# LITERATURE REVIEWS

# PUBLIC PRIVATE PARTNERSHIPS: LOOK BEFORE YOU LEAP INTO MARRIAGE

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#### Abstract

Public Private Partnerships (PPP) have gained importance since they have seen the daylight. The synergies and value for money that can be created by engaging in a long-term commitment can be appealing, but as in every marriage planning is a necessity. This research focuses on the two important issues in planning. Firstly, it considers how the tendering phase should be concluded while guaranteeing the best of both worlds, namely public provision with private engagements. Secondly, the most common practices to manage risks are studied. The literature shows that the societal relevance of this topic is increasing, but research findings in other project planning areas should be extrapolated to this peculiar way of contracting.

Keywords: competitive tendering; contract bid; Public Private Partnerships (PPP); risk management

JEL Codes: D81

## I. INTRODUCTION

It is a very daunting task to define a public private partnership (PPP). The concept is widely known around the world, but there is a lot of disagreement about the content of this concept.

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Some authors argue that it has always been there. Wettenhall (2010) claims that PPPs have been developed from the earliest civilizations onwards, but that might be a little bit misleading. The PPP acronym itself has been used since the seventies and got a buzzword status in the nineties with the rise of the importance of the Public Finance Initiative for social and economic environment renewal under surveillance of the public expenditures (Bovaird, 2010).

Several attempts have been made to define a PPP (e.g. Wettenhall, 2010, Hodge and Greve, 2007, Van Ham and Koppenjan, 2001), but no consensus has been established. That might be due to the wide landscape of features that a PPP contract can adopt. As stated by Yang and Yang (2010), several contract types are possible: build-own-operate-transfer, joint ventures, sale-and-lease-back, design-build-maintain, et cetera. Besides, legal requirements may provoke different interpretations of the concept. For the purpose of this research, all the ornaments of the sometimes exotic definitions will be removed in order to keep the essential characteristics in the proposed definition: a public private partnership is a settlement between a public party and a private sector company to engage in a long-term contractual agreement for designing, building and operating capital intensive projects while trying to attain value for money by the appropriate allocation of risks.

Ahadzi and Bowles (2004) and Yang and Yang (2010) identified that the contract negotiation phase is the critical stage in the PPP process, often causing delays and overruns of the advisory and bidding costs of approximately 25% to 200%. In total, 85 per cent of the PPP projects run over time because of inefficiencies in the contracting procedure (Ahadzi and Bowles, 2001). Several attempts have been initiated to analyse the different aspects of the tendering process. This paper tries to structure and integrate the different research fields and will try to identify the current trends and niches that should be elaborated by future scholars to overcome key challenges.

## II. METHODOLOGY

PPPs have been studied in several research fields: political sciences, legal sciences, planning, international business, finance and relationships. Both empirical as well as non-empirical studies have been performed based on case studies, surveys, literature reviews and interviews (Tang et al., 2010). For the purpose of this research, papers between 2004 and 2011 of prominent journals have been analysed. The *International Journal of Project Management*, The *Journal of Construction Engineering and Management* and *Construction Management and Economics* were the main data sources, accompanied by the readings of articles suggested by the Web of Science. Approximately 125 papers have been studied and in this text the highlights and most important trends in PPP planning research are reported. Finally, the Vlaams Kenniscentrum PPS (www2.vlaanderen.be/pps/), a governmental institution that functions as a public research agency for PPP contracting, has been interviewed in order to gather real-life experience of the PPP field in Flanders.

### III. THE EMPIRICAL PPP FIELD

PPPs have been a popular means to perform long-term public investments. Hodge and Greve (2007) describe PPPs as a mega credit card for governments. In 2010, the total market value of all PPP projects in Europe reaching financial close was EUR 18.3 billion, a significant increase after the worse performance of 2009 (EPEC, 2011). PPP contracting is most popular in the United Kingdom and Australia, but also South-America, Europe and Asia are getting more involved in PPP contracts.

The literature on PPPs covers different research areas. Hodge (2010) points to the multidisciplinary character of PPPs as one of the major challenges. Law disciplines raised their interest in PPPs. The definition of a PPP differs according to the region and the ESA (European System of Accounts) neutrality is a hot topic. ESA neutrality refers to the fact that a PPP project must meet certain conditions in order to allow a government to remove it from its balance sheet, also relying on the accountant's knowledge. Economists study the societal impact of PPPs and will assess the social marginal cost. Engineers will be involved in the feasibility studies and project management scholars will ensure an adequate planning of the project. Due to the often high dependency on the capital market for e.g. financial risk management, raising equity capital and debt finance, financial institutions and finance practitioners will also be involved. In this study, only the planner's point of view is applied.

