Allocation of risks in PPP projects
-A comparison of UK Standard Form and Swedish ABT 06

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This report has been written on Halmstad University and in cooperation with Skanska Sweden AB to simplify the risk sharing in a Public Private Partnership (PPP).

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ABSTRACT

Public Private Partnerships (PPP), as the name suggests, are partnerships between a public and a private entity. There are many options of how to form the partnership, however the contractual relationships and the structure of the partnerships are very complicated.

Since there has been few accomplished PPP projects in Sweden, the Swedish contractors have little experience and are unwilling to use this method of procurement. Compared with a traditional procurement, the allocation of risks in PPP is different. This is the main reason of the unwillingness amongst the contractors. They do not understand why there is a shifting of risks and most importantly, they need to acquire knowledge on how to price the extra risk commitment.

To simplify this procurement method, we have defined certain risks. By comparing the risk-sharing in a traditional Turnkey contract with a contract used for PPP, we increase the comprehension among the contractors.

Our result shows that the Private Entity bears 83% of the risks when using PPP, whilst using a traditional method, the Private Entity bears 47% of the risks.

Extra risk commitment is not free of charge. The Client needs to understand why the relief of risks needs to be compensated and also be willing to compensate for it.
1. Introduction

This thesis is about PPP projects and the allocation of risks in them. PPP is the abbreviation of Public Private Partnerships. Another well-used abbreviation for the same concept is PFI, Private Finance Initiative. Depending on which country the project takes place the names differ. However, the concept of PPP/PFI is still the same.

1.1 Background

Public Private Partnership (PPP) is a method of procurement that is still relatively untested in the Swedish construction industry. A basic definition could be as “an arrangement in which a government and a private entity, for profit or non-profit, jointly perform or undertake a traditionally public activity”. The project company, also referred to as Special Purpose Company or Special Purpose Vehicle, is after completion in charge of the day-to-day operation, maintenance and provision of services/equipment to the building. They are responsible during an agreed period of time (concession period), which is between 30 to 40 years.

Since very few PPP-projects have been accomplished and no project has yet been returned after its concession period, the knowledge, especially among the Contractors is limited. The available knowledge is taken from abroad, mainly The United Kingdom of Great Britain (UK). The Contractors in the UK have in a greater extent realised the concept of PPP and what the risks are in participating in such a project.

In Sweden there is currently one PPP project running. The NKS-hospital (New Karolinska Solna) in Stockholm is the largest hospital ever built with PPP. It started 11 years ago when a decision was taken that Stockholm needed a new hospital. The politicians basically had two choices; to rebuild and renovate the current hospital (Karolinska) or build a new one from scratch. An investigation showed that Karolinska was in a terrible condition and a renovation would cost at least 10 billion crowns. A rebuilt was not profitable and the fact that the hospital operations was spread over 40 separate buildings did not feel particularly modern.

However, the politicians had to decide how to procure this huge project. Price Waterhouse Coopers (PWC) together with the law firm Mannheimer & Swartling was commissioned to investigate which procurement method to use. The report showed that PPP would be more suitable than a traditional procurement. One of the reasons mentioned was that a project this big would attract many international

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1 Savas, Privatization and Public-Private Partnerships, 2000
2 Tomas Nordenskiöld, Dagens Industri Dimension, 3 February 2011
3 Barts and The London, New Hospitals Programme, Briefing Document, 2010
actors, allowing big competition and probably a lower price for Stockholm County Council.

When the bidding process was over and the procurement was made public it stood clear that only one company had submitted a bid, Swedish Hospital Partners (SHP). SHP is a joint venture between Skanska and Innisfree, a private equity fund from UK. This consortium is nothing new, they have performed many PPP/PFI-hospitals together in UK.

The remarkable thing with all this is not the fact that it is the first PPP-hospital in Sweden and the largest PPP-hospital in the world, neither that a British private equity fund is participating. The most remarkable factor is that SHP was awarded the contract without any competition.²

This raise mainly two questions;

- Why was it only one company to submit a bid?
- Where were all the international bidders?

A definite answer could be that the project was too big for the Swedish companies, NCC and Peab for instance. That takes us to the second question, if the project was too big for Swedish Contractors (except of Skanska) why did not any of the international Contractors (Vinci, Balfour Beatty, John Laing etc.) submit a bid?

After an interview with the vice President of Skanska ID, we have realised that one reason to the low participation could be the shifting of risks that a PPP project means. The Contractors are unwilling to undertake a risk that usually is undertaken by the Client. In a PPP-project the possibility for additional compensation is limited, therefore, cost estimations must be made accurately.

An important factor to enable a stable PPP-market in the Swedish construction industry is that the Contractors can accept such shifting of risks and that the Client fully realise the value of it.

This is a crucial problem in order to obtain more PPP-projects in Sweden.

1.2 Objective and demarcation

The object with this thesis is to clarify the risk-allocation between the involved partners, such as Client, Project Co, Lenders, Contractor and FM-company (Facility Management). By demonstrating the allocation of some risks, we increase the comprehension for the Contractor and therefore minimising the unwillingness of using PPP.

² Tomas Nordenskiöld, Dagens Industri Dimension, 3 February 2011
PPP is a wide subject that includes economy, law and politics. However we will only concentrate on the allocation of risks and how it affects the Contractor. This thesis focuses on risks with low possibility but high impact, as those are the ones that require especially good management.

1.3 Methodology
The work begin with literature studies, then an investigation is made to see what has been written about PPP in its entirety, in form of scientific articles, books and reports.

The keystone of this thesis is the study and comparison of ABT 06 (the Swedish standard contract for Turnkey projects) and Standard Form Project Agreement (a contract developed by the Department of Health, especially for PFI-hospitals in The UK). The comparison concentrates on the allocation of risks, and the thesis will investigate how the differences affect the Contractor.

After the literature study interviews were performed with persons familiar with the topic. These interviews will work as a complement to the literature study, i.e. to get expertise knowledge and an even better understanding regarding the risks and possibilities of using PPP.
2. Some existing PPP projects

In this chapter we will present three PPP projects that are running at the moment. This will serve to give the reader a picture of that there is several projects that successfully have implemented PPP. Since NKS already is presented in the background there will not be any further presentation here.

Barts and the Royal London Hospitals

Barts and the Royal London are two big hospitals that are being redeveloped by Skanska. Capital Hospitals Limited is the Project Co, it is a consortium of Skanska ID, Innisfree and Dutch Infrastructure Fund (DIF). The Project Co holds a 42 yearlong concession agreement with the Trust, National Health Service (NHS). Several partners are contracted to manage the operation and maintenance. Carillion is responsible for Soft FM, Hard FM is taken care of by Skanska Facilities Services and Siemens is providing the entire spectrum of imaging systems (CT-scanners, MRI-scanners etc.).

Barts Hospital is UK’s oldest hospital founded 1123, and The Royal London was founded 1740. The redevelopment of the hospitals is supposed to be finished 2016, after ten years of construction. However, it started already in 1998 when NHS started planning the redevelopment. Skanska-Innisfree was appointed Preferred Bidder in 2003 and the Planning Permission was granted 2004 (for the Barts) and 2005 (for The Royal London). Construction costs are one billion pounds.3

Figure 1. Barts Hospital. (Source: Barts and The London, New Hospitals Programme, Briefing Document, 2010)

These projects are still running but they are already successful. They are likely to be completed within the time frame and budget and most important, they will have a

3 Barts and The London, New Hospitals Programme, Briefing Document, 2010
satisfied Client. There are many reasons for this, however the Technical Manager at Barts Hospital emphasises three reasons. 1) The team benefited from their work on earlier smaller PPP projects. 2) The long pre-construction phase gave the design team sufficient time to finalise the design prior to Financial Close (when all contracts are signed between the parties), minimising uncertainty and risk of changes in design. 3) Both the bid team and the construction team had considerable PFI experience, which ensured precise contract documents, defining Skanska’s duties and obligations and also containing adequate financial allowances for contingencies.

