Framework for Structuring Procurement Contracts

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Abstract

The aim of this paper is to propose a new framework for structuring contract types and payment methods. Concerning procurement contracts, the first important new feature of this framework is a stepwise structure with three main steps in the contract design: (1) what will be procured—should the contract only include construction, or should it include both construction and operation/maintenance (2) who will do the detailed design of the premise and (3) how many contractors will the client use? The second important new feature of this framework is that both step 2 and step 3 include a continuum of alternatives. Concerning payment methods, the new framework is primarily based on how the specific risks of the project are shared. These frameworks can be useful for policy formulation in that they can help to avoid some problematic ways of formulating policies.

Keywords: Procurement, Contract, Construction sector, Infrastructure projects

Introduction

Discussions about productivity problems and cost overruns are common in many countries. Changes in procurement have been proposed as ways to create incentives for innovation and for taking life-cycle cost into account (Mandell & Nilsson 2010). These changes involve moving from Design-Bid-Build (DBB) contracts to Design-Build (DB) contracts, and/or to contracts in which construction and maintenance are bundled, such as in Public Private Partnership (PPP).

A survey done by Eriksson and Laan (2007) shows that for the majority of projects procured as DBB contracts, the clients and their consultants make the detailed design together. In these cases, it is possible for the design to be handled in-house if clients use their own staff (SOU 2009:24). On the other hand, in a typical DB contract the client specifies the general characteristics of the end product. This can theoretically be done in a number of ways, such as: by referring to earlier products ('we want a standard type of this'); by specifying the general characteristics of the house ('we want a residential building in seven floors with *x* square metres and fulfilling basic legal quality demands'); or by specifying various functional characteristics of the object (e.g., Bejrum & Grennberg 2003; Mattsson & Lind 2009). The fundamental difference between DBB contracts and DB contracts is who has the responsibility for the detailed design; in the first, the responsibility lies with the client, while in the second, the responsibility lies with the contractor. However, in both cases, the client typically has the responsibility for the operation and maintenance phases. In the construction of some projects, such as PPP projects, operation and maintenance is bundled to one contract (Leiringer 2003; Lind & Borg 2010). It is argued that this kind of contract (both DB contracts and PPP) gives the contractor a higher degree of freedom and the ability to use new solutions to cut costs and resources (Ng & Wong 2007).

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The starting point for this paper is the belief that logical and clear terminologies and clearly structured arguments are important in a number of contexts. Clients have to make decisions about how to procure projects and if the alternatives are described in a vague and unsystematic way, then there is a risk for incorrect decisions, and the optimal procurement contract is not chosen. The framework determines how we formulate the alternatives and how we think about an issue. Clarity and logic are also important from a scientific perspective. If you want to compare and evaluate procurement contracts and find out their advantages and disadvantages, it is important that the alternatives are described in a logical and clear terminology. Otherwise we will not know what has been compared and what characteristics of the contract are responsible for the observed consequences. Without well-structured and clear alternatives it will be difficult to draw policy implications from research.

Our aim is to present a new and simple framework for describing and analysing alternative procurement and payment systems. As shown below, the definitions in leading textbooks lack consistency. In this article, we focus on contracts for infrastructure projects, such as roads and railways, which typically have a public client. This is a conceptual paper based on a selective sample of literature. The books we discuss here were chosen because they are leading textbooks in construction management[1]. The structure of the paper is as follows. In the next section, we examine how contracts and payment forms are described and categorised in leading textbooks (Gould & Joyce 2011; Ritz & Levy 2013; Winch 2010). Then we present our proposed framework, followed by some general reflections about the choice of procurement contract and payment methods. In the subsequent section, we present reflections on the choice of contract type and payment mechanism. In the final section, we present our general conclusions and the advantages of the proposed framework will be clarified.

How Contracts are Structured in Selected Literature

It is common in the selected literature to start with a rather long list of procurement contract types without a clear system: DBB contracts, DB contracts, performance-based contracts, PPP contracts and more. Each contract is seen as a unique entity with specific characteristics. Types of contracts are often graded in terms of additional commitment for the contractor. Secondly, the selected literature contains no common terminology for the whole problem at hand. American literature primarily uses the term *Project Delivery Method* (see Gould & Joyce 2011; FHWA n.d.) while Winch (2010) uses the term *ways of procuring*. Ritz and Levy (2013) use the term *contract executing approach*.

