

A CRITICAL ANALYSIS OF CHOOSING BY ADVANTAGES IMPLEMENTATION IN THE TENDERING PROCEDURE BASED ON EU DIRECTIVE AND GERMAN LEGISLATION

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ABSTRACT

The Choosing by Advantages (CBA) Tabular method is a decision-making method that differentiates between alternatives based on the importance of advantages. By doing so, cost-related factors are excluded from the table to better understand the value of each alternative. After evaluating the value, the cost/price of each alternative is analyzed in relation to the value. This is a crucial rule to avoid overestimating cost/price and underestimating the value of an alternative. In the public tendering procedure, price is usually the only factor or the main factor used to decide between proposals. As other authors have already pointed out, this leads to speculative bidder behavior that might be rewarded. Using CBA requires a change in thinking, but it will be beneficial in truly understanding the differences between proposals. Therefore, this paper examines the use of CBA in the tendering procedure based on EU Directives and German legislation. It was found that it is possible to implement CBA in the current tendering procedure without violating the principles of CBA. However, the adjustment needed to apply CBA within the current regulations clearly goes against what CBA intends. Therefore, we suggest changing the current reactive tendering procedure to an active decision-making process. This paper does not provide a final answer but aims to open the discussion.

KEYWORDS

Choosing by Advantages (CBA), legislation, public, tendering.

INTRODUCTION

Can a tendering procedure for large projects be fair based on price alone? In many projects, there is a tendency to prioritize the lowest price, or if other factors are considered, the price is given significantly more weight. This makes it difficult to understand the differences between proposals and creates room for speculation to win bids. Rosenfeld (2014) refers to these unrealistically low tender-winning prices as “suicide tendering.” So, what happens when someone is contracted under these conditions? Over the years, numerous authors have already pointed out that competition based solely on price often leads to disputes and claims during project execution, creating an unhealthy project organization where the project ultimately suffers (e.g., BMVI, 2015; Elfving, 2005; Eriksson & Laan, 2007; Rosenfeld, 2014; Rooke, 2014; Schöttle & Gehbauer, 2013). However, public tendering has not undergone significant changes yet; the transactional approach still dominates the public system and is based on a

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misguided focus. Instead of focusing on project requirements and needs, the emphasis shifts to monetary transactions. Each tender partially sets the tone for the project because it represents the initial interaction between the owner and the contracted parties (Schöttle, 2022). The parties' behavior during the tendering procedure will ultimately impact the project execution. So, how can we improve the tendering procedure?

We believe that a tendering procedure based on a fair evaluation of proposals is essential, meaning an established method such as Choosing by Advantages (CBA) needs to be applied. The benefits of CBA in the tendering procedure were first mentioned by Schöttle et al. (2017). They explained that traditional methods, such as weighted sum, have two major issues. First, by mixing value with price/cost, they open the door for speculation. Second, it becomes difficult to differentiate between proposals when factors are the primary focus. Suhr (1999) refers to this as unanchored judgment and highlights the danger that arises from overestimating insignificant facts and underestimating significant ones. Both issues were further discussed by Schöttle and Arroyo (2017). They illustrated the magnitude of the price impact compared to other information and how irrelevant information influences decision-making.

We acknowledge that this is only one aspect of the overall procedure. However, this paper aims to enhance the evaluation of proposals, improve the differentiation between them, and select the best opportunity for the project. Therefore, the research question is: How can CBA be applied in the public tendering procedure in Germany?

With this in mind, we are not focusing on a specific delivery system. The proposed approach can be implemented in both traditional delivery settings and more collaborative approaches. Of course, a more collaborative approach already includes a different mindset as it involves selecting partners rather than just contractors. Implementing CBA in a traditional tendering procedure, however, offers owners a chance to better understand their expectations and the value at stake. We argue that this will change the owner's attitude toward task and risk transfer. Therefore, based on the EU Directive, this paper will demonstrate if and how CBA can be applied in the German public tendering procedure without violating the method. This will not only provide German public owners with a guideline but also offer guidance to other EU members and countries worldwide facing similar challenges.

Consequently, we will first introduce CBA and the prior anchoring procedure proposed by Suhr (1999). Second, we will explain the EU Directive and German legislation as the foundation for the tendering procedure. Then, we will outline the research method, discuss the findings from the focus groups, and conclude.