Widening of the M25, the orbital motorway around London
The M25 is one of the busiest motorways in the world. Some routes are now being widened to meet the higher rates of traffic and make sure there will be no stockpiles during the Summer Olympics (that will take place in London 2012). It is a DBFO project (Design, build, finance, operate) executed by a consortium called Connect Plus team. The consortium consists of Skanska (40 %), Balfour Beatty (40 %), Atkins (10%) and Egis (10%). Skanska is investing 80 million pounds and is the party responsible for design and construction, whilst a joint venture between Balfour Beatty, Atkins and Egis are responsible for operation and maintenance. Totally 63 kilometres will be widened. All works are carried out without disrupting the traffic at any time. Closing the M25 during construction is not an option. The Trust, British Highway Agency, is issuing tremendously high fines if the highway of any reason needs to be closed.¹

Figure 2. Map showing the location of M25. (Source: Webpage of Computer Analysis, 2011-04-25 16:46

Figure 3. Casting of the dividing barrier. A special variant of slip forming had to be used to manage the tight time plan. (Source: Anders Hoffman)

¹ Press Release from Skanska, May 22, 2008
Croydon and Lewisham Street Lighting

Street lightning systems are often facilities that no one ever notices, it is just suppose to work. However, some time the system need to be renewed as new technology is coming. This project recently reached its Financial Close. A consortium shared 50/50 between Skanska and John Laing Infrastructure. The consortium is commissioned to replace approximately 38,000 streetlights and 8,000 street signs. A refurbishment of another 4,000 streetlights is also included in the contract. Skanska will operate and maintain the street lightning for 25 years. The consortium is implementing a Central Management System. It enables exact control of the lightning. For instance maximize lightning in specific locations at peak times and vice versa, be able to shut down sections not in need of light. The contract only for construction is worth 74 million pounds. After completion Skanska will have an income of 2 million pounds per year, due to the operation and maintenance.5

Figure 4. Croydon and Lewisham Street Lightning. (Source: Webpage of Local Partnerships, Project: London Boroughs of Croydon and Lewisham – Street Lighting)

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5 Press Release from Skanska, April 20, 2011 and John Laing April 20, 2011
3. Theory

*Initially this chapter will give a brief introduction to the most common procurement methods. Furthermore, there is a thorough review of PPP, its different parties, the overall functionality and some history. The chapter presents a few advantages and disadvantages of PPP, giving a quick understanding of why to use or not to use PPP. Since this thesis concerns the allocation of risks in PPP projects, the chapter also contains an introduction to Risk Management and an explanation of why certain risks are concentrated on.*

3.1 Common procurement methods

This subchapter will serve to give the reader a better knowledge of how different procurement methods usually are implemented in the construction industry. This chapter presents the most common procurement methods in today’s construction industry and also presents similar concepts to PPP.

![Diagram of procurement methods](source)

*Figure 5. A model showing how the contractor’s commitment varies in different contracts. (Source: Magnus Trollius, Vägverket 2007 (translated))*
Design – Bid – Build (DBB)
Together with DB-contracts, DBB is the most common method to procure construction projects. DBB is also referred to as Traditional procurement. The Client involves a design professional to prepare plans, specifications and other contract documents. These documents are compiled to a Bid Package. As the name suggests, DBB separates the design phase from the construction with a tendering/bid-process. In this process, Contractors receive the Bid Package and after thorough estimations they submit a tender/bid. This allows the Client to choose the Contractor with the best offer.

![Diagram](image1)

Figure 6. A timeline showing the process of a Design-Bid-Build contract. Each period is separated and has to be completely finished before the next phase starts.

Design – Build (DB)
DB, also referred to as turnkey, means that the Client enters into one contract for both design and construction. By doing so, the Client passes all responsibility (concerning design and construction) to the prime Contractor. The Client just needs to provide the requirements of the facility. Contractors will then submit bids with possible structural solutions and appearance. This might be referred to as Contractor-led DB. There can also be a Client-led DB. In such situation the Client, together with a Project Manager provides some or all design documents. DB contracts are often used when the appearance of the facility is not of great importance. As a client you have little to say about the design.

![Diagram](image2)

Figure 7. A timeline showing the process of a Design-Build contract. The difference to DBB is clear. In DB or turnkey the periods overlap each other and the time consuming bidding process is accomplished before preliminary drawings are made.

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6 Construction Planning, Programming and Control, Cooke & Williams, 2010, p27
Construction Management (CM)
The basic theory of CM is that the Client/Owner enters into a contract with a Construction Manager. There is then basically two ways of how to proceed:
1) The Client enters into contracts with Subcontractors, this is also referred to as Agency CM (fig. 8)
2) The Construction Manager enters into contracts with the Subcontractors, also referred to as CM at risk (fig. 9).
The second option minimizes the risk for the Client. Although the fee for the Construction Manager will probably be higher due to the extra risk the CM is undertaking.

Figure 8. Model showing the relationship in an Agency CM. (Source: Doc. Ing. Aleš Tomek, Czech Technical University, Czech Republic)

Figure 9 Model showing the relationship in CM at risk. (Source: Doc. Ing. Aleš Tomek, Czech Technical University, Czech Republic)

The benefits (for the Client) of procuring projects as Construction Management, is that the coordination responsibilities are taken care of by a professional.
Private financed and/or operated projects
A beloved child has many names. The construction industry has developed several procurement methods where private finance and maintenance is used. Below, only a small selection is listed of the various amount of combinations possible. The procurement methods in this list are in some way financed and/or operated by a Private entity. The term PPP is only a concept for collaboration between a Public party and a Private entity.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>DBFO</td>
<td>(Design, build, finance, operate)</td>
</tr>
<tr>
<td>BOT</td>
<td>(Build, operate, transfer)</td>
</tr>
<tr>
<td>BOOT</td>
<td>(Build, own, operate, transfer)</td>
</tr>
<tr>
<td>DBFMO</td>
<td>(Design, build, finance, maintenance, operate)</td>
</tr>
<tr>
<td>DCMF</td>
<td>(Design, construct, maintain, finance)</td>
</tr>
<tr>
<td>BOO</td>
<td>(Build, own, operate)</td>
</tr>
<tr>
<td>BROT</td>
<td>(Build, rent, operate, transfer)</td>
</tr>
</tbody>
</table>

The M25 motorway, the orbital motorway around London is now being widened with an extra lane in both directions to meet the higher rates of traffic. A consortium with Skanska and Balfour Beatty is performing the project. It is presented as a DBFO – project. However, during a study-visit of the project, the Project Manager confirmed that it is a PPP/PFI project.

In a report from *The Swedish Construction Federation*, the author suggests that there are different types of PPP. The author presents a list, similar to the one above, showing that they are all somehow examples of Public Private Partnerships. It just depends on which components are included in the contract.7

A conclusion is that PPP or PFI are wide concepts that do not have a definite meaning. Depending on the project composition and the components of the partnership, different names and acronyms are used.

Despite all versions, this thesis emanates from a PPP model explained below and shown on page 14.

3.2 What is PPP/PFI?
In today’s welfare society, it is common for the public sector to have competitive markets and different organisational structures. Consequently, the public sectors have started to distribute the public services to private operators instead of doing them themselves. In Sweden, this has become a more and more common practice. In the UK, researchers have started to name the municipalities for local governances instead of local governments. As more authority is transferred down to the

7 Lars Jägrén (2004) Finansiering av infrastruktur, en rapport från Sveriges Byggindustrier
municipalities, the privatisation rate is increasing. This leads to stronger competitive markets. However, it has also led to several controversial issues such as, if public property companies shall become private or if emergency hospitals shall be owned by a profitable business. In the early 90's in Sweden, the conservative government enacted several strategic changes in law making it possible for private operators to perform public services. One can easily refer to this information as the foundation of PPP/PFI in Sweden.8

As mentioned before, PPP stands for Public Private Partnership, and it is a procurement method where the private party helps with the finance of the project (in a pure PPP-project it is 100% private financed). When the construction is complex, the private party also manages the operation and maintenance of the plant. This results in that the Project Co will have a lifecycle perspective, which means that all the materials and works must be of adequate quality to ensure optional operation/maintenance costs. In the article “Critical success factors for PPP/PFI projects in the UK construction industry” the writers says that "the whole concept of PPP is underpinned by a government desire to resolve financial constraints in the provision of public facilities and services by calling upon private management skills to increase the efficiency, effectiveness and quality of facilities and services delivery".9

In a PPP project, the government writes a concession agreement with the private operator that allows him to perform the public service. This is nothing new, since a concession agreement was used in the Roman Empire for constructing, planning, maintaining and financing of aqueducts and harbours. The French have also used PPP, for instance for The Eiffel tower. Another example is when the French diplomat Ferdinand le Lesseps obtained a concession by the Egyptian vice King, Said Pascha, for the construction and maintenance of the Suez Canal. Le Lesseps started a company, where ownership was shared 78 % by French and 22 % by the Egyptian King. The company obtained all revenue and the canal was then transferred to the Egyptian government.10 Private financed projects have been used many times in the past, but they have just had different names.

Today's PPP have complex contracts between the parties, these can be difficult to establish an overall picture of. To simplify a PPP project there is a model explaining the structure (fig. 10). A private consortium (Project Co) obtains a concession agreement from the Public Party. In the concession, there are agreements (Project Agreement) stating how long the contract is valid (normally 30-40 years) before the structure is nationalised and handed over to the public entity. For PFI-hospitals in the UK a contract called Standard Form Project Agreement (further on called, UK Standard Form) is used. It is developed by the National Health Service who always is the ordering party when it comes to public hospitals. The contract includes all consortium rights and obligations.

The Project Co obtains capital from both Lenders/investors and may also invest from their own capital. In a Swedish PPP project, the most common contract between the Project Co and the Contractor is the Swedish turnkey contract, ABT 06\textsuperscript{11}. Between the Project Co and the FM-company there is a special contract called AFF\textsuperscript{12}. The Lenders have a Funders Direct Agreement with the Project Co, and to be able to control the progress of the project, they normally use a neutral technical advisor. The Trust also need an independent tester together with the Project Co, to make sure that everything is handled as it should.