Contract type refers to payment method in Gould and Joyce (2011); but payment method is called *Contract format* in Ritz and Levy (2013). In Federal Highway Administration (FHWA) publications, *Procurement Method* refers to the selection criteria used when choosing a contractor (FHWA n.d.), which are called *Ways of procuring* in Winch (2010).

We recommend using the basic terminology *Procurement contract type* and *Payment method*. The first term refers to how tasks are allocated between different actors, and the second term refers to how the contractor is paid.

Procurement Contract Type

The tables below, and the comments after the tables, summarise how procurement contract types are structured in different sources. We first look at Gould and Joyce (2011), as shown in Table 1. In the text, Gould and Joyce (2011) also discuss:

- Concession contracting (p. 34) including DBFO (Design-Build-Finance-Operate) and BOOT (Build-Own-Operate-Transfer); and

[1] Based on interviews with Swedish lecturers in the area.

- Innovation in project delivery (p. 91), where they mention PPP as a way to finance and give BOO (Build-Own-Operate), DBO (Design-Build-Operate), and DBF (Design-Build-Finance) as further examples.

Table 1: Contracts structure in Gould and Joyce (2011, Ch. 4)

Name of contract type	Description
Design-Bid-Build	The client hires a designer (architect), who prepares a design and completes contract documents. With correct documents, the client either conducts a bidding process or negotiates with a specific contractor. The contractor is then responsible for constructing and delivering a complete project. Both the architect and the contractor have the option of choosing subcontractors. The contractor is solely responsible for the execution of the work.
Design-Build	The client hires a firm, that is, a contractor that will perform both design and construction. The contractor has the option of hiring subcontractors and architects for the design.
Construction Management	The client hires both a construction management firm and a designer (architect) and has the sole responsibility of hiring individual construction contractors. The construction manager can vary in expertise and can be put in place at different stages. The architect is free to hire subcontractors.

Table 2 describes the structure presented in Winch (2010), who uses the term *formation of the project coalition*. Winch (2010) also discusses four basic types of privately financed procurements (p. 43): Concession, Private Finance Initiative, Public Private Partnerships, and Company Limited with Guarantee.

Table 2: Contract structure in Winch (2010, Ch. 5)

Name of contract type	Description
Separated	The client hires suppliers and (designer) architects and uses competitive tendering to obtain subcontractors. The architect is then responsible for selecting the trade contractors who will execute the site work. The architect is responsible for co-ordinating the contractors, but is not responsible for any failings on their part. One version involves the client hiring a general contractor that takes over the responsibility of the execution of the project on-site.
Integrated (Turnkey)	The client hires a single contractor for both the design and construction stages on a competitive tender basis.
Mediated (construction project manager)	The client hires architects, as well as a construction manager who is responsible for managing the trade contractors on site. The contractors are selected on the basis of a competitive tender organised by the construction manager. The arrangements and terminology vary considerably depending on the clients' or the construction managers' different responsibilities at various stages.
Unmediated	The client has a high level of in-house project management capability, and has the necessary knowledge for and option of hiring subcontractors.

Table 3 presents the contract structure in Ritz and Levy (2013). In the text, Ritz and Levy (2013, p. 51) also mention Build-Operate-Transfer (BOT) as another alternative. The FHWA (n.d.) presents the structure outlined in Table 4.

Table 3: Contract structure in Ritz and Levy (2013, Ch. 2)

Name of contract type	Description
Traditional	The client hires a separate designer and a single general contractor that both have the option of hiring subcontractors.
Turnkey	The client has two options. The first option is design-build, where a single engineering contractor has the responsibility for both the design and construction. The general contractors hired by the engineering contractor have the option of either hiring subcontractors or using their own workforces. In the second option, the client hires an engineering construction manager with the responsibility for the design and construction, who in turn hires a designer and a construction manager who have the responsibility for the construction and for possible subcontractors.
Owner Builder	The client is responsible for design and construction and has the option of either using in-house competence or hiring subcontractors.
Construction Management	The client has two options: first, hiring a separate designer and a general contractor that acts both as a construction manager and as the client's agent, with both designer and contractor having their own hired subcontractors; or second, hiring a designer, a construction manager that acts as the client´s agent, and individual construction contractors.