Pro and contra arguments have been formulated. The most cited advantages are substantial public benefits, cost savings and the risk sharing opportunities (Bloomfield, 2006). Of course, the appraisal often depends on a country-specific infrastructure. Some governments are not yet prepared to engage in PPP projects and other legislations will never be suitable for PPP contracting. The most popular criticism is that it is more expensive to raise capital from the market for the private company than for the public sector. Consequently, in order to create value for money, the cost savings and efficiency gains should outweigh the higher cost of capital. Other often encountered disadvantages are based on the complexity of the contract and the inherent dangers (e.g. lock-in, moral hazard and adverse selection) (Zou and Fang, 2008).

Case studies of good and bad PPP experiences have been performed. Indeed, as PPP contracting might sound nice, experiences were not always prospering and sometimes even disastrous. The next section investigates one of the most vital process steps: the tendering phase and the preparation of the project proposal.

#### IV. TENDERING

The tendering process is composed of several steps. Firstly, the government will launch a project proposal which will be evaluated by the private parties who will, after a prequalification by the government, bid or not bid for the project. The public agencies will analyse the

contractors' proposals, often based on multi-attribute decision making. That means that contractor selection is not solely based on price but for instance also on the quality of the contractor. The bidding procedure itself can have diverse forms depending on a country's policy, but the competitive dialogue seems to gain popularity. Here, there is still room for clarification and feedback when a private entity submits a proposal, while guaranteeing a competitive setting for bidding.

Three critical aspects are under study. Firstly, the pricing of a construction contract by a private partner is an essential issue. Secondly, the bidding procedure has gained importance and last but not least, risk management is incurred in the model. We assume that the bidding price is dependent on a number of factors: the cost of the project, the number of bidders and their experience in the field, the governmental policies about competition creation and the management of risk.

Pricing methodologies have been studied extensively. The most popular quantitative methods are net present value methods (Shen et al., 2002), regression models (Ngee, 1997), Monte Carlo simulations (Zhang, 2009), social marginal cost pricing (Eriksen and Jensen, 2010), System-Dynamics (Xu et al., 2012) and fuzzy logic (Ng et al., 2007). The literature mainly focuses on pricing for infrastructure projects, while pricing mechanisms for partnerships with educational purposes, healthcare solutions or prison operation are less common.

Pricing is of course not equal to bidding. As stated earlier, the contractor will also take other factors into account, like the number of bidders, the quality of the government or the attractiveness of the project. All these (and probably even more) determinants will be considered in the composition of the optimal bid. Shr and Chan (2003), for instance, show graphically how to determine a minimum contract bid. The bidding procedure is analysed in further detail in the next paragraph.

Besides, the government has to cope with corrupt behaviour of bidders. The situation of asymmetric information incurs moral hazard problems and adverse selection issues. De Palma et al. (2007) acknowledge that PPP agreements suffer from contractual risks that need to be covered.

#### A. BIDDING

From a contractor's point of view, Wang et al. (2009) apply a phase classification for competitive bidding, starting with the acquisition of the project information followed by a pre-evaluation of the project deciding to bid or not to bid. Thirdly, in the mid-evaluation of the project, the private party decides how to bid and afterwards the implementation of the project can be taken care of.

When we also take the government into account, the bidding process can be seen as consisting of the following steps: (1) the government launches a project and it calls for tenders,

(2) the private entities will evaluate the project and decide whether to bid or not, (3) the government will perform a pre-qualification, (4) the bidders perform further feasibility studies and decide upon which bid to launch, (5) the government will select the preferred bidder and might execute the bid compensation model by reimbursing the private parties for the pre-tendering costs.

