IRR in Public-Private Partnerships

Case study: Project IRR of four PPP companies in Finnish infrastructure procurements

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Abstract:

Infrastructure undertakings have been heavily criticised worldwide and in Finland. The main reasons for the criticism is that these often have budget and time overruns. A possible solution to this is the use of private financing in procurements, or more precisely Public-Private Partnerships. These types of procurements are run by Special Purpose Vehicles, which are private consortiums founded merely for the specific PPP. These consortiums seek as other private companies return on their investments.

Compared to traditional procurements, PPPs have high financing costs, since the private companies involved want sufficient return on their contributions. This means that public funds are used to finance returns in private companies, and the question arises if this is reasonable from the view of taxpayers. The purpose of the thesis is therefore, to research how much the public sector has paid to use PPPs as procurement methods. The purpose more specifically is attempting to answer how much more is paid for PPPs, compared to if traditional procurements were chosen instead. This is done by calculating 4 different Finnish PPP companies' returns by calculating their IRR. Since the purpose is to attempt to answer how much excess is paid for the PPP option, an additional question arises about if the excess paid is reasonable.

The results of the computations show that estimated Project IRR in the Finnish procurements is on average 5.95%, with the excess return yearly being on average 2.72%. Compared to a previous study by Fernandes et al. (2016), this excess return is lower. If budget and time overruns between 17-77% and other benefits of PPPs are taken into consideration, this excess return can be seen as reasonable. The main reason being, that there is a possibility that due to budget optimism traditional procurements could cost in the end more and that due to budget constraints in the public sector, these procurements would have not been built, since resources were not enough.

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Table of contents

List of Figures

ABBREVIATIONS

PPP - Public-Private Partnership

PSA - Public Sector Alternative

PSC - Public Sector Comparator

VfM - Value for Money

NPV - Net Present Value

WACC - Weighted average Cost of Capital

IRR - Internal Rate of Return

FCFF - Free Cash Flow to Firm

1   INTRODUCTION

Infrastructure undertakings and public projects in Finland have often been criticised, much like in many other countries. This criticism has arised due to budgets exceeding on big scales and projects exceeding their timelines. An article by Paula Collin in Yle Uutiset (2020) discusses the Logomo bridge project in Turku, which exceeded its 5 million original budget to 19 million euros. The timeline of the bridge was also problematic, since the project was finished 2 years after its original plan. This is not an unusual phenomenon in Finnish undertakings and many citizens criticise undertakings and their original plans that are usually not realistic, when considering budgets and timelines (Collin, 2020). Other examples of widely criticised projects due to budget and timeline overruns are in Helsinki Länismetro, The Olympic Stadion and the Parliament House (Herrala, 2021). According to the article in Kauppalehti the reason is that projects are planned inadequately and on a surface level, especially the budgets (Herrala, 2021).

The big issue with traditional procurements failing to stay within their plans, financially and timewise, is that it affects every party of the project (Olupitan, Ajator & Nzeneri, 2021). One of the most affected parties is the taxpayers. Public undertakings are financed with government money, meaning Finnish taxpayers are the ones paying for the undertakings. A procurement is started only when there is a need or demand for something, so if its delivery fails the need will be unsatisfied. Projects are considered successful when they are within the iron triangle constraints, meaning it is within the project's frame for time, money and quality (Olupitan et al., 2021). When the time phase and budgets exceed there is more need of taxpayers' money while the project also loses value due to delays, since more of taxpayers' money is put for an undertaking when simultaneously the project is not finished in time.

As mentioned, public procurements are started only when there is a need or demand for them, however in order to start these there need to be enough funds distributed

for these. According to Väylävirasto (2022a), in Finland in 2023 the amount of money available for traffic routes has decreased significantly from the previous two years. The funding for traffic route upkeeps will be 1.3 billion euros in 2023. Also the level of costs is high, meaning construction and coating costs are higher than previous years. This means that the demand will be higher than the supply which will directly impact the traffic routes. More maintenance jobs will be postponed both on roads and railroads, which will lead to lower speed limits on roads and delays for trains. Fewer new projects will also be started due to the financial situation (Väylävirasto, 2022a).

When the world economy is like it is in 2023 where costs are high and less funds are available, governments need to find other solutions to maintain infrastructures. There are other options than traditional procurements, which according to their advocates bring projects in time and within budgets. The advocates also suggest that these options ensure a better quality of projects. This option is called Public-Private Partnership (PPP) (Boardman, Vinning & Siemiatycki, 2016).

Public undertakings in Finland mainly use Public Sector Alternatives (PSA). However, PPPs could be an excellent alternative when public funds are low and procurements tend to exceed budgets and timeline. It is a way to use the private sector to fund projects and receive better expertise for public projects (Boardman et al., 2016). As mentioned the PSA alternative is mostly used in Finland, however as of 2013 four public undertaking projects have used the PPP option instead (Liikennevirasto, 2013).

1.1 Problem definition

PPPs are used in many countries across the world for large infrastructure projects. These are used in order to improve the quality of projects and lower their costs and risks (Regan, Smith & Love, 2009). Many countries have gone through big

budgetary cuts, which has had a very large impact on why PPPs have become more popular and a new way of financing undertakings was developed. The public sector involves the private sector in the provision of public infrastructures and services (Iossa & Saussier, 2018). The private companies bring to the infrastructures modern ways of building, operating and maintaining projects and help the governments in funding these undertakings (Iossa & Saussier, 2018; Regan et al., 2009). PPPs are also a way to spread procurement costs over a longer period of time, which frees public funds for other projects where the private sector cannot be used (Beckers & Stegemann, 2021).

According to Burger and Hawkesworth (2011) traditional procurements are still today the type of procurements used as a default in public projects. This is problematic from the public view, since if PSAs are the default option, the most valuable option for the public is not chosen. Value for money (VfM) can often be defined as the optimal combination of price, effectiveness and efficiency over a project's whole lifetime (Karanja, 2021). It can also be defined as the combination of lowest price and optimal quantity, quality and features (Burger & Hawkesworth, 2011). It is important that public undertakings would give the most VfM possible for the public. From a VfM perspective, PSA should not be the default option, however, it would most likely continue to be the more common option if PSAs and PPPs were compared. This is due to the fact that many countries' criterias for choosing PPPs instead of PSAs are vague. Burger and Hawkesworth (2011) argue that the procurement chosen should be based on VfM calculations, so that the projects would be most valuable for the society.

PPPs have been used by governments for projects to increase design, construction and operational innovation in major projects. However, according to scholars the effectiveness of PPPs should be challenged, since the value of these for society cannot be calculated well (Himmel & Siemiatycki, 2017). Governments and the promoters of PPPs suggest that through innovation and increased design, projects can improve in quality and reduce costs. However, the issue arises when evaluating the profitability of PPP undertakings, since these evaluations are done by the

government. It is rare for governments to give access to their calculations of projects, meaning the public cannot calculate PPP undertakings' true VfM.

PPPs are usually run by Special Purpose Vehicle (SPV) companies, which are specifically created for the project (Grimsey & Lewis, 2007). A private consortium will establish a SPV to fulfil its objective as an own legal entity temporarily (Gosrani & Gray, 2011). SPV will be in charge of designs, building, finances, operations and maintenance for the project of its whole longevity, which is usually between 20 and 30 years. After the concession period the SPV company transfers the procurement to the public sector and liquidates (Grimsey & Lewis, 2007). SPVs' purpose, like any other companies, is to make a sufficient return for the parent company.

SPVs are used since they have many features which make them beneficial and open new opportunities for investors, which would not be possible otherwise. The features of SPVs are the following: supporting securitisation, financing, risk sharing and raising capital (Gosrani & Gray, 2011). These features are beneficial for PPPs, since they make the projects possible for companies to partake in. Financing and risks will be contained to the SPV and in return the SPV can make more profit for the mother company.

Since SPVs' purpose is to make profit and risk is transferred to them, their premium becomes higher. This leads to the return investors are making on PPPs higher, which has led to studies attempting to answer if governments are paying too much for PPPs (Buso, Moretto & Zormpas, 2021). This means that even though PPP has been chosen, it is not profitable from the public perspective. Typically in PPPs financing costs can be double as high than in PSA options (Shaoul, Stafford & Stapleton, 2006), which often leads to the issue that the financing costs of PPPs are so high that the project is in total of bad value.

PPPs have been chosen in Finland for road projects four times and according to news outlets they have been successful (Sinervä, 2012). The PPPs have held the time phase and according to news outlets even their budgets. However, evidence

supporting the latter is difficult to find due to contracts not being public, meaning it is difficult to answer if the government has paid too much return for the PPPs.

1.2 Purpose

As mentioned, PPPs have high financing costs, which can make a procurement more expensive than a traditional procurement alternative. For the society, especially taxpayers and the decision makers it can be interesting and crucial to know what the public sector pays to the private sector when PPP is chosen. Which leads to the main purpose of the thesis, which is to research how much the public sector has paid to use PPPs as procurement methods. The purpose more specifically is attempting to answer how much more is paid for PPPs, compared to if traditional procurements were chosen instead. This is done by calculating 4 different Finnish PPP companies' returns by calculating their IRR. Since the purpose is to attempt to answer how much excess is paid for the PPP option, an additional question arises about if the excess paid is reasonable.

1.3 Research question

SPVs are typical companies with investors and shareholders having a required rate of return. In connection to studies about PPPs stating that risk transferring should be higher in them, studies also state that the risk premium these investors and shareholders are taking is high. Leading to the question, if the return that is required for SPVs being interested in these types of procurements is too high from the taxpayers perspective. Since comparing PPPs and PSAs before procurement has started is quite private, the thesis will be trying to answer what the Project IRR for four Finnish road projects built as PPPs is. The research question of the thesis is two-folded:

What is the Project IRR in the four Finnish infrastructure PPPs and if the excess that the public sector pays for PPPs is reasonable?

1.4 Delimitation

This thesis is limited to research the return on Finnish infrastructure companies building roads as PPPs. Since at the time of writing this thesis, there are four procurements that qualify into this criteria, only four cases will be analysed. Return on procurements has been limited to Project IRR in this thesis, meaning other methods to calculate companies' return have not been calculated.

1.5 Disposition

The thesis will be structured according to the following. Chapter two will present Public-Private Partnerships, the advantages and disadvantages of them, other procurement methods and how procurement methods are chosen. Chapter three contains relevant theories and terms for the thesis. In the chapter risk, return and cash flow are presented. Chapter four introduces previous studies connected to the thesis. Studies on how return in companies is calculated are presented, followed by studies on Internal rate in PPPs. Lastly the chapter will present studies on profitability in PPPs. Chapter five will present the research question for the thesis and chosen methodology. In chapter six empirical evidence is presented and lastly in chapter seven the results are presented with recommendations for future research as the closing part.

2 PUBLIC-PRIVATE PARTNERSHIP (PPP)

The first part of the chapter Public-Private partnerships are defined and discussed, also how PPPs are financed is presented. SPVs are closely related to PPPs, which is why these are presented in the chapter. To assist with the understanding of PPPs, PSA is presented followed up by the PSC, which is an aid to compare PPPs and PSAs. In order to furthermore understand PPPs and how they are implemented, their benefits and disadvantages are presented, followed up by how governments should choose a procurement method. The chapter's last part discusses VfM, which is a crucial part of PPP valuation.

2.1 Public-Private Partnership (PPP)

PPPs started to emerge in the 1980s and 1990s with the privatisation wave (Wettenhall, 2003). These are based on the United Kingdom's Private Finance Initiative (PFI) method, which started after World War Two when public funds were low and there was a need to improve current infrastructures. The method is a financing method, not a funding method and it is a way for the government to defer public spending. With the PFI method the costs are higher than with traditional procurements. (Gaffney, Pollock, Price & Shaoul, 1999). PFI started to become popular in the beginning of the 1990s in the UK, which made other countries interested in the privatisation of infrastructure procurements (Wettenhall, 2003). PPPs in other countries are developed from the PFI in the UK (Boardman et al., 2016).

A clear definition for Public-Private Partnerships, or also known as PPPs, does not exist. All PPPs are unique and are defined through written agreements. They essentially are an agreement or contract between a government and one or more private partners (Burger & Hawkesworth, 2011). Depending on jurisdiction, these contractual agreements have different names (Gray, Hall & Pollard, 2010). These

contracts are agreements for the private sector to deliver a social infrastructure or service and also finance the project (Gray et al., 2010). The difference from a traditional procurement method, is that in PPP the private sector is in charge of building, maintenance, financing and some of the risks of the service. Meanwhile in a traditional procurement the private sector is in charge of building and the public sector is in charge of everything else (Grimsey & Lewis, 2007).

Even though all PPPs are unique there are some common features that most PPPs have (Gray et al., 2010). The agreements include a private sector consortium, which usually include banks, engineering and construction firms and operations firms. The banks in the consortium are in charge of financing and the structuring, the engineering and construction firms are in charge of building and designing meanwhile the operations firms are in charge of operations, billing and maintenance (Gray et al., 2010). Another common feature of PPPs is that the government pays the private consortium series of payments (Burger & Hawkesworth, 2011) and the private consortium owns the service usually 15-30 years, after which the ownership of the service is transferred to the government (Gray et al., 2010; Regan & Smith, 2009). The third and last common feature in PPPs is risk sharing between government and the private consortium. The government typically covers residual delivery risk, which is that if the private consortium fails to deliver the service, the government will be in charge of seeing that the service is delivered. The private consortium is typically in charge of demand and construction risks (Gray et al., 2010).

The main reason that PPPs are used is that their purpose is to improve service delivery , this means that its purpose is to create more value for money to the public than a traditional procurement would create (OECD, 2008). This does not necessarily mean that the service provided by a traditional procurement would have bad quality service, merely that the PPP is able to improve the service. PPPs are used for social and economic infrastructure projects (Regan et al., 2009). Social infrastructure includes typically schools, universities, hospitals, prisons and community housing. Economic infrastructure includes roads, railways, airports and generation,

transmission and distribution of electricity, water and telecommunications (Iossa & Saussier, 2018).

A frequent question asked about PPPs is why governments would choose them instead of traditional procurement, especially when it commits governments for up to 30 year contracts to procurements (Grimsey & Lewis, 2007). According to research PPPs work, especially from a VfM perspective (Boardman et al., 2016). This means that according to these studies PPPs have a lower whole-life cost than PSAs, measured in present value. However, it should be noted that most VfM studies are made by parties which are affected by the results, so they cannot be considered impartial and therefore studies can be seen as unreliable (Heald, 2003).

According to Iossa and Saussier (2018) PPPs are expected to increase, especially in Europe mainly due to large budgetary cuts in many European countries, along with recent trends. Due to budget cuts many governments choose PPPs to fund infrastructure undertakings, so that even if the government lacks the financing at the moment the public does not suffer and the country is able to develop. The previously mentioned trend is a public interest to involve the private sector into public projects, mainly due to an increased demand for efficiency around the globe (Iossa & Saussier, 2018). Beyond improved service delivery, PPPs are used due to public-sector budget constraints and financial gaps (Beckers & Stegemann, 2021). However, PPPs should not be used to solve gaps in public funding according to Beckers and Stegemann (2021), instead a tool to deliver effective, cost-efficient services for the public. Politics and politicians are also a reason PPPs are used. PPPs can be used by politicians for their own political advantage and for re-elections (Hodge, Greve and Biygautane, 2018).

2.1.1 Special Purpose Vehicle (SPV)

The private consortiums in charge of PPPs commonly establish Special Purpose Vehicles (SPVs), which will provide the service to the public sector (Boardman et

al., 2016). The SPV is a separate legal entity from the companies included in the private consortium. It provides the services to deliver the project and limits all financial liabilities to itself, separate from the companies that have established the SPV (Boardman et al., 2016). The most common type of contract made by SPVs for PPPs are DBFOMs. This contract makes the SPV in charge of design, building, financing, operation and maintenance for the infrastructure procurement (Boardman et al., 2016). SPVs are shell companies. These consortiums include companies able to build, maintain and operate the infrastructure, in some cases these companies are also financiers. The design, construction, maintenance and operations are subcontracted by the SPVs, that are its shareholders or related to them (Fernandes, Ferreira & Moura, 2016).