Table 4: Contract structure in FHWA (n.d.)

Name of contract type	Description
Design-Bid-Build	The client hires separately for design and construction services, and keeps a high level of both control and risk. The contractor's involvement is restricted to the construction phase. The client completely defines the scope.
Design-Build	The client combines design and construction under a single contract. The contract can also cover design-build-maintain, design-build-warranty and design-build-operate. The owner has the option of defining a scope of work, but has opportunity for innovation. This type of contract is often used for projects that are complex in nature or have a high level of urgency. The contractor's involvement runs from just after the pre-design and ends at least after the warranty have expired.
Construction Management	The client hires a construction manager to act as a construction advisor during the pre-construction phase and as a general contractor during the construction. This contract transfers the cost and risk to the construction manager. The client has control over the scope and design during the process. The contractor's involvement runs from just after the pre-design and ends when the warranty has expired.
Public Private Partnership (PPP)	The client hires a developer who takes part in the financing of the project in return for the ability to collect toll revenues, or to pursue development rights. The developer is responsible for the integrated delivery of design, construction, and operation and maintenance for a time period specified in advance.
Alliance contracting/ Integrated project delivery (IPD)	The client and at least one service provider, such as constructors, consultants, and designers, collaborate on the delivery of a project. The client collaborates with the industry to allocate risk.

It can be seen that three of the procurement contract types are repeated in several of the classifications. *Design-Bid-Build* is explicitly present in two of the four classifications, and appears to be the same as what is called *Separated* or *Traditional* in the remaining two. *Design-Build* is also present in two of the tables and is called *Integrated* or *Turnkey* in the other two. *Construction Management* is present in three of the tables. What Winch (2010) calls *Unmediated* seems to be similar to what Ritz and Levy (2013) call *Owner Builder*. Several of the books include some form of PPP as a fourth alternative, although others see PPP as being outside their classification system, and merely comment on it in their text.

Payment Methods

Concerning payment methods, Tables 5, 6 and 7 summarise the main alternatives, as described by the authors. Again, there is a lack of common structure in these classifications, even though some forms are repeated a number of times. *Fixed price* is mentioned by all three classifications, and *Cost-plus* and *Unit price* contracts are mentioned by two. In addition, there appears to be no common structure in how alternatives are presented.

Table 5: Payment method structure in Gould & Joyce (2011, Ch. 4)

Name of payment method	Description
Single fixed price	Also called lump sum, this is a contract in which the contractor has agreed to deliver a specified amount of work for a specific sum of money. Once the contract is signed, both parties have to live with the terms.
Unit price contract	The client and contractors agree on the price that will be charged per unit for the major elements. The client often provides estimated quantities, and the contractor calculates the final price according to this information, with additions for the contractors' overhead, profit, and other project expenses. The final contract price is not known until the final work has been done.
Cost plus a fee	This is a contract in which the contractor is reimbursed by the client for all work costs, and also receives an additional agreed-upon fee, or a fee that is a percentage of the costs.

Table 6: Payment method structure in Winch (2010, Ch. 6)

Name of payment method	Description
Fee based	This cost-reimbursable contract also seems to cover a unit price contract.
Incentive contract	This can be both a fee based and a lump sum contract, and varies in outline. The consistent part of this type of contract is the attempt to have positive incentives within the contract, to motivate performance fulfilment by gainsharing between parties.
Fixed price	A contract in which the price is fixed for an agreed-on amount of work. It may be that the contractor's price is fixed, or it may be an after-measurement, if the quantity of work to be done is not known in advance.

