

## **Contract types in the Swedish construction sector: Overview and theoretical analysis**

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### **ABSTRACT**

Efficiency problems in the construction sector are reported worldwide, both when it comes to delays as well as cost overruns and failure in the construction. In Sweden, investigations of the building sector have been done and improvement measures have been suggested to increase quality and keep the costs down particularly in a life-cycle perspective. One suggested measure is to procure more contracts that provide incentives for contractors to work more cost efficient, stick to schedule and improve quality, e.g. performance contract and private public partnership (PPP). In many countries, e.g. the UK, Australia and New Zealand, PPP is a concept well used to build public facilities. Just a handful of projects in Sweden have been PPP projects or other type of contracts where building, operation and maintenance are procured as one, such as performance contract. Compared to other countries this is a small amount of all projects in the construction sector. The debate in Sweden seems, in one way, not to be one about “be or not to be” but rather a discussion about the meaning of the contracts and concepts, where an infinite number of definitions are used, instead of the actual utility of the working strategy. To contribute to a better understanding, a literature review in the field has been done to structure and categorize these more or less new contracts in the Swedish construction sector but also the relationship between performance contract, PPP and other more traditional contracts is clarified. Further, a discussion under what circumstances the different contracts are preferred has been done.

**Key-words:** Performance contract; construction; construction sector

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## 1. INTRODUCTION

In 2002 the Swedish government called for a commission to investigate the Swedish building sector and shortcomings in the construction, such as quality failure, efficient problems and lack of innovation, amongst other things. The result of the investigation was presented in SOU 2002:115 and became a much discussed and debated report. The commission requested the sector to take the recommendations stipulated in the report, e.g. increased roles for the actors responsibility of construction failure, enhance cooperation, open up for pilot project which aim is to lower the cost or represent good example of life- cycle projects, into action if any possibility to change the under- achieving sector in a new direction.

According to several investigations, long- term relationship and more cooperation is a key- stone to a more efficient construction sector. Furthermore it is stated that some contracts can increase the force of a change in the work of increasing the quality and cost efficiency and thereby contribute to a life- cycle thinking within the construction industry (SAPM, 2009). This is also verified in the international investigations and literature, see e.g. Egan 1998. One suggested measure is to procure more contracts and systems that provide incentives for contractors to work more in the new direction, partnering contracts, contracts focusing on functions and PPP contracts are examples of this.

However, it seems that the Swedish construction sector has not developed to the same extent as in other countries in this matter. The debate in Sweden seems, in one way, not to be one about rather a discussion about the meaning of the contracts and concepts, where an infinite number of definitions are used, rather than one of the actual utility of the working strategy and the utility of new systems.

The purpose of this article is to contribute to a better understanding of contracts in the construction sector and to clarify the circumstances under which each contracts or concepts are rational. A literature review in the field has been done to structure and categorize the more or less new contracts in the Swedish construction sector but also the relationship between performance contract, PPP and other more traditional contracts is clarified.

The structure of the article is as follows: In section two a brief literature review about the background of the Swedish construction sector is presented. Section three explains the main groups of contracts in the Swedish sector. Section four contains a theoretical background underpinning the analysis of the contracts in a transaction cost approach. The final section contains the conclusions of the study.

## 2. BACKGROUND

Since the big investigation of the Swedish construction sector, done by the Building Industry Commission in 2002<sup>1</sup>, many investigations have followed with roughly similar conclusions. The roles of the client and the contractor have to be developed, there is lack in quality and competition but also problems with cost overruns caused foremost by delays in the production line and thereby delays for the end users. There is also stated a low motivation of technical development, no incentive for developing new techniques, many times depending on lack of ability to utilize knowledge and take benefit of previous experiences to lower the costs. (SOU 2009:24)

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<sup>1</sup> There have been other investigations before but not as debated and discussed in media and the sector as SOU 2002:115 which is referred to here.

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The culture and tradition in the construction sector is well-built, the design bid build is the dominating contract system and the public sector is the main client. The myth about the uniqueness of each project is strong and every project ends up with factors that can't be forecast and have to be solved at spot. In addition to this the start-up phase is short, sometimes there are only one day or two between signing the contract and the day of project start. After final inspection the staffs disperses and the team spirit and united knowledge is not taken care of and in the next project the same proceedings with new staff will be done. All this hamper knowledge transfer and innovation and technical development to a large extent. One big complain in the latest decades is how slow the change is in the attitude in the sector towards a more efficient and productive way of work.