CHOOSING BY ADVANTAGES TABULAR METHOD WITH THE PRIOR ANCHORING PROCESS (PAP)

CBA is a decision-making system that compares alternatives by analyzing the importance of the advantages (Suhr 1999). The system is based on the following four principles: (1) decision-makers must learn and skillfully use sound decision-making methods; (2) decisions must be based on the importance of the advantage; (3) decisions must be anchored to the relevant facts, and (4) different types of decisions call for different sound methods of decision-making.

The comparison of advantages and the magnitude of the difference between them helps the decision-maker to see and understand the real differences between the alternatives. Differentiation is based solely on value, meaning price is not considered in the initial assessment. The price of each alternative will be analyzed in the final step by showing the relationship in a diagram. In CBA, it is a fundamental rule not to mix price with value, as cost-related data is seen as a message and medium of exchange (Suhr 1999). Once the money is spent, it cannot be spent again. Therefore, it is crucial to have a clear understanding of how money is being spent, especially if it is taxpayer money. In CBA, the ultimate question is whether decision-makers want to spend the proposed money on a specific value (importance of

advantages [IoA]). This allows the decision-maker to understand and reflect on the trade-off. However, separating price from value and viewing price as a constraint is often one of the most challenging aspects of learning CBA (Arroyo et al. 2019), as commonly used scoring methods mix cost-related data with value to generate an apparently objective number.

For a public tendering procedure, Suhr (1999) introduced the prior anchoring process (PAP) because public authorities must transparently publish how proposals will be evaluated before the request for proposals. The prior anchoring process is an add-on to the CBA Tabular method and must be included in the tendering documents to evaluate the proposals using the Tabular method (see Figure 1). The PAP consists of the five steps (Suhr, 1999):

1. Define the factors.
2. Define the must and want-to-have criteria for each factor.
3. Estimate the expected range of attributes for each factor.
4. Define the expected range of advantages for each factor by defining the worst acceptable (WA) attribute, the worst expected (WE) attribute, and the best expected (BE) attribute as anchors for identifying future advantages. Select the least-preferred attribute, either WA or WE, or both if they are the same, and calculate the anchor-statement advantage (ASA), which is the difference between the least-preferred attribute and the BE.
5. Decide the importance of the expected advantages by choosing the paramount advantage (PA) from the ASA. Then, assign the importance weight of each ASA compared to the PA, and for each factor, create either a preference curve for qualitative data or a preference chart for qualitative data.