Table 7: Payment method structure in Ritz and Levy (2013, Ch. 2)[2]

Name of payment method	Description
Cost-plus (a number of versions)[3]	The client agrees to pay the contractors for the cost of the work plus a fee, very often calculated as a percentage of the cost. This contract can be complemented with a guaranteed maximum, a guaranteed maximum and incentive, or a guaranteed maximum and provision for escalation.
Bonus (a number of versions)	The bonus in this type of contract may be related, for example, to time, completion, and/or performance.
Lump sum (a number of versions)	A contract in which contractors prepare their bids according to a completed set of plans and specifications. No more and no less than is stipulated in the documents should be included.
Unit price contracts	The client and contractors agree on the price that will be charged per unit for the major elements. The client often provides estimated quantities, and the contractor calculates the final price according to this information, with additions for the contractors' overhead, profit, and other project expenses. The final contract price is not known until the final work has been done.

The Proposed Basic Framework: Procurement Contract Type

We believe that similarities and differences between procurement contract types become clearer if a stepwise procedure is used; that is, a structure in which one dimension is introduced at a time. The following framework is based on three steps: determining what is to be procured; determining who will do the design; and determining how many contractors will be used.

Step 1: What Is to Be Procured; Construction Only, or Construction with Operating/Maintenance?

It is confusing that, especially in the FHWA (n.d.) framework, 'delivery methods' do not concern different ways of 'delivering' the same type of object. In addition, the composition of the object differs between methods. In one method, 'delivery methods' only concern a 'premise' - for example, a road or a tunnel - while in another method, they concern both building an object *and* operating/maintaining it for a considerable number of years.

In our proposed framework, the *first* step for the client is to decide whether a contract that delivers an object should be chosen, or whether a bundled contract that includes both construction and operation/maintenance should be chosen. The descriptions above show that PPP and BOT projects are not integrated in their basic framework. Instead, these types of contracts are mentioned in the text without a clear relation to their basic framework. Here, they are integrated in the same framework as traditional contracts that only concern a premise. Figure 1 illustrates this first step.

[2] They also discuss convertible contracts used in joint ventures, which is not relevant here.
[3] Here we also include what they call *Time* and *materials.*

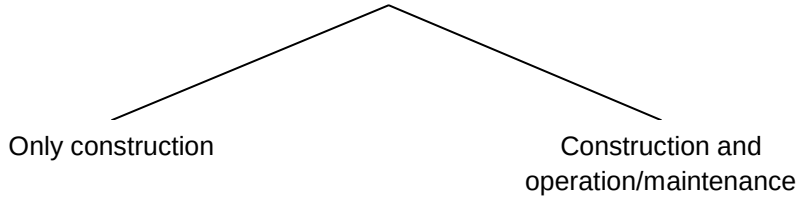

Figure 1: Initial decision when producing a contract in the infrastructure sector (Source: authors)

Step 2, Version 1: Who Will Do the Design?

The line drawn between DBB and DB contracts concerns who is responsible for the detailed designs of the facility. The same distinction is drawn between what Winch (2010) calls *Separated* versus *Integrated* contracts, and what Ritz and Levy (2013) call *Traditional* versus *Turnkey* contracts. In the first type of contract, the detailed design is the client's responsibility. In the second type, the detailed design is the contractor's task. This distinction is illustrated in Figure 2.

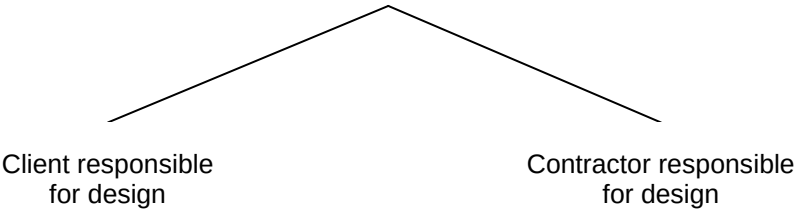

Figure 2: Step 2, Version 1: Who will do the design? (Source: authors)

In the literature, the distinction related to who makes the design is only used for pure construction contracts. However, the same distinction can be made for bundled contracts also. The client may have a clear view of exactly the kind of facility they want and how it should be managed, but may still write a bundled contract. The study presented by Borg (2011) indicates that in the (few) Swedish PPP projects that have been carried out, there was very little innovation. To a large extent, the contractor in these cases used techniques that the client had used earlier in DBB contracts. The choice of bundling construction and operation/maintenance can be motivated by arguments other than giving the contractor freedom concerning the design. For example, efficiency in the operation of the facility can motivate a bundled contract. Combining Figure 1 and Figure 2 therefore gives four basic options; however, as we argue in the next section, the real world options do not fit neatly into this framework.