There is often a contrast with the manufacturing industry which is seen as being characterized by close production planning and a strong control of the process. The subcontractor in this case is an integrated part of the total production and a big weight is put on the relationship between the actors in the network to achieve flows with high efficiency. In the manufactory industry the productivity<sup>2</sup> and innovation development have been much better than in the construction sector and it is believed that the attitude in the manufactory shouldn't be that difficult to transfer into the construction sector. However, to achieve this attitude in the construction sector the focus have to change from a focus on a particular project to a focus at an end product and all of the processes that leads to this end product, i.e. a change in the roles of the game (SOU 2009:24). To achieve the goal of a more manufacturing oriented contract sector, clear roles has to be implemented. The client should have the focus on the function and property of the construction, that the activity is correct and procurement are handled in the right way. The contractor on the other hand should handle the production and development of the production phase and try to achieve large-scale production and repetition to enhance the productivity. The client i.e. shouldn't place resources and goods at the constructions' disposal rather have the responsibility of the activity and the correctness of the procurement. The contractor's role on the other hand is to have the full responsibility of the recourses.

To some extent a life-cycle perspective is taken in consideration in the construction sector but it tends more to rely upon old experience of good solutions. Traditional contracts don't have the incentive for the contractor to undertake life-cycle cost analysis and guarantee long-term functionality (Johansson & Svensson, 2003). Today there are several clients on the market, each with different perspective on their building strategies. Some have an obligation of a long-run management view and some with relative shorter horizon. The two ways of look at a project seems in many ways be a good point to start with when it comes to change the sector in to a cost efficient and productive sector with less contraction failure. The client has different incentive in their activity on the market, where focus on low cost in a life cycle perspective is more of interest when the client has a long run management view but not for the clients that build and after completion deliver to e.g. a tenant owned building. The incentive for a client with a long-run perspective of the construction should be to lower the cost and increase the quality in the long run and there by lower the maintenance cost. By not just focusing on the appropriate project contractors should also have a long-run view of their working methods and gather all knowledge from previous similar projects. Thereby they have bigger chances to avoid construction failure and the chances of avoiding cost overruns increases. (SAPM, 2009)

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<sup>2</sup> Productivity in this context means that over time the same product or service should be produced but at a lower consumption of recourses (SOU 2009:24)

### 3. SWEDISH CONTRACTS: A FRAMEWORK

#### 3.1. Swedish contracts

Within the construction sector there are numbers of different contracts. They can be divided into two main groups. The first group (Design-Bid-Build - DBB) refers to the bid done after client has presented the design. The second group (Design-Build DB) is when the procurement is done before the detailed design phase (Nilsson, 2009). During the last couple of years new contracts and procurement systems has been discussed in Sweden such as performance contract and public private partnership.

##### *Design Bid build contract*

The biggest amount of construction procurement in Sweden, but also in many other countries, is made by DBB either by general contractor or procured as split contracts<sup>3</sup>. However, since the aim of this article is not to go in to details about every contract in the sector sub- contract and split contract will not be described in more details.

In DBB the client is responsible for the design and the contractor build according to, in advanced, stipulated demands from the client. In many cases the client turns to a consultant who designs the facility and takes the responsibility for the design or the client does the in- house (SOU 2009:24). Likewise, the general contractor has the chance to procuring own sub-contractors<sup>4</sup>, with no involvement from the client, if necessary to full fill the client's requirements. The general contractor acts as a coordinating function for the sub- contractor/ sub-contractors and only has an obligation towards the client to full fill the project and it is the client's responsibility to have the controlling function of design and construction documents (Lejon, 2009). The client in their turn takes the full responsibility for the operation and maintenance and thereby has the eventual life-cycle costs.

Even thou it might be a solution more suited to its purpose considered the buildings function or quality this form of procurement as said earlier are to build according to the client's instructions in the contract and the contractor is procured on the grounds of their delivered bid on the specific inquiry document.

After final investigation that is set up after completion the contractor has the responsibility for errors and shortcomings that might occur in the construction. The majority of contracts in which a client procures a contractor in the Sweden construction sector are, except from the roles of regulation such as Planning and Building Act (1987:10), The Work Environment Act (1977:1160), Act on Technical Requirements for Construction Works etc. (1994:847) and so forth, based on the general conditions that the Construction Contracts Committee<sup>5</sup> (CCC) has developed (SOU 2002:115). For DBB "General Conditions of Contract for Building, Civil Engineering and Installation Work" of 2004 (referred to Swedish shortage AB 04<sup>6</sup> hereafter) are the applicable conditions that regulates among lots of things in the client contractor relationship

<sup>3</sup> A Split contract refers to means that the client signs many different contracts in which each contractor has their own expert area and together they should accomplish the construction activities

<sup>4</sup> The contractor carry out a limited amount of the work on contract for the client that either is a head contractor e.g. DBB.