Beyond governments profiting from PPPs, even the companies participating in the partnership have benefits, otherwise these types of partnerships could not exist. The reasoning behind SPVs is that the parent company does not need to put the entire company at risk, and can instead transfer the risk to the SPV (Gosrani & Gray, 2011). The SPVs have some key features, which makes it possible for companies to invest in new investment opportunities, which would otherwise not be accessible.

Risk sharing is one of the main benefits of using SPVs, since through the SPV the financial risk is isolated and affects merely the finances invested in the SPV. However in addition to this it gives the parent company tax benefits, legal protection and reduces bureaucratic issues. Since SPV has asset ownership, documentation and freedom of jurisdiction also become benefits for the parent company. Regulatory requirements are also met more easily (Gosrani & Gray, 2011).

SPVs also have some risks, which include lack of transparency, reputational issues and risks with liquidity, funding and equity. In pursuance of minimising these risks, strong measures have been taken into action, which has led to regulations on SPVs (Gosrani & Gray, 2011). For the private-sector PPP is favourable since the dependance on internal cash flows are minimised due to improvement of availability

in external financing. The SPV can depend less on internal cash flows in procurements (Chauhan & Marisetty, 2019).

2.1.2 Costs of PPPs

The PPP option for a procurement involves different types of costs, which are typically base costs, financing costs, retained risk and ancillary costs (Infrastructure Ontario, n.d). In figure 1 below, these costs are presented, with clarifications on what these include and lastly what is required in order to calculate them. Figure 1 is based on Infrastructure Ontario (2015) guide to calculate VfM for a PPP. Followed Figure 1 are explanations on the specific cost categories, what they include and how these can be decided in a PPP.

Cost category	What is included in the cost category	Required data for the cost
Base cost	- Design costs - Construction costs - Maintenance costs - Lifecycle costs	- Capital costs - Operating costs - Applicable discount rate, time span and inflation rate - Annual service fee
Financing cost	- Financing costs for the project	- WACC - IRR
Retained risk	- Retained risks for the project	- Identification of risks throughout whole lifecycle of the project - Assessing financial impacts of the risk - Assessing likelihood of risk - Possible sensitivity analysis
Ancillary cost	- Planning and delivery costs for the project	- Project management costs - Transacation costs

Figure 1. Cost categories of a PPP.

Base costs are typically the most substantial cost category (Infrastructure Ontario, n.d). The category base costs include costs for design, construction, maintenance and

lifecycle costs (Infrastructure Ontario, 2015). Depending on the project base costs can be either higher or lower than in a PSA (Infrastructure Ontario, n.d), this depends on if an innovation factor is calculated into the base costs (Infrastructure Ontario, 2015). The innovation factor includes the assumption that the contractors try to find different alternatives to deliver a project where they are in charge of the maintenance of a service and that the environment in the bidding stages is more competitive, lowering the costs (Infrastructure Ontario, 2015). In the base costs of a PPP a provision can be included for certain taxes. These are not included in PSA alternatives, since the public is exempt from paying these (Infrastructure Ontario, 2015). This means that if the innovation factor in a PPP is not high enough and a premium is added into base costs, the base costs for PPP can be higher than for a PSA.

In a PPP the financing costs are higher than in a traditional procurement, since the debts are taken privately where rates are higher than if public debt is raised, which makes the costs higher (Infrastructure Ontario, 2015). Financing costs of PPPs are connected to the costs of SPVs, so these will be explained more in chapter 2.1.3.

Even though all costs of a PPP are identified and estimated before procurement starts, there are risks that these estimations are incorrect and there are factors that can affect estimated costs to differ from the realised costs (Infrastructure Ontario, n.d). Risk transfer in PPPs makes it possible to lower the expected costs of retained risk in a procurement (Vecchi & Hellowell, 2013). In order to calculate risks and their estimated costs, they need to be identified, then allocated to the correct party, estimate the probability of their occurrence and lastly calculate their cost (Infrastructure Ontario, n.d). Following formula can be used to calculate cost of risk in a PPP (Infrastructure Ontario, n.d):

Base cost x Probability of occurrence of the risk x impact of the risk

It can be difficult to estimate the probability of occurrence and impact of a risk. In order to do this, risk analysis is needed, where workshops are held to evaluate these

(Infrastructure Ontario, 2015). In chapter 3.1 risks in a PPP are discussed, with deeper analysis on risk transfers effects and how these should be done.

Ancillary costs are costs linked to the planning and delivering of a procurement. Depending on the type of procurement, these can be costs for project management or transaction costs. Project management costs refer to fees for internal or external project management. Transaction costs in a PPP include legal, transaction or engineering fees paid to other parties (Infrastructure Ontario, 2015).

2.1.3 Financing structure of SPVs

In a SPV there are debt and equity providers. Depending on the SPV, private banks and bond holders are typically debt providers and equity providers are usually the construction companies, however these can also be debt providers in some SPVs (Fernandes et al., 2016). The shareholders in a SPV have been illustrated by Akintoye, Beck, Hardcastle, Chinyio and Asenova (2001), which is presented in Figure 2.
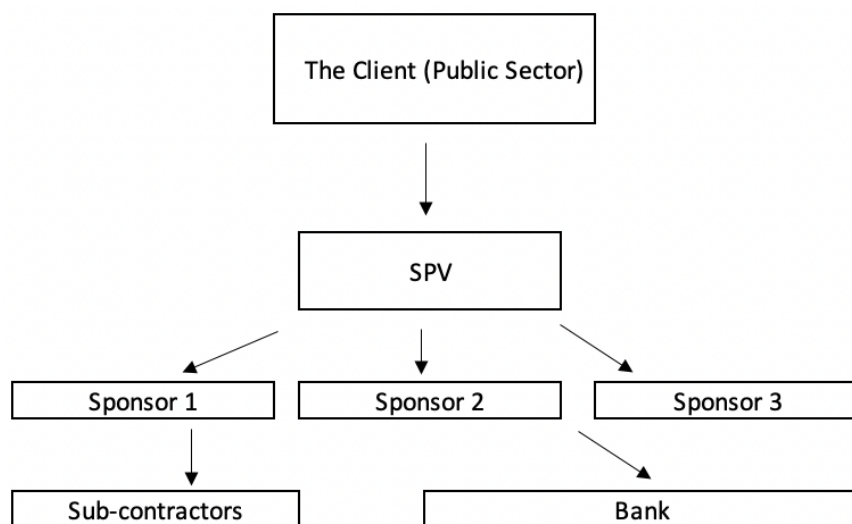
Figure 2. Typical shareholders of a SPV.

The public sector in a PPP becomes the client for the SPV, which will be owning the asset for 20-30 years. The SPV will consist of different "sponsors" or companies that bring different knowledge to the consortium (Akintoye et al., 2001). In figure 2 Sponsor 1 is a construction company that has sub-contractors for the building and management parts of the procurement. Sponsors 2 and 3 are different debt providers that provide the large initial investments needed for the procurement to start (Akintoye et al., 2001). The financing is typically structured in a way so that shareholders in a SPV are paid back from expected cash flows. The assets in a PPP are longer infrastructure projects with long lifespans with low liquidity which makes the debt providers take a provision to protect their interest (Akintoye et al., 2001). This creates a premium, which is added to the financial costs of the PPP paid by the public sector.

Debt providers borrow the debt from banks, which are senior debt providers (Akintoye et al., 2001). In a PPP contrary to the PSA, the SPV will borrow capital from private banks which have higher borrowing rates than what the public sector would pay (Fernandes et al., 2016). In addition the senior debt providers take a premium on the debt. The reasoning behind this is that typically 90% of a PPP is financed by debt and roughly 10% of private equity. This is the another reason why financing costs in a PPP compared to a PSA are larger.

During the assets contract period the debt and equity ratio in a PPP changes constantly. At the initial investment most of the procurement is financed with debt, with merely a small part of the investment being equity (Akintoye et al., 2001). During the contract period the SPV receives service fee payments from the public sector, which is partly how revenue is generated for the SPV. The revenues cover the initial investment, the debt of the asset, and is used to pay back debt and add equity to the asset (Boardman et al., 2016). At the end of the contract debt will be fully paid off and the SPV will have merely equity. Also at the end of the contract between the SPV and public sector the assets ownership is transferred from the SPV to the public sector and the SPV will cease to exist (Boardman et al., 2016).

The premium taken by debt providers for taking the risk on lending their finances, return paid to shareholders of the SPV and the type of debt in a SPV are the largest reasons why financing costs in a PPP are larger than in a PSA (Fernandes et al., 2016; Boardman et al., 2016).

2.2 Value for Money (VfM)

According to Regan et al. (2009) PPPs achieve VfM, defined as they reduce costs and contribute to more projects being within budget and time. According to the study, PPPs also allow new technologies and innovations to be introduced to the industry in Australia.

When or if a PPP is decided, it is chosen on the basis of which contender can give the most VfM. It can be difficult to compare PPPs to PSAs, since there is not a definite way of calculating VfM. VfM is often decided by what the government sees as an optimal balance between quantity, quality, features and price of an undertaking during its whole lifespan. The quantitative criterion is an analysis involving comparing private bids with a risk-weighted model referred to as PSC, which was presented in chapter 2.3. The qualitative side of the analysis focuses on looking at the chosen private companies' capabilities, track records and anything that can be related to a future risk (Regan et al., 2011). The usage of VfM and if it is successful is highly dependent on the culture it and the PPP are in (Andon, 2012). This could be one of the reasons, along with the diffuse definition of VfM, why VfM is successful in some countries and not in others.

In PPP research, the most vague parts are VfM and risk transfer. These issues are assumed to exist due to the uncertainty of the meaning and application of VfM and the appropriate risk transfer (Andon, 2012). A common issue in VfM calculations and determination, is risk analysis. In the analysis, risks should be analysed in whole.

However, according to accounting treatment, risks should be transferred. This makes calculating VfM correctly and without bias to risks very difficult (Heald 2003).

Figure 3 is a visual representation by Infrastructure Ontario (IO) (2015) of how VfM is determined and how it fits the procurement process. Since figure 3 is merely a visual representation, the numbers and their proportions are fictional. PSC in figure 3 refers to the Public Sector Alternative, not Public Sector Comparator. In Figure 3 financial costs are not presented separately, they are instead a part of base costs.
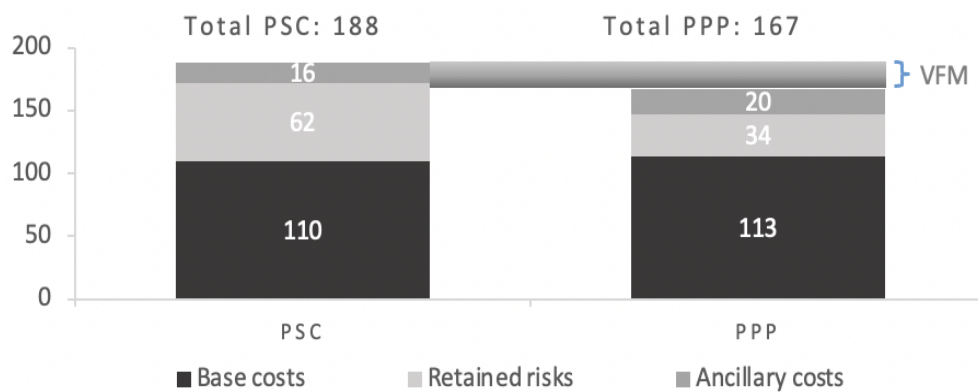
Figure 3. A typical VfM comparison between a PSC and a PPP.

The difference between PSA and PPP, which will be VfM, can be calculated according to the following formula (IO, 2007):

(Total PSA project costs - Total PPP Project Costs) / Total PSA costs

IO, which is a leading organisation in delivering infrastructure undertakings with VfM for the public in Canada, has defined what is used by IO in each category of Figure 3. In Figure 1 these categories are listed with required data for each category. The organisation exists purely to support the government with infrastructure undertakings, and making sure that the undertakings are valuable (Infrastructure Ontario, n.d).

2.3 Public Sector Alternative (PSA)

Public Sector Alternative (PSA), also called Traditional procurement, is the common procurement for the public sector to use when undertakings are made (P3 Toolkit, 2012). In traditional procurement the public sector is in charge of every aspect of the project. When in PPPs the private sector can be in charge of building, innovation and much more in the traditional procurement every decision and risk is on the public sector (P3 Toolkit, 2012).

Researchers often praise Public-Private Partnerships and their way of making VfM for the public, however, it is often forgotten that PPPs are not always the correct choice. Public procurement can also be the correct choice, when looking from a VfM perspective, since some projects are more suitable as PSAs. It should be remembered that the procurement method chosen should be the one that creates the most VfM for the public (Burger & Hawkesworth, 2011).

Burger and Hawkesworth (2011) claim that in most countries surveyed traditional procurement is the default procurement used. According to the writers it should not remain the default method, even though it would probably be the most commonly used procurement method. A big issue in many countries is the unclear criterias for what can be classified as PPPs, which can make testing PPPs against public sector options unfair (Burger & Hawkesworth, 2011).

2.4 Public Sector Comparator (PSC)

When a government is choosing between a PPP or PSA alternative, the only factor which should be taken into consideration is which of these two methods can bring more value to the public (Burger & Hawkesworth, 2011). However, even if the PPP project transfers more of the risk to the private sector, it should be noted that not all

projects are suitable for PPPs. In these cases PSAs should be favoured (Burger & Hawkesworth, 2011).

There are both qualitative and quantitative tools for making VfM assessments. The most used quantitative tool is the Public Sector Comparator (PSC). PSC calculates PPPs fiscal costs against the fiscal cost of PSAs in order to determine VfM (Public-Private-Partnership Legal Resource Center, 2022). It is commonly used to reduce optimism bias in PPPs compared to PSAs (Burger & Hawkesworth, 2011). The PSC in these models is a hypothetical PSA alternative, which is then compared to the PPPs that are in the bidding stages presenting their costs for the procurement (Infrastructure Ontario, 2015).

2.5 Advantages of PPPs

The main advantages of using PPPs in undertakings are that they aim to improve services and make more VfM. This can be done by risk-transferring, innovations, asset utilisation and choosing professionals (Fitzgerald, 2004). Due to budget cuts a big advantage of PPPs for the government is that the payment is made in partial payments with no startup fee. The government pays to SPVs a service fee for their service, which includes all of the costs for the project's whole lifetime (Regan et al., 2011).

2.5.1 Cost efficiency, being within budget and time

Promoters of PPPs argue that a clear advantage of them is that PPPs have previously proven to be on time and on budget. The promoters argue that this is due to the private consortiums having more inflexibility of contracts and more financial risk, which makes them take more responsibility (Boardman et al., 2016). The public sector can also signal SPVs that cost and time overruns are not acceptable by having

agreements, that if there are cost or time overruns service payments will be withheld. This also shifts the risk and responsibility to the SPV (Grimsey & Lewis, 2005). Cost efficiency, being within budget and time can be achieved even by other factors, which are also discussed in later sections of PPPs advantages. The biggest reasons however to achieve these three factors, is by adding more financial responsibility on the SPVs, since their own returns will be affected by these.

PSAs between the years 1927-1988 have exceeded estimated costs in approximately 86% of the procurements, of which the average excess was approximately 28% (Burger & Hawkesworth, 2011). According to studies the main reasons for this was the lack of information, experience and updated technology (Burger & Hawkesworth, 2011). With the help of PPPs these factors can be avoided, and therefore also costs held within budget. Another reason why PPPs can stay within budgets better than PSAs, is that since these need to go through competitive bidding stages to be chosen and accepted they have more detailed budgets (Burger & Hawkesworth, 2011).

2.5.2 SPV responsible for the whole flow of procurement

Since the SPVs are in charge of providing a flow of infrastructures over a long period of time instead of merely building the undertaking (Grimsey & Lewis, 2007), more responsibility is given to them. Maintenance, repair and refurbishment of the undertaking even after constructions are finished are on the SPV, which means they will strive from the start to make better quality (Regan et al., 2011). Since the quality of the undertaking is higher, less maintenance costs can be expected in the future (Grimsey & Lewis, 2007). In a PSA where the private sector builds the service, there is less responsibility on them to make good quality that last for longer periods of time, since they will not be as liable on maintenance costs than in PPPs. Also in a PSA due to this, costs for construction and maintenance at the end become usually higher since the private partners are not as incentivised to invest in the procurement (Himmel & Siemiatycki, 2017). In PPPs the private firms bidding on the

procurements have incentive to work together and establish SPVs from the beginning, since they want to find new innovations to lower costs for the whole procurement lifetime, not merely the building process (Himmel & Siemiatycki, 2017).