Step 2, Version 2: Who Will Do the Design?

Nyström, Lind and Nilsson (2014) show that one cannot assume that a so-called 'DBB contract' has fewer degrees of freedom for the client than a so-called 'DB contract'. They also make it clear that most DB contracts include detailed technical specifications concerning a number of aspects of the premises. In order to simplify repairs or the handling of spare parts, the client might have very specific demands concerning some components, while leaving other things open. In practice, the responsibility for the detailed design is divided between the client and the contractor. It is therefore more correct to talk about a

continuum of contract forms than to talk about just two alternatives (i.e., the client versus the contractor being responsible for the design). This continuum is illustrated in Figure 3, with an arc between the two extreme points. In one extreme, the client makes detailed design choices for all components; in the other extreme, the client only formulates rather general functional demands (e.g., the capacity of a road, maximum track depths). Each point on the arc represents a specific division of responsibilities for the detailed design.

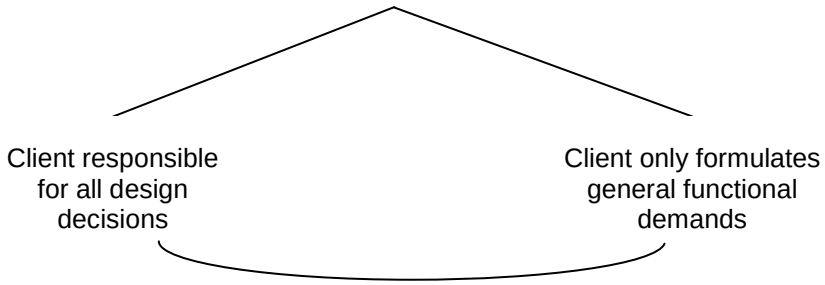

Figure 3: Step 2, Version 2: Who will do the design? (Source: authors)

If the client is responsible for design decisions, the framework contains a further subdivision concerning whether the design department is in-house, or whether independent consultancy firms are contracted for the design work. For example, the Swedish Transport Authority (STA) has gone from an in-house design department to almost complete outsourcing over the last fifteen years. This subdivision could be added to as 'step 2b' in the diagram. We do not include it here, in order to avoid unnecessary complexity in Figure 3.

External or In-house Project Manager: Construction Management

In the American literature in particular, Construction Management (CM) is described as one of the basic procurement strategies. In Sweden this is not seen as a specific 'delivery method' or contract form for infrastructure procurement (Eriksson & Hane 2014), but as a more pragmatic issue of whether to have an in-house project manager or whether to hire an external project manager. The STA, for example, sometimes uses a combination of CM and both external and internal project managers within the same project.

In the literature, CM is sometimes described as having a role in which the construction manager is almost the same as a contractor. The construction manager is described as being responsible to the client, and the construction manager hires subcontractors. Large contractors in Sweden, such as Skanska, PEAB, and NCC, currently describe themselves as CM companies, because they use subcontractors to a large extent. In this way, these contractors can reduce their fixed costs and risks. The comparative advantage for the company is being able to put together the right team of companies for a specific task.

In our proposed framework, CM is for these reasons not seen as a specific procurement contract type. How the contractor structures their work is up to them, and is not part of the procurement contract type.

Step 3: How Many Contractors Will Be Used?

In the models discussed above, it has been assumed that there is only one 'general' contractor, but this is of course not necessary. In the literature, there were models like the one Winch (2010) calls *Unmediated* or what Ritz and Levy (2013) call *Owner Builder*, in which the client hires several contractors to carry out specific tasks. Our framework therefore includes a continuous scale concerning the number of subcontractors: from one general contractor to a large number of separate subcontractors. This scale is shown in Figure 4.