<sup>5</sup> The Construction Contracts Committee is a non-profit making association of authorities, associations and organizations on the building proprietor, consultants and contractor sides of the construction sector. "to constitute a negotiation body for the principals regarding general conditions for different kinds of contracts, to draw up such conditions, to work for the observance of agreements made within the association and to conduct other activities connected therewith" (<http://www.foreningenbkk.org>)

<sup>6</sup> In Swedish: Allmänna bestämmelser för byggnads-, anläggnings- och installationsentreprenader (AB 04).

the warrant. The conditions are recommendation and can be used as a hole but also or be complemented with additions, extended warrant. For DBB contracts, according to AB04 the warrant for material is 2 years and for work performance in stated warrant is valid for 5 years.

#### *Design build contract*

Another fundamental contract in the construction sector is DB contract, a development in many ways from DBB. In DB the contractor is responsible for the detailed design as well as the building phase, i.e. a responsibility of the technique as well as the production lies in the hands of the contractor. In DB, the contractor engages to build a facility with belonging specific properties. In the Swedish housing sector this is a rather common contract and the intension is to enhance even in the infrastructure sector (Nilsson, 2009).

Likewise said when describing DBB warrant is of big importance even in this contract and has to be well stated between the client and the contractor. For DB “General Conditions of Contract for Building, Civil Engineering and Installation Work performed on a package deal basis” of 2006 (referred to the Swedish shortage ABT 06<sup>7</sup> hereafter) is the valid concision developed by the CCC. Also in ABT 04 most of the relationship between the client and the contractor is regulated but as expected differs from AB04 in many ways, warrant to exceptions. The warrant for this type of contract runs for five years for both work as well as material. Extended warrant will in needed situations be regulated as additions to ABT 06.

#### *Performance contract*

In the beginning of the 1980s, a start up for procuring an end product from the contractor took place in which one aim was to reach the goal of one contractor for the whole project and thereby increase the incentive to build with a life-cycle perspective and enhance the innovation of the technique. As a first step in the infrastructure sector towards one contractor was procurement of maintenance of surfacing with the demand that the surface of the road had pre- determined levelness and friction. How and with what technique the contractor used was not of interest for the client. The result was so good that this way of procurement even was applied to new construction and rebuilding. At the beginning this form of procurement was called design-build contract with a functional responsibility. During the 1990s the work of developing design-build contract to performance contract started. (Bejrums & Grennberg, 2003)

In recent years performance contracts has been given another meaning where the focus has been on expanding the already existing DB contract with “extended warrant”, to involve not only the design and construction part but also to take in consideration the operation and maintenance in the contract. Formally it is a design- build contract (DB) with the addition of the operation and maintenance of the end product. However, the difference lies in the extent that the contract just don't contains the properties of the end product but also the performance of the facility that should be fulfilled during a contracted time ahead. Focus for the client will be at describing the performance of the facility and the contractor's work is to choose the techniques to reach the required performance goal during the contracts- belonged maintenance period. This gives a high degree of freedom and the possibility to use solutions to cut down cost and recourses (Ng & Wong, 2006) but also to the possibility to higher cost in the construction phase to obtain lower cost in the maintenance and operation phase but also open up for innovative solutions and calculated time- tables to prevent cost- overruns.

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<sup>7</sup> In Swedish: Allmänna bestämmelser för totalentreprenader avseende byggnads-, anläggnings- och installationsarbeten (ABT 06)

A general problem with performance contract is to describe performance that the client requires in measurable terms and one strategy has been to describe the properties of the facility related to the performance and there by properties that should maintains by the contractor (see, Mattsson & Lind, 2009). The forerunner, DBB, as mentioned earlier was procured by the properties of the facility. As defined in Cambridge online dictionary a property is; “a quality in a substance or material, especially one which means that it can be used in a particular way”, e.g. the properties of the road could e.g. be how the slope, edge, railings and draining systems are dimensioned. It is characteristic of the facility that is in focus here. In this new contract the clients makes it even more open by defining that a performance should be fulfilled during the whole contract period. Performance is defined as; “In a way something works or operates the natural purpose (of something) or the duty (of a person)”<sup>8</sup>, i.e. a road is a facility built for vehicles where the function of the road is to travel along it in a safe way.

At the moment, the accurate procurement conditions is on the same bases as in DB with additional paragraphs e.g. for the operation and maintenance. Despite the performance contract has the possibility to use already existing ABT 06 with addition of paragraphs CCC has, on their homepage, published a proposition of new conditions for this specific contracts and has been send out for consideration in which they make suggestions of alternations and additional paragraphs of the already existing ABT 06 to meet the growing amount of contracts where a commitment for maintenance is bundled with planning and construction.