2.5.3 Innovation and higher competition in the market

Innovation has stagnated in constructions, which makes PPPs with new innovations an incentive to invest in them (Himmel & Siemiatycki, 2017). Since the private companies are working together from the start, they have incentive to identify innovations from the beginning. Innovation in a PPP can mean better design, new ways of building constructions, better material choices, using experts. All of these can lead to lower costs of undertakings and minimising risks (Himmel & Siemiatycki, 2017).

Also knowledge and expertise on design and innovation can be lacking in the public sector. This can lead to that if PSA is chosen, the public sector does not have the expertise on how to design a service or who to hire for it. If the PPP option is chosen, experts within their respective fields will propose best options for the specific procurement (Burger & Hawkesworth, 2011). A service that is of good quality provides more benefits to its end users or operators (Boardman et al., 2016).

In the bidding process of PPPs the public sector creates more competition for the private sector, since the companies are trying to win procurements that are long term commitments with the government (Burger & Hawkesworth, 2011). Higher competition between the private companies has benefits on the public sector. The SPVs bidding, try to lower costs, which they can do by creating more in-depth budgets and trying new solutions for innovation.

Competition needs to exist at both the bidding and operational phases. The competitive environment puts pressure on private partners to ensure VfM is

achieved. If the private sector companies are not aware of the competition, they will not perform optimally which leads to them being replaced by a rival or going out of business (Burger & Hawkesworth, 2011). With PPP options the private sector is more aware of the competition and performs better.

2.5.4 Risk transfer

One of the biggest advantages of PPPs is that it is a tool for risk transferring for the public sector (Grimsey & Lewis, 2005). Instead of the private consortium entirely taking over the risks of a project, risk-sharing is preferred. The part that is best suited to handle the risk will be in a PPP in charge of it (Iossa & Saussier, 2018). Chauhan and Marisettys study from 2019 finds that the private sector can profit from PPPs from a cash flow perspective. Since the government can manage the risk of demand, the risk of uncertainty of future cash flows is reduced for the private sector. Successful risk-sharing lowers the estimated costs for risk which also lowers estimated costs for the whole procurement (Vecchi & Hellowell, 2013). Risk transferring benefits are discussed more in depth in chapter 3.

2.5.5 Public spending can be deferred

With public funding becoming smaller, public spending needs to be deferred (Iossa & Saussier, 2018). PPPs can be a solution for this. Since with PPPs the public sector does not pay large upfront payments, and instead pay service fees that are contracted in advance for a long period of time (Burger & Hawkesworth, 2011; Grimsey & Lewis, 2007). This allows the public sector to invest in procurements, even if the financial situation in the market is not optimal (Iossa & Saussier, 2018). If public spending is deferred, the public can receive needed infrastructure and services with the help of PPPs.

2.5.7 VfM and comprehensive benefits of PPPs

These advantages of PPPs all contribute to better welfare in societies. Since the quality of delivered procurements are better, and even though the procurements can be more expensive the costs are usually within budget and therefore better anticipated. The first PPP in Finland, delivered by Tieyhtiö Nelostie Oy is an example of this. The motorway was finished under budget and one year ahead of schedule. According to the CEO of Tieyhtiö Nelostie Oy, this could be attributed to good performance by the team and that there were no limits to financing. The company could lend money as needed (Sinervä, 2012), which would not be possible for traditional procurements. In addition to this, traffic on the motorway increased from 14 000 to over 25 000 vehicles per day, with the accident rate staying low (Sinervä, 2012). The director of Liikennevirasto (Väylävirasto), added that the costs are considerably less when comparing the benefits of the motorway. In 30 years the benefits are expected to be 2.7 times more than the costs (Sinervä, 2012).

The main advantages of PPPs include that more VfM can be created and the best option for the public is chosen (OECD, 2008). According to research if VfM is calculated well, PPP options stay better within budget and time phase than PSAs (Regan et al., 2009). All of the above mentioned benefits are intertwined and can make more VfM individually and linked together.

2.6 Disadvantages of PPPs

PPPs have many advantages, however the critics of PPPs have been able to show many disadvantages to them. A large difficulty of PPPs is that there is often little indication of why a PPP has been chosen and what its advantages truly are (Andon, 2012). The reasons behind this can be due to those who create surveys about PPPs and their values are the same people that use them (Shaoul, Stafford & Stapleton, 2007).

2.6.1 Gaps in the VfM method

Research shows that when looking from a VfM perspective PPPs are often unsuccessful, often due to over-promising while making contracts and during implementation making taxpayers pay more due to failing in keeping their aggressive pricing strategies (Mutiganda, Skoog & Grossi, 2020). Due to the nature of the contracts, the public cannot access enough data of PPPs to evaluate if the PPP alternative is actually profitable and what the public expenditure of the PPP is (Shaoul et al., 2007). This means that the actual VfM cannot be calculated (Boardman et al., 2016). According to Burger and Hawkesworth (2011), if more data is evaluated it would be possible to eliminate this disadvantage. VfM calculations can also often be seen as merely a facade for promoting PPP schemes, benefitting shareholder-oriented decisions so the government becomes merely an economic actor, a tool for politicians and lastly a way to redistribute public wealth to the financial elite (Andon, 2012).

The VfM method has some gaps, which can make the evaluation show a distorted result. One of these disadvantages is that if it fails to assess the total risk, the VfM will not be efficient (Heald, 2003). The study indicates that all risks need to be quantified with correct proportion, even if they are not different in the different procurement methods (Heald, 2003). Another gap in the method is that the Vfm analysis is not always done properly according to accounting treatment rules (Heald, 2003). Lastly, VfM can be difficult to determine, since different shareholders related to the investment have different view points to what VfM is. Especially different views within the shareholders are about what the VfM outcome should be and what it should represent (Andon, 2012).

2.6.2 Insufficient risk transfer

Calculating risk can be difficult if historic and current data is not available for analysis (Grimsey & Lewis, 2005). If the risk calculation cannot be done correctly,

the risk transfer analysis can be more difficult (Grimsey & Lewis, 2005), since it will be harder to evaluate which party should be responsible for a specific risk. Risk transfer is one of the main benefits of PPPs if these are chosen as the procurement method (Boardman et al., 2016), however if risk transfer is not enough, the public sector still carries the risks and pays more for the procurement. Insufficient risk transfer is a possible scenario if there is no competition in the private sector for the PPP or if the government is not capable of identifying the correct risks or correct amount of risk (Burger & Hawkesworth, 2011). Also according to Andon (2012) risk transfer is not sufficiently studied, which is a large cause to the issue of why risk transfer in PPPs is not optimal. Even if the disadvantage of poor risk transfer is eliminated in a PPP the public sector will always be the residual risk holder of a procurement (Boardman et al., 2016).

2.6.3 Political games and influence on the assets are limited

According to Boardman et al. (2016) politicians in some countries can have the most advantages of PPPs, meanwhile the taxpayers end up receiving the less suited procurement option for the service. This scenario is possible since in a PSA the government pays a large cost and in a PPP lower costs over a longer period of time, a government can influence voters by choosing PPP and showing its benefits. By this voters are influenced to believe the current government is legitimate. However, future governments automatically suffer since costs are deferred until later and they will be responsible to fix the issue (Boardman et al., 2016). Big corporations have always had power and influence over politics and the public. With the use of PPPs big corporations have even more power and influence, especially political and financial power (Shaoul et al., 2007).

The reason for this is that major capital investment is required of the SPV upfront, which eliminates smaller companies from being able to participate in the bidding process (Boardman et al., 2016). Also the SPV that will be chosen will be responsible for the design for the service as well as building and maintenance, which

means that they will be hiring professionals from the private sector, and these jobs will disappear from the public sector. Long contract periods, which are typical for PPPs (Iossa & Saussier, 2018), also limit the public sector's influence on procurement.

2.6.4 High financing costs

As stated earlier merely a limited number of companies have the resources to bid on large PPP projects, which leads these bidders to build in higher profits (Boardman et al., 2016). SPVS are also aware of the risks of the undertaking, which means a premium is added to the price, in order to account for possible delays and increased costs. Private companies also have private debt which finances the undertaking, inflating the prices further from the prices of government cost of capital (Boardman et al., 2016). In addition to this if risk transfer is insufficient and a risk premium is added by the SPV, the public sector pays more and is still responsible for risks. With PPPs financing costs are larger than in PSAs, due to risk premium and transaction costs for debts and the private companies involved are seeking profit. Meaning that if competition in the market is low, a SPV can include much higher financing costs that the public sector will have to try to negotiate or accept (Burger & Hawkesworth, 2011). Due to these from the taxpayer view, a PPP is more expensive than a PSA, since they are more expensive options for a procurement if VfM is not taken into consideration.

2.7 Factors for deciding between procurement methods

It is important to remember that PPP is not always the best option for an undertaking. For this reason Burger and Hawkesworth (2011) have listed criteria that the public sector needs to evaluate in their tests when deciding between procurement methods. Burger and Hawkesworth have also listed criteria that need to be met so that PPP can

be favoured as the procurement method. These criteria are based on many previous studies reviewed by Burger and Hawkesworth (2011).

The first factors for the public sector to evaluate are related to risk. Firstly it needs to be evaluated if risk can be distinctly defined, identified and assessed particularly those that can be shifted to private entities. Secondly the public sector needs to evaluate what risks can be transferred to the SPV and if these risks are the correct ones to transfer. The size of the risk needs to also be evaluated. The size should be sufficiently significant to have a meaningful impact on VfM. If the risk is too minor, there is no justification for transferring it to the SPV, making the decision to choose PPP unnecessary. Last risk related factor to evaluate is if the SPVs are willing to accept the risks and enough of them for the PPP option to become more valuable. (Burger & Hawkesworth, 2011).

There needs to be sufficient competition in and for the specific market where the service operates in order for the private partners to be willing to accept risk (Burger & Hawkesworth, 2011). If there is no competition in the bidding stages, the SPVs can make offers with higher returns for themselves than if there is competition (Vecchi & Hellowell, 2013). Since in a PPP the private sector is in charge under the same contract for both of the construction and operational phases, the benefits of these needs to be identified by the public sector in advance (Burger & Hawkesworth, 2011). With the correct amount of competition and whole lifecycle contracts SPVs become incentivised to lower their costs for the procurement, which leads to the public sector's next factor to evaluate before choosing between procurement methods. The pursuit of cost savings inevitably involves making trade-offs in terms of quality. If these trade-offs significantly outweigh the benefits, the public sector should refrain from choosing the PPP alternative (Burger & Hawkesworth, 2011).

When the public sector is unable to precisely decide the service design and quality beforehand, the PPP option should be chosen as the private sector possesses greater skills for innovation throughout the entire service lifecycle (Burger & Hawkesworth, 2011). Connected to this factor for the public sector to evaluate is the factor of what

kind of public sector skills are available (Burger & Hawkesworth, 2011). If the public sector does not have the proper skills needed to operate the procurement, the PPP should be chosen. Similarly changing technology is a factor to be evaluated. In typical PPP procurements technology is often rapidly and significantly changing, which makes the supply and redundancy risks higher. The private sector is usually better at handling these, which leads to the criteria that if technology is rapidly and significantly changing for an investment, PPP option should be favoured (Burger & Hawkesworth, 2011).

When the public sector has evaluated above criterias, they can start to evaluate if following criteria are met for the procurement. The first criterion that favours PPP is that the investment needs to require major capital investment, so that the public sector has the advantage of using private finance for the investment. Related to this a criterion which favours PPP is that the capital value of the investment exceeds a certain amount so its cost is not disproportionate to its size (Burger & Hawkesworth, 2011). A typical PPP is a longer investment, with a lifespan of 15-30 years (Gray et al., 2010; Regan & Smith, 2009), which is also when PPPS should be favoured. An investment that is planned to operate on a long lifespan, is well suited as a PPP (Burger & Hawkesworth, 2011). A possible explanation why PPP is well suited for long procurements, is that the public sector then does not need to follow up on maintenance of the service, since it is done by the SPV. Another large criterion is that risk allocation between the public and private sector needs to be possible and is also applied on the investment. Otherwise, the biggest advantage of PPPs is not being applied. Last criterions on the list that favour to choose PPP as the procurement delivery method is that the technology in the investment project is stable, the investment is able to operate independently and there is an existing market for the service investment in which the public service can influence the demand for the service (Burger & Hawkesworth, 2011). In summary all of these criterions which favour PPP lead to that the preferred option should be the one which brings higher service quality. If these criteria are met, PPP should be the procurement which brings higher service quality.

3   THEORETICAL FRAME OF REFERENCE

This following chapter will focus on relevant topics for the thesis. In investment valuation risk is an important factor, which is defined in this chapter and how risk needs to be managed in PPPs. This will be followed by ways to estimate return in an investment. Firstly return is defined and some key ratios related to return are presented. Since this thesis is estimating return for a multiperiod investment, NPV and IRR is defined. In order to calculate both NPV and IRR, free cash flow is needed. The chapter's last part will discuss the difference between cash flow and free cash flow, and how free cash flow can be calculated.

3.1 Risk

Risk is any quantifiable consequence from an activity, which can be either a cost or a benefit (ITF, 2008). In theory risk is defined as double sided and shows the probability of acquiring both higher and lower compensation than expected. Meaning that risk is a measurement of the difference between actual future outcome and the expected outcome (Lindblom & Sjögren, 2020). Risk can be divided into systematic and project specific risk.

Systematic risk, also referred to as market risk, indicates how a company's expected return is affected when the market portfolio's expected return changes. The other type of risk, project specific risk, is risk which affects merely a part of the economy, an industry or isolated companies. Meaning, that project specific risk affects merely the specific company and possibly its competitors (Lindblom & Sjögren, 2020).

Risk premium is a measure of the additional average return taken as compensation for taking a higher risk (Drury, 2012). The suitable return for an investment is when it is equal to the rate on similar risk class financial assets required by the capital market. If an investment return is higher, the risk premium is excessive, meaning a

PPP would not be a correct choice from a taxpayer's perspective (Vecchi & Hellowell, 2013).

In order to minimise risk, and simultaneously risk premium, risk diversification can be implemented. Since risk diversification makes companies' risk premium lower, it also directly affects the required return requested. Which affects the discount rate, making the cost of capital a company requires lower (Lindblom & Sjögren, 2020). Meaning that the risk involved in an investment determines the return required (Vecchi & Hellowell, 2013).

3.1.1 Risk in PPPs

In a PPP, risk is defined as any quantifiable vague or undefined uncertainty caused by an activity. The transfer of this uncertainty into a precisely calculated risk, makes it possible for the private sector to accept taking over the risk from the public sector (ITF, 2008). The consequences of undefined uncertainties from activities can be both positive and negative. Risks in PPPs can be divided either into systematic or project related risk (Vecchi & Hellowell, 2013). Another way of dividing risks in PPPS is into exogenous and endogenous risks. Exogenous risks can be actively managed by behavioural changes by different parties, meanwhile endogenous risks cannot be minimised by either party (Carbonara, Constantino, Gunnigan & Pellegrino, 2015). PPPs are used partly to eliminate or minimise risk in the procurement, since in a PSA the risk transfer to the private sector cannot be done similarly (Vecchi & Hellowell, 2013), this is why it is important to understand how PPP risks can be categorised.

Systematic risk in PPPs is primarily uncertainty in future economic activities and how change in these activities can affect the demand for the finished product of the undertaking. For investors of PPPs the biggest risk is inflation and its effects. For the project finance contracts a risk is that residual value can be affected by changes in interest rates and market demands (Vecchi & Hellowell, 2013). Project related risk in PPPs refer to risks which affect the return on the specific undertaking. In PPPs a risk

which can be both systematic and project specific risk is the uncertainty of contractors being able to deliver the service (Vecchi & Hellowell, 2013).

In an infrastructure project typical risks are related to design or technology, construction, availability, demand, operations, finance, politics, environment and force majeure (ITF, 2008). Iossa and Saussier have explained in their study from 2018 what these risks typically consist of. Below in Figure 4, these risks and their explanations are summarised. It should be noted that the risks presented are merely typical risks in projects within infrastructure, and that there can be many more since every project is unique. The risks presented are the same for PPPs that are infrastructure procurements, the difference being which party is managing them.