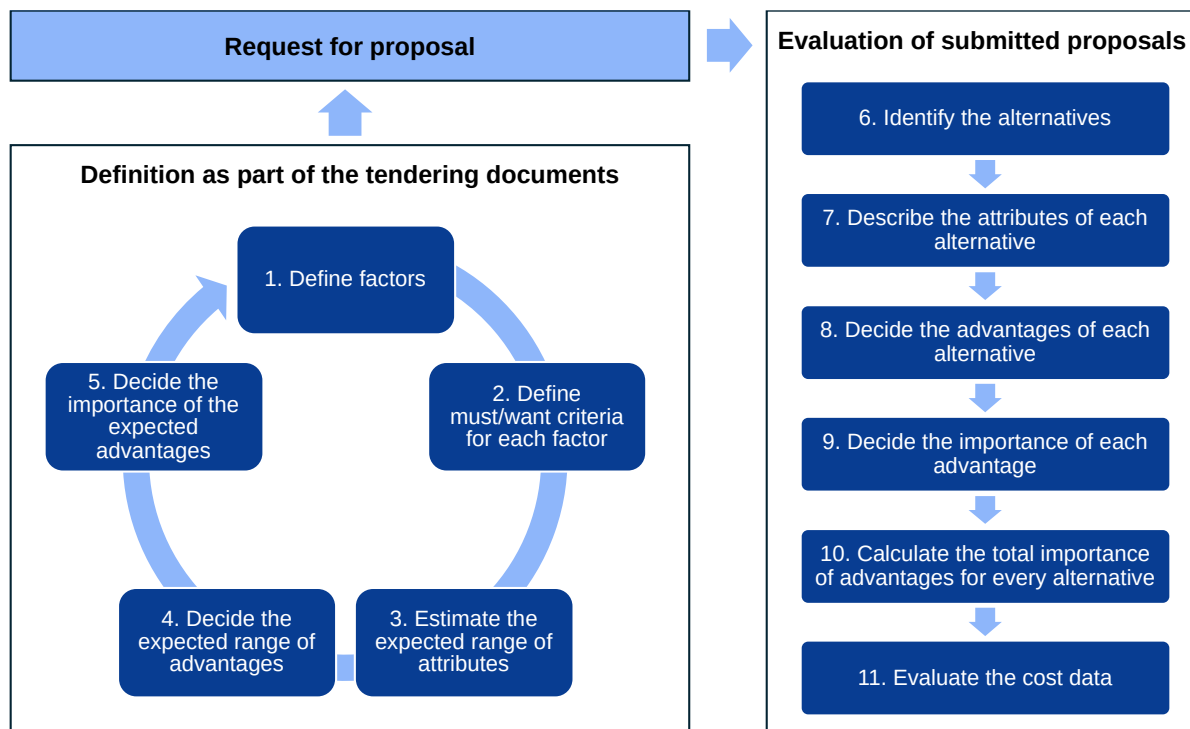


Figure 1: Process steps of CBA in the tendering procedure

Compared to Suhr (1999), Schöttle et al. (2017) introduced the minimum requirement (MR) as the attribute that must be achieved and defined ASA as the difference between BE and MR. However, we will not discuss whether WA, WE, or MR should be defined, as ultimately, they serve the same purpose. They help determine the ASA and identify the preference curve/chart.

While the PAP requires significant effort to develop, Suhr (1999) proposed that, if the law suffices, the RFP should simply state that CBA will be used to evaluate the proposals and to avoid favoritism, the proposal should be analyzed anonymously so that the bidder cannot be identified. This is feasible when there is no contact between the bidder and the judge during the tendering procedure. However, if a competition phase is included in the tendering procedure, it becomes difficult to avoid identifying bidders with their proposals, as both sides interact. This is where the PAP becomes necessary. Another option proposed by Suhr (1999) is to change the legal process, as the current assessment of the proposal is based on unanchored judgment. In this regard, Suhr (1999) points out that “factor weight and attribute ratings are unanchored judgment, and [...] that selecting a contractor based on unanchored judgment is legally unacceptable” (p. 225). Consequently, he argues that using a factor weight method in a legal procedure should be prohibited. However, using a PAP in the tendering procedure means that the price proposal and the proposal containing the technical and social aspects, referred to as the value proposal, must be submitted separately but simultaneously. The price proposal will be opened after evaluating the value proposals to overcome price bias.

Nevertheless, Suhr (1999) states in his book that it would be preferable to use CBA as simply as possible, and thus, not everything needs to be defined in advance. However, different countries have different rules and regulations, and what works in one country may not work in another. However, his book lacks evidence of whether CBA works within a public tendering procedure in a specific country or if the law needs to be adjusted to apply CBA effectively.

EU DIRECTIVE AND GERMAN LEGISLATION

In the European Union, the requirements for award criteria in public procurement law are primarily based on Directive 2014/24/EU, issued on 26 February 2014. Directives are not directly applicable but need to be transposed into national law by member states. Individual member states have the autonomy to determine how they implement these directives in practice. Since EU Directives are framework legislation, member states are obligated to implement them in a timely and proper manner. It can be assumed that the legal situation within the EU is generally harmonized. Therefore, the following statements apply to all EU member states.

"MOST ECONOMICALLY ADVANTAGEOUS TENDER" AND MINIMUM WEIGHTING OF PRICE

Article 67 of Directive 2014/24/EU provides the framework for national procurement regulations to design award criteria in a public procurement procedure. This European Directive allows contracting authorities considerable freedom by expressly permitting the inclusion of various factors such as quality, technical merit, aesthetics, expediency, organization, environmental characteristics, innovation, qualifications of the personnel entrusted with execution, and delivery or execution time as award criteria. However, a public contract must always be awarded based on the criterion of the “most economically advantageous tender” (Article 67, Paragraph 1, Directive 2014/24/EU). This limits the freedom of contracting authorities to include non-monetary, qualitative evaluation aspects in that these can only be factored into the procurement decision as part of a price-performance ratio. The price—or the costs, as Article 67 of the 2014/24/EU Directive also explicitly allows costs to be used instead of price—must be considered when evaluating tenders. However, there is no stipulation for a minimum weighting of the price, at least according to German jurisprudence. In fact, the Federal Court of Justice has clarified that qualitative award criteria should generally receive more weight the less the requested asset represents a standardized service customary in the market. An excessively one-sided focus on price carries the risk of award decisions that ultimately prove to be uneconomical because they fail to account for qualitative differences in the service (BGH X ZB 3/17, p. 16, para. 35).