#### *Public Private Partnership*

Most western countries have found it difficult to find a balance between the high demand of public facilities, e.g. highways, hospitals and schools, and financial resources. A solution emerged, through cooperation between the public and the private actors on the market. This was the start up for public private partnership (PPP) procurement in the world. The common view is that PPP, under the name of private finance initiative (PFI), was first implemented in the UK in late 1980s. Others, as mentioned in Leiringer (2003), looks at PPP as a concept derived back to 1970s and the Hong Kong tunnel, a BOT project. However, the notion of PPP was generally accepted first when the British government imitated it in the late 1980s and early 1990s (Leiringer, 2003). Since that time, different contractual concepts have established such as Build Operate Transfer (BOT), Build Own Operate and Transfer (BOOT), Design Build Finance and Operate (DBFO). In 1994 the first PPP was tested in Sweden in the construction of Arlandabanan, the Swedish high-speed railway and train between Stockholm city and Arlanda Airport (Andersson, 2009). But since then no other PPP project has been initiated by the Swedish government. Some projects have however been carried out on the local and regional level, and recently a very large PPP-project has been started when it was decided that the new Karolinska Solna University Hospital should be procured as a PPP-project.

I some way performance contract can be mixed up with PPP, BOT and other variances of PPP, and is not totally wrong. The characteristic features of PPP is resemble to the stated above, long-term contract between the public and the private actor<sup>9</sup> to supply public facilities, contract with the building, operating and maintenance phase included and the risk allocation between the client and contractor is rather equal, the difference appears when it comes to financing. The fifth criteria for a PPP project is that the financial part has to be, at least partly, founded by a private party. Ng and Wrong (2006) assert the opposite; will come back to that later.

<sup>8</sup> Cambridge online dictionary

<sup>9</sup> Commonly known as a consortium or a project company

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PPP can be seen as a further step in the construction procurement chain. This type of projects are often large in scale where private actors partly or fully undertake the task of designing, financing, construct and also operating a facility that in old terms would have been provided by the public (Leiringer, 2003). In addition, compared to performance contract, the private actor takes responsibility by equity or/and loan from the bank, to build the public facility. Further, the contractor gets compensated for the investment during the contract operate and maintenance period instead of dividing the payments in two rounds, e.g. compensation for the construction phase after completion and a yearly payments for the operation and maintenance until the contract expires. The most common payment methods in PPP is; (Nilsson, 2009)

- Fixed price
- Shadow tolls
- Road- tolls or ticket revenue

A central purpose, as in performance contracts, is to give the contractor the opportunity of freedom of action due to the performance description in the contract. This, as in performance contract can be more or less detailed. The less detailed, in how and what way to build, demands the more space for technical innovation and a life-cycle thinking and responsibility and thereby an possibility of spending more money in the construction phase and in turn lower the future operation and maintenance costs (Nilsson, 2009). When the PPP procurement was born, the main aim was to finance public facilities by private financing, in some extend that's still one of the main purpose in many countries. In Sweden, as well as in other countries, the PPP procurement is a way of allocate risk in the project and in more or less extent lays the risk on the private actor. This could be compared to performance contract, where risk allocation also is a vital variable.

By BOOT is meant that the private actor designs, finances, build, maintains and operates the facility constructed. The ownership of the facility transfers to the private actor for a contracted time. After expiry of contract the ownership goes back to the public party.

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*Table 1: Allocation of responsibility between the actors in the construction sector*

<b>Contract</b>	<b>Detailed design</b>	<b>Build</b>	<b>Operate and Maintenance</b>	<b>Warrant</b>	<b>Ownership</b>	<b>Transfer of Ownership</b>	<b>Finance</b>
DBB contract	Client/ consultant	Contractor	Client/consultant	According to AB 04	Client	No	Public
DB contract	Contractor	Contractor	Client/consultant	According to ABT 06. Could also be extended according to contract.	Client	No	Public
Performance Contract	Contractor	Contractor	Contractor	According to ABT 06 and contracted maintenance and operation period according to function, property etc.	Client	No	Public
PPP	Contractor	Contractor	Contractor	Contracted in the procurement about function, property etc.	Client but the contractor has the full responsibility of the facility during contract period	No (Not necessary)	Public and/or private
BOT/ BOOT	Contractor	Contractor	Contractor	Contracted in the procurement about function, property etc	Contractor	Yes	Public and/or private

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## 4. ANALYSIS

### 4.1. Theoretical Framework

A big amount of the human world makes analysis of organizations on the bases on efficiency and evaluates it on the bases o how well the organization satisfy the wants and needs of people on the basis of their efficiency. We try to understand the exiting arrangements as efficient choices and interpret the changes in the existing arrangements as efficiency enhancing strategies. To declare an organization or an arrangement inefficient, by the definition of efficiency in Milgrom and Roberts (1992), there will be another arrangement that would do better in every circumstance. This is a rather normative way of describing efficiency. By using efficiency as a positive principal requires taking care about whose interests are being served and what kind of arrangements are feasible. (Milgrom &Roberts, 1992)