Planning risk	The risk that the infrastructure project plan is rejected, and the plan is not granted, that the planning process is prolonged or estimated costs are exceeded.
Unclear definition of requirements	The risk that output requirements are not clearly defined in the contract that specifies every partner's obligations.
Design risk	The risk is the possibility that the infrastructure investment fails to complete the design process in time and fails to stay within its budget. It can also refer to the possibility that the infrastructure fails to deliver a satisfactory solution or fails to meet requirements set on the infrastructure.
Construction and time schedule risk	These risks arise from changes in material and labour costs, inadequate cost management, construction practice being inadequate, delays due to force majeure and obtaining permits and approvals.
Operation risk	The risk of operation cost being large and that availability and performance standards are not met, due to lack of skilled labor, disputes, late equipment deliveries, poor maintenance in schedules and cost management.
Availability risk	Risk that the infrastrucutre is unavailable or underperforming during its operational phase or that the quality standard is below requirement.
Demand risk	The risk that actual revenues are lower than expected, due to the demand of the service being lower than expected.
Risk of changes in public needs	The risk that society's preferences change from the inital contract to when the service becomes available. For longer contracts this risk is higher.
Requlatory risk	Risk that legislative or requlatory frameworks change during the contract.
Financial risk	This risk inclued operating and capital losses that can occur from interest and exchange rate fluctuations or other financial changes in the market.
Residual value risk	The risk that the value of a facility or service is lower at the end of the contract than expected.

Figure 4. Explanations on types of risks in infrastructure procurements.

PPP risks are mostly the same as in PSAs, however there are also some PPP specific risks that do not occur in PSAs. These are fiscal, residual value and bidding risks (Carbonara et al., 2015). There is no list of all risks in PPPs and risk allocation strategies that can be implied on all PPPs, since every project is unique, however there are some factors that are similar and can be applied to most PPP projects (Carbonara et al., 2015). Figure 5 showcases types of risks that occur in most infrastructure PPPs, divided into different phases of the project. The last column are risks in PPPs for their whole life-cycles. This figure also includes which party is best suited to manage a risk in a PPP, which is based on several studies used in this thesis.

Project phase	Type of risk	Sector handling the risk		
		Private	Public	Shared
Project development phase				
	Pre investment risk		x	
	Site risks		x	
	Project finance risk	x		
	Design risk	x		
Construction phase				
	Construction risk	x		
Operation phase				
	Operating risks	x		
	Revenue risk	x		
Transfer phase				
	Asset service level risk		x	
Project total life cycle				
	Financial risks	x		
	Force majeure risks			x
	Political risks		x	

Figure 5. Typical risks in PPPs and parties which are most able to manage the risk.

Following sections will discuss more Figure 5 and how the decision on which sector should handle a specific risk can be made.

3.1.1.1 Risk transferring in PPPs

One of the reasons behind using PPPs is so that the public sector can transfer design, construction and operational risks to the private sector, by paying them a provision and risk premium (Iossa & Saussier, 2018). The risk is transferred in a PPP to the party best capable of bearing it, meaning the party which can bear the risk at the lowest cost (Boardman et al., 2016). Carbonara et al., (2015) expand on this by stating that two aspects need to be taken into consideration in the decision of which party should manage a risk. The first being identifying which party is best able to prevent the risk and second aspect being that if neither party is able to prevent the risk, identifying which party is better at managing the risk with less consequences (Carbonara et al., 2015).

According to Burger and Hawkesworth (2011) a PPP needs the correct amount and type of risk transfer for it to be successful. A PSA usually includes the same risks, however, the amount and type of risk transfer to the private sector is usually the reason why a PPP can create more VfM to the public. Research shows that in risk management, the optimal way of transferring risks is placing project related risks on the PPP partners and the so-called macro-level risks should be retained by the government (Andon, 2012). This would ensure that the risk transfer is efficient and that using PPPs would be optimal for the public. By risk transfer the public sector transfers not only the risk, but its cost to the private partners, with the latter part also attempting to reduce the cost of risk (ITF, 2008).

Some risks in a PPP should be managed by both the public and private sector simultaneously. As with the other risks, this can differ depending on the procurement. However, often macroeconomic, natural and social risks should be managed jointly by the private and public sector, in order to achieve best risk management (Carbonara et al., 2015)

3.1.1.2 Risks on the private sector

The private sector can often be better at minimising risk than the public sector, due to their motive to make profit. A PPP makes the private partners find better ways to reduce unexpected costs, since they are contracted to own the investment during both the construction and operating phases (Vecchi & Hellowell, 2013). Private companies are also usually closer to the required activity to provide the service, meaning there are better knowledge and opportunities for cost savings (ITF, 2008). The private sector can by following actions reduce costs of risks. By doing measures to eliminate the risk, measures to reduce the risk and measures limiting the negative consequences of risk (ITF, 2008).

A PPP typically includes both debt and equity (ITF, 2008). Meaning that there is risk on the investors of the debt, the type of risk assumed on senior debts by investors is credit default risk. This risk is the uncertainty of an SPV being able to make a payment in time, which is called the probability of default. The second dimension of credit default risk is recovery rate, which is the proportion of debt recovered in default. Debt providers take into consideration that there is no upside risk in PPPs, which leads them to factor in a margin into project specific risk. However, risk of credit default in PPPs are extremely low, since default risk in these is low. Also, debt providers have a seniority to other forms of finance, since they receive internet and capital repayments in priority to all other investor distributors. Debt investors in private consortiums also bear the risk of inflation (Vecchi & Hellowell, 2013).

In a PPP the risks of construction are usually on the private sector, and as an incentive the maintenance is also laid on them. The reason behind this is to guarantee that the private company in charge of construction and maintenance, invests in the project from the beginning since they would be responsible for maintenance if the undertaking has flaws or is of bad quality (Burger & Hawkesworth, 2011). Also the SPV often includes a construction company, making them experts in construction, which makes them best capable to manage construction related risks (Carbonara et al., 2105). Related to construction risks, the SPV will manage design risk in a PPP.

Since design risks relate to if a procurement design is of contracted quality and finished in time, the private companies in the SPV will be the best parties able to manage the risk.

Another large risk that the private consortium will obtain is contractor insolvency, which is mostly a project specific risk, however a serious prolonged economic downturn can affect the whole portfolio since many contractors would become insolvent (Vecchi & Hellowell, 2013). In a PSA, the public sector would bear the risk for contractors and other construction and time schedule as well as operation risks, however in PPPs these risks will be attained by the SPV. These third-party risks exist during the whole lifecycle of the investment (Carbonara et al., 2015).

For the private consortiums having a PPP contract with the public sector, has some risk minimising advantages. With PPP the planning risk is nearly completely eliminated, since when the bidding process for the procurement starts it is already decided that the service is needed and the project will be pursued (Shaoul et al., 2006). Demand risk can be lowered for the private consortiums by minimum revenue or return guarantees defined in the contract that the public sector guarantees (Chauhan & Marisetty, 2019).

3.1.1.3 Risks on the public sector

If risk transfer is done well by the public sector, risks for construction, operating, design and revenue risk will be allocated to the private consortium when PPP is chosen as the procurement method (Boardman et al., 2016). Successful risk transfer from the public sector view includes also that the costs for risk will be lower when these are allocated to the private consortia (Boardman et al., 2016).

Even though many risks in a PPP can be allocated to the private consortia, some risks will still be attained by the public sector, which is coherent with the rationale that the party best able to manage the risk will attain it (Boardman et al., 2016). The

largest risk where the public sector is always the holder is residual risk, even though risks are transferred to the private sector, if the procurement fails in the end the risk is on the public sector (Boardman et al., 2016).

The public sector can lower construction risks of PPPs for the SPVs. For the project development phase different permits and approvals are needed, as well as acquiring properties next to construction for the procurement, which can be difficult to acquire. Since the public sector is the commissioner, acquiring these becomes easier (Chauhan & Marisetty, 2019). Another major risk in procurements is the demand risk. This risk is the uncertainty of projections for future activities and how this will affect the demand for the service. In a PPP the demand risk will remain mostly in the public sector, since they are most capable of managing it (Vecchi & Hellowell, 2013). The public sector is able to manage demand on public services, meanwhile this would be difficult for the private sector to manipulate. Political risks are allocated to the public sector in PPPs, since the public sector can affect political decisions, meanwhile the private sector cannot (Carbonara et al., 2015).

3.2 Return in an investment

The profitability in a company or an investment is usually presented in relative terms, which shows the percentage profit an investment is calculated to generate (Lindblom & Sjögren, 2020). When profitability is presented in this manner, it can be referred to as the company's return. Return is in core to relate the investment's financial result to the capital invested to achieve this financial result. There are many different ways to calculate return, depending on what the profit is compared to and depending on if the return is calculated for one period or an investment's whole lifetime. In this section these different methods are presented.

The overall purpose why companies present the return is to bring forward something the company is proud of or for a stakeholders own interest. If return is presented it is

to make a company legitimate and because the ratio has been presented before (Almqvist et al., 2017). These key ratios or rate of return contribute to the planning of the business operations. Leaders need to decide and formulate goals and ratios needed to concretise the business plan. Key ratios and rate of return presented are usually the same each year, in order to make it possible to follow-up their development, which can be seen as control (Almqvist et al., 2017).

3.2.1 Key ratios related to return

There are many different return ratios, however, these have all the same base formula (Almqvist et al., 2017):

$$Return = Result \,/\, Capital$$

As seen in the formula, the result is in relation to the capital, which is the reason why profitability is expressed in percentages. The popularity of profitability ratios can be partly explained by the organisation's leaders being interested in how a considered investment would affect the result. Depending on which profitability ratio is reported externally to stakeholders can affect how the company is valued (Lindblom & Sjögren, 2020). The disadvantages of return ratios are mainly due to them being calculated from the numbers in the results and balance sheets. This can lead to some fluctuating numbers, depending on the result and invested capital used in each period. Another disadvantage of profitability ratios is time value of money is not taken into consideration (Lindblom & Sjögren, 2020). Most common key ratios related to return are Return on Assets (ROA), Return on Equity (ROE) and Return on Investment (ROI) (Lindblom & Sjögren, 2020).

3.2.2 Rate of Return

Rate of return is used by companies to calculate estimated future earnings for shareholders from the investment, compared to investing in an equivalent-risk investment in the capital market (Brealey, Myers & Allen, 2011). Usually the investment with highest return for shareholders is accepted, however, investment that increases the most firm value should be accepted. If the rate of return is calculated right it will calculate this (Brealey et al., 2011). Book rate of return can be used by managers to present to shareholders a proposed investment's estimated rate of return. This is used by managers, so that cash flows are not shown to shareholders (Brealey et al., 2011). In discounted cash flow calculations, rate of return is the return available in the financial market on equal risk investments (Drury, 2012).

3.2.3 Net Present Value (NPV)

According to Lindblom & Sjögren (2020) Net Present Value (NPV) is one of the most common investment calculation methods. NPV is one of the discounted cash flow methods (Lindblom & Sjögren, 2020). NPV calculates discounted future cash flows to their present value (CFI Team, 2022a). Since NPV is the difference between a project's value and cost, it is used by managers to calculate projects profitability in order to determine its value for the organisation (Brealey et al., 2011). If the NPV is positive the project can be seen as favourable, and should be accepted. Negative NPV indicates a project should be rejected and if the NPV is zero it can be seen as neutral (Drury, 2012). When managers are deciding if the initial payment for investment can be motivated, future estimated cash flows in the form of surplus payments are adequate taking shareholders' required return into consideration (Lindblom & Sjögren, 2020).

NPV and other discounted cash flow methods are used to compare returns on investment alternatives with equal risks, in order to decide which investment is more favourable during its whole lifetime. The present value of an investment is the net

cash flows reduced by the initial investment amount (Drury, 2012). An investment's present value is what it is valued to today (Hopkinson, 2016). By knowing the interest rate for the investment, its present value from various times from the future can be calculated, the interest rate can be also referred to as discount rate. NPV can be calculated with the following formula (Lindblom & Sjögren, 2020):

$$NPV = -I + \sum CF_t / (1 + r)^t$$

I = Initial investment at the end of first period
CF_t = Cash flow at the end of period t
r = discount rate

Benefits of applying the NPV method is that the value of money is taken into consideration. Implicating that value today is more than value tomorrow, since profitability and risk are taken into consideration (Yan & Zhang, 2022). Since NPV calculation takes the initial investment into consideration, the method accounts for investment size. Also by calculating cash flows instead of net profits, the NPV eliminates non cash earnings from the investment decisions.

Since NPV is communicated by presenting either a positive or negative future cash flow, it can be difficult to read. Another disadvantage with NPV, is that the method is merely predicting the future outcome. This is due to it being difficult to estimate risks and an appropriate discount rate (Yan & Zhang, 2022). The discount rate most commonly used in NPV is the weighted average cost of capital, or WACC, which is described later in this chapter.

3.2.4 Internal Rate of Return (IRR)

Since key ratios, for example ROI, time value of money is not taken into consideration (Lindblom & Sjögren, 2020), when analysing return for multiple

periods other methods need to be used. Internal Rate of Return (IRR) is like the NPV method, a discounted cash flow method. IRR is the rate at which an investment's NPV is equal to zero (Almqvist et al., 2017). Like the NPV, IRR is one of the most common investment calculation methods (Lindblom & Sjögren, 2020).

IRR calculates how much return an investment can contribute. This means that the project with the highest IRR should be chosen (Goedhart, Levy & Morgan, 2015).

The benefit of using IRR instead of NPV is that instead of assuming an investment is profitable when its NPV is over 0, the method estimates future return of the investment itself, during its whole life cycle. The return can then be compared to an internal objective which the internal rate needs to exceed or to other alternatives (Almqvist et al., 2017). Other factors, such as the initial investment and future cash flow, can be estimated in the same way as in NPV (Lindblom & Sjögren, 2020).

Since IRR calculates investments' internal rate, or discount rate, it can be used instead of NPV. When estimating NPV, the discount rate or shareholders' return requirement needs to be known (Almqvist et al., 2017). If these two factors are unknown, IRR can be implemented.

IRR can be formulated as an equation, like in the following formula (Lindblom & Sjögren, 2020):

$$0 \ (NPV) = -I + \sum CF_t / \ (\ 1 + r \ )^t$$

$I = Initial\ investment\ at\ the\ end\ of\ first\ period$
$CF_t = Cash\ flow\ at\ the\ end\ of\ period\ t$
$r = discount\ rate\ which\ is\ unknown$

Contrary to the NPV, IRR is presented in percentages, which is one of the reasons for IRR being preferred over the NPV (Yan & Zhang, 2022). However, contrary to the NPV, in IRR the size of the initial investment matters. Since the IRR will be affected

by the size of the initial investment, two investments with different initial investments can be difficult to compare merely with IRR. Rank order between two projects could possibly be distorted by the IRR method (Lindblom & Sjögren, 2020).

IRR can be divided into different categories, Project and Equity IRR. Project IRR measures the rate of return of the entire project's costs from all sources of capital financing it, meanwhile Equity IRR measures merely the rate of return on invested equity (Vecchi, Hellowell & Longo, 2010).

With unconventional cash flows, the IRR has some flaws. Conventional investments have cash flows which are negative during the first years and are followed by positive cash flows in the latter cash flows. If the cash flows change and so that the algebraic sign changes, there will be as many possible IRR as there are changes in signs (Drury, 2012).

3.2.5 Weighted average cost of capital (WACC)

Weighted average cost of capital (WACC), is typically used as the cost of capital in investments (Drury, 2018). WACC is most commonly used as the discount rate when discounting cash flows to NPV. WACC can also be used as a benchmark, it is especially an appropriate benchmark for evaluating Project IRR (Vecchi and Hellowell, 2013). The concept of WACC has been around for a long time, however, there is still much misinterpretation and misuse of WACC (Mian & Vélez-Pareja, 2008).

WACC is the average rate for financing assets and it takes into consideration the proportion of capital from both debt and equity. The cost of total assets is often needed since most companies are financed by both debt and equity and these companies aim to maintain a target proportion of debt and equity (Drury, 2018). This means that WACC signals the minimum return a company desires on the total assets. In order to calculate WACC cost of equity and cost of debt needs to be calculated,

with the addition of a ratio between equity and debt. Depending on what information is available, WACC can be calculated based on accounting data or market data.