It is important to note that a divided model with several subcontractors is also possible in a case where both construction and maintenance are included in the contract. In this case, using a number of contractors means that each one is responsible for a set of components of, for example, the road being constructed. For example, one company might be responsible for building and maintaining electronic information systems in a tunnel, while another might be responsible for the road in the tunnel. Even if it is typical for a PPP project to have one (general) contractor, this is not theoretically necessary.

Partnering

As described in Nyström (2005) and Eriksson (2010), partnering can be given a number of more specific interpretations. Their view, and ours, is that partnering should be seen as a way to carry out a certain project in a more collaborative way, opening up for adjustments during the project. This means that partnering should not be seen as a specific procurement contract type, but as something that can be implemented in any type of procurement contract.

The Complete Proposed Framework

Figure 4 shows all the different dimensions of our proposed framework. The idea is that a specific procurement contract could be seen as a specific point on this diagram. Notice that, for the second and third steps in the diagram, there are choices along continuums. The continuum in the second step is between the client being responsible for the entire design; and the contractor being responsible for the entire design, with the client only formulating general demands. The continuum in the third step is between there being one or many contractors.

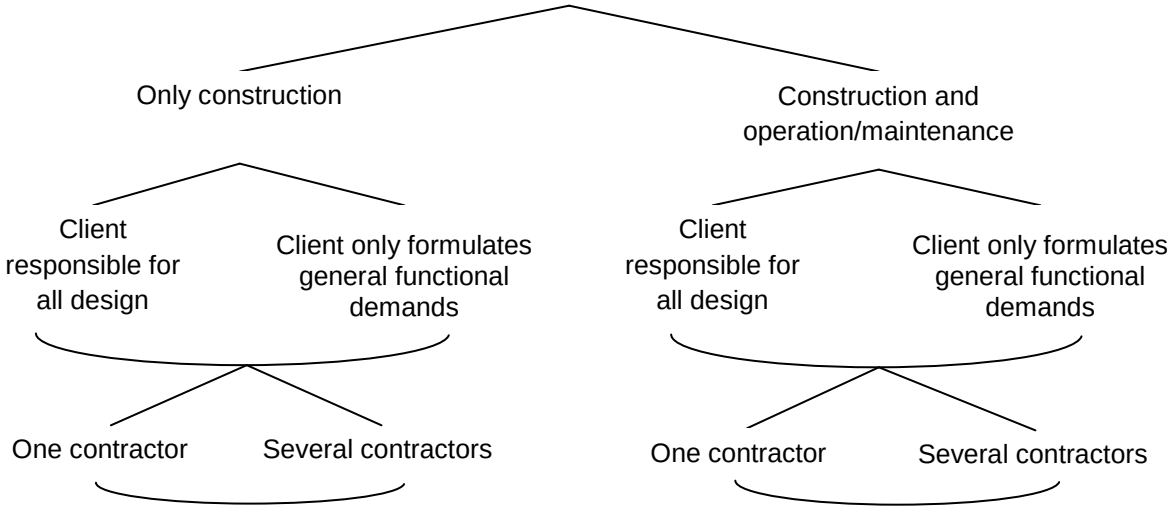

Figure 4: The complete proposed framework (Source: authors)

The Proposed Basic Framework: Payment Method

We propose that payment methods be divided into two main categories depending on whether there is any project-specific risk sharing or not. It can be argued that bonuses in relation to completion time and higher quality can be introduced into all payment methods; therefore, we discuss bonuses separately. Here, we only include payments where the public client pays the contractor. We will not discuss the risk of the client not paying according to the contract, since that can happen in any type of contract. For a PPP project, payment

methods are also possible in which the user pays for the use of a road/rail; but we will not discuss these methods here. However, we include a discussion of some special issues that occur in contracts in which construction and maintenance is integrated.

No Project-Specific Risk Sharing

Here there are at least three subgroups:

1. Fixed price: All risk is borne by the contractor/contractors.
2. Fixed price with general indexing (e.g. consumer price index, or a general construction price index): All risk except changes in the general price level is borne by the contractor.
3. Cost-plus contracts: All risk is borne by the client.