Wang et al. (2009) give an overview of the performed research about pre-evaluation of projects in a project bidding context. Pre-evaluation means the determination by the private entity whether it is interesting or not to spend time and resources on the bidding procedure. Next to the general pricing methodologies mentioned before, a wide range of decision methodologies is known in the literature for the private partner on how to decide on the different aspects of the bid, like the probability to win a bid (Cagno et al. 2001), the optimal length of the concession period (Ng et al., 2007) and the composition of a project portfolio (Wang et al., 2009). These methodologies have a general approach and cannot always be induced to a PPP framework. The most applied are cost analysis methods (Okpala, 1991), analytical hierarchy process methods (Alidi, 1996), linear and integer programming (Gori, 1996), fuzzy logic methods (Wong et al., 2000) and evaluations based on utility theory (Moselhi and Deb, 1993). Zitron (2006) remarks that the chance to win a bid plays a significant role in the bid/no-bid-discussion, next to the perceived risk of the project.

From the public point of view, McAfee and McMillan (1986) claim that a lack of bidders can involve the disruption of the value for money concept and, on the contrary, a larger number of bidders might force strong bidders to be reluctant to bid because of the reduced probability of winning, while they are faced with a possible high sunk cost of the feasibility and tendering costs.

Consequently, the government can come into play to stimulate the competition in the bidding stage. Zou and Fang (2008) identified the lack of competition as one of the important reasons for failure. Ho (2008) used a game-theoretical approach to model a possible bid compensation system by the government in which the second best bidder is paid a compensation fee to cover its bid preparation costs. That might generate improved efforts in the bidding stage by private partners. Interestingly, Ho (2008) concludes differently. Only under a limited number of conditions, bid compensation could help, but in general the effect is not outspoken and he advises governments against compensating the bidders. Nonetheless, the assumptions applied can be questioned. All bidders are assumed to be equally good, the attribution of the project is solely based on price and bid compensation is only given to the second best bid, which is not really a reproduction of reality. Governments can apply different schemes for bid compensation and one might argue that an equal share of compensation to all preselected bidders or a decreasing share attributed in decreasing order of bid quality is a better option. There is not yet a consensus about the advisable policy: in the Netherlands, for instance, the compensation fee has been increased, while in the United Kingdom concerns were raised about possible perverse incentives of non-qualitative bidders that, attracted by the appealing compensations, will bid anyway without being properly capable of conducting the project.

The contractor will then have to decide how much he will invest in planning, feasibility studies and risk analysis to submit a bid that is of sufficient quality for acceptance and that yields the desired profit. As stated earlier, the probability of winning is taken into account and thus the bidding problem can be rephrased as follows: maximize the expected profit under the environmental conditions known as the number of other bidders, the characteristics of the project (e.g. risk, partnerships, relationships) and the different stakeholders' attitude and policies.

The final decision lays at the public side. The proposals and bids will be evaluated against multiple criteria depending on the project characteristics. The multi-criteria decision theory offers methodology to deal with these complex systems of decision making. According to the Vlaams Kenniscentrum PPS, in Flanders the selection depends approximately for 40% on price and for 60% on the content and quality of the proposal. In game-theoretical modelling as in Ho (2008), this is often disregarded. It is challenging though to assure a reasonable evaluation of monetary and non-monetary aspects. Vertex methods with a probability distribution (Mohamed and McCowan, 2001), analytical hierarchy process (Cagno et al., 2001), regression analysis, fuzzy logic and fuzzy multiple criteria decision making (Hsieh et al., 2004) have the aim to assess the quality of the bids.

The bidding game itself is a static game with asymmetric information, often called a static Bayesian game, between different contractors and with the government defining partly how the payoffs are determined (Gibbons, 1992). The government determines the payoffs in the sense that it establishes the decision criteria of the assignment and the bid compensation policy. The different bidders have asymmetric information, because they do not know each other's bid. Game theory would be an interesting tool to investigate the behaviour of each agent. Nevertheless, in the literature, a real quantitative analysis is lacking.

#### B. RISK MANAGEMENT

A next area that has already proven its exigency is risk management. Proper risk management is key in any project, but the PMBOK (PMI, 2008) cannot entail all particular aspects of PPP projects. Al-Bahar and Crandall (1990) define risk as "the exposure to the chance of occurrences of events adversely or favourably affecting project objectives as a consequence of uncertainty". Consequently, risk is a function of the uncertainty of an event and the potential loss or gain resulting from the event. Risk is everywhere in a PPP.

Grimsey and Lewis (2002) underline that the risk in a PPP project is mainly due to the complexity of the arrangement itself. De Palma et al. (2009) add the risk incorporated in the contractual arrangement itself to the traditional project risks.