Formula used commonly to calculate the WACC is the following (Investopedia Team, 2023):

WACC = (Proportion of E% x Cost of E) + (Proportion of D% x Cost of D x (1-Tax rate))

E = Equity
D = Debt

Proportion of Equity percentage can be calculated by dividing total equity with total assets (Investopedia Team, 2023). Cost of Equity can be estimated with the Capital Asset Pricing model (CAPM). It is used to determine the cost of capital on an equity investment, which is the same as the cost of equity in an investment with both debt and equity.

The cost of capital according to CAPM is a function of the rate of return available on risk-free investments and the amount of risk premium on systematic risk in the equity investment. Rate of return available on risk-free investments is the IRR on bonds issued by the government in a relevant jurisdiction. Equity risk premium is calculated by multiplying Beta of the investment with Equity market risk premium, which is average premium on the relevant market (Vecchi & Hellowell, 2013). Equity Risk Premium according to CAPM is multiplied by: the Beta of the investment and the Equity Market Risk Premium (EMRP). Beta is the weighted covariance of the projected excess return on the investment with the average excess return on the market as a whole and the EMRP is the average premium on equities, reflecting the market's view of the risk in the equity market portfolio.

Cost of equity can be difficult to determine precisely, which is why there are different methods used to estimate it (Vecchi & Hellowell, 2013). Beta cannot be

estimated precisely, since the estimation is dependent on which period returns are calculated for, whether an arithmetic or geometric approach is used and if Beta is reflecting the current or expected market conditions (Vecchi & Hellowell, 2013). Regarding the EMRP there are two different approaches for the estimation, the "orthodox" and "opportunistic" approach. With the "orthodox" approach EMRP has a theoretical uncertainty and needs to be acceptable across all stakeholders in a PPP contract, EMRP that is used by competition regulators in the relevant jurisdiction can be applied. With the "opportunistic" approach to CAPM, it is highlighted that in PPPs investors are usually specialists in infrastructure, leading to them having small portfolios. If an investors portfolio is not well-diversified it may require a premium for bearing the risk of contractor insolvency, leading to the conclusion that in a PPP the "orthodox" approach can be ill-fitted. EMRP in the "opportunistic" approach is the discount rate actually used by large PPP investors (Vecchi & Hellowell, 2013).

In a PPP cost of equity is estimated slightly differently as previously presented. Finding an appropriate Beta for a PPP can be difficult, since SPVs are financing the project and these are newly established companies specifically for the project. This means that there is no historical data for dividend or share prices, hence there not being directly observable market data to base Beta on. Instead, Beta in a PPP can be derived from related industries or SPVs (Vecchi & Hellowell, 2013).

Proportion of Debt percentage can be calculated similarly to the proportion by equity. It is calculated by dividing total debt with total assets in the company in that specific period (Investopedia Team, 2023). Cost of Debt is the interest rate on loans for the investments (Vecchi & Hellowell, 2013). Cost of debt estimated is a benchmark, similarly to Cost of Equity, so the cost of debt will guide to an expected investor returns given their risks.

Cost of debt is a function of the long-term swap rate, the swap credit premium and the credit margin. The long-term swap rate is the underlying cost of the fixed interest rate financing for the payment period. Interest rate in a PPP is fixed at the time the contract is signed, since it reflects the fact that most SPVs are unable to bear interest

rate risk. The swap credit premium is a charge, which reflects the risk of conducting the swap. This cost is typically small. The credit margin represents the amount of default risk associated with the loan (Vecchi & Hellowell, 2013). The long-term swap rate should be matched with the payment period of each project's senior debt loans; these can be accessed in different databases depending on the country PPP is based in (Vecchi & Hellowell, 2013). The swap-credit premium in PPPs should be low since PPPs usually do not go into default, however the typical credit premiums are higher than expected. In the UK these have had a range between 0.6-1.5% in the years 1996 and 2008 (Vecchi & Hellowell, 2013).

For a PPP WACC is a little bit more complicated than usual, since equity over time grows as debt is paid off (Vecchi & Hellowell, 2013). This makes the debt to equity ratio different for each period, and therefore also WACC changing each period. When using WACC as a benchmark to Project IRR, the average of each period WACC is used (Vecchi & Hellowell, 2013). In order to calculate WACC for a PPP a benchmark cost of debt and gearing needs to be calculated. Gearing is the ratio between equity and debt (Vecchi & Hellowell, 2013).

3.3 Cash Flow

As stated previously, in order to calculate NPV and IRR discounted cash flow needs to be calculated. To make this possible cash flows need to be reformulated and future cash flows need to be estimated (Penman, 2013). If simplified cash flows of a specific period is the difference between the companies or projects incomes and expenditures (Lindblom & Sjögren, 2020).

Due to changes in laws and accounting principles, income statements have undergone changes to a great extent, which has made them abstract and difficult to read. To make it easier to interpret and calculate financial ratios, adjustments should be made to the income statement and balance sheet. This is vital due to key ratios

having a great impact on decision making about the company, its performance and risks. When calculating cash flows adjustments are made in order to eliminate accruals and valuations issues. With the adjustments, conclusions are made merely on the basis of cash flows (Leppiniemi, Leppiniemi & Kaisanlahti, 2021).

According to Leppiniemi et al. (2021) necessary expenses, for example running costs such as purchases, personnel costs and rental costs are deducted. After these have been deducted from the earnings, entries such as interest and dividends are deducted, investments are moved to fixed assets. When these steps are completed, changes in liquidity reserve, invested capital and adjustments in debt capital are taken into consideration.

Cash Flow model according to (Leppiniemi et al., 2021):

> *Cash proceeds from sales*
> *- Current cash expenses*
> *= Cash balance Ⅰ A*
> *+ Other cash receipts*
> *= Cash balance Ⅰ B*
> *- Cash expenses from profit sharing, finances and taxes*
> *= Cash balance Ⅱ*
> *-/+Cash flow of net investment*
> *= Cash balance Ⅲ*
> *+/- Changes in liquidity reserve*
> *= Cash balance Ⅳ*
> *+/- Investments change in capital*

However, cash flow calculates net cash inflow of operating, investing and financing activities of a company. Free cash flow calculates the investments or company's present value, meaning cash flow calculates the viability of a company's activities and free cash flow its value (Singh, n.d.).

3.3.1 Free Cash Flow (FCF)

Free Cash Flow is the cash left to investors in investment after all necessary payments for the growth are made (Brealey et al., 2011). In it are all factors included which can affect cash flows, making it the perfect indicator for the health of a company. FCF is also used by the company itself to calculate attainable cash flow for investors for distribution (Bragg, 2012).

FCF can be divided into two different categories, Free Cash Flow to Firm (FCFF) and Free Cash Flow to Equity (FCFE). The difference between these two free cash flows is that in FCFF interest expenses and net debt issuance are not taken into consideration.

There are multiple different methods to calculate both FCFF and FCFE, depending on which financial statement ratio the calculation is started. Below is a method presented for both FCFF and FCFE.

FCFF can be calculated by the following method (CFI Team, 2023):

> *Net income + Depreciation and Amortisation + Interest Expense (1- Tax rate) + Capital Expenditure + Net Change in Working Capital*

FCFE can be calculated from EBITDA by the following method (CFI Team, 2022b):

> *EBITDA - Interests - Taxes - Change in Working Capital*
> *- Capital Expenditure + Net Borrowing*

FCFE are the remaining cash flows after meeting all financial obligations, meanwhile FCFF are the cash flows available to all shareholders of the company. Meaning that FCFF presents cash generated by the company's all assets. It is unaffected by how the assets are financed (Janiszewski, 2011). Which FCF is needed

depends on if Project or Equity IRR is calculated. If Project IRR is calculated FCFF needs to be calculated and for Equity IRR FCFE is needed.

4   PREVIOUS STUDIES

This chapter will be focusing on previous studies in evaluation methods for companies returns. Studies on IRR are also presented and lastly studies about profitability in PPPs are presented.The previous studies are both PPP specific, however also generally for investments, since PPPs essentially do not differ when calculating profits and return. The studies are limited to the 21st century.

4.1 Evaluation of return in companies

Due to the Enron bankruptcy scandal in 2001 managers needed a new method to value companies, which became estimating cash flows and risks qualitative evaluations and quantitative calculations. The value of a firm is its capacity to generate cash flows from its assets and risks (Beneda, 2009).

Liljeblom and Vaihekoski (2004) argue in their study that methods calculating projects rate of return is advocated in financial literature by professors. However, these methods are not properly utilised by companies. The study also found that IRR has become a popular method worldwide, however that Finnish companies are not as eager to use the method (Liljeblom & Vaihekoski, 2004). Also according to Cuthbert & Cuthbert (2012) IRR is worldwide the most common measurement used in PPPs. However, in the study the authors argue that IRR should be used merely if the payment types in a PPP are flat. They also argue that when deciding between PPP options, IRR by itself is an inadequate measurement.

4.2 Returns in PPPs

Studies conducted on return rates in PPPs have evidence of them being higher, however according to Buso et al. (2021) these results are not justified theoretically.

According to Vecchi and Hellowell (2013) if an IRR is bigger than the cost of capital, it has bad value for the public, since it is excess cost paid from public funds. Figure 6 presents studies that have calculated returns in different PPPs. These studies have been conducted in different parts of the world, different times and within different markets. These factors can affect the risks and therefore results of the return for the PPPs. The studies are listed in figure 6 chronologically by age.

Study	Years	Country	Sector/type of PPP	Avg. return	Range of return	Explanation
Sirtaine et al. (2005)	?-2001	Latin American countries	PPP in infrastructure	over 14%*	-	Avg. WACC
Enright (2006)	2005-	USA	Infrastructure, toll road	-	8.0-18.7%	Forecasted IRR
Inderst (2010)	1993-2007	Worldwide	Infrastructure funds	5.5%	-33.4-53.8%	Median net IRR
Vecchi et al. (2010)	?-2009	Italy	PPP in healtchare services	8.23%	3.10-10.18%	Avg. IRR
Newell et al. (2011)	1995-2009	Worldwide, Australia	Infrastructure funds (listed, unlisted)	16.74% 14.07% 9.07%	- - -	Annual return, AUS listed Annual return, AUS unlisted Annual return, Worldwide
Bitsch et al. (2012)	1971-2009	Worldwide	Infrastructure (transportation, telecommunication, energy)	18.74%		Median IRR
Vecchi & Hellowell (2013)	1997-2008	United Kingdom	DBFO in hospitals	9.48%	7.22-10.72%	Avg. IRR total capital
Bird et al. (2014)	1995-2009	Australia, USA	Infrastructure funds (listed, unlisted)	7.9% 16.2% 12.1%	- - -	Avg. annual return, USA listed Avg.annual return, AUS listed Avg. annual return AUS unlisted
Fernandes et al. (2016)	1999-2002	Portugal	Toll roads	15.5%		Hidden IRR
Santandrea et al. (2017)	1997-2014	United Kingdom	PFI, Infrastructure	-	14-27%	Avg. IRR total capital for different years
Haran et al. (2019)	1999-2014	Worldwide	Infrastructure funds	11.0%	-	Avg. IRR for fund
Albarate et al. (2019)	-	Spain	Tram line	-	6.54-10.00%	Guaranteed ROC
Andonov et al. (2021)	2002-2019	Worldwide	Infrastructure funds	9.92%	-	Avg. IRR for fund

Figure 6. Studies on Returns in PPPs.

Studies by Vecchi and Hellowell (2013) and Vecchi, et al. (2010) have calculated IRR for healthcare services and hospitals. Vecchi and Hellowell (2013) have calculated project and equity IRR for 10 DBFO projects for healthcare services in the United Kingdom. Meanwhile Vecchi et al. (2010) calculated project and equity IRR for 14 PPP projects in Italian healthcare. The results showed that in DBFO contracts in the UK the Project IRR for 7 projects was between 7.22% and 10.72%. Required data to calculate Project IRR was not accessible for three of the projects (Vecchi & Hellowell, 2013). The average project IRR of the projects was 9,48%. The results for the Italian projects showed that Project IRR was between 3.10% and 10.18% (Vecchi et al., 2010). The average Project return landed on 8.23%. As previously mentioned, if the IRR of a project is higher than its cost of capital, it can be considered to be bad value to the public. Studies by Vecchi and Hellowell (2013) and Vecchi et al. (2010) used WACC as the measurement for cost of capital. WACC was used as a benchmark

against Project IRR, and both studies showed that IRR was higher than the benchmark. Vecchi et al. (2010) also mention that return rates were much higher than predicted in a well functioning competitive market.

A study from Latin America, computed return rate for 34 PPPs within infrastructure. These PPPs were located in 9 Latin American countries within different infrastructure sectors. PPPs studied had been in average operating for 7 years and data was collected until 2001. The results showed that the projects had low profitability, however they should be able to generate Project IRR above benchmark WACC, which was 14% (Sirtaine, Pinglo, Guasch & Foster, 2005). In the study average IRR or the ranges of IRR were not stated, however IRR was presented as being above the benchmark WACC. This means that the average WACC for PPPs used in the study was 14% and IRR for these was over 14% (Sirtaine et al., 2005). A similar study from the UK studied PFIs within different infrastructure sector procurements, which included hospitals, schools and roads (Santandrea, Sironi, Grassi & Giorgino, 2017). The study included 706 PFI projects between the years 1997 and 2004. The study calculated yearly average IRR, which landed between 14.0-27.0% (Santandrea et al., 2017), which is similar to Sirtaines et al.´s (2005) findings. In the UK study it was stated that the IRR declined over the years, so the highest IRR of 27.0% was in 1997 and lowest of 14.0% in 2004 (Santandrea et al., 2017). A worldwide study by Bitsch, Buchner and Kaserer (2012) also calculated IRR for infrastructure projects within different fields. The study had access to the PPPs full histories of cash flows, which is rare. 363 fully-realised infrastructure deals were studied between the years 1971-2009. As there were many outliers for the IRR, the average IRR was 66.88%. Due to this median IRR, which was 18.74%, is more appropriate for the evaluation, since it eliminates the outliers (Bitsch et al., 2012). Also the study by Bitsch et al. (2012) has similar findings to Sirtaine et al. (2005) and Santandrea et al. (2017).

Quite a few studies within returns on PPPs, studied what returns private infrastructure funds have. Studies by Inderst (2010), Haran, Lo and Milcheva (2019) and Andonov, Kräussl and Rauh (2021) presented an average IRR for private

infrastructure funds. Meanwhile studies by Newell, Peng and De Francesco (2011) and Bird, Liem and Thorp (2014) presented the average annual return for three different infrastructure fund types.

In the study by Inderst (2010) 37 funds from years 1992-2007 within infrastructure worldwide, with investment sizes of varying sizes were studied. The study presented that the average net IRR landed at 6.3%. Since the IRR ranged between -33.4% and 53.8%, the median IRR gives a more accurate picture. Median IRR landed at 5.5% (Inderst, 2010). Haran et al. (2019) calculations landed at average IRR for funds at 11%. Infrastructure funds included were between the years 1999-2014, with them being worldwide (Haran et al., 2019). Last study by Andonov et al. (2021) with the newest data, was also conducted worldwide by calculating average IRR on funds between years 2002-2019. Average IRR for these was 9.92%. The difference for the different average IRRs can be explained by the fact that there are many different funds included and that the funds in different studies were from different years which also affect the returns.

Newell et al. (2011) researched the performance of listed and unlisted infrastructure funds in portfolios in Australia and worldwide. Performance of the funds was presented as average return for Australian listed and unlisted funds as well as average return for listed worldwide funds. Average return for listed Australian funds was the highest at 16.74%, closely followed by average return for Australian unlisted funds at 14.07%. Average return on funds worldwide landed at 9.07% (Newell et al., 2011). The funds researched were between the years 1995-2009. A similar study was conducted by Bird et al. (2014), with it calculating average annual return for 180 funds between the years 1995-2009 in the US and Australia. The results were similar to Newell et al. (2011). Average return on Australian listed funds was the highest at 16.2% and average return on Australian unlisted funds was at 12.1%. Average return on funds in the USA was much lower at 7.9%. According to Bird et al. (2014), Australian infrastructure funds often have higher returns than funds from other countries, which correlates with their and Newell et al.´s (2011) results.