The contracting authority is, therefore, mainly free to determine the relative weighting of the individual award criteria relative to each other, as the weighting of the selected award and sub-criteria interact with each other and significantly influence the award objective pursued. For an award—for example, for a bridge—the contracting authority will receive significantly different tenders with a weighting of 30 % price and 70 % quality than, for example, for an award with a weighting of 50 % price and 50 % quality.

Relative weighting only finds its limits in the prohibition of arbitrariness and discrimination. For example, in cases where an excessively marginal weighting of an individual award factor leads to a distortion of competition or unequal treatment of individual bidders. According to German jurisprudence, this is only the case “if qualitative evaluation criteria individually or as a whole are given a weighting that cannot be objectively justified and therefore suggests that the criteria have been designed in such a way that only one or individual companies have realistic prospects of being awarded the contract, while other bidders would have no chance from the outset despite (...) objectively given suitability.” (BGH, X ZB 3/17, para. 38).

With the relative weighting of the award criteria, the contracting authority believes it ultimately makes its priorities clear to the bidders. It is an assumption that weighting factors are a powerful tool for achieving the award objective. However, this contains two major mistakes. First, assigning a numerical weight does not determine the method’s objective, and second, the importance of a factor cannot be accurately represented by a single numerical value; rather, it is an evaluation based on an assumption (Suhr, 1999).

FURTHER REQUIREMENTS FOR THE INCLUSION OF NON-MONETARY CRITERIA

Link to the subject matter of the public contract (Article 67 (2) and (3) Directive 2014/24/EU)

A prerequisite for the admissibility of an award criterion is that it must be linked to the subject matter of the public contract, as stated in Articles 67 (2) and (3) of Directive 2014/24/EU. According to Article 67 (3) of the Directive, this link is established if the criterion relates in any respect and at any stage of the life cycle to the works, supplies, or services to be provided under the contract. This may concern, for example, the specific process of production or provision of works—or a specific process related to another stage of their life cycle. The specific criterion does not have to be part of the material substance of the subject matter of the contract. Thus, European Directive law provides extensive possibilities for including qualitative, non-monetary aspects in the evaluation.

No unrestricted freedom of choice (Article 67 (4) Directive 2014/24/EU)

According to European Directive law, an award criterion must not grant the contracting authority unrestricted freedom of choice. Therefore, the chosen award criterion must support the possibility of effective competition and be accompanied by specifications that enable an adequate review of the tenderers’ information to assess how well the tenders meet the award criteria. Consequently, award criteria must ensure an objectifiable and verifiable decision-making process to prevent arbitrary decisions. However, this does not preclude subjective aspects—such as the aesthetics of a building—from consideration, provided certain conditions are met. For instance, multi-member evaluation committees should be established for such criteria to deter arbitrariness, and these may be contracted externally. For transparency reasons, the complete evaluation matrix, including the planned evaluation process, should be publicized beforehand. During the evaluation process itself, the criteria used to award points should be meticulously documented. Therefore, it is not advisable to base the evaluation of individual award criteria solely on oral statements made by bidders during a presentation meeting (Braun, 2021).

Weighting and specification in the procurement documents (Article 67 (5) Directive 2014/24/EU)

Article 67 (5) of Directive 2014/24/EU mandates that the contracting authority must weigh the individual criteria and present the intended weighting in the procurement documents. This obligation applies not only to the overall weighting but also to the respective sub-criteria. Only under very strict conditions may the contracting authority deviate from the principle that weighting rules for sub-criteria must be published in advance and cannot be introduced subsequently (ECJ, C-677/15P, para. 41 et seq.). The requirements for sub-criteria, particularly their substantive specification, are closely linked to the tender specifications. Therefore, an abstract description of the required depth of content cannot be expressed in abstract terms; it depends on the individual case.

Compliance with the general principles of Community law

In addition to the requirements of European Directive law, award criteria must also comply with the general principles of Community law. The transparency requirement is especially pertinent here. The requirement of transparency under public procurement law means that the award criteria provided by the contracting authority must be sufficiently specific and comprehensible in terms of content. As “quality” is not a self-explanatory criterion, the contracting authority is required to describe the qualitative requirements of the procurement object as precisely as possible and establish corresponding sub-criteria. Vague terms, such as “best possible fulfillment of requirements,” may constitute a breach of the transparency requirement, as they hinder the genuine comparability of tenders.