As Mattsson and Lind (2009) mentions, changes of organizational structure and contract design can be understood in an efficiency perspective. The transaction cost hypothesis is that a specific contract or an organization model is chosen by a close balance of on one hand production of scale and on the other hand the incentives that the organization and construction design creates for the parties involved but also by flexibility and handling of risk and uncertainty to obtain the most efficient one. Some other characteristics of a transaction that are of big importance and affect the organizational structure and contract design are: (Milgrom & Roberts, 1992)

- Asset specificity
- The frequency and duration of the relation
- The complexity and uncertainty of the work to be done
- Difficulty of measuring performance
- Connectedness to other transaction

If we look in the business literature, long- term cooperation requires flexibility and emphasizes common interest and not just trying to give the risk to the other party and the organization and the business process is in a need of continuous documentation (Nystén- Haarala et. al, 2010). The relationship between the contractor and the client is dependent of the choice of contract but also when it comes to instructions, type of compensation and cooperation. The choice of contract is also crucial when it comes to responsibility and allocation of duties. (SOU 2009:24)

Ganesan (1994) refer to a study done by Noordewier et al (1990) that indicates long-term orientations enhance the performance outcome in a buyer-seller relationship and furthermore points at a study done by Andersson and Weitz (1992) where the authors refer such long-term orientation in a relationships to commitment and they indicate that a mutual commitment results in independent channel members working together to serve costumer needs better and increase mutual profitability.

The risk allocation in a contract is vital. Nilsson (2009) mentions two types of risk, the exogenous and the endogenous. The exogenous risks are connected to global risk and are almost impossible to influence, e.g. natural disasters and the state of the market. On the other side of the scale are the endogenous risks in which can be controlled by either the contractor or the client, e.g. quality.

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## 4.2. Design Bid Build Contract

In DBB contract the amount of activity and material that is assumed to be required of the contractor is intended to be declared by the client and the work for the contractors when procuring phase is to calculate and control the amounts of material that is stated in the documents. The common views of this work allocation, according to SOU 2009:24, are that the knowledge the client and the contractor have are equal, i.e. the asymmetry of the knowledge of the facility are rather small. The argumentation of this is to obtain a serious and well calculated bid, the contractor should have the same knowledge as the client to otherwise a good result (SOU 2009:24). However, the contrary and especially the knowledge of life-cycle costs and there by the technical solutions and sustainability of material should be in the favour of the client. Meant by that is that the knowledge of the technical solutions and its life-cycle costs of the construction would more belong to the client. Hence, a strong client with an interest of a long-term perspective of their stock and a long history of time on market should have built up knowledge at least as good as, or even better than, the contractor. The client should from experience from history know what technique and construction that is best suited for its purpose. In a project that designs by the client builds by the contractor and then maintains either by the client or by a new contractor would as any other projects strive to lower costs in the long- run. A client with good experience and rather big recourses the failure in construction shouldn't be that severe if the contractor follows the established technical documents.

A weak point in all construction projects is to control the performance done by the contractor. However, in DBB contract the performance of the contractor is rather well defined when almost every detail, e.g. depth of keyway, surfacing and distance are specified in measurable terms and thereby the performance can be measured rather easily. When it is time for final inspection, i.e. it is time for delivery of completed product; this can be measured and checked according to predetermined documents. However, even though the client has taken good precautions and the contractors obtain a pass in the final inspection, the client still could doubt the quality and thereby it could be said that even rather detailed work instruction also has drawbacks. The doubt is based on the few incentives available for the contractor to build with a good quality in a life-cycle perspective due to the fact that the contractor doesn't have the responsibility for the operation and maintenance in the long run and thereby is not in the need of calculating the cost that could be generated during the facilities life- cycle but also doesn't have to take care of the shortages in the construction if any. There is no actual incentive to do more than required, use new or even better technique than contracted, carelessness of the construction could occur as common result from the contractor in hope of managing the warrant period. Whether it is to keep the maintenance in- house or outsource to a new contractor the maintenance of the facility is in the interest of the client and it should lay in the interest of the client to design the facility and decide material according to, in advanced, calculated life- cycle costs. In other words the long-term perspective in the actors' point of view is dedicated the client and thereby the incentive for the client to lower the cost and design the construction according to that instead of the contractor.

With this form of procurement, as said earlier, the contractors' role is to build according to the client's instructions in the contract independent of what's most suited to its purpose considered the buildings function or quality and the contractor has almost nothing to gain by putting efforts and recourses e.g. on higher the expenses for better quality in the construction to lower the maintenance costs, i.e. no savings can be done over a longer period of time. When the contractor doesn't have the responsibility of the facility in the long- run, all that remains is the warrant and the incentive for long-run responsibility disperse. This means in one way that there is a rather limited space for alternative inputs on the design from the contractors as they are brought to the

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project post design and there is little opportunity for innovating solutions others than the clients'. (SOU 2009:24). The flexibility of the construction is hereby rather limited, the instructions and documentation of the construction are in advance stated and everyone knows from the beginning what's expected of them.