Enright (2006) analysed in his study estimated IRR for toll roads in the USA. The study estimated what the effects would be if a toll road was sold from the public sector to the private sector. This would eliminate toll revenue from the public sector and if the IRR would be too high also add unnecessary costs to the public sector and higher costs for the public paying for the tolls (Enright, 2006). IRR for this was estimated both from initial estimated equity investment and final equity investment, however different estimated traffic growths and estimated increase on tolls were added as factors. Lowest estimated IRR, the best case scenario was at 8.0% and the highest, worst case scenario, was at 18.7% (Enright, 2006). A study conducted by Fernandes et al. 2016) had similar findings for toll roads in Portugal between the years 1999-2002. Their hidden IRR was estimated to 15.5% (Fernandes et al., 2016).

A study by Ye and Liu (2008) presents an alternative way of looking at IRR for PPPs. A model is presented where the private sector would be guaranteed a minimum IRR by the public sector. If the actual IRR is below the minimum, the public sector will pay the difference. A maximum IRR can also be set and if actual IRR is above it, the surplus is shared with both sectors (Ye & Liu, 2008). In a study by Albalate, Bel & Gragera from 2019, an estimated guaranteed return for a planned tram line in Barcelona was presented. According to the contract the guaranteed return is between 6.54-10.00%. The study indicates that the Ye and Lius alternative is used in PPPs. It should be noted that as of 2019 the procurement had yet to be started, so the true return was not presented.

From the studies it could be concluded that return on PPPs is affected by regions of the investments, by years they were active and also by the sector a PPP operates in. Inflation, crises and world situations can especially affect the results. Haran et al. (2019) stated that returns in PPPs, especially infrastructure funds are not well researched. Yet these have become very popular investment types (Haran et al., 2019).

4.3 Profitability of PPPs for the public sector

In Boardman, et al.'s study from 2016 PPPs advantages and disadvantages are discussed from a potential theoretical view. The study compares PPPs to traditional government procurement methods. The study points out that VfM studies in Canada are not able to disclose whether PPPs cost the government less than PSAs nor are they able to conclude if PPPs are able to provide more social welfare to the country than PSAs. However, PPPs are often preferred over PSAs, since politicians can use them in their favour (Boardman et.al., 2016). Buso et al. (2021) provide in their study an explanation to the reason PPP alternatives can be too expensive for the public.

The effect of the private sector using its knowledge and resources optimally, PPPs are able to reduce cost and time overruns. However Buso et al. (2021) discuss in their study, that the cost of the project can be too costly in the end when the premium the private sector charges are taken into account. Private consortiums inquire for a higher premium on PPPs than they do on corporate portfolios and other equity assets (Buso et al., 2021). In order to lower the premium, Buso et al. (2021) present that if partners associated with a PPP are eliminated from their negotiating power, PPP can be modelled to be most efficient. If partners have negotiating power, it cannot be guaranteed the PPP will be as efficient as possible (Buso et al., 2021).

Shaoul et al.'s study from 2007 has similar conclusions to Boardman et al. (2016) and Buso et al. (2021) regarding the costs of PPPs for the public sector. The study shows that DBFO's are more expensive than traditional procurements. The study also shows that it is hard to disclose the real costs of DBFO's since expected costs and contracts are not publicly accessed. This makes it difficult to compare expected and actual costs.

4.4 Financing costs in PPPs

Buso et al. (2021) state in their study that PPPs are more expensive than PSAs, which is not surprising since private finance is more expensive. According to the study, private financing has double the cost of public financing. This is similar to findings from a study by Fernandes et al. (2016). The study concluded that financing costs of PPPs in Portugal were on average 370 basis points higher than public finance, which was also much higher than expected (Fernandes et al., 2016).

Risk in infrastructure projects is relatively low and risk in PPPs usually lower (Vecchi & Hellowell, 2013). Credit default risk is low and recovery rates in PPPs high (Vecchi & Hellowell, 2013), which should mean that even risk premiums in PPPs should be relatively low. However, financing costs in PPPs which include risk premiums are much higher in PPPs than in traditional procurements, since risk is transferred to the private sector and the SPVs included want returns on their investments (Vecchi & Hellowell, 2013). This raises the question of if the financing costs and therefore risk premiums in PPPs are too high, meaning that they have bad value to the public sector.

In the study by Vecchi & Hellowell (2013) it was established that in most of the PFIs researched, IRR was higher than the cost of capital. This means that even though savings were made in other costs, the premium paid of private financing was unreasonable and of bad value. According to the study the rate of return of a PPP should be equal to the WACC, since then the revenue costs of each project would be lower (Vecchi & Hellowell, 2013). Fernandes et al. (2016) stated that the base costs of equity in PPP options increased from 10.75% to 12.47% when equity transaction costs were taken into consideration. It was also discovered that global financing transaction costs were more than double as high from initial margins than what was agreed in contracts for senior debt (Fernandes et al., 2016). IRR for these procurements also increased by 4.7-7.12% when all actual costs of an SPV were taken into consideration, making the average hidden IRR for Portuguese toll roads

between years 1999-2002 15.5% (Fernandes et al., 2016). A similar study to these was conducted by Shaould et al. (2006), where cost of private finance in DBFO projects in the UK was researched. However, due to lack of clarity on what the public sector was paying for each project and what the public sector would pay for each project in the future, the study was unable to answer how much private financing cost the public sector (Shaoul et al., 2006). The study could come to a conclusion that private financing in infrastructure through DBFOs costs more than double if compared to state financing, with the main reason being cost of risk transfer (Shaoul et al., 2006).

In conclusion, financing premiums of PPPs should be reduced, mainly by optimisation of risk transfer and base case and accounting rules-related matters prior to the financial close (Fernandes et al., 2016). Also the main finding from these studies was that the rate of return in PPPs in order for it to be of good value should be equal to its WACC (Vecchi & Hellowell, 2013). If this excess premium is eliminated the public sector would first of all receive more value on its investments and invest the excess in other projects (Vecchi & Hellowell, 2013).

5   RESEARCH QUESTION AND METHOD DISCUSSION

Chapter four will present the chosen methodology of this thesis and why the method used was chosen. Chapter 5.2.1 will describe the process of calculating IRR from financial statements more in depth. The chapter will also present how the chosen methods assist in answering the research question.

5.1 Methodology

The research question in this thesis will be answered by conducting a case study, by using financial statements from four companies in Finnish infrastructure. A case study is conducted so that it can be researched if there is a pattern of IRR levels in these companies that are operating within the same field. The main feature of case studies is that they include one or multiple cases. The research question is therefore related to the case and how it can be solved or understood, however also what can be learned by studying the case (Eriksson & Kovalainen, 2008). In this thesis the cases are researched in relation to previous cases within similar fields.

This Master's Thesis is a qualitative case study. A qualitative study as a research method relies on words and not numbers. The data is collected by the researchers observations, interviews, documents and focus groups (Bryman & Nilsson, 2018). In a qualitative study it is important to choose relevant data and then interpret the given data (Bryman & Nilsson, 2018). Quantitative data can be used to construct a case study, however the nature of the study can still be qualitative (Eriksson & Kovalainen, 2008). In this thesis quantitative data is collected, by using financial statements from four companies to calculate the projects' IRR, however the answers cannot be generalised hence the study is of qualitative nature.

From theory above it can be stated that case study as a method is well suited for this thesis as a method. Since to be able to calculate IRR in Finnish infrastructure

procurements, realised financial statements from real procurements are needed, a case study of them is the best suitable method to do this.

5.1.1 Data collection

Data collection method used in this thesis in document analysis. Documents created by organisations are heterogeneous sources for studies within the field of business administration. These documents can be both open to the public, however also private documents. For case studies, these are of great value to the one conducting the study, since organisational documents showcase the organisations background information and other information which can be relevant for the study (Bryman & Bell, 2017). The difficulties with document analysis as the data collection method, are that documents are not always publicly accessible (Bryman & Bell, 2017) and due to this it can be difficult to compare results to other organisations.

In this thesis documents analysed are financial statements for four Finnish companies within infrastructure. In addition old news articles and press releases are analysed for background information about the companies studied.

5.1.2 Analysis

In case studies data collection as a method is considered as the most important part, since data collection is used as the aid to find the results of the study. Case studies can be used for descriptive or explanatory purposes. Descriptive testing describes a situation and explanatory testing finds explanations on why something specific has happened (Yin, 1981). Bryman and Bell (2017) emphasise that in qualitative studies, large amounts of data is gathered which then needs to be analysed. There are also few rules and instructions for analysis in qualitative studies, which makes the analysis even harder to complete. The purpose of data collections analysis is to provide insight and knowledge on analysed data (Bryman & Bell, 2017).

Within studies in the field of business administration, there is big importance in analysing background information and previous studies. It is important to have knowledge in existing literature within the subject since previous studies and theories behind these affect the study performed (Bryman & Bell, 2017).

In this thesis the analysis began with literature review of previous studies and their results. The literature review also provided methods on how data collected in this study can be processed and analysed. As the last step data collected from the financial statements is analysed by comparing the results with previous studies within the same subject.

5.1.3 Reliability and relevance

The concepts reliability and validity is often associated with quantitative studies, however it can, if modified, also be applied to qualitative studies. Reliability and validity can be affiliated with qualitative studies without changing the meaning of the concepts, however by having less importance in questions regarding measurement (Bryman & Bell, 2017). A study's reliability can be seen as its authenticity or trustworthiness, meaning that they showcase the consistency of different studies with the same parameters. Reliability is due to this being used as a measurement of how good a qualitative study is (Bryman & Bell, 2017).

Reliability can be achieved by thoroughly describing in a study the processes of how results are analysed and achieved and by comparing results with enough other data. In this thesis the process is thoroughly explained in chapter 5.3 and the findings are compared to previous studies from different countries, in order to achieve reliability.

The relevance of a study is its significance in the field of the study and what it contributes to research (Bryman & Bell, 2017). The thesis relevance to its field is to research if PPPs are profitable for the public, since these have been critiqued in

previous studies. There is also a gap in research of how PPPs have performed by comparing the budgeted realised returns.

5.1.4 Methodology criticism

Qualitative studies are critiqued due to the issue that results cannot be generalised (Bryman & Bell, 2017). Especially in case studies, results vary depending on the case. Since the method used in the thesis is document analysis, a difficulty from a reliability perspective is the issue that not all organisational documents are publicly available (Bryman & Bell, 2017). This makes the analysis more difficult, especially since previous studies analysed also have used documents that are not publicly available.

Results of the thesis need to also take into consideration the reliability of previous studies that results of computations are compared to. The method chosen for analysis needs to take into consideration if previous studies have measured the correct concepts (Bryman & Bell, 2017). Also results of this thesis can be affected by the choice of studies computations are compared to.

5.2 The process

The process started with reading studies, books and articles about estimating returns on investments and reading how PPPs differ from traditional procurements. With the help of these it has been defined what is needed to calculate the return. The following part will present the methods used to calculate IRR for the investment projects.

5.2.1 Adjustments and simplifications

In the financial statements for the four PPPs some accounting periods are longer than a calendar year. However, in calculating free cash flows, the periods have been simplified and adjusted per calendar year. This simplification will affect the result merely marginally (Lindblom & Sjögren, 2020). If a financial statement is missing, a Median from the previous and following years has replaced the missing information. Even this simplification affects results only marginally. The financial statement for the year 1999 for Nelostie is missing, so in this case the median from 1998 and 2000 has been calculated with the excel formula to fill in the series. The same calculation has been made for the financial statement for Valtatie 7 year 2017, which is missing.

Nelostie was founded in 1996 when Finland's currency was the Finnish markka, so the years 1997 and 1998 have been converted to euros by dividing the numbers with 5.94573. The exchange rate is taken from the website of Suomen Pankki (2012). Since the financial statement for the year 1999 was missing, the currency was not converted for this year.

5.2.2 Calculations

To calculate the overall rate of return for an entire investment, the relevant FCF is FCFF (Vecchi & Hellowell, 2013). Which is why FCFF is used in this thesis, since the IRR of the whole investment needs to be calculated. Project IRR shows the rate of return for the whole lifetime of the entire investment.

5.2.2.1 Free Cash Flow to Firm (FCFF)

FCFF has been calculated from Net Income by the following formula (CFI Team, 2023):

Net income + Depreciation and Amortisation + Interest Expense (1- Tax rate) + Capital Expenditure + Net Change in Working Capital

Net Income is calculated by subtracting interests, taxes and appropriations from the operating profit, which is calculated by subtracting depreciation from EBITDA. Net Change in working capital is calculated by subtracting the current period's fixed assets from the previous year. Capital expenditure is the Change in working capital minus current years depreciation.

5.2.2.2 Estimating future FCFF

Following assumptions have been made in order to calculate estimated future cash flows:

      Inflation: 3% (Suomen Pankki)

      Interest: 2,5%

      Taxes: 20% (Vero, 2023)

Numbers which are included in the EBITDA are adjusted with the inflation rate, with the exception for other operating income. These will be estimated to zero in forecasted financial statements, since in all cases the realised other operating income are not recurring each year and are often smaller sums. Interest expenses are adjusted by the interest rate for loans, meanwhile interest expenses and other financial expenses are estimated to zero with the same grounds as other operating income. Future taxes are calculated by subtracting interests from operating profit and adding appropriations to this, so that taxes are calculated only from profits that are taxable. Finally the sum is multiplied with the tax rate. Depreciation is divided evenly for the estimated years so that it is zero the last period, since there cannot be any depreciation at the end of an investment's economic lifespan. Appropriations are estimated by dividing depreciation difference from the last realised financial statement evenly between the forecasted financial statements.

Fixed assets are estimated by subtracting the current period's depreciation from last periods fixed assets. Cash and cash equivalents are estimated by adding EBITDA into previous years cash and cash equivalents. From this sum taxes, interests and net dividend is subtracted, since they are not included into cash owned by the company.

Future equity is estimated by adding net income to previous years equity. For estimating future deprecation difference, the same logic is applied. From previous years depreciation difference current year appropriations are subtracted.

In order to estimate total debt capital, change in debt capital needs to be estimated since debt capital for future periods is calculated by subtracting change in debt capital from the previous years total debt capital. Change in debt capital is estimated by dividing the last realised total debt from the financial statement evenly, so it will be zero by the last accounting period.

5.2.2.3 Project Internal Rate of Return

To answer the research question Project IRR needs to be calculated, since it reflects the rate of return for the entire investment. In order to do this FCFF has been calculated for realised financial statements and estimated for future years. For the calculation of Project IRR on cash flows, the excel function IR has been implemented. The calculated IRR for the four Finnish PPPs, will be compared to the results of previous studies, in order to decide if the IRR is at an acceptable level.

5.2.3 Analysis of results

Project IRR of the case study procurements is analysed, with the aid of previous literature. From previous literature and previous studies of IRR in PPP procurements it is analysed if IRR is at a reasonable level.

6 EMPIRICAL EVIDENCE

Chapter six will start by presenting the companies used as empirical evidence for the thesis, with base facts about the companies. Lastly the chapter will present the results from computations from the case study objects.

6.1 Case study objects

The procurements that have been analysed in the thesis are Tieyhtiö Nelostie Oy, Tieyhtiö Valtatie 7 Oy, Tieyhtiö Vaalimaa Oy and Tieyhtiö Ykköstie Oy. Figure 7 has summarised base facts about the companies.

	Tieyhtiö Nelostie	Tieyhtiö Valtatie 7	Tieyhtiö Vaalimaa	Tieyhtiö Ykköstie
Established	28.8.1996	2011	19.5.2015	11.07.2005
Completion date according to contract	1.9.2000	2015	2018	-
Actual completion date	17.9.1999	2014	2018	2009
Delivered to public sector	2012	2026	2034	2029
Initial investment	26 million €	153 million €	35 million €	22 milion €
Total cost	235 million €	-	-	-
Realised financial statements	1997-2013*	2012-2019*	2015-2019	2005-2019
Estimated financial statements	-	2020-2026	2020-2034	2020-2029
Missing realised financial statements	*1999	*2017	-	-

Figure 7. Base facts about companies used in the empirical evidence.