Based on information from an interview with the Technical Manager on Barts Hospital in London, the tender process is time consuming and therefore also very expensive. The consortiums need to be careful choosing which projects to submit a tender on. The cost for a tender on these large projects can vary. When speaking of

\textsuperscript{11} Allmänna bestämmelser för totalentreprenad, General regulations for Turnkey contracts (2006)
\textsuperscript{12} Avtal för fastighetsförvaltning, Agreement for facility management
PPP projects, one often speaks of several million British pounds in procurements costs. Nine to ten million British pounds is not unusual. One reason to these high costs is the amount of contracts, but an even larger reason is the amount of time and resources needed for executing the tender.

This is how the procurement was carried out in the 1990's (fig. 11).

1. The Trust announces the project for bidders via OJEC (Official Journal of the European Community).
2. PQQ’s (Pre-Qualification Questions) are performed to determine which companies/consortiums are allowed to submit tenders.
3. A tender list is created. It is based on the tenders that the consortiums did submit (Usually six tenders were on the list).
4. The four most interesting consortium receives a PITN, Preliminary Invitation to Negotiate.
5. After negotiation the three most interesting consortium receives a FITN, Final Invitation to Negotiate. After further negotiation with the Trust, only two consortium are left.
6. These two consortiums are asked to submit a BAFO, Best and Final Offer.
7. The BAFO’s are reviewed and negotiated, and the consortiums are asked to submit a LAFO, Last and Final Offer.
8. The Trust chooses the best one of the LAFO’s and appoints a PB, Preferred Bidder. In this stage the contracts are reviewed to make sure both parties understand their rights and obligations. When all juridical issues are managed the parties reach the Financial Close, which is the moment when both parties sign the final contracts. Shortly after this the construction starts.

This process could last for up to four years but after complaints from both the public and the private entity the process has now been streamlined.

This is how the procurement is carried out in the 2000's (fig. 11).

1. The Trust announces the project for bidders via OJEC (Official Journal of the European Community).
2. PQQ’s (Pre-Qualification Questions) are performed to determine which companies/consortiums are allowed to submit tenders.
3. A tender list is created. It is based on the tenders that the consortiums did submit (Usually six tenders were on the list).
4. The four most interesting consortium receives a ITN, Invitation to Negotiate.
5. After negotiation the three most interesting consortium receives a FITN, Final Invitation to Negotiate. After further negotiation with the Trust only two consortium are left.
6. The Trust appoints the best consortium to Preferred Bidder. As in the 1990’s the parties reach the Financial Close after reviewing and signing all contracts. Shortly after this the construction starts.
Figure 11. Timelines showing how the tendering/bid process is streamlined in today's PPP.
(Source: David Wills - Technical Manager at Barts Hospital in London)
The design is ongoing during the whole tender process. It is not unusual that the design continues into the construction process but hopefully it shall be completely finished when commencing on site.

Concerning the design process in a PPP project, the detail of the design becomes greater the further into the tender process you come. In the beginning of the PITN stage the design is not in more detail than 1:500-drawings. However, the drawings get in more and more detail and 1:200-drawings are finally produced in this stage. In the FITN stage the design team continue with the 1:200-drawings and begin with the 1:50-drawings (room detailed). When the Trust has decided its Preferred Bidder (PB) the design team finishes both the 1:200-drawings and the 1:50-drawings. Hopefully the design is 100% finished when the Final Close (FC) is reached (which was the situation for Barts Hospital). If it is not, they have to extrapolate their costs for the design and hopefully calculate it right.

![Diagram showing the drawing detail through the tendering process](image)

**Figure 12.** Model showing how the drawings get in more and more detail through the tendering process.

To ensure that the Contractor will keep the time plan there is a penalty for each day the project is delayed. Further on for the construction period, the Lenders/Investors follow the progress intensively. They want to control that the financial plan is followed which can be frustrating for the Contractor.

As mentioned earlier, it is important for the Contractor to construct the facility/road with high quality to ensure the operation and maintenance costs will be lower for the Project Co. If something with poor quality can be related to the Contractor's mistakes or that the Contractor is not fulfilling the requirements given in the Project Agreement, they can be charged for this. In Private financed projects there can be many different areas of maintenance and operations. For hospitals, this can include services as receptionists, clinical services or food delivery. These can be referred to as soft facility management (Soft FM). But PPP projects also normally include the maintenance of for example changing lights, fixing radiators or cleaning the floors. These FM-services are called hard facility managements (Hard FM).
3.2.1 Advantages and disadvantages of PPP/PFI

Opinions vary depending on whom you ask, when speaking about politics, generally the conservative parties are more positive of using PPP than the socialist parties. However, finance ministers are (independent party affiliation) usually opposed to use PPP. The main reason for that is the long concession agreement. One incurs for annual expenditures for 30-40 years and the Ministry of Finance losses its power to control and regulate the economy.

Due to the many parties in PPP projects, a disadvantage for one party could be an advantage for the other. Therefore, to make a fair analysis, the most common advantages and disadvantages for the Private and Public Entity are presented in the table below.

In an interview with the Technical Manager for the Barts Hospital project, he gave us his point of view of the advantages and disadvantages.

Table 1. A table showing the major advantages and disadvantages of using PPP for the Contractor and the government.

<table>
<thead>
<tr>
<th></th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
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<tbody>
<tr>
<td><strong>Private Entity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>If managed properly, profitable works</td>
<td>Time consuming and costly tendering process.</td>
</tr>
<tr>
<td>2</td>
<td>Better margin</td>
<td>Increased consequence for non performance</td>
</tr>
<tr>
<td>3</td>
<td>Secure long term income</td>
<td>Lack of expertise and experience etc.</td>
</tr>
<tr>
<td><strong>Public Entity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Fixed time and cost</td>
<td>Locked into long contracts</td>
</tr>
<tr>
<td>2</td>
<td>Outsource delivery of services. (Allows client to focus attention on core services, i.e. making “sick” people better.)</td>
<td>Less flexibility of public finances</td>
</tr>
<tr>
<td>3</td>
<td>Performance requirements. Available at time and accurately maintained</td>
<td>Public staff unwilling to be transferred over for the Private sector. (due to job security etc.)</td>
</tr>
</tbody>
</table>

Proponents of PPP often emphasises the efficiency of that one party is undertaking the responsibility of all phases (design, construction, maintenance). That decreases the uncertainty for the Client and cooperation problems are minimized. Due to this, cost savings of 5-20 % are often mentioned.\(^{13}\)

\(^{13}\) Magnus Arnek, Lars Hellvik, Magnus Trollius (2007) En svensk modell för offentlig-privat samverkan vid infrastruktursatsningar.
PPP also enables large investments of infrastructure and health care, even though the public finances are not the best. It is possible due to the establishment of the annual payment plan.

Instead of that authorities or governments makes their own conclusions of how facilities should be built, they set specific functional requirements of how they intend the facility to work. By doing so, the responsibility of designing and finding innovative solutions is passed to a professional private party. However, to make this work properly the requirements have to be very precise. There must not be any doubts of the requirements, this is to procure that both parties fully understand their commitments and that the tender is more precise. For example, one should avoid using phrases as “We need a minimum of 1500 parking lots” or “The Hospital shall meet the standards of the future health care requirements”. If using phrases like this, the requirements are hard to understand and turn into design. Does “a minimum of 1500 parking lots” mean 1500 parking lots or 2500 parking lots? “Future health care requirements", does that mean that all surgery is performed in vacuum to prevent infection and diseases? No one knows, and therefore the tender will be inaccurate, leading to higher costs, risk for time overrun and probably a dissatisfied Client.

In PPP projects, a fixed price is always used. The Trust undoubtedly knows the price of the facility from the beginning. This means that the Project Co is liable for all costs exceeding the value stated in the contract. This is one of the biggest benefits for the Trust, as it eliminates the uncertainty and the risk of cost overrun.

“State borrowing is always cheaper!” is one of the most used arguments of why not to use PPP. Governments are considered (in most cases) to be the most liable lender available. Therefore, a government always obtain lower interest rates on loans than a private actor. This is why the financial model (with a majority of privately borrowed money) for NKs had to be refurbished. Lilla Batjan (Social Democrats) considered the financial model to be unnecessary expensive for the government. He managed to renegotiate the model and by letting the government borrow more money, he cut costs of approximately 8 billion Swedish crowns.\textsuperscript{14} However, this lowers the incentives for the private entity. When the Private Entity lends the majority of the capital, the pressure of a successful project increases. One is always more aware of costs if the own capital is at risk. Furthermore, the control from the lenders increase when the Private Entity lends the capital, since the lenders want to ensure their capital is used in an effective manner.

The long concession agreements will result in problems when elections lead to political transitions. When a new party gets the majority in the parliament, they shall be able to change the existing politics to reflect the “voters/electors” preferences. With many PPP projects this is hard to manage, as the government is locked in to long contracts that probably are very costly to terminate.