A REAL-LIFE EXAMPLE OF CURRENT PRACTICES

Real-life example for a relative evaluation method (simplified): The tendering process was for external project supervision services for the megaproject second core line of the city train (2.SBSS) in Munich. The heart of the route is a 7-km-long tunnel connecting Munich Main Station, Marienhof Station, and Munich East Station. The route intersects several lines of Munich’s subway network, with platforms to be constructed between 40 m and 16 m below ground.

Framework for the tender:

1. The tender with the lowest price receives 80 points. Bids exceeding 1.5 times the value of the lowest bid price receive 0 points. Points for other bids are linearly interpolated between the lowest bid price and 1.5 times that value.
2. Up to 20 points are available for the written and oral elaboration of the concept regarding the quality of the personnel and the software tools to be used.

Table 1 shows that bidder 1 reached 85 out of the maximum of 100 points and was awarded the contract.

Table 1: Result of the real-life tendering procedure

Bidder	Total Price (fictional)	Price Points	Quality Points	Total Points
1	40 €	80	5	85
2	50 €	40	10	50
3	60 €	0	20	20

This simplified example illustrates that within the specified legal framework, it is feasible to establish the legally required price-performance ratio by simply converting price and quality

into evaluation points and determining “the most economically advantageous tender.” In this scenario, a relative evaluation method focused on the criterion “total price” was employed. Nevertheless, the setup of this tender clearly indicates that the decision was predominantly price-driven and that other factors had minimal influence. Moreover, this example starkly demonstrates that our judgments are based on scoring factors that do not provide a clear understanding of the differences between the proposals or their significance. This is precisely what Suhr (1999) criticizes as unsound. Thus, the authors will explore how CBA might be applied and its potential benefits for future tender processes.

RESEARCH METHOD

This paper aims to understand how CBA can be applied based on the EU Directive in the German public tendering procedure without violating the second and third CBA principles specifically. The research question is: How can CBA be applied in the public tendering procedure in Germany? This qualitative research utilized two focus groups to collect data from experts through discussion (Gray, 2009; Morgan & Krueger, 1993). The first group included contractual experts focusing on the EU Directive and German legislation, while the second group comprised three CBA experts (including the first author) to discuss whether the outcomes of the first group violated the second and third CBA principles.

In addition to the two authors (a CBA expert and a contract manager), the first focus group included an architect, a lawyer from the DB legal department, and a second contract manager from DB InfraGo. Additionally, a project manager shared his thoughts with the authors before the focus group, as he could not participate. During the first focus group, two significant questions were addressed:

- Can we apply the CBA Tabular method with the PAP proposed by Suhr (1999) in Germany?
- Is the diagram showing the price versus the IoA sufficient, or do we need to present the relation in a numerical ratio or weighted sum based on the EU Directive and German legislation?

Before discussing the questions, the participants were introduced to CBA. During the discussion, a simplified example was used to illustrate the table and diagram to facilitate a shared understanding. In the second focus group, the results from the first group were reviewed to determine if any aspect of the procedure violated the CBA principles or the intended approach.

DISCUSSION

In general, there are two options for implementing a method into the public tendering process: either the regulations concerning the tendering procedure need to be changed, thus altering the law, or the method needs to be adapted to comply with the second and third CBA principles. We will now discuss the questions from the two focus groups to determine how to apply CBA in the German public tendering procedure.

CAN WE APPLY THE CBA TABULAR METHOD WITH THE PAP PROPOSED BY SUHR (1999) IN GERMANY?

As the tendering procedure requires that the assessment method for proposals be published, the tabular method needs a more precise definition upfront. Suhr (1999) proposed that the CBA tabular method should be adjusted by integrating the PAP to help bidders understand how their proposals will be evaluated. During the discussion, the question of whether defining WA, WE, and BE is sufficient arose. The group concluded that defining WA, WE, and BE and the resulting ASA alone is challenging and agreed with Suhr (1999) that the preference curve/chart

also needs to be defined. They argued that there is too much uncertainty about how the evaluation tends to be if we assume non-linearity. Since preferences are usually not linear (Suhr, 1999), the preference curve/chart for each factor must be clearly defined in the tendering procedure. This should not result in significant efforts to discuss mathematical functions. A set of curves/charts should be defined in advance so the owner team can select the one that best represents the relationship between attributes, advantages, and the IoA.