6.1.1 Tieyhtiö Nelostie Oy

Tieyhtiö Nelostie Oy was the first privately financed motorway in Finland (Tiehallinto, 1999). The part of the motorway built was from Järvenpää to Lahti, a stretch of 70km, which included 88 bridges. Finnish Transport Infrastructure Agency (Väylävirasto) deemed the project as successful (Sinvervä, 2012). The initial plan to deliver the project, according to contract, was set for 1.9.2000, however construction was completed early and the motorway was opened 17.9.1999. Meaning that the constructions were finished one year before contracted. The costs were also under

budget, with total costs landing at 235 million euros (Sinervä, 2012). The initial investment was 26 million euros according to the financial statement from 1997.

The company was established 28.8.1996 by Skanska, with the sole purpose to build and finance the motorway. Realised financial statements from 1997 to 2013 have been collected as data. The financial statement for 1999 was not accessible, so the financial statement has been estimated by calculating a median from the years 1998 and 2000. 2013 is the last financial statement, as the company dissolved after the motorway was delivered to the public sector's ownership.

6.1.2 Tieyhtiö Valtatie 7 Oy

Tieyhtiö Valtatie 7 Oy was established in 2011 by Yit, Destia, Meridiam Infrastructure Projects S.á.r.l and Keskinäinen Eläkevakuutusyhtiö. The purpose of the company is to deliver E18 Koskenkylä-Kotka motorway as a PPP to the Finnish Transport Infrastructure Agency. According to the contract the motorway was scheduled to be fully opened to the public in 2015 and the procurement's ownership will be handed over in 2026 (Yit Group, 2011).

The motorway was fully opened to the public one year in advance in 2014. The total cost of the service is estimated at 623 million euros (Väylävirasto 2022b), with the initial investment being 153 million euros according to the company's financial statement from 2012.

Realised financial statements for the years 2012-2019 are collected as data. The year 2017 has been estimated with a median from the years 2016 and 2018. The years 2020-2026 have been estimated as forecasted figures by using data from the previous financial statements and basic bookkeeping principles.

6.1.3 Tieyhtiö Vaalimaa Oy

Tieyhtiö Vaalimaa Oy was established in 2015 by YIT and Meridiam Infrastructure Finance II S.á.r.l, with the purpose to finance, build and maintain E18 Hamina-Vaalimaa motorway until the year 2034, when it will be handed over to Väylävirasto (Yit Group, 2015). The Hamina-Vaalimaa part of the motorway was, according to contract, planned to open to the public in 2018, which it successfully did (Väylävirasto 2022c).

The initial investment for the procurement was 35 million euros, for a 32 kilometre long motorway including other road arrangements (Väylävirasto 2022c). Financial statements for the years 2015-2019 are available for data collection. Financial statements for the years 2020-2034 have been estimated with previous financial statements and basic bookkeeping principles.

6.1.4 Tieyhtiö Ykköstie Oy

Tieyhtiö Ykköstie Oy was established in 2005 by Skanska Ab, John Lang Ltd and Lemminkäinen Oyj. The purpose was to deliver E18 Muurla-Lohja motorway to Väylävirasto as a PPP. The motorway was completely finished and opened to the public in 2009 (Väylävirasto, 2020), the contracted date was not stated or found in public documents. According to the contract Tieyhtiö Ykköstie Oy will deliver the procurement in its entirety to Väylävirasto in 2029 (Väylävirasto, 2020).

Initial investment of the procurement was 22 million euros. The procurement total estimated value is at about 700 million euros (Väylävirasto, 2020). Realised financial statements from 2005-2019 have been collected as data. Financial statements for the years 2020-2029 have been estimated with the help of previous financial statements.

6.2 Results from computations

6.2.1 FCFF in the case study objects

In order to estimate Project IRR in the procurements, FCFF has been calculated and estimated for each year for each of the procurements. These are presented in the following four figures to give a better understanding of the cash flows.

In figure 8 FCFF for Tieyhtiö Nelostie Oy is presented. The cash flows are relatively even, with the first four years being negative. After the initial negative cash flow, the cash flows grow and are even until the end of investment.
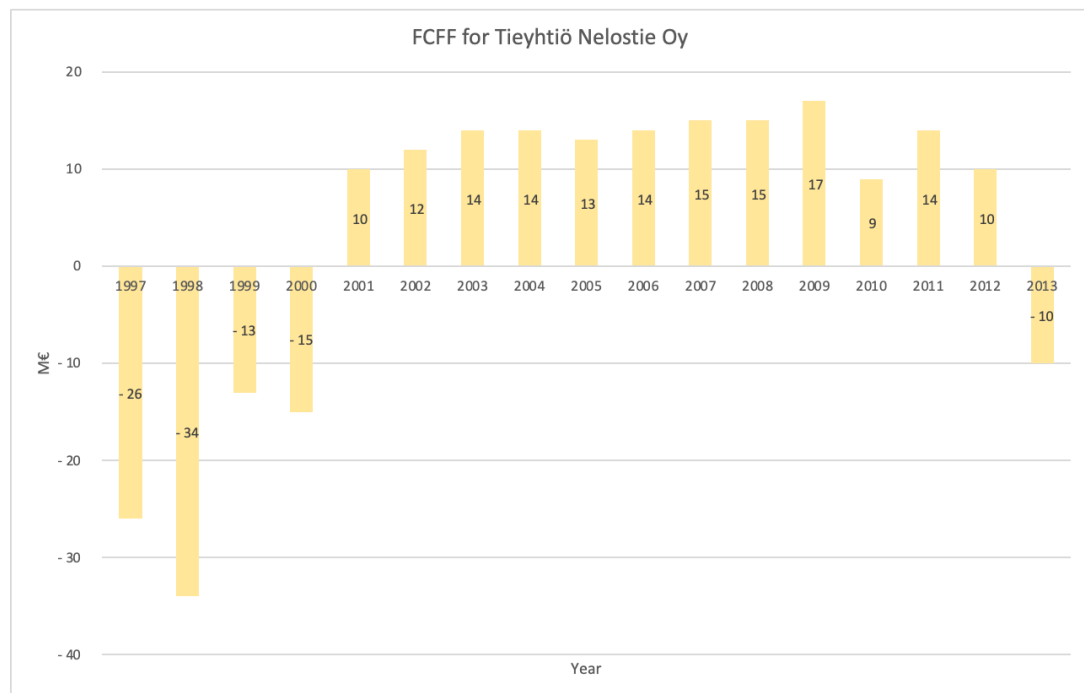

Figure 8. Graph of FCFF in Tieyhtiö Nelostie Oy.

Figure 9 presents FCFF for Tieyhtiö Valtatie 7 Oy. Similarly to Tieyhtiö Nelostie Oy, the cash flows are negative the first three years, after which the cash flows become positive and are growing relatively evenly.
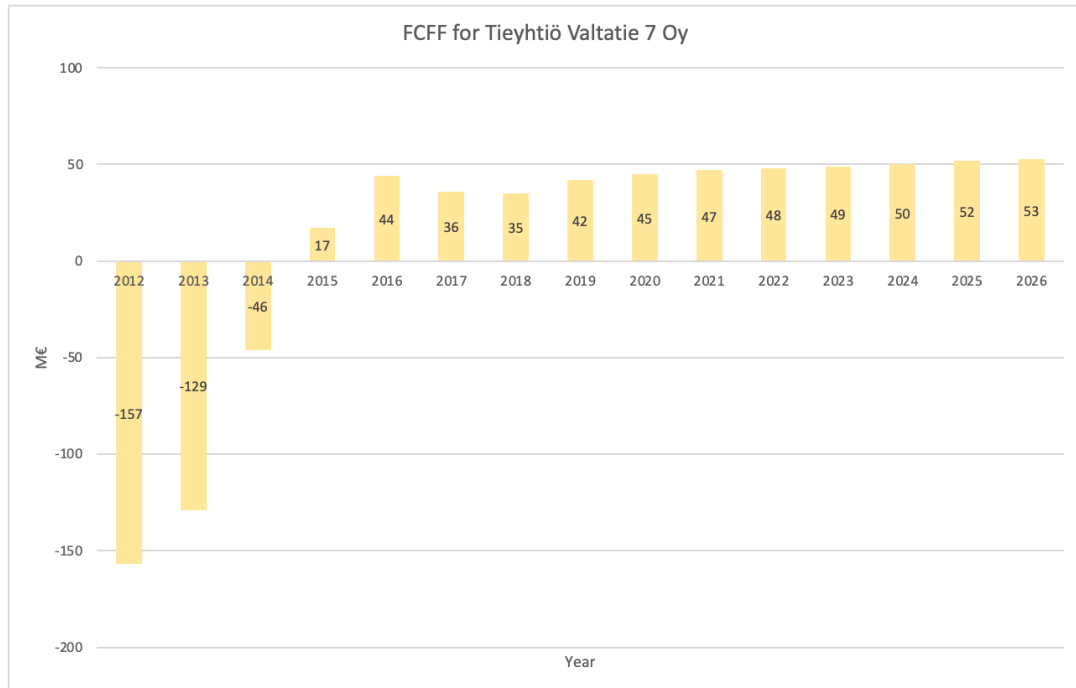
Figure 9. Graph of FCFF in Tieyhtiö Valtatie 7 Oy.

FCFF for Tieyhtiö Vaalimaa Oy is presented in Figure 10. The FCFF in the procurement follows the same patterns as the previous two. First three years FCFF is negative, after which it grows steadily each year, with the exception of year four.
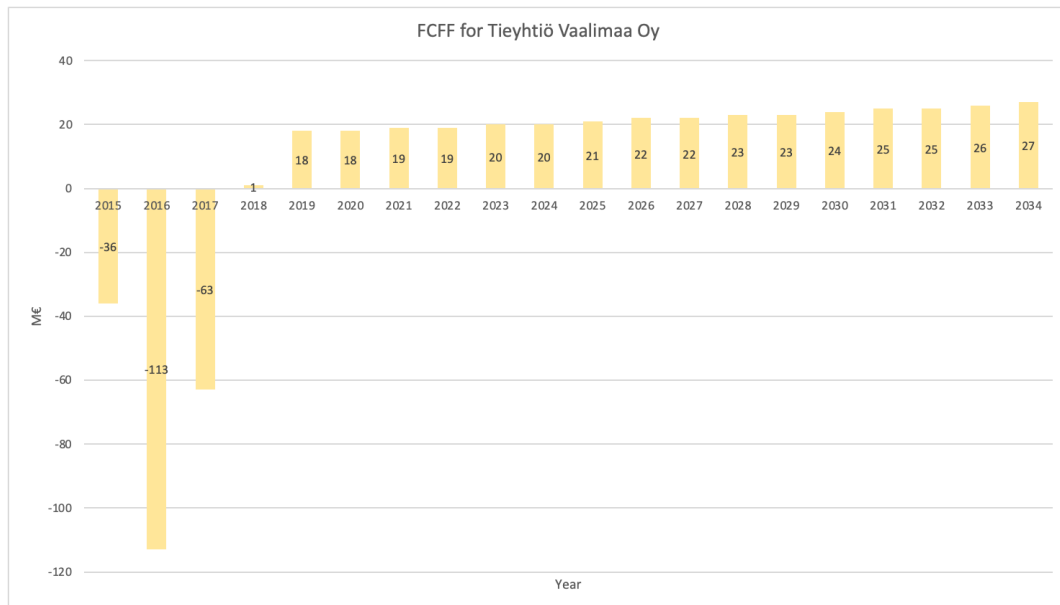

Figure 10. Graph of FCFF in Tieyhtiö Vaalimaa Oy.

Lastly figure 11 presents FCFF for Tieyhtiö Ykköstie Oy. Cash flows for Ykköstie mostly follow the same pattern as the other procurements. First four years the cash flows are negative, after which they become positive and are relatively stable.
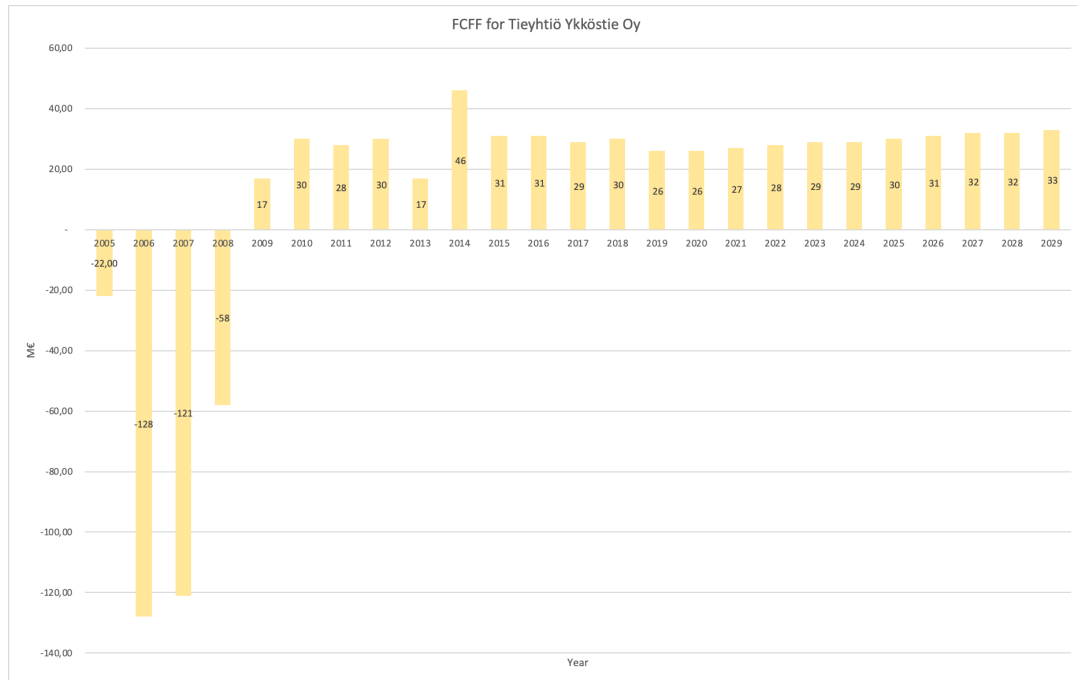
Figure 11. Graph of FCFF in Tieyhtiö Ykköstie Oy.

6.2.2 IRR in the case study objects

IRR in all of the procurements range between 5.00% and 7.46%. Tieyhtiö Nelostie Oy which is delivered to Väylävirasto entirely has the highest IRR, with it being 7.46%. Tieyhtiö Vaalimaa Oy has the lowest predicted IRR, at 5.00%. Tieyhtiö Valtatie 7 Oy has a predicted IRR at 5.61% and Tieyhtiö Ykköstie Oy has a predicted IRR as 5.72%. In figure 12 Project IRR for all four companies is presented.

Case study object	Project IRR
Tieyhtiö Nelostie Oy	7.46%
Tieyhtiö Valtatie 7 Oy	5.61%
Tieyhtiö Vaalimaa Oy	5.00%
Tieyhtiö Ykköstie Oy	5.72%

Figure 12. Project IRR for the case study objects.

7   RESULTS

The chapter will start by presenting the analysis of the empirical evidence and previous studies. The analysis includes background to why Project IRR was chosen as the method to calculate return for the object cases. This will be followed by an analysis on the Project IRRs in case study objects with Project IRRs from previous studies. The chapter will lastly include a discussion of the presented analysis and recommendations for further research within the field.

7.1 Analysis

From the literature review of previous studies in chapter four that have analysed returns PPPs ex post facto, it has been concluded that calculating IRR is the best suited option for this thesis. From the theoretical background it was determined that analysing IRR is better suited than ROI or NPV. ROI does not take into consideration the value of time (Lindblom & Sjögren, 2020) and NPV merely determines that an investment is profitable if the NPV is over zero (Almqvist et al., 2017). IRR estimates the future return of the whole investment, during its whole life cycle. The IRR can be compared to different benchmarks depending on the study.

More specific Project IRR is calculated in the thesis, since it showcases the return for the entire company and all shareholders (Vecchi et al., 2010). Project IRR is based on calculating FCFF. FCFF is cash that can potentially be distributed to both shareholders and lenders (CFI, 2022b). Meaning that Project IRR reflects the entire return on an investment.

Project IRR is calculated by estimating FCFF for the procurements. As Drury (2012) stated investments conventionally have negative cash flows during the first years which are followed by positive cash flows. The flaw with IRR is that if the algebraic sign changes in the cash flows, there will be as many possible IRR as there are

changes in signs (Drury, 2012). In this thesis, the case objects have conventional cash flows, with the exception of Tieyhtiö Ykköstie Oy for two years, when the cash flows are irregular. This means that IRR for the case objects is a good measurement.