As Milgrom and Roberts (1992) arguing, many transactions are one-time affairs but there are also others that are repeated frequently. In DBB it could be both ways, not in the specific project, but in the relationship between the actors can be seen as a repeated game where future contract situations might occur. By this, even though the contractor doesn't have to act as they are in a long-run relationship in the specific project, they have to take in consideration that they are in need of a good relationship to the client, the contractor's survival depends in many ways on good judgments from clients to obtain future work both from that specific client but also from new once.

#### **4.3. Design Build Contract**

Since the beginning of the 1970s the work of developing the construction sector to achieve higher quality, minimization of failure in the constructions and cost over runs due to delays has proceeded. By DB contract the goal has been to obtain incentives for the contractor to build with techniques and materials they prefer by allow the contractor to do the detailed design but also to build the facility with perhaps even better quality than before. This should also make the flexibility of the working procedure easier when the contractor has control of the whole project from inception to final end product. This was a step further from the traditional DBB contract where the common notion was that the contractor didn't have the incentive to look in a longer perspective than the actual building process. Even though the inquiry document for DBB and DB look rather different, hence DBB has rather strict descriptions how much, when and where while DB contains only the properties of the facility to be built in functional terms, the owner condition still is the same. The ownership belongs to the client during the whole process and also the responsibility of the facilities function and maintenance.

It could be assumed that a contract like design- bid- build contract has limited uncertainties where limited amount of material and construction techniques has been decided by the client and there by just for the contractor to build. However, the environmental impact on the facility may be unknown at the inception, the right way to proceed might not be as clear as it could be when the contractor just will be given the technique and in many cases not even the preferred one for the contractor. This in their term will in many projects cause delays in the construction time when knowledge has to be created and also cost overruns which at the beginning is hard enough to forecast. Uncertainties also increase when there is a lack of knowledge transfer between different projects. To increase the efficiency and work towards a more industrialized sector the concreteness between projects and knowledge transfer is vital. Some transactions are largely independent of all others but in the construction sector, if a good efficiency will be reached, more interdependent and coordination between projects are required. The advantage of DB contract in this case is just the fact that coordination and knowledge transfer is could be reached and the contractor can in a direct way influence the technical solutions, hence the document of inquiry.

The duration of the relationship between the contractor and the client has been extended from the DBB contract and buy that the attempt to enhance the incentive of a more frequent cooperation and efficiency in the construction sector. The difference when it comes to the long- run perspective and the life- cycle cost has in a number of articles been criticized (see for example Bejrums and Grennberg, 2003) and one argument is that even though the design and construction

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part is dedicated to the contractor the maintenance of the facility still remains at the client and thereby the incentive to build with a long-term perspective and look more in detail on the life-cycle cost fade away. However, efficiency assumes to be reached in this type of contract when knowledge transfer between different projects is possible, the knowledge of one contract can be taken in consideration when a new project is introduced and the design phase in present. The return, in project cost perspective, is the opportunity to bring the design and construction professionals together in a collaborative environment to complete all the stages in the construction process in an overlapping system to some extent, i.e. the construction phase has begun while design phase still is ongoing. This allows the contractor not to looking at one entity at a time and calculate unit price in the bidding process but to have an overview perspective and if errors in the drawing are discovered an correction can rather easily been done, i.e. an increased flexibility both in drawings, material and cost and in the end time savings can be reached and in the end avoiding cost overruns.

In the construction sector there is always a warrant on the construction both for the work done and the material, in some way to guarantee that a certain limit of quality is reached. There is also a possibility for the client and the contractor to make an agreement for a warrant to be extended for a longer period of time than the already stated in ABT 06. If the facility, during the extended warrant, not full fills the requirement in the contract the contractor is in charge of the correction of the mistake that arise during the contracted time. It can be assumed that this addition was created to catch the measuring problem that occurred when more and more DB contract was procured as one with functional demand and there by the difficulties for the client to control the quality and for the contractor to know what was required of them. Sometimes this type of contract, with an extended warrant, goes under the name of performance contract, but according to described conditions for performance contract in earlier section contract with an extending warrant does not fulfil the criteria's for that specific contract. It would be more appropriate to explain it as DB with the exception of a longer responsibility of the technical solutions for the contractor than in a traditional one. The contractor takes DB a step forward than the traditional contract by not just to build a facility and the belonging ABT06 condition of warrant, they also have to build with a perspective of eventually correction further on for a longer period than originally stated in the regulations. Even here the time aspect has a vital impact on the quality, even if it can be assumed to be rather weak. A higher cost in the construction phase might lead to none or really low cost of correction during the contract.