\textsuperscript{14} Tomas Nordenskiöld, Dagens Industri Dimension, 3 February 2011
It is quite obvious that no direct conclusions can be made by only studying advantages and disadvantages. Ahead of each new PPP project all factors need to be carefully considered and evaluated to achieve the PPP model that is best suitable for the situation.

3.2.2 PPP in Sweden today
Due to the political governance in Sweden, PPP is a hot topic. One can easily say that the conservative government want to use private finance more and socialist government wants to use it less.

According to an interview with the technical manager of Barts Hospital in London, Sweden has started to see the advantages of PPP, but we are starting in the wrong end. Sweden has little experience of PPP, and when the decision comes to use it, we are constructing the largest PPP hospital in the world. In the UK they started on smaller projects to build confidence among the British population. They can then continue the expanding for larger projects such as Barts Hospital, Royal London Hospital or the M25 project when they have more experience and reliance. It has actually been a few smaller projects in the past, but the New Karolinska Solna (NKS) might be too large for the Swedish market anyway.

Previously, the construction company NCC has built the Arlanda Express, a railroad between the city of Stockholm and Arlanda Airport. In 1994 the Swedish government signed an agreement with a consortium of Swedish, British and French companies. The consortium started the company A-Train AB. The agreement was carried out as a concession and A-Train had sole rights to run the business for 45 years with a chance of further extension of 10 years.

The most common usage for PPP in the construction industry in Sweden is for public swimming pools, both indoors and outdoors. Example of this is in the Tyresö and Sollefteå municipalities. The municipalities control the tenders by an overall evaluation of the tenders were design, opportunities for various fitness activities, finance solution for construction and maintenance, how likely it is that the construction is economically viable and which actions that are taken to lower the maintenance costs and energy costs are some factors considered.\(^{15}\)

The future for PPP in Sweden is highly dependent of the outcome of the NKS. If the NKS will fail to keep its budget and time plan it can become even more difficult to start a PPP project in Sweden.

Some might say that the Öresund bridge is a PPP, but it is not. A consortium called Öresundsbro Konsortiet was started. It was 50% owned by the Danish government.

\(^{15}\) Tom Madell, Tobias Indén (2010) Offentlig Privat Samverkan – Rättsliga förutsättningar och utmaningar
(through A/S Øresundsförbindelsen) and 50% owned by the Swedish government (through SVEDAB). The principle is the same, with the operation and maintenance as well as the tariffs for paying back the investment costs, but it is not private financed.

3.3 Risk Management

A risk could be defined as the probability of a negative event occurring. The opposite would then be, an opportunity, i.e. the probability that a positive event will occur. How you handle the risks is called Risk Management and an introduction to it is given in this subchapter.

Risks are something you have to deal with on a daily basis in both your private life and while doing business. The difference is while managing business related risks, the impact if the risk occurs, will often be of greater importance. All kinds of businesses are managing risks, however, "the construction industry is subject to more risk and uncertainty than many other industries". Why the construction industry is particularly risky is mainly due to the intense competition for work and the effort to always provide the highest possible (in terms of money) bid, but competitive enough to be selected. The fact that the conditions are never the same from project to project and that every project itself is unique makes the construction industry even more risky.

Risk Management is all about identifying risks, i.e. assessing and managing them. Once a risk is identified and defined, one should strive to reduce, retain and preferably remove it (fig. 11).

Figure 13. Risk Management process. Showing that no matter how efficient the risk assessment is, there will still be residual risks to be taken care of by the Risk Management. (Source: Cooke & Williams (2010) Construction Planning, Programming and Control)
4. Risks and risk allocation

This chapter is locating significant risks occurring during a PPP-project. We have made a timeline of an arbitrary PPP-project and divided it into certain risk-periods (fig. 13).

In each period the events of importance and the risks connected to them are demonstrated. Each risk is defined and controlled in ABT 06 and UK Standard Form to control which party is responsible for it. The differences between the contracts and how it affects the Contractor are reported in Conclusions.

This report emanates from a list of risks stated in the article The allocation of risk in PPP/PFI construction projects in the UK\textsuperscript{17}. In the article there are PPP-specific risks stated, those are supplemented with standard risks in the construction industry. Table 2-5 demonstrates these risks.

An analysis of the risks is made with help of a simplified Risk Diagram (fig. 14). Every risk is assigned a number, 1 or 2, based on the probability of the risk occurring and how big the impact will be if it occurs.

![Risk Diagram](image)

Figure 14. Risk diagram, divided into fields, showing the impact and probability of a certain risk occurring. This model was used to assess the risks in the Risk Matrix.

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>This field contains risks that can almost be ignored, at least one do not need to put much effort in managing them.</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Risks with high impact and low possibility are risks that need careful management.</strong></td>
</tr>
<tr>
<td>3.</td>
<td>This field should be empty, risks with high impact and high probability barely exist.</td>
</tr>
<tr>
<td>4.</td>
<td>This field contains risks that basically are part of the daily work.</td>
</tr>
</tbody>
</table>

The report is concentrating on risks in Field 2, as those risks are difficult to predict and prevent. Therefore they are especially necessary to manage.

\textsuperscript{17} Li Bing, A Akintoye, P. J. Edwards and C. Hardcastle (2004) The allocation of risk in PPP/PFI construction projects in the UK
Table 2. Risks occurring during Period 1. Every risk is assessed and evaluated with the Risk Diagram (fig. 14).

<table>
<thead>
<tr>
<th>Risks</th>
<th>PPN/HI</th>
<th>Probability</th>
<th>Impact</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whole period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Big changes in design, far in to the period.</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Lack of participation</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3. Inefficient handling of documents</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4. Inadequate time planning for production</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4.1 Inadequate time planning for tender</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5. Low availability of contractor/FM-company due to inadequate experience of PPN/HI</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. Delay of choice of contractor/FM-company</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7. Unclear enquiries</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8. Miscalculations of scope of work</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>9. Miscalculations of time</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10. Miscalculations of need of material</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>11. Miscalculations of pricing</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12. Insufficient geotechnical investigation</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>13. Failure to translate requirements into the design</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>14. Investigation of available methods of finance</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>15. Unable to find lenders</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>16. Low financial attraction for investors needed to start the Project Co</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Evaluation/Assessment and choice of contractor and FM-company

- In turn-key contracts this risk regards the availability of subcontractors.
- The risk does not exist in turn-key contracts.

Receiving tenders from contractor and FM-company (evaluation/assessment)

- The risk does not exist in turn-key contracts.

Investigation of available methods of finance

- The risk does not exist in turn-key contracts.
Table 3. Risks occurring during Period 2. The risks are assessed and evaluated with the Risk Diagram (fig. 14).

<table>
<thead>
<tr>
<th>Risks</th>
<th>Probability</th>
<th>Impact Factor</th>
<th>PPP/PFI</th>
<th>Probability</th>
<th>Impact Factor</th>
<th>TURN-KEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. A delayed decision from the Trust might lead to renegotiations</td>
<td>1</td>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>18. Big changes in design</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>19. Lack of participation</td>
<td>1</td>
<td>3</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20. Inefficient handling of documents</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>21. Inadequate time planning for design/production</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>22. Failures in contracts</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>23. Poor coordination of subcontractors</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>24. Difficulties when establishing on site</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>25. Difficulties in recruiting personnel</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>According to today's situation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>26. Difficulties in obtaining public documents</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>27. Poor flow of information (to workforce)</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The risk does not exist in turn-key contracts.

Table 4. Risks occurring during Period 3. The risks are assessed and evaluated with the Risk Diagram (fig. 14)

<table>
<thead>
<tr>
<th>Risks</th>
<th>Probability</th>
<th>Impact Factor</th>
<th>PPP/PFI</th>
<th>Probability</th>
<th>Impact Factor</th>
<th>TURN-KEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Poor workmanship</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>29. Late material deliveries</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>30. Unforeseen ground conditions (consequence of 11)</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>31. Damages to existing buildings</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>32. Third party claims</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>33. Weather (force Majeure)</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>34. Injuries</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>35. Theft</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>36. Fire</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>37. Cost and time overrun</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Under existing buildings, Cracks, settlements etc.

Low impact for contractor.
### Table 5. Risks occurring during Period 4. The risks are assessed and evaluated with the Risk Diagram (fig. 14)

<table>
<thead>
<tr>
<th>Risks</th>
<th>Probability</th>
<th>Impact</th>
<th>Factor</th>
<th>Period 4 - Operation and maintenance</th>
<th>Probability</th>
<th>Impact</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>38. Excessive contract variation</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>39. Operation cost overrun</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>40. Operational revenue below expectations</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Leads to 39 and 40</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>41. Low operating productivity</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>42. Higher maintenance cost than expected</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>43. Maintenance more frequent than expected</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>44. Need to change FM company due to competitive tendering</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>45. Problems during rationalisation</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

In a real-life situation there are no definite periods with “starts and stops”, there is a grey area between the periods and they are often overlapping. When dealing with commercial Clients the pressure of shorter construction periods and early completion is large. The Client is striving to earn revenue as early as possible. To deal with this demand, Fast-Track Construction is often used. For instance the design of the roof might not be complete when the construction works are started.