252

1e PROEF

#### Dennis De Clerck, Erik Demeulemeester and Willy Herroelen

The study of Zwikael and Saleh (2007) revealed that the quality of risk management planning has a positive impact on success measures like customer's satisfaction and technical performance. Planning involves several steps that can be summarized as follows: risk identification, risk analysis and evaluation, risk response management and risk system administration (Al-bahar and Crandall, 1990). This means that there is more than just the identification and quantification of risk. In projects, one also needs to take into account what risk response behaviour is suitable: avoidance, reduction and prevention, retention, transfer or insurance. Besides, risks are not only to be considered upon negotiation of the contract, but risks should be monitored during the life-cycle of the project, so that risk devolution from the private to the public party is prevented (Monteiro, 2010, Zou and Fang, 2008).

How to deal with risks in PPPs has been studied extensively. Fisher (2010) proposes an integrated risk management system for PPP projects. He identifies three dimensions that have to be taken into account. Firstly, one needs to assess risks over the whole project life-cycle, from preparation till transfer, and to allocate the risks on the long term. Next, the analysis of the interests of the public party as well as of the private party have to be studied. Thirdly, Fischer (2010) claims that the project risk management itself has to be integrated with the other dimensions.

Especially, because of the very long-term horizon of these projects, often thirty years and more, particular risk factors show the delicate features of PPPs. The danger lies already in the decision making process of the government to launch a PPP project instead of relying on traditional procurement. Value for money is a common identifier for analysing PPPs. The cost of a PPP to the government are compared to those of a hypothetical counterfactual, the so called public sector comparator. There is a lack of accurate information about the present conditions, the future and the implied social cost of the project. Moral hazard and adverse selection troubles are even harder to identify. The competitive tendering procedure is already a way to circumvent cost uncertainty, but prudence is in order. The risk of contracting has been discussed earlier because of the strategic approach of the bidders in the negotiation process, but also the nice sounding adagio "allocate the risk to the party that is most capable to deal with it" is not always a bed of roses. Many examples of failed projects due to the exposure to dangerous risks exist. The failure to meet expected revenue in the Eurotunnel project is a typical textbook case. Besides, the bidders make mistakes or maybe they are "corrupt". Monteiro (2010) reports that incentive schemes that align the private interest with the public interest can give solace. These can also overcome problems of quality dilapidation of the infrastructure that would fall at the government's expense anyway.

Both empirical as well as non-empirical research about risks in PPPs has been performed. Case studies can give management insights into which risks to take into account and how certain risks influenced the success of a project. Shen et al. (2006), for instance, used the study of the Disneyland theme park in Hong Kong to identify the key risk areas. Li et al. (2005) identified the preferred risk allocation in construction projects under the Public Finance Initiative in the UK. The results of these case studies, interviews and surveys often

generate a risk allocation matrix. These matrices could give guidelines to project managers and governments to set up a risk allocation method in this particular case. These empirical studies lack the possibility of generalization to other PPPs, hence a careful analysis of the peculiarities of a certain PPP project is essential.

Researchers published risk classification schemes and huge lists of possible risks. Grimsey and Lewis (2002) define global and elemental risks. Other authors and institutions apply classification schemes depending on the features of the contract (e.g. Monteiro, 2010, Loosemore, 2007). Li et al. (2005) classify risks in three levels: a macro level with exogenous risks occurring outside the project, the meso level for risks occurring within the boundaries of the project and micro level risks due to inherent differences between the public and private entity. Nonetheless, whatever classification scheme is applied, a whole-life-cycle assessment needs to be made and risks of the project itself as well as exogenous risks should be identified. Of course, one only deals with perceived risk from a certain point of view, because every party will have its own interpretation and estimation of the risk (Jin and Doloi, 2007). That is again a reason to also focus on an integrated system and a continuous monitoring of the project risks.

After the identification of the PPP project risks, one needs to analyse the impact of the risk. Grimsey and Lewis (2002) list the different methodologies for the stakeholders in the project. The procurer of the project will look at net present value calculations and he should perform the necessary sensitivity analysis. The sponsor will evaluate the impact of a certain risk on his return. The downside and upside of the different variables is analysed, simulation exercises can be performed and the impact on the internal rate of return is estimated. A software package like @Risk\* that implements Monte Carlo simulations is a popular tool. Last but not least, the lender will assess the possible defaults or delays on the interest and principal payments. All stakeholders get different probabilities and appraisals of the incurred risk. Setting up an appropriate allocation model is the next challenging step in the risk management process in PPPs.