Still the same problem with performance measuring as in DBB can be observed. Even though the aim of DB is to give the contractor a bigger freedom to choose the technique or material in hope of obtain efficiency, time savings and at least as good quality as in DBB, the drawbacks for the client could be to measure the performance done and be sure of a quality that will last. To specify the property of the facility could be one solution to the problem (see Mattsson & Lind, 2009) but as in DBB the client has either to trust the contractor as the deliverer of the facility or keep in order by a more detailed documentation program when procuring the contractor, similar to the one in DBB, in hope of a rather measurement of detailed specifications of e.g. surface and distance. The incentive to lower the cost in a maintenance period is assumed to be close to zero and not even in DBB the long-term perspective is a parameter of importance in the calculation of the project. However, as mentioned earlier, an incentive as good as any is the repeated relationship that can be followed from a good performance done.

#### **4.4. Performance Contract**

When the development of DB to performance contract took place a new aspect of construction was introduced, a construction sector was incentives for the contractor to build cost efficient and

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thereby, if wanted, save lower the cost in the future. This contract was also created to give space to create new technical solutions to increase the quality of the facility and reduce the production cost but also enhancing the asymmetry in knowledge at the same time (SOU 2009:24). To achieve this, not just the design and construction part was contracted but also operation and maintenance was included. In the beginning of performance contract, when performance contract only was stated as an extended warrant this type of contracts used to call performance contract with an overall obligation. But as mentioned several times before, performance contract only is refereed as contract where both property, function and the maintenance is connected to the facility in the procured contract. The addition of the maintenance and operation of the facility leads to longer commitment for the contractor. The responsibility for the contractor is hereby in a life-cycle perspective and the incentive should be stronger to build with higher quality and maybe invest more in order to reduce costs in the future, i.e. lower cost over the life-cycle increases. The contractor has the decision making role on how the building process will develop and take responsibility of the facility, i.e. savings in the planning and construction phase could lead to higher costs in the maintenance phase and vice versa. (Nilsson, 2009)

In Sweden ABT 06 are the current general conditions even for performance contract and that also includes the stated roles for warrant. An extended warrant is not of interest since the obligation of operation and maintenance lies in the hands of the contractor, even the warrant in ABT 06 could seem as rather needless. This not only contains the obligation for the contract to take responsibility for the work, material and technical solutions but also take responsibility for the maintenance of the facility during a predetermined contracted period of time. Many times the contracted time for operation and maintenance responsibility is for 10 years but it is not unlikely to even have 15 years. Hereby, it gives the contractor the opportunity to control the project and use solutions of a life-cycle thinking and calculation and the duration works as an incentive of a long-term perspective and a good way combine the facility and the contractor. A more cost efficient construction project could also be an incentive for the contractor. Still no transaction of ownership is done so after contracted time the facility goes back to the client as in any other construction contracts. The uncertainty of the work done is rather obvious where measuring of performance is difficult, but in performance contract the parties decides and allocating the risk to the one that best can take it and not as in the traditional contracts where it is common stated that the client is the one with biggest risk taking part. One way of handle the risk in performance contract is through the compensation, e.g. fixed price, current account where the compensation is correspondent to actual cost or compensation thru incentives. In fixed price the contractor takes the risk for cost overruns and in the current account is the opposite, the client takes most of the risk. In the latter an allocation of the savings or overruns is divided between the parties in a predetermined contracted way.

As Mattsson and Lind (2009) points at, a problem with performance contract as well as in every other contract were stipulations of exact technique or any other exact descriptions in the contract is not stated, problems in describing desired performance in measurable terms occurs. Often the procurement of performance contracts, operation and maintenance includes a guarantee that a number of properties and functions should be fulfilled, here is a need of a close inspection of the facility to make sure that all parameters about the existing facility is documented. Still uncertainty is connected to the documentation if the object has been done by someone else than the procured contractor for the maintenance, in form of lack of information about details in the construction, e.g. the quality of materials, how the management have been done previous.

#### 4.5. Public Private Partnership

In many ways PPP is a performance contract, the design, build and the maintenance phase is contracted to the contractor. The durations are long, incentive for enhance the efficiency and quality and think in a life-cycle equal and thereby savings in the theoretical perspective is rather clear. The knowledge transfer could in the same way as in performance contract be gained both from the design phase as well as the maintenance. If you know how you have designed the facility then it is easier to know from the beginning how to maintain it and vice versa. But there are some further issues that are an addition to performance contract. First as can be read from the name of the concept, there is a partnership or a relationship between the public and the private actor where the private company or as in many situation the established consortium, are the financing actor and takes the responsibility of the financing of the project. Not until the final investigation is done and the maintenance period has started the compensation from the public act are present. This gives the contractor a little other perspective of the project and are contemplated to give an extra incentive to think in the projects and the financier's interest, i.e. avoid delays, cost overruns and also over the life- cycle do savings. In many performance contract the client pays the contractor according to a fixed price in relation to the final investigation when the facility is taken in use. Payment for operation and maintenance is on yearly bases until the end of the contract. When it comes to PPP there are even more ways of payment to the contractor or the consortium, e.g. tolls and shadow tolls. The most important here is that the client or consortium doesn't get any payments after completion of facility but gets it during the operation and maintenance phase, and here as said before the contracted time horizon is up to 45-50 years.