The exact number of curves/charts the set should contain is not specified and requires further research. However, it must be considered that Suhr (1999) states that preference curves are only for quantitative data and qualitative data must be represented using a preference chart, but it is unclear how detailed the chart for qualitative data must be. Further testing might also be necessary to determine whether qualitative data can be represented by a preference curve and if the scale of attributes can be defined in detail using the x-axis. Nevertheless, defining the preference chart will require more effort than defining the preference curve for quantitative data.

Another point of discussion was the definition of the criteria. According to Article 67 (4) of Directive 2014/24/EU, the criteria must be precisely defined to comply with the requirement to prevent unrestricted freedom of choice. For example, criteria such as “the less uncertain the construction schedule, the better” or “the higher the technical experience, the better” would be too vague and allow too much room for interpretation. Without further specification, these criteria would violate the prohibition of arbitrary freedom of choice and the principle of transparency. Therefore, it can be stated that the degree of detail and, therefore, the effort to set up a PAP is high.

IS THE DIAGRAM SHOWING THE PRICE VS. THE IOA SUFFICIENT, OR DO WE NEED TO PRESENT THE RELATION IN A NUMERICAL RATIO OR WEIGHTED SUM BASED ON THE EU DIRECTIVE AND GERMAN LEGISLATION?

As noted, the public tendering procedure must represent a relationship between price and value. However, the specifics of how this relationship should be presented are not detailed in the EU Directive or German legislation. Under German case law, it is not necessary to assess price and quality criteria using the same method. In practice, the degree of fulfillment of a factor is commonly used for assessment. The contracting authority has considerable leeway in relating price and value. A standard of comparison must be established—for example, by converting the tender price into price points. Both absolute and relative evaluation methods are allowed. According to German case law, the price conversion formula can only be challenged under public procurement law if it is incompatible with the principle of fair award competition (BGH X ZB 3/17). The contracting authority has a broad margin of discretion. Therefore, the authors conclude that using CBA in a public procurement process is feasible under current legislation. Indeed, the owner is free to determine the weight of the price. In practice, public owners interpret the relationship as a ratio or weighted sum, but creating a ratio or weighted sum based on the IoA vs. price contradicts the third CBA principle that decisions must be anchored in relevant facts. In CBA, cost-related data is not mixed with value to produce a number as other scoring methods do.

Nevertheless, neither the EU Directive nor German legislation restricts using the IoA vs. price diagram to represent the proposals. The conflict with interpreting the diagram arises when considering how a public owner can justify selecting a proposal that has a higher IoA but also a higher price (see Figure 2, point A vs. point B). This is a tricky part. Therefore, the public owner may need to establish predefined rules on how to handle a trade-off in terms of IoA and price, for example, defining that a higher IoA could justify a specific price or specific price range.

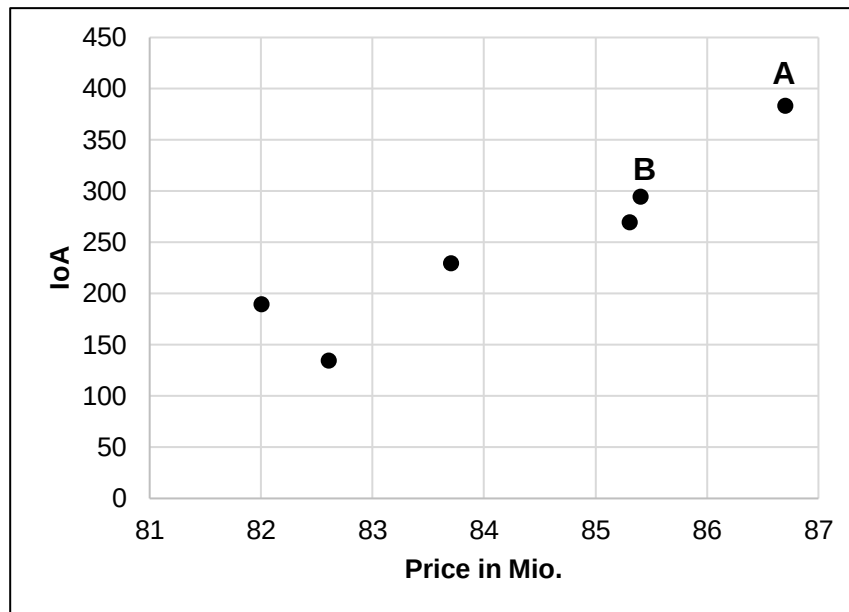


Figure 2: Example of the Importance of Advantages (IoA) vs. price diagram

DOES CBA GET VIOLATED BY THE CURRENT REGULATIONS?