Medda (2007) developed a theoretical allocation model of risks in transport PPPs. The author relies on game theory and considers the settlement between the public and private partner as a bargaining game or final offer arbitration game in which two agents compete to achieve the most reasonable offer. Lam et al. (2007) use a quantitative approach as well. The goal of risk management is seen as the minimisation of the total cost of a project's risks. The authors use fuzzy set theory. Fuzzy logic is applied to transform linguistic variables into fuzzy subsets in order to execute fuzzy mathematical operations. Afterwards, the fuzzy outcomes are translated into understandable linguistic decisions (Lam et al., 2007). The fuzzy logic has gained popularity and has also been applied recently by Jin (2011) and Li and Zou (2011).

Other risk allocation principles are often qualitative and rely on expert judgement. An easy practically applicable tool are the risk matrices. In a risk matrix, the role of each stakeholder in the mitigation of the risk is defined. Loosemore (2007) lists the necessary

conditions in order to allocate the risk to a certain party. The party should be aware of the risk while he is capable of managing the risk efficiently and effectively. Besides, the risk taking party should have the willingness to undertake the risk while charging a suitable risk premium. Li et al. (2005) propose a clear allocation: the public sector should carry site availability and political risks and the private sector should take care of the majority of project risks, while relationship risks, force majeure risks and the risk of legislation changes should be shared. Loosemore (2007) underpins a major limitation of such straightforward policies: risks must be identified, managed and monitored on a project-by-project basis. Jin and Zhang (2011) use artificial neural networks to decide either to keep the risk or refrain from taking the risk or any hybrid form of risk sharing. This method uses a cost-benefit analysis based on transaction cost economics (TCE). The inputs of the model are the risk management characteristics of the contracting partner.

The next issue is the valuation in monetary terms of the risk taken. How should a private party determine the value of the appropriate risk premium? Eriksen and Jensen (2010) warn for the fact that asymmetric information is a threat for the acceptable risk premium, leading to an excessive contractor compensation. They use the Capital Asset Pricing Model (CAPM) to calculate the risk premium, where the total return is composed of the risk free rate plus a premium.

The literature study revealed that risk has taken an important position in the assessment and the planning of PPPs. In 2011, the majority of papers published in the Journal of Construction Engineering and Management deals with quantitative and qualitative approaches to deal with risk. The next challenging question will be how to bring those developed methodologies on the PPP market and how to make practitioners aware of them.

## V. CONCLUSIONS AND FUTURE RESEARCH

PPPs have increased in popularity over the last few decades. They brought along a whole new glossary of buzzwords and the specific features make PPPs interesting but also very dangerous. This study of planning and governing PPP contracts has proven that prudence is a necessity. Researchers performed numerous case studies and surveys all over the world. The diversity of the content and the different interpretations of PPP contracts all around the globe make a clear understanding of this topic a real challenge.

This paper claims, supported by an extensive literature review of different project management journals, that the planning of the partnership must be developed in detail from the perspectives of all stakeholders. The contractual risk is an important extra risk in PPP agreements. The tendering process was identified to be critical, as the project might develop as a rollercoaster after the contract is signed and both parties might be locked in and might become the victim of uncertainty and of their own relationship. A divorce without huge opportunity costs in PPP contracts is often not possible, so planning of the marriage is vital.

This paper focused on risk management and the tendering procedure. The concept of risk management is known and is recognised by scholars and business people alike, but the active application of continuous risk management policies is not widespread. A wide range of methodologies have been developed, but it should be investigated how these methods can be implemented comprehensively. Perhaps neither the public party nor the private party wants to rely on simulations or possibly the quantitative models do not capture reality very well.

As the contractual risk is of major importance, a more rational approach of the tendering process is necessary. Game theory is a nice tool to model the process and to give advice to both the government and the private partners in their decision making. It would not be a good evolution when a PPP is seen as dangerous, because that could incur even more corrupt actions by the different stakeholders or even the refusal to enter into a PPP, while its societal value makes it such a nice vehicle. Current research on contracting and risk management is often applicable in a too general setting, but because of the special features of PPPs, contracting theory and risk management studies might increasingly focus on PPPs.

Further research could consist of the development of quantitative methods with assumptions as valid and as representative for reality as possible. This could lead to methodologies that a practitioner can easily apply in his particular context. Other quantitative methods can lead to management insights to govern PPPs from both the public as well as from the private point of view.

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