Several publications and reports from the UK show cost- savings and an increase of quality generated by projects procured as PPP. A study ordered by the Treasury Task- force in 2000 examined 29 private financed projects had average net-present cost savings of 17 %. The UK National Audit Office reported that the first four PPP project completed were likely to generate a net saving of approximately 13 %. Hence, there are also several reports that have indicated projects with cost overruns lower quality and lack in service quality. (Leiringer, 2003)

In Sweden the focus is on the risk allocation and cost savings that can be achieved, not so much on the financing. The driving forces in Sweden want to put the focus on providing a high-quality both technically and in terms of service rather than try to get the project off the public sectors balance sheet (Leiringer, 2003). As motioned earlier, there are very few projects procured as PPP, almost close to zero and one reason for that could in fact, as Leiringer (2003) mentions, due to the small amount of projects and the knowledge transfer that was hope to be achieved has not been that successful and production of scale is also difficult to obtain due to the few projects procured.

A rather new phenomenon in infrastructure and public sector is the possibility to procure contracts just for the maintenance or operation in itself. An earlier problem in the public sector, where maintenance was done in- house, was how the owner should optimise the maintenance to achieve the goals. Since the 1990 when the former Swedish Road Association (SRA)<sup>10</sup> started to outsource maintenance and almost all maintenance is outsourced the problem lies more in how the procurement of maintenance should be done (Mattsson & Lind, 2009). Mattsson and Lind (2009) emphasis that a radical solution could be to procure maintenance by Private Public Partnership (PPP) or Built-Operate-Transfer (BOT) solutions to achieve efficiency by long-term

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<sup>10</sup> The Swedish Road Administration together with the Swedish Rail Administration and the Swedish Institute for Transport and Communications Analysis were phased out and since 1 April 2010 the Swedish Transport Agency has the responsibility of all transport system in Sweden.

contracts. However, in the definition of PPP and BOT the main focus is of an overall responsibility of planning, construction and maintenance bundled together for the contractor (most time a consortium established for this very project), yet most of the infrastructure already is built and the incentive with this procurement seems more to be a try of enhance the efficiency in the management rather than the whole process. Ng and Wong (2007) shows another side of PPP by make a study of a non private-funded infrastructure maintenance project in Hong-Kong. Important here is to make notice of the definition of the PPP and BOT where the overall responsibility and the incentive is build on the life-cycle perspective, if the design part of the contract is out of the picture and failure and could be blamed at a older contractor and the technique an material is depended on previous performance then the main incentive is gone.

## 5. CONCLUTIONS

Efficiency problems in the construction sector are reported worldwide, both when it comes to delays as well as cost overruns and failure in the construction. In Sweden, investigations of the building sector have been done and improvement measures have been suggested to increase quality and keep the costs down particularly in a life- cycle perspective (see Egan, 1998; SOU 2002:115; SOU 2009;24). One request measure is to procure more contracts that provide incentives for contractors to work more cost efficient, stick to schedule and improve quality to and to replace the traditional contracts with long- run contracts based on legible performance demands, e.g. performance contract and private public partnership (PPP).

The transaction cost hypothesis is that a specific contract or an organization model is chosen by a close balance of on one hand production of scale and on the other hand the incentives that the organization and construction design creates for the parties involved but also by flexibility and handling of risk and uncertainty to obtain the most efficient one and that efficiency requires taking care about whose interests are being served and what kind of arrangements are feasible. But out of a transaction cost perspective there is almost impossible that certain contract creates a situation that is better in every circumstances and that the project will achieve better quality, be more time saving etc. That depends more on the actors on the market, it shouldn't make any difference if the client is the one that has the long- term perspective or the contractor. The incentive of designing and specify the material should more depend on the experience and the responsibility for the owner to work against. In Sweden where road construction and maintenance has been in the public posses they should in theory be as good or even better in both design and calculate the maintenance costs as the private actor, if you look at the time they have been on the market and the knowledge transfer that should have been and are created and by that the traditional contract shouldn't be as bad as it seems. But still, cost overruns and failure is one of the biggest issues in the construction sector and it is shown that incentives for the actors is of big importance in every situation in the industry and that efficiency can be reach by knowledge transfer, economy of scale and saving money. The most important thing is not to say that this procure contract with the long- term responsibility for the contractor is the only one to obtain the goal.

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