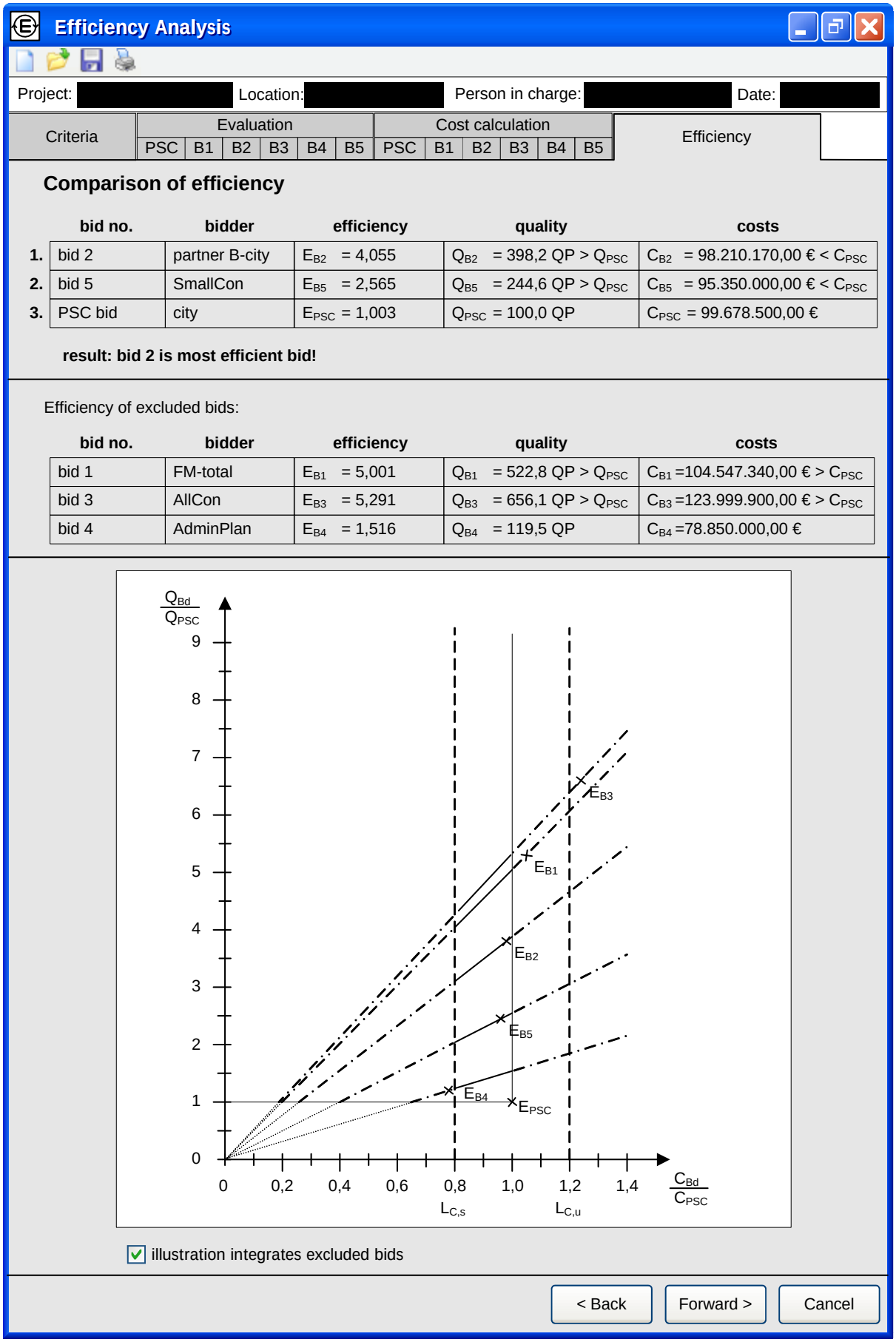

Fig. 9: Comparison of PPP bid efficiency

6 Conclusions

In a transparent way the most efficient PPP bid can be identified by the presented method. The analysis method is based on four levels. On the first level criteria for evaluation of bids are determined, based on user requirements. These criteria are worked out and weighted with help of quality function deployment (QFD) method of Prof. Akao. It ensures that user and client requirements are the important facts for the evaluation of benefit by a PPP project. The weighted criteria become part of the tender documents to support bidding companies by showing the important issues for the user and client and to reach best quality of real estate and related services in sense of the client. After submission of private company's bids, the method which is presented supports on its second level the identification and objective evaluation of the benefits of a certain bid for the planned PPP project. Therefore evaluation schemes of single quality aspects in three categories building, operation and management are worked out in a catalogue. The objective benefit assessment generates a quality competition for the best real estate and services for the public client. The third level enables the user of the method to analyse the costs of a PPP bid. This cost analysis is based on a further development of German calculation standard for PPP total cost calculation. On the fourth level of the newly developed analysis method the most efficient PPP bid is going to be named due to the best benefit-cost-ratio. Due to the identification of the most efficient bid follows legal security for awarding the contract. Competition for best quality and cost transparency through the new method lead to best value for tax money.

7 References

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