In PPP projects a method called Management Contracting is often used. It is similar to Fast-Track Construction. The difference is that a manager is selected (after an invitation to several managers to submit quotations), who is then managing the works and gets paid by a pre-determined management fee. However, to simplify the model an assumption is made that the periods have definite “starts and stops” and that the rest of the project is carried out in a traditional manner.

All clauses and paragraphs that are referred to in this chapter are own interpretations and translations and are not verbatim quotes (unless anything else is mentioned in the text).

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18 Construction Planning, Programming and Control, Cooke & Williams, 2010, p.105
Figure 15. An arbitrary PPP-timeline showing the four risk periods.
4.1 Period 1 – Bid/Tender process

This period stretches from the receiving of Pre-Qualification Questions (PQQ’s) to the day that the Trust has decided for their Preferred Bidder (PB). The different steps in this process are presented in figure 5. The bid/tender process includes many different risks, including for example the one where the Contractor has to decide whether to bid or not. The Technical Manager at Barts Hospital describes this decision as a poker game. “You have 5 million pounds that you will invest in a tender for a PFP project, where will you put them?”

Below we define the risks existing in this period.

4.1.1 Changes in design

This risk is also to be found in Period 2, however this subchapter only focuses on the risk of changing design during Period 1. This can affect both the time-plan and/or the budget for the project. Both parties may require a change in design if certain requirements are fulfilled and Therefore this might be a risk for the Contractor and the Trust. The consequences in Period 1 are often smaller, since the design is still in an early stage.

To make it analysable, an assumption is made that the changes in mind are relatively large so that the consequences are relevant to evaluate. A high impact for a change in design will lead to an increased construction cost and also a lot of extra document handling which is time consuming. An example could be a small change, such as new doorknobs. Due to the amount of doors, the cost will be high. It could also be a big change, such as changing facade material or increasing the thickness of a slab.

According to ABT 06

Chapter 2 § 3

The Contractor is entitled and obliged to carry out extra work provided by the Client, but the changes or amendments must be associated with the rest of the construction requirements. If possible, the Client should wait until after completion for the specific change, but if he can wait he can also choose to go to another Contractor for this specific task. This might lead to problems due to liability between the prime Contractor and Client. Other Contractors are aloud to perform changes that are associated with the original contract.

Chapter 2 § 4

The Client is responsible for the provided documents, that the site is in the same condition as it was when tenders was collected and that the conditions are as they can be predicted to be according to a professional assessment if nothing else is mentioned in the requirements.
Chapter 2 § 5
If the amount of work increases due to the Contractors way of work, it is not a change or an addition of work, unless the Client orders the Contractor to perform it this way.

Chapter 2 § 12
Changes in design-work after acceptation of tender, has to be presented to the Client before the Contractor on site performs it. The proposal should apply to the original requirements. If the Client does not answer within a reasonable time, this will be interpreted as a tacit mediated. If the Contractor's proposal is an amendment in relation to the contract document, this has to be clearly stated and then accepted by the Client.

According to UK Standard Form
Clause 17.1 (Part D)
First of all the Project Co has to 1) Ensure satisfaction of the Trusts construction requirements, 2) Perform the construction as the tender says and 3) Perform the works according to the Project Agreement.

Clause 17.7 (Part D)
The Project Co shall develop and finalise the design and specification of works, and then the Trust will review it. The Project Co shall not commence or permit commencement of any changes until the Trust's representative has confirmed them. The Project Co will then be able to proceed with the construction according to paragraph 3.3 in Schedule 10. If the Project Co perform a change without having the Trust's confirmation, they shall at their own cost, undo, remove from the site and replace so that the Trust's construction requirements is fulfilled.

Clause 17.8 (Part D)
Further on if rectification of amendment is needed, the structural, mechanical and electrical standard should be equivalent to the performance that it had before changes.

Schedule 22, § 3.1 (Part 1)
The Project Co may if they want to, within ten business days, give the Trust a non-binding estimated cost and time-frame for the change. Then the Trust has further five days after receipt to confirm to the Project Co whether to continue or not on the calculation of the change. If the Trust has stated an intention that the Project Co shall obtain finance, the Project Co will with “reasonable endeavours” try to obtain a non-binding response from the Lenders.

Schedule 22, § 3.2 (Part 1)
The Project Co may within 1 month of receipt of variation enquiry or 1 month after the Trusts confirmation that it wishes Project Co to proceed with it, object or accept to the variation enquiry.
Conclusion: When making amendments in design in a turnkey contract, the Client bears the majority of the risks. In a PPP-project, the risks are undertaken by the Project Co who transfers the risks to the Contractor. Therefore, the Contractor bears a greater risk than in a traditional turnkey contract.

4.1.2 Inefficient handling of documents

When planning or executing a construction project many documents need to be handled, for instance; drawings (structural, architectural, installations etc.), permits, contracts, reports, delivery notes and more. The documentation is provided by various actors, such as Designers, Architects, Lawyers and Contractors, all with different meanings of how the documents should be handled. When the document handling is not working properly, it might increase the costs or at worst, errors in the production that might cause even higher costs and delays. All parties in the project must therefore handle the documents in an efficient way.

It is preferable to have some kind of digital system to handle the documents. A digital system enables an efficient tracking possibility and will streamline the work as all documents are available online. Building Information Modelling (BIM) is one method to keep at least all drawings up to date. With BIM every consultant, sub-Contractor and other party is connected to the same 3D-model of the building. The moment someone makes an amendment to a drawing, it updates automatically and all other parties will be notified.

This risk has to be handled during the whole project due to the large amount of documentation, but for this risk, we have focused on the document handling in Period 1 and Period 2.

According to ABT 06

Chapter 1 § 6
The part that provides a certain document is responsible for its accuracy. Approval from the counterpart does not affect the responsibility.

According to UK Standard Form

Clause 2, Schedule 2 part 1 and part 2
In these Schedules it is clearly stated which document to be provided by which party. The Project Co shall deliver not less than 19 specific documents and the Trust 8 specific documents. The documents specified are of economic and legal nature, proving that the parties have sufficient funds, the right certificates and an efficient organisational structure etc.
Conclusion: According to ABT 06 the risk is shared between the Client and the Contractor. The rules about document handling are wide and open for own interpretations. Which documents to be provided by which party is not specified in the contract.

According to UK Standard Form the risk is shared between the Project Co and the Trust. The fact that the responsibility of each document is clearly stated, minimizes the risk of inefficient handling. Although the Project Co have more documents to deliver and Therefore they might be a bigger part of Inefficient handling of documents.

Due to the extra party (the Project Co) in PPP projects there are more documents and contracts that need to be handled. However, between the Contractor and the Project Co there is a standard turnkey contract. Therefore the amount of documents to handle for the Contractor do not differ in PPP compared a Turnkey contract. Although, the larger amount of documents in PPP may cause logistic problems.

4.1.3 Inaccurate time planning

Time planning is one of the most essential and crucial factors in a construction project. Without an accurately performed and very precise time plan, it is difficult to execute a project with success. When preparing a bid you have to perform two separate time plans (also referred to as programmes), one for the process of preparing the bid (Pre-tender Programme) and one for the construction phase (Construction Programme). In the Pre-tender Programme deadlines has to be set for when certain documents has to be submitted and who is responsible for submitting them. This is important to make sure that a complete tender is submitted in time.

In the preparation process many persons are involved, engineers, consultants, sub-Contractors, architects and jurists etc. Each of them is producing and providing several documents that depend on each other, therefore the coordination and time planning in this stage is very important.

The construction phase also requires careful time planning. All upcoming events must be assessed with regard to how time consuming they are and how many workers they need. Then, the events need to be planned and executed in a correct order. The time planning is based on previous experiences from similar projects and it might be difficult to estimate the needed time.

Since the tender is not complete in Period 1, one must manage both the Pre-tender Programme and the Construction Programme.
The risk is that you, as a manager, have misjudged for instance the time needed for each event, whether it is in the preparation of the bid or the construction phase. If this occurs, at best a revision of the time-plan is needed, at worst the whole project will be delayed.

According to ABT 06
Chapter 4 § 1
The Contractor is responsible for planning the construction works in a manner that enables project completion within the time frame for the project. The Contractor shall present the plan for the Client in a Time plan. The Client is responsible to provide the documents the Contractor needs to establish the Time plan. In a Turnkey contract the design is part of the Contractors work, Therefore design should be part of the Time plan.

According to UK Standard Form
Clause 19.1
Time plan is referred to as The Programme. The Programme is the sole responsibility of the Project Co and shall be prepared in accordance with Good Industry Practice and be in sufficient detail so that the Client's Representative can monitor the progress. The Project Co shall ensure that any changes of The Programme are submitted to the Client's Representative.