Project-Specific Risk Sharing

The cost of a project depends on prices for various inputs, and on how much of each different factor of production is needed (see Brunes & Lind 2014). Especially in more complex projects, there are uncertainties in both dimensions; and there are various ways of sharing these risks.

- Unit price contracts: In this case, the prices for different types of work are fixed in the contract. For at least some dimensions, there are 'variable quantities', which means that the contractor is paid according to the actual quantities, but using the agreed price per unit. This means that the risk related to the prices is born by the contractor (unless prices are correlated with a general index), while the risk related to the quantities needed is borne by the client.
- Sharing in cost increases/cost reductions (Cost sharing): In this case, the basic idea is that there is an 'agreed price', but if the actual cost is higher than this price, a certain share of the increased cost is paid by the client. If the actual cost is below the agreed price, then the price paid by the client is reduced by a certain share of this saving. This means that both price and quantity risks are shared.

Bundled Contracts with Construction and Operation/Maintenance: A Special Issue

These bundled contracts typically cover a 10-30 year period, opening up at least one extra issue concerning the payment method. Should the client pay only a yearly fee - covering both capital costs and operating costs? Or should the client pay a combination of an 'up-front' payment and a yearly fee - the up-front payment when the premise is ready for use (which can be seen as covering the investment cost), and the yearly fee for operation and maintenance? This second model was, for example, used in one of the first road projects of this type in Sweden (Norrortsleden). There appear to be at least two arguments for the second model. The first argument is that this payment method fits better into the government budget system, if the government has a traditional investment budget. The second argument is that if the financing cost for the government is lower, then the total cost will be reduced if a certain sum is paid by the government when construction is finished.

Bonuses and Penalties in Relation to Time and Quality

All contracts specify what the contractor should deliver. In all contracts, it is possible to add bonuses and penalties if the contractor delivers something that is better or worse than what was agreed on in the contract. The simplest versions of bonuses and penalties relate to project completion. However, other measurable indicators can also be used as a basis for bonuses and penalties related to quality. In some cases, it may be more rational to make the contractor pay a penalty rather than having to redo work to reach the desired quality; however, we will not discuss this option further here. Bonuses and penalties for construction

contracts may also relate to the guarantee period. These and other bonuses and penalties may also relate to contracted quality, both during the contract period and, for integrated contracts, at the end of the contract period. How the contract handles bonuses and penalties is a complex issue that requires special study.

Payment Methods in Relation to Selected Literature

Our proposed framework covers the different payment methods presented in the literature review that we outlined earlier. What we call *Fixed price* in our framework covers what Gould and Joyce (2011) call *Single fixed price*; what Winch (2010) calls *Fixed price*; and what Ritz and Levy (2013) call *Lump sum*.

Gould and Joyce (2011) further mention *Unit price* contracts and *Cost plus a fee* contracts which are included above. The *Fee based* contract in Winch (2010) is similar to the *Cost plus* contract, and his *incentive* contract covers both what we refer to as *Cost sharing* and the various bonus systems mentioned above. Ritz and Levy (2013) further mention *Cost-plus* and *Bonus* contracts, which are covered by our categories above.

Reflections on the Choice of Contract Type and Payment Mechanism

Potential Problems

From a theoretical perspective, it is clear that all models contain potential problems:

- Integrating construction and maintenance has potential advantages in terms of creating incentives for minimising life-cycle costs. On the other hand, integrating construction and maintenance tends to reduce competition; and it is always difficult to write long-term contracts (e.g. Lind & Borg 2010).
- Leaving the detailed design to the contractor opens up new solutions, and makes it easier to adapt the design to the skills of the contractor. On the other hand, giving the contractor an increased degree of freedom also increases the risk of moral hazard. In addition, it increases the chance of solutions that minimise the short-term cost of the contractor (see Nyström, Lind and Nilsson 2014; Borg 2011). This creates a problem because a risk-averse contractor tends to choose traditional established solutions that might reduce the rate of innovation (Borg 2011).
- Using a general contractor reduces the transaction costs and the risk for the client. On the other hand, this model also reduces competition; and transferring risk to another party always comes with a cost.