As explained in the previous section, CBA is possible in a public procurement process under restrictions. However, does this violate the positive effects of CBA?

The current practice in the tendering procedure involves following the law and puts the decision-makers in a position where they are not truly making decisions. The decision-maker assists with the procedure rather than taking ownership. Making a decision is an investigation. But how can we investigate by defining everything upfront? Applying CBA in tendering procedures results in an endless number of rules that need to be set for every possible outcome. This makes CBA burdensome and almost impossible to implement in complex situations. CBA requires ownership and a mindset of investigating the differences and the importance of the differences represented in the IoA (second and third CBA principle). However, the high degree of upfront definition makes it difficult to see the benefit of the application. The current practice focuses on the procedure itself rather than the decision itself, and this needs to change for successful CBA implementation. This raises the question of whether the law can cover everything. Obviously, it cannot. So, what should be the focus? Should we prioritize fulfilling the procedure or invest in involving people who can address the needs and constraints together? Should we deflect or instead train people and establish processes to make effective decisions in the tendering procedure for the project's success?

Another issue ignored by current practice is how to deal with new or unexpected information. Especially in megaprojects, where a tendering procedure can take months or even a year, new information is generated, and the tender documents quickly become outdated before the tender is awarded. This poses a dilemma for every project. Thus, we cannot freeze our information status, but we do freeze the tendering process, or we already know which claims to address. So, why can't we act accordingly?

The tendering procedure is reactive. It does not provide the opportunity to correct mistakes as soon as the tendering document is published. For public owners, this means they must adhere to known practices. This is primarily due to political constraints and the fear of making a mistake. There is always the risk of project delays because bidders may have a claim against the tendering procedure. Nevertheless, there are good examples where public owners successfully changed the tendering procedure. For instance, the University of California San Francisco changed its scoring method during the evaluation process of a project, and even the

non-winning bidder teams found the new procedure fair (Schöttle, 2022). Consequently, we need to change our mindset and understand tendering as a proactive decision-making process.

FINAL REMARK

There are only two options here: (1) Everything needs to be defined in such detail that decision-makers might avoid the use of CBA in a complex decision, although it is the right thing to do, or (2) the law needs to change to put the decision-maker in a position to really decide and not follow instructions no matter what. Understandably, favoritism and corruption must be stopped. However, in the current system, the tendering process can be manipulated to generate favoritism. Right now, people are not taking responsibility for their decisions as they frame them according to the law. Thus, the question is: What problem are we trying to solve here? No method alone can do so, as humans will find a creative way to circumvent it. The tendering procedure is a human-made artifact. What needs to happen is that a board of decision-makers with different perspectives should be empowered to make decisions. They should act as a court of law (see Koskela et al., 2018).

Therefore, the problem of favoritism and corruption cannot be solved by a rule; it can be minimized by making decisions as a group. The issue needs to be reframed, and with this paper, we invite you to start a discussion about how we select partners in the tendering procedure.

CONCLUSIONS

After providing a brief overview of the legal framework for awarding in the EU, the authors believe that CBA can be incorporated into public procurement procedures—even within the existing public procurement legislation framework. Therefore, the research question of whether and how CBA can be applied in the public tendering procedure in Germany can be answered by utilizing the PAP. This approach will not violate CBA principles. However, the adjustment required to apply CBA within the current regulations will discourage owners from using it, which goes against the intentions of the CBA. Public authorities must recognize that the current practice is reactive, subjective, unfair, and does not foster ownership. We need to shift our perspective and view the law as a means rather than an end goal that must be achieved. Therefore, we invite owners to engage in discussions regarding current practices and the implementation of CBA in the tendering procedure.

In addition to discussions, further research is necessary as this study has limitations in its theoretical approach. Data should be collected through experiments or applications to validate the theoretical findings. This should be the next step for future research.

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