Conclusion: It is not specified that either part shall produce a time plan in any of the contracts. However, it is clear that the Contractor (in a Turnkey contract) and the Project Co (in a PPP-project) is responsible for carrying out the works and finish them before or at the agreed date of finish. To manage that, an accurate time plan is necessary, therefore there are not any big differences between the contracts.

4.1.4 Miscalculations (scope of work, time, material, pricing)
The tenders are very much based on previously experiences from similar projects. During the tender process, the calculators has to keep in mind which construction method to use, the amount of work needed, the time it takes, the necessary material and the prices for all the specific tasks in a project. With this, there comes a great risk for miscalculations. Normally, the consortium has talented calculators with great experience, but one can never predict the outcome of an event with high precision. A high impact could be that the calculator misses one small detail, but this detail will be used so many times in the project, that the cost for this mistake will be large. This risk only lies with the Contractor, since it is the Contractors mistake.
4.1.5 Insufficient geotechnical investigation

When a geotechnical investigation is performed you never get the full picture of the ground conditions. It is only adjacent to the drilled holes you know for sure how the conditions are, if it is soil, clay, sand or bedrock, the amount of contaminated soil, antiquities etc. Between the holes the conditions are assumptions, this entails a big risk for the Contractor as unforeseen ground conditions is often costly to address. In all projects there can always emerge unexpected ground conditions, but a high impact could be if the unforeseen ground conditions are extremely contaminated or a large amount of unexpected antiquities is found. The consequence of Insufficient geotechnical investigation occurs in the construction phase, but managing of the risk has to be performed in this period.

According to ABT 06
Chapter 1 § 7

The Contractor is assumed to have gained required knowledge and information about the site before his tender is submitted.

Although the following is to read in the comments to the paragraph: “In the Contractor’s actual duties are not normally included demolishing or ground investigations, unless otherwise is stipulated in the contract documents.”

According to UK Standard Form

Clause 15.1

If the site is not occupied, the Contractor shall be deemed to;
- have performed a geotechnical investigation
- have examined the site, its surroundings and existing structures or works that is on, over or under the site.
- provide them selves with all information concerning site condition, ground, subsoil and form.
- provide them selves with all information concerning the risks of injuries or damages to properties on the site.
- provide them selves with information about which materials (natural or non-natural) that are going to be excavated.
- taken precautions and chosen times and the right methods to the extent it is possible to not interfere with people living/working next to the site.

Clause 15.2

To make sure there will not be any misunderstandings, the Project Co can not make any claims against the Trust concerning the site. The Project Co takes full responsibility for all matters referred to in Clause 15.1.
Clause 15.3
If unforeseen ground conditions are discovered under existing buildings and conditions are in a manner that the geophysical investigation could not discover them, the Trust shall be responsible.

Conclusion: In ABT 06 it is not specified that a geotechnical investigation need to be carried out. However, the Contractor is obligated to ensure he has sufficient knowledge about the site to submit a correct tender. A geotechnical investigation is normally not included, unless otherwise is agreed in the contract. Alternatives are that either the Client, Contractor or any consultant perform the geotechnical investigation, the party that performs it is also responsible for its accuracy (according to ABT – 06 chapter 1 § 6).

In UK Standard Form contrariwise it is clear that the Project Co shall be responsible for investigation of the ground conditions, unless it is not possible.

The Project Co is responsible for carrying out a geotechnical investigation. Although, the actual investigation is performed by either the Contractor or any other subcontractor.

4.1.6 Unable to find Lenders
This is not a risk regulated in UK Standard Form. If the Project Co fails to find Lenders they will be eliminated in an early stage of the tendering process. If the financial model is unclear and has flaws, the Project Co is probably not even receiving the Preliminary Invitation to Negotiate. Problems arise if the Project Co is an untested consortium with parties that has never worked together before or if the Project Co has little experience of PPP projects. Then there might be unwillingness for Lenders to provide Project Co with money, as the Lenders might think it is a too big risk.

Therefore the risk is clearly taken by the Project Co itself.

4.1.7 Low financial attraction for investors needed to start the Project Co
The situation of this risk is almost as for Unable to find lenders. The Project Co is likely to be precluded even before the PITN. It is rather clear that if no investors are willing to invest in the project it is hard to even form a Project Co. Due to this, it is a risk undertaken by the company who decides to participate in the bidding contest.
4.2 Period 2 – Preferred bidder

Period 2 stretches from the selection of the preferred bidder to Financial Close. During this period there are almost no ambiguities that the Preferred Bidder will be awarded the contract. However, no contracts are signed until Financial Close and therefore there is an amount of uncertainty and risk for the Project Co.

4.2.1 Late changes in design

The consequences of changing the design get worse as the project proceeds. It is quite obvious that it is easier to make changes in upcoming events rather than changing finished work. In Period 2 the Preferred Bidder is already appointed, which means that the design is completely finished. Changes or amendments are likely to come from the Client/Trust due to changes in law, new requirements etc. The contractor might also require amendments due to hidden errors in the design, that is although implausible since the design is reviewed and controlled so many times just to make sure there are no errors. The risk sharing however, is the same as in Period 1 and is written about in chapter 3.1.1.

4.2.2 Inefficient handling of documents

This is an on-going risk during a whole project and the risk is the same as in Period 1. The difference in Period 2 is that the impact might be higher due to that the Project Co is chosen as the Preferred Bidder and is further in to the procurement procedure. All documents must be efficient handled when the construction at site starts so it can run smoothly without disruptions.

4.2.3 Time planning

In this Period the risk of inaccurate time planning only concerns the construction phase. This is because the tender already is submitted and therefore the Pre-tender Programme probably was successfully followed. The risk of an inaccurate Construction Programme still remains though. When the company/consortium reach the Financial Close with the Client/Trust the Construction Programme is definite and the contractor/Project Co must take all precautions to follow it.

The risk sharing is as in Period 1 and is described in chapter 3.1.3.
4.2.4 Failures in contracts
Contracts are seldom perfect, they contain vast amounts of information and failures occur from time to time. Due to the large amount of contracts in a PPP project, the risk for failures increase. Failures are both time consuming and complicated to correct.

Failures could for instance be misunderstandings due to unclear enquiries, it might lead to sub-Contractors submitting tenders on inadequate works or tenders with errors. The risk is shared between all parties.

4.2.5 Difficulties in obtaining public documents
The meaning of public documents in this context could be building permit/planning approval, permissions and notifications. If one party fails to deliver these documents in time, the completion of the project might be delayed.

According to ABT 06
Chapter 1 § 11
The Client is responsible to provide and finance a building permit. The Client shall also provide all other necessary documents, such as permissions and notifications needed for the activities to be implemented after construction completion. However, the Contractor shall provide the permissions needed for the construction, for instance permission for rock blasting, rearrangements of traffic etc.

According to UK Standard Form
Clause 16
UK Standard Form assumes that a detailed planning permission has been obtained and that the judicial review period has expired before signing of the contract. The Project Co is responsible for obtaining all documents and consents required for the performance of the Project Co. Project Co is also responsible for performing the works within the period of validity of the consent.

Conclusion: In both contracts the responsibility of obtaining the planning permission/building permit lies within the Client/Trust. According to ABT 06 the Client shall also provide necessary permissions needed for the operation/activities that will be implemented after completion. In UK Standard Form contrariwise that responsibility is undertaken by the Project Co, that makes sense as it is the Project Co that will operate the building after completion.

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4.3 Period 3 - Construction

The construction period is when all construction works are carried out. Since all works are carried out by the contractor and its subcontractors most of risk lies within the contractor. An assumption is made that the construction works starts on a specific day with the first shovelful and ends at a specific day when all construction works are completed.

4.3.1 Late material deliveries

The delivery of the material to a construction site is crucial in order to obtain sufficient productivity on the site. As Project Manager you need to ensure that the supply chain is as efficient as possible. Several issues need to be discussed when procuring material, for instance; purchasing from abroad, how to deliver, lifecycle of the materials, are procurement alliances possible, is there space for storing etc. If the material supply do not work efficiently, the impact can be a delayed project and/or higher total cost due to waiting workforces.

**According to ABT 06**

Chapter 1 § 10

Unless anything else is agreed, the Contractor shall at own expense procure all the materials needed to complete the project. Due to this, the Contractor is also responsible for that the material is available on the site when it is required.

**According to UK Standard Form**

Clause 33.3

Project Co shall procure that sufficient stocks of goods, consumables and materials are held in order to maintenance the work.

**Conclusion:** The starting point in ABT 06 is that the Contractor shall supply the site and its workers with all required material, the Contractor is Therefore also responsible for accurate deliveries. However there might be agreements that the Client will supply some of the material, then he is also responsible for delivering it. Not much differ in the UK Standard Form, the Project Co is responsible to procure and provide all materials and manage the deliveries in a good manner.