In the same way, all payment methods contain potential difficulties:

- Putting all the risk on the contractor can reduce competition, and can be costly if the contractors are risk-averse.
- If a price index is used, it leads to the issue of choosing the right index. In some cases, indexing can create new uncertainties, because the effect of the index is unsure; for example, when different prices change in different directions.
- A cost-plus model that puts all the risk on the client reduces incentives for the contractor.
- Unit price contracts can open up strategic bidding, if contractors think that the actual quantities will differ from the quantities listed in the procurement documents (e.g. Mandell & Nyström 2013; Skitmore & Cattell 2013).
- Sharing divergences from an agreed price makes it necessary to measure the actual cost, which can be difficult. Risk sharing contracts also reduce incentives for the contractor.

- Bonuses that are related to certain specific parameters (e.g. completion on time) may lead to reduced quality in other dimensions, as the contractor focuses on dimensions that lead to a bonus (Milgrom & Roberts 1992, Ch. 7).

How deterministic are the relations?

Given the complexities discussed above, a reasonable research strategy would be to find relationships of the following type: 'In situation X, contract type Y is the best' (e.g. Eriksson & Hane 2014). Warsame, Borg and Lind (2013) however, question whether finding such relationships is really possible. How a certain model works in a specific situation depends on the skill and experience of the parties involved. If an actor believes in 'model A' and is aware of the potential problems in this model, it might be possible for that actor to take measures to control these problems and therefore get good results from 'model A'. A different actor who believes in 'model B' might instead make that model work well in the same situation. A client who has had problems with one model might choose to change to another just to get a new start.

Conclusion

The main contribution of this paper to the existing body of research is our proposed framework for classifying contract types and payment methods. This has advantages in at least three different contexts.

The first advantage of a logical classification system is that it helps the client to make the right decisions. Here are some examples of how our frameworks can be helpful for the decision maker:

- Instead of initially think in terms of a number of contract types (DBB, DB, and PPP) and a choice between them, the framework points out that the first step is to decide what is to be procured. Should the contract only include construction, or should it include both construction and operation/maintenance?
- The next step is to think in terms of: 'Who will do the detailed design of the premise?' Our framework makes it clear that this is not an either/or decision, but rather continuums of alternatives, and that it is rational for a client to regulate certain things in detail, while leaving other things to the contractor.
- The final step in our framework is then to analyse the optimal structure of the contractor side. How many contractors will the client use? Should it be one general contractor or should the responsibilities be divided in one way or the other?
- The framework concerning payment methods also starts from what we believe are the fundamental issues: How should various risks be divided? How should incentives for good behaviour be created? Instead of starting with a long list of different payment methods, the proposed framework pushes the decision maker to start by thinking about the underlying basic issues concerning risk and incentives.

The second context where our framework can be useful is for structuring scientific investigations. Nyström, Lind and Nilsson (2014) present results from a number of evaluations of the effects of using DB contracts instead of DBB contracts. The conclusion is that no pattern can be found. Given our framework, that is not surprising as there is no clear line between DB contract and DBB contracts. When there in reality is a continuum of alternatives for allocating the task of making the detailed design, it might as well be the case that the line is drawn in different ways in different organisations or for different project. This means that what in one case is called a DBB contract may be similar to what in another case is called a DB contract. Then it is not surprising that no significant difference in outcome can be found. In order to make interesting evaluations, it is necessary to go into details of the

projects compared, to really find projects where there were large differences between how the design was made, and then compare the effects of these differences.

Finally our framework can be useful for policy formulation, or at least a help to avoid some problematic ways of formulating policies. In recent years, one goal for the Swedish Transport Administration (STA) has been to increase the rate of innovation in infrastructure projects. This has in turn led to a measurable goal that the share of DB projects should be increased at a certain rate. The framework above indicates that this is not a good way to formulate a goal that is to be used to evaluate how successful the administration has been. As, according to our framework, there is no clear line between DBB projects and DB projects, a risk with formulating a goal in this way is that the STA simply re-labels their contracts without making any real changes in the contracts. Our framework can be used to formulate more precise goals, for example in terms of more projects where construction and operation/maintenance is integrated, and more projects where specific parts of the detailed design are left to the contractor/contractors.

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