7.1.1 Analysis on the FCFF

FCFF follows the same pattern for each of the case study objects, which can be seen in Figures 8-11. FCFF in all companies is negative for the first three to four years and becomes positive until the company is dissolved. The reason for this can be explained by the fact that FCFF is negative for those years that construction is ongoing or there are construction costs. Tieyhtiö Nelostie Oy has a positive cash flow 2001 and onwards, with the motorway being completed in 1999. Similarly Tieyhtiö Valtatie 7 Oy has its first positive FCFF in 2015, with the motorway being completed one year prior in 2014. This could mean that there were some construction costs that were delayed by a couple of years in these two procurements. Meanwhile in Tieyhtiö Vaalima Oy and Tieyhtiö Ykköstie Oy FCFF became positive the same year as constructions were completed. For Tieyhtiö Vaalimaa Oy FCFF was positive 2018 and the motorway was also completed in 2018. Similarly Tieyhtiö Ykköstie Oy had positive FCFF in 2009 which was the same year that constructions were completed. It can be concluded that in these two latter case study objects, construction costs last year were not as high, so that FCFF could become positive the same year. For Nelostie FCFF the last year is different from the rest, since it is negative. This is due to the company having other operating expenses in the last year, however there was no income that year.

7.1.2 Analysis of the Project IRR

In Figure 6 IRR and annual return from different previous studies were presented. If these are compared to the case study objects, it can be concluded that within Finnish Project IRR is lower than these. IRR in studies by Vecchi et al. (2010), Vecchi &

Hellowell (2013), Fernandes et al. (2016) and Santandrea et al. (2017) are calculated from specific IRR projects within infrastructure. This makes their IRRs most comparable to the case study objects. In these four European studies, IRR is much lower than in the others. They are also much closer to Project IRRs in the Finnish case studies. In conclusion for this part of the analysis, Project IRR for the Finnish PPPs in roads can be estimated to be lower than the PPPs used as the benchmark IRRs.

However, comparing IRR from different countries and different years can be misleading and does not answer how much the government pays more for a specific project as a PPP. IRR from different projects can be misleading as comparisons, since it consists of a discount rate. Discount rate is affected by inflation, crises and common world situations, meaning that discount rate in different years and in different countries varies. IRR in different projects can therefore be used as a benchmark, to compare if there are common trends between different projects.

In order to calculate how much the public sector pays excess of a PPP as returns, IRR can be benchmarked against its WACC. This is according to Vecchi & Hellowell (2013) a good comparison, since project WACC is the cost of capital of a project, meanwhile Project IRR is the rate of return on a project. If IRR is higher than the cost of capital, the excess is the overprice paid by the public and of bad value (Vecchi & Hellowell, 2013).

To calculate a WACC cost of debt, cost of equity and a ratio between these two is needed (Vecchi & Hellowell, 2013). The cost of debt can be difficult to determine since the swap credit premium and credit margin are needed. The swap credit premium is not accessible, for example Vecchi & Hellowell used in their analysis swap credit premium average from previous PFIs in the UK. In Finland, the case study objects are the first and only PPP projects, so a comparable swap credit premium does not exist. The credit margin can also be difficult to assess, however since PPPs are usually low risk projects it can be assumed that this should be low (Vecchi & Hellowell, 2013).

Since WACC cannot be calculated in this case study, another method needs to be chosen. The method chosen is adapted from Fernandes et al. (2016) study. Fernandes et al. (2016) compare return of PPPs to if public debt was raised in a PSA project. The study's results showcased that PPPs financing costs are on average 370 base points higher than in PSAs, which is 3.7% (Fernandes et al., 2016). Similarly to the Portuguese study, in this thesis monthly yields on Finnish benchmark government bonds for a maturity period of 10 years has been used as a benchmark (Suomen Pankki). The month chosen for each case is the month that constructions for the procurement started. Figure 13 showcases the benchmark government bond yields, project IRR for the case study objects and the difference between these.

Case study object	Yields on benchmark government bonds		Project IRR	Difference
Tieyhtiö Nelostie Oy	May 1997	6.26%	7.46%	1.20%
Tieyhtiö Valtatie 7 Oy	December 2011	2.31%	5.61%	3.30%
Tieyhtiö Vaalimaa Oy	June 2015	1.03%	5.00%	3.97%
Tieyhtiö Ykköstie Oy	October 2005	3.33%	5.72%	2.39%
Average			5.95%	2.715%

Figure 13. Yield on government bonds with 10 year maturity compared to case study objects Project IRR.

As seen in Figure 13, the difference between Project IRR and yields on government bonds is between 1.20-3.97%. This means that the public sector in Finland pays on average 2.72% more for the four case study object PPP alternatives, than if a traditional procurement was chosen. However, since in PPPs risk is transferred from the public sector and budget and time overruns are rare compared to traditional procurements where these are common, the question stands if the excess is reasonable. In order to make this analysis previous studies are analysed and discussed. Figure 14 showcases previous studies results on budget and time overruns in PSAs.

Study	Country	Year	Overrun type	Overrun %
Fernandes et al. (2016)	Portugal	1985-1995	Cost	77 %
Boardman et al. (2016)	Europe	1990-2005	Cost	24 %
Shaoul et al. (2007)	UK	-	Cost & Time	28 %
Grimsey & Lewis (2005)	UK	-	Time	17 %
Grimsey & Lewis (2005)	UK	-	Cost	47 %
Infrastructure Ontario (2015)	Canada	-	Cost	18-47 %

Figure 14. Findings on cost and time overruns in previous studies.

In Figure 14 it is showcased that according to previous studies cost overruns in traditional procurements are on average between 18-77%. Time overruns are on average between 17-28%. No studies from Finland were found for the analysis. However, these average overruns are one time occurrences on PSAs, meanwhile the excess of 2.72% percent is paid yearly. This means that these are not directly comparable and more analysis is needed to evaluate the excess return. Compared to the average excess return in the Portuguese study by Fernandes et al. (2016), here excess average was analysed to 3.7%, the average excess return of 2.72% is reasonable.

PPPs also have many advantages compared to traditional procurements, which make the excess return reasonable. In Portugal the excess was acceptable, since without PPPs the road system could not have been updated and many parts of the country would be inaccessible, since the government did not have the resources to build the roads without private financing (Fernandes et al., 2016). PPPs are also contributing with innovation to the specific fields and since the private companies are responsible for maintenance and its costs also quality becomes better (Himmel & Siemiatycki, 2017).

Figure 12 answers the first part of the research question which was what is the Project IRR in the four Finnish infrastructure PPPs? Project IRR in the case study objects was between 5.00-7.46%, with average Project IRR landing on 5.95%. To answer the second part of the research questions of the thesis regarding if the excess paid for PPPs is reasonable, the following has been concluded. If these average cost

overruns of 18-77% and time overruns 17-28% are taken into consideration with the addition of possibilities that the public sector would not have been able to build the roads due to lack of resources and that the quality of the roads is most likely better an excess return of 2.72% can be seen as reasonable to pay for PPPs. There is also a high probability that the actual costs of a traditional procurement could become higher if the worst case scenario from Figure 14 is taken into consideration, where cost overruns would be 17%.

7.2. Discussion

Buso et al. (2021) state in their study, that IRR is often higher in a PPP rather than in a PSA. This is due to the premium taken by the SPVs for taking the risks and ownership of the procurement. However, if the premium is too high, the PPP is too expensive from the public perspective. Studies such as Vecchi & Hellowell (2013) due to this claim that a PPP is of good value if its cost of capital is higher than its IRR. The return in a PPP can also be compared to other projects, to see if there are some similarities. The case study objects in this master´s thesis were lower than in other studies which can be caused by many factors. The discount rate being one of the main affecting factors. It is also possible that in some countries IRR is lower than in others, which could be possible for Finnish projects. According to studies Australian infrastructure projects have commonly higher IRR compared to other countries (Haran et al., 2019). If more Finnish infrastructures are studied, possibly similar findings could be done.

The Project IRR in the case study objects was on average lower than the PPPs they were compared to. Meaning that the four Finnish PPPs are of better value to the public, compared to their benchmarks in other countries. However, since comparing IRR in different procurements can be misleading Project IRR was also compared to yields on Finnish benchmark bonds. The yields on bonds were as expected lower than the Project IRR in case study objects. However, the excess can be seen as

reasonable since traditional procurements commonly have cost and time overruns and PPPs have many benefits in comparison to PSAs. Since this is a qualitative study, no generalisations can be made on the results. This thesis contributes to the study field by researching what Finnish PPPs have costs to the public and showcasing to the public sector that the choice between PPPs and PSAs is not always clear. From a public view, the results can be interesting and generate more discussion and studies on the topic. As discussed previously in the thesis, PPPs and the discussion surrounding these is not transparent, with this thesis the discussion becomes more open and it can bring more transparency on the costs of PPPs.

Since the need for PPPs will increase due to many countries' budget cuts (Iossa & Saussier, 2018) and the need for maintenance on infrastructure also increasing, it is important that return rates in PPPs are studied more. Even though public spending can be deferred by PPPs, the excess paid for them is money that could be spent on other infrastructure improvements (Vecchi & Hellowell, 2013).

7.2.1 Recommendations for further research

Previous studies in PPPs are focused on determining if a PPP is a profitable option compared to a PSA, however most of the studies use budgeted numbers to make these determinations. It would be beneficial to study more PPPs from the realised costs, rather than budgeted costs.

The case study objects used as data in this thesis can also be studied more. It would be beneficial to study their WACC compared to the Project IRR and compare these PPPs to traditional procurements of similar type. Using WACC as the benchmark to Project IRR would give an answer on how much the excess paid by the public sector is. Academic studies about PPPs within Finnish infrastructure are also something worth studying in the future, since compared to other countries they are quite few.

SUMMARY IN SWEDISH - SVENSK SAMMANFATTNING

IRR i fyra finska PPP företag i finska infrastrukturprojekt

Infrastrukturprojekt i Finland, så som i andra länder i världen, har kritiserats starkt på grund av att de ofta överskrider sin budget och sina tidsramar (Collin, 2020). En orsak till detta är oftast att de, särskilt budgetarna, är otillräckligt planerade och planeringen har gjorts på en ytlig nivå (Herrala, 2021). För att förebygga otillräcklig planering och att ramarna överskrids i projekten har regeringar i flera länder sedan 1990-talet använt sig av privata aktörer för att verkställa projekt, istället för det traditionella offentlig sektor-alternativet (Public Sector Alternative, PSA). Alternativet som oftast används för att finansiera och förbättra infrastrukturprojekt är offentlig-privat partnerskap (Public-Private Partnership, PPP) (Boardman, m. fl., 2016). I ett PPP äger det privata företaget investeringen under byggtiden och flera år efter, eftersom de även har ansvar för underhållet av investeringen. Detta leder till att privata aktörer har större ansvar och större risk i investeringar och leder oftast till att kvaliteten på produkterna blir bättre (Boardman, m. fl., 2016).

PPP anses föra med sig innovation, expertis och bättre riskhantering av infrastruktur. De är även ett sätt för stater att finansiera projekt då de anses hålla budget och tidsramarna, dessutom sker betalningen under förlopp av 15–20 år som serviceavgifter. Detta innebär att i stället för att staten betalar stora summor till företag under några årsperioden för sitt arbete, kan betalningarna fördelas i mindre summor på flera år och företagen förbinder sig att ta mera risk och ansvar inom infrastrukturprojekten (Burger & Hawkesworth, 2011; Grimsey & Lewis, 2007).

Eftersom PPP har använts i Finland för fyra vägprojekt inom infrastruktur, väcks frågan om PPP är ett bättre alternativ än PSA från skattebetalarnas synvinkel. Innan de statliga aktörerna väljer huruvida något projekt ska verkställas som PSA eller PPP, måste man beräkna vilket ger mera värde för pengar (Value For Money, VfM) (Regan, m. fl., 2011). I denna process kan privata företag presentera sin offert för statliga aktörer, i hopp om att vinna bud tävlingen för att få bygga

infrastrukturprojekt i form av PPP. Dessa PPP-företag tar en premie för att de tar risken för projektet och även en premie för anbud som gjorts för att vinna projektet, vilket ökar på hela investeringens kostnad och ska tas i beaktande när valet görs. Om en PPP väljs, har detta valts på basis av budgeterade siffror från anbud, vilket innebär att de slutgiltiga kostnaderna för staten kan vara olika jämfört med de presenterade innan något alternativ valts.

Syftet med denna avhandling är att undersöka om PPP-företag inom finsk infrastruktur är ett lönsamt alternativ från skattebetalarnas synvinkel. Detta görs genom att beräkna vad fyra vägbyggen i Finland som har byggts som PPP:n har avkastat under projektets hela livslängd. I avhandlingen har avgränsningar gjorts för att fokusera på byggprojekt inom finsk infrastruktur. Antalet är fyra, eftersom i Finland har vägar byggts som PPP enbart fyra gånger.

För att beräkna investeringens värde finns det flera olika metoder. De två vanligaste metoderna är nuvärdesmetoden (NPV) och internräntemetoden (IRR) (Lindblom & Sjögren, 2020). NPV beräknar framtida kassaflöden till deras nuvärde (CFI Team, 2022a), medan IRR diskonterar kassaflöden för att beräkna den totala avkastningen för investeringen (Goedhart, m. fl., 2015). För båda metoder krävs det att man beräknar investeringens fria kassaflöden för hela dess livslängd. Detta innebär att framtida fria kassaflöden behöver estimeras för att kunna beräkna investeringens avkastning.

Eftersom syftet med avhandlingen är att beräkna vad avkastningen har varit eller förväntas bli för de fyra företagen, har företagens IRR beräknats. För att göra detta möjligt krävs det att man beräknar fria kassaflöden för hela företaget (FCFF). Med FCFF beräknas hur mycket likvida medel det finns för att distribuera till alla medverkande parter (CFI Team, 2023). FCFF kan beräknas på flera olika sätt, men i denna avhandling har det beräknats genom att subtrahera avskrivningar och amorteringar, räntekostnader samt förändring i rörelsekapital och kapitalutgifter från nettoinkomsten (CFI Team, 2023).

Tre av fyra projekt som ska beräknas, har inte ännu slutförts, vilket innebär att framtida kassaflöden behöver estimeras för att kunna beräkna investeringarnas IRR. För att göra detta har det gjorts antaganden om följande. Inflationen antas på längre sikt vara 3 %, skattesatsen antas vara 20 % enligt statsskatten och räntesatsen 2,5 % vilket är taget från Finland Banks webbsidor om räntesatsen. Även förenklingar och justeringar har gjorts vid beräkningarna. Ett av de fyra PPP inleddes 1997, vilket innebär att boksluten för 1997–1999 är i mark, som här har förvandlats till euro. För några år stämmer inte heller räkenskapsperioden med kalenderåret. Dessa har förenklats för att stämma överens med kalenderår, vilket orsakar enbart marginella fel. Alla bokslut finns inte heller till förfogande, så för några enstaka år har en median räknats från åren före och efter, vilket även påverkar resultatet enbart marginellt.

De fyra PPP-företagens estimerade IRR analyseras med hjälp av tidigare studier inom ämnet. Tidigare studier om vad IRR har varit i andra länder för motsvarande projekt jämförs och även diskussion utförs på basis av tidigare studier om vad som kan anses vara en passlig grad av IRR för PPP-projekt. IRR är den premie som företagen tar för att de tagit ansvaret för investeringen, vilket även är det som skattebetalarna betalar som tillägg för investeringen.

IRR för Tieyhtiö Nelostie Oy beräknades till 7,46 %. Detta var den högsta IRR i fallstudien. Tieyhtiö Valtatie Oy estimeras ha IRR på 5,61 %, Tieyhtiö Vaalimaa Oy på 5,00 % och Tieyhtiö Ykköstie Oy på 5,72 %. Då man jämför fallstudiens IRR mot tidigare studier, är de lägre.

Ämnet PPP och deras lönsamhet från statens sida bör studeras mer, särskilt på basis av förverkligade bokslut, eftersom de flesta studierna inom ämnet är baserade på budgetsiffror. Inom Finland särskilt finns det mycket att studera inom för att effektivera användningen av PPP.

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