4.3.2 Unforeseen ground conditions

As mentioned in Period 2 - Preferred Bidder, it can be difficult to establish a clear view over the ground conditions. Unforeseen ground conditions are rather a
consequence than a risk, due to a poor geotechnical investigation. The Project Co is responsible for all risks concerning the ground conditions except if a geotechnical investigation is difficult to perform. An example of this can be under existing buildings. A high impact for the Contractor could be if a great amount of contaminated soil is found, that was not calculated for in the tender. A high impact for the Trust would then be if the contaminated soil is under an existing structure that did not enable a geotechnical investigation. To see risk sharing, see chapter 3.1.5.

4.3.3 Damages to existing buildings
The risk refers to all possible damages to existing buildings adjacent to the construction site. The damages could be direct; caused by vehicles, workers, heavy machines etc. They could also be indirect; for instance subsidence of buildings due to unwary excavations (leading to future cracks) or cracks due to vibration caused by blasting etc. This risk is not regulated in ABT 06, instead it is regulated in Miljöbalken 1998:808 (Environmental Code) which is a dispositive law that must be complied with.

Chapter 32 § 1
Indemnity shall be paid for, if property damage occurs.

Chapter 32 § 4
Damages that occur on adjacent buildings due to blasting rocks shall be indemnified by the Contractor (or subcontractor) no matter how thorough the safety precautions are.

Chapter 32 § 5
Damages due to excavations (or similar works) shall be not indemnified by the Contractor if enough safety precautions are taken.

Chapter 32 § 7
The party who is carrying out the works or has the works done is responsible to indemnify the damage.

According to UK Standard Form
Clause 8.1 and 8.2
Both parties shall indemnify the counterparty if any damages to properties/facilities occur. This applies if the Trust/Project Co has breached the agreement.

Clause 36.20A
The definition of a material damage on the facilities is when the repair and/or reinstatement costs exceed a decided amount of money.
Conclusion: Depending on what kind of work that has caused the damage, the Contractor (or a Subcontractor) is responsible for all damages to existing buildings, unless they have not taken enough safety precautions.

In PPP-projects, the parties share the risk. Depending on who made the damage and what the damage occurred on, the counterparty shall indemnify the other. The Trust and the Project Co decides in the Project Agreement on which value to use as definition of damage. When damage on a facility occurs, the Project Co shall arrange for a meeting within three business days with the Trust to make a preliminary assessment of the damage. The handling of this event will be according to Clause 36.20.

4.3.4 Weather (Force Majeure)
This risk is events that might be referred to as “act of god”. These events are unstoppable and impossible to control or manage and Therefore Force Majeure is difficult to prevent. If the construction site is in an earthquake zone or tsunami zone, the building shall be constructed to withstand these forces. Using weather-protected construction can in some cases prevent heavy rain from destroying materials or machines.

The biggest concern for Force majeure is in the construction phase, but in harsher climates this should probably be considered in the design phase as well. The Client might even ask for a stronger structure due to Force Majeure.

According to ABT 06
Chapter 5 § 1
The Contractor is not responsible for any damages that might occur due to force majeure.

Chapter 8 §§ 1 & 2
The contract may be cancelled due to force majeure.

Chapter 8 § 5
The Contractor has the rights to obtain compensation for material and goods that has been damaged and not yet built in.

According to UK Standard Form
Both parties may claim relief of obligations. They have to make an agreement if something like this happens.
Clause 43.2
When one party has claimed relief from liability due to force majeure, it can not be able to perform its obligations under the Standard Form Contract.

Clause 43.3
The party claiming relief shall take all reasonable steps in order to mitigate the consequence of the force majeure before relief of obligation is possible.

Clause 46.1
One of the parties may after six calendar months terminate the agreement if the "relevant event of force majeure" continues to prevent the parts from performing a material obligation.

Conclusion: In a Swedish Turnkey contract, the Client takes the largest risk if an event of force majeure occurs. Both parties can cancel the project but the Contractor takes no risks for damages and is entitled to obtain compensation for purchased materials and goods that have been damaged.
As for Standard Form Contract the parties share the risk. One party claims relief from its obligations and the other can accept it. After six month of alerting the other party, the contract agreement can be terminated if the force majeure still is preventing the party to perform its material obligation.

4.3.5 Injuries
Construction sites around the world are amongst the most dangerous places of work in the world. Many heavy machines, rough ground, heights and noise contribute to that.
As late as May 2008 two workers died in an accident during the construction of the bridge crossing Ålandsfjärden in Sweden. Studs supporting a concrete form broke due to miscalculations of the dimension and insufficient control of the project manager. This thesis define a high impact of this risk as, from a broken bone to fatalities during the construction work.

According to Arbetsmiljölagen (1977:1160) (Work environment act)
It is not specified in ABT06 which party is responsible for injuries occurring due to poor safety on the site. However, according to chapter 3 § 6 in Work Environment Act the party performing the works is responsible for; 1) During programming and design procure that working environment is taking into account both during construction and future use. 2) Appoint a person responsible for working

19 http://www.byggvarlden.se/nyheter/arbetsmarknad/olyckor/article3136365.ece 2011-03-28 11.18
environment during programming and design (BAS-P). 3) Appoint a person responsible for working environment during the construction works (BAS-U).

Contractors in Sweden are required by law to appoint a BAS-P and BAS-U.

**According to UK Standard Form**

Clause 33.3

Project Co shall throughout the progress of the Works be fully responsible for all persons on the site. Project co shall keep the site, the Works and the Facilities in an orderly state in accordance with good industry practice. The Project Co shall also provide fences around the site to prevent unauthorised persons residing there.

**Conclusion:** During a turnkey contract in the Swedish construction industry it is always the Contractor who is responsible for safety on site, however it is not regulated in ABT 06 but in Work Environment Act instead. However, in a traditional design-bid-build contract the Client is responsible for working environment during programming and design. In UK Standard Form the Project Co is clearly responsible for everything concerning the safety on site.

4.3.6 Cost and time overrun

In all projects, whether it is a Private Financed project or a Turnkey contract, there is always a risk of exceeding the timetable and the budget. PPP projects are so large, that it becomes more difficult to predict the amount of time and resources for the projects. Due to the fixed price in a PPP project, this becomes an even bigger risk for the private party. But this risk together with the fact that penalties for every day the project exceeds the time plan, are assigned the Project Co, will lead to a higher focus on keeping the budget and time plan.

**According to ABT 06**

Chapter 4 & 3

The Contractor is entitled to an extension of the time plan if:

- Problems comes up due to the Clients mistakes
- There is a lack of aids, materials, goods or limits of workforce due to an authorities decision
- An event of force majeure occur
- There is a weather condition that is unusual for the area of construction
- Other things happen, that the Contractor can not do anything about.

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Chapter 4 § 6
To lower the risk of time extension, the Contractor can perform a so-called forcing. This means that the Contractor has to take actions on the Clients expense, so that no inconvenience will be caused to him. The action has to be put down on paper and accepted by the Client. If the Client says no and the Contractor performs the action anyway, a compensation is still entitled if the extension was justified.

According to UK Standard Form

Clause 41.1
The Project Co shall notify the Trust as soon as a delay or impediment is known. If the Trust is satisfied, or it is determined that the delay or impediment is a result of a Delayed Event, then the Trust shall allow an extension of time that is equal to the delay itself and then fix a new completion date.

Clause 41.2
The Project Co has to take all reasonable steps to eliminate or mitigate the delay.

Clause 41.3
In Standard Form they define Delayed Event as:
- The Trust's variation enquiry
- Any breaches by Trust/Trust does not perform its obligations under the Standard Form Contract
- Execution of works on the site that's not formed in the agreement
- Trust wanting to open up a completed work where they are not defected.
- Force majeure
- Relief event
- Relevant changes in law.

Compensation is payable for all these events except force majeure and relief events.

Conclusion: The risks-sharing is quite similar between ABT 06 and UK Standard Form. The Contractor has almost the same responsibility in a PPP project compared a Turnkey project, but in a PPP, the Project Co receives a penalty fee for each day the project exceeds the deadline. As Clause 41.3 in UK Standard Form says, almost every delay due to "delayed events" is compensated from the Trust. However, delays due to the Contractor's poor work will not be compensated. In ABT 06 the Contractor can extend the contract period if something happens that the Contractor cannot help. The Contractor is entitled for compensation if the delay was justified according to ABT 06. As for the cost overrun, the project has a fixed price, which means that the Project Co has a stricter budget than for a Turnkey contract.
4.4 Period 4 – Operation and maintenance

The period stretches from the day the building is finished till the nationalisation. In terms of operation and maintenance in a PPP project it is common to speak about Soft FM-services and Hard FM-services. FM is the abbreviation of facilities management. Soft FM-services could include for instance, car park management, catering, laundry and textile services, reception services, security etc. Hard FM-services could be for instance, maintenance and repair (also referred to as estate management), lifecycle management, minor new works, energy management etc.21 There are no standards of how to organise the different FM-services. It varies from project to project and it is up to the parties to agree on what suits them best.

This period do not exist in traditional Turnkey projects, since the operation and maintenance is not included in such contracts. Therefore, only UK Standard Form has been reviewed in this subchapter.

4.4.1 Operation cost overrun

Operational costs are the costs for Soft FM services, in other words, clinical services, laundry, catering etc. For infrastructure projects, this is a smaller risk since the majority of the operations after completion are Hard FM-services. For large projects, like a PPP project, there are many different factors to consider in the operation and maintenance phase. Since PPP project has a fixed price, the Project Co, Contractor and the Facility manager need to strictly follow their financial plans. If a small operation is miscalculated or more expensive than expected, it could lead to a high consequence due to the lifecycle perspective and the long concession period.

4.4.2 Higher maintenance cost and maintenance more frequent than expected

Higher maintenance costs or the need of maintenance more frequent than expected might be a result of different reasons. E.g. unexpectedly low lifecycle or durability of materials, poor quality of performed works or unexpectedly high wear of the facilities. Accurate calculations of the cost and frequency of maintenance must be made in an early stage. The Contractor and FM-company has to cooperate closely to procure that these estimations are as accurate as possible.

According to UK Standard Form

Comments to Clause 28

The Trust must ensure that risks related to maintenance and replacements lies with the Project Co. The Trust must develop their output specifications and payment

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mechanism in sufficient detail to procure that there are no doubts concerning costs and frequency of maintenance.

Clause 28.1
The Project Co shall perform and submit a Schedule of Programmed Maintenance to the Trust’s representative. The maintenance programme will take effect from the completion date to the expiry of the concession contract.

Clause 28.3
The Schedule of Programmed Maintenance shall contain details for each period and the works to be carried out.

Conclusion: In UK Standard Form it is clear that the Trust will not bear any risk concerning maintenance. The risk is completely undertaken by the Project Co. However, it is the contract between the Project Co and FM-company that is important. In that contract it shall be stated what to do if estimations are wrong. If higher costs or frequency can be deduced to poor quality of works or materials it would be reasonable for the Contractor to be liable for extra costs.

4.4.3 Need to change FM-company due to competitive testing
After approximately 5-10 years (the time varies from project to project) the FM-company/FM-companies need to be subject of competitive testing. It is basically a test to control the competitiveness of one or more of the FM-companies. If the test shows that other FM-companies might be able to carry out the operation and maintenance of the facility cheaper, the Trust might have to change one or more of the FM-companies. According to LOU – Lagen om offentlig upphandling (or Public Procurement Act) the Trust shall (with few exceptions) choose the cheapest available company at all times.

However, one cannot ignore the huge costs of performing a change like this. It is likely that the original FM-company/FM-companies will be asked to adjust their costs to be more competitive.

Service Provider’s Collateral Agreement is a part of UK Standard Form. It is an agreement signed by the Trust, Senior Funder, Service Provider and the Project Co. It governs the legal and judicial relationship between the parties and states what rights each party has. In Clause 4, Novation, the question of changing FM-company is treated. Novation could be defined as, the substitution of one contract for another or the substitution of one party in a contract with another.22

According to Service Provider's Collateral Agreement

Clause 4.2
If the proposed substitute is the Trust itself, i.e. the National Health Service, the Service Provider's consent shall be assumed to have been given automatically. If the proposed substitute is not the Trust, the Trust shall provide the Service Provider with all legal and economic information of the proposed substitute.

Clause 4.3
The Service Provider may withhold or delay its consent if the Trust fails to prove that the Proposed Substitute is an adequate substitute (in terms of: legal capacity, financial and technical resources).

Conclusion: The competitive testing is inevitable. A risk for the FM-company is that the Trust may take over the service. However, that is unlikely as the whole concept with PPP is that risks are supposed to be taken care of by the party best able to. In the case that the Proposed Substitute is not the Trust, the burden of proof (that the substitute is "better") lies within the Trust. That gives the existing Service Provider an advantage in negotiations and they will be able to review and revise its commitments.
5. Analysis

Since this report does not treat every available risk, it should only be used as guidance and an introduction to PPP. Our results are supposed to work as an indication of how the risks are allocated in PPP rather than give a complete picture. However, we have tried to cover the most important risks.

As mentioned earlier, a PPP differs from the Turnkey project, in a way that the Project Co handles the contact with the Trust/Client. The unique parts of PPP are, among many, the fixed price and the shifting of risks. According to an interview with the vice-president of Skanska ID, the risks from the Project Co shall be transferred to the Contractor and the FM Company, as those are the parties best able to handle the risks. Although, this thesis considers some risks that are undertaken by the Project Co. Due to the amount of risks we have treated, the risk-sharing in our result shows a different sharing than in the reality. The contractor might therefore be liable for more risks.

Risk-sharing in PPP

![Pie chart showing risk-sharing in PPP]

Figure 16. The diagrams are showing the risk-sharing in a PPP project. The left diagram demonstrates the risk-sharing between the public and the private entity. Since the Private Entity consists of Contractor, FM-company and Project Co, the right diagram demonstrate the risk-sharing between those parties.

Risk-sharing in Turnkey contracts

![Pie chart showing risk-sharing in Turnkey contracts]

Figure 17. The diagram demonstrate the risk-sharing between the Public Entity (Client) and the Contractor in a Turnkey contract.
In return for the risks, the Project Co charges the Trust for these risks through yields and as the Contractor undertakes some of the risks, they receive compensation.

Table 6. This table is a summary of all Conclusion's. It gives a quick overview of which party is responsible for each risk. Some risks are shared between two parties or more, we assume the sharing is equal.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Trust</th>
<th>Private Entity</th>
<th>Contractor</th>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Changes in design</td>
<td>Contractor</td>
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<tr>
<td>2. Inefficient document handling</td>
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<td>Project Co</td>
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<td>3. Inaccurate time planning</td>
<td>Contractor</td>
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<tr>
<td>4. Inaccurate geotechnical investigation</td>
<td>Contractor</td>
<td>Project Co</td>
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<td>5. Unable to find lenders</td>
<td>Project Co</td>
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<td>6. Low financial attraction for investors needed to start the Project Co</td>
<td>Project Co</td>
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<td>8. Inefficient document handling</td>
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<td>Project Co</td>
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<td>9. Inaccurate time planning</td>
<td>Contractor</td>
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<td>10. Failure in contracts</td>
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<td>11. Difficulties in obtaining public documents</td>
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<td>12. Late material delivery</td>
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<td>13. Unforeseen ground conditions</td>
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<td>14. Damage to existing buildings</td>
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<td>Contractor</td>
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<td>15. Force Majeure</td>
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<td>16. Cost and time overrun</td>
<td>Contractor</td>
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<td>17. Operation cost overrun</td>
<td>FM-Company</td>
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<td>18. Higher maintenance cost and maintenance more frequent than expected</td>
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<td>FM-Company</td>
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<td>19. Need to change FM-company due to competitive testing</td>
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Table 6 shows a summary of all risks in this thesis and which party is liable for them. This table is visualised in figure 16 and figure 17, which presents the risk-sharing between the Public Party/Client and the Private Entity/Contractor. Since the Private Entity is divided into Project Co, Contractor and Facility Management Company, we have also decided to show the risk-sharing between the different parties within the Private Entity. If it is not clearly stated in the different contracts, we have decided to choose the party that bears the majority of the risk. Concerning shared risks, we assume that the sharing is equal, two parties shares 50/50, three parties 33/33/33 etc.

First of all, the diagrams demonstrate the difference in risk-allocation between a PPP project and a Turnkey project. The Private Entity bears a distinct majority (83%) of the risks in PPP projects. That is an argument often used to promote the use of PPP. When the Private Entity is divided into its different parties the risk-sharing is visualised even more clear. The Contractor is undertaking the majority of the risks that the Private Entity stands for and is liable for 57% of the privately held risks.
When multiplying the Contractor's risk with the total risk commitment for the Private entity (0.57 x 83 = 47 %), it is clear that the amount of risk undertaken by the Contractor does not differ in a PPP project compared to a Turnkey contract. This means that the Contractor in fact is not liable for more risks in a PPP project. However, this value is only valid if one is comparing the very same risks as we have done and if the shared risks are evenly shared between the parties.

To implement PPP in the Swedish construction industry, we believe that the outcome of NKS (New Karolinska Solna) is of great importance. Since the project already has been so publicised in the media and got a lot of criticism, the review after its completion will be intense. Therefore the Project Co, SHP (Swedish Hospital Partners), carries a great responsibility of the future PPP market in Sweden. An other important factor is a continued conservative government or other politicians positive to the topic, they will likely facilitate a continued use and development of PPP. In our interview with the Technical Manager at Barts Hospital, he says Sweden has started in the wrong end with the implementation of PPP. Sweden should have started with smaller projects and slowly move forward to project such as the NKS.

In Sweden, the subject Public Private Partnership needs to be brought to the surface and discussed more. The more contractors that are familiar to the subject, the more common it will become. To ensure the expansion, Clients and Contractors need to be aware of the advantages, disadvantages, risks and liabilities concerning PPP. So, hopefully this thesis will result in even more discussions about PPP.
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