Risk Mitigation in PFI/PPP Project Finance: A framework Model for Financiers' Bankability Criteria.

Abstract:

Purpose: *This study explores the perspectives of UK PFI financiers' regarding the bankability of four critical risks (construction and completion risk, operations, supply and demand risk) in PPP projects.*

Design/methodology: *The study adopts multiple case study methodology and leveraged in-depth Interviews, documentations and focus group discussions to investigate the phenomenon.*

Findings: *Results from the study unravelled 36 suitable bankability criteria including acceptable mitigation strategies for evaluating the four critical risks during PFI/PPP financing appraisal.*

Research Limitations/Implication: *The study examined only projects with similar nature and selected from two sectors of the UK economy (Road and Education Sectors). The context of the study is also based on UK's PFI/PPP and Construction Industry, with other geographical regions outside the context of this study.*

Practical Implication: *This study provides a less complicated but useful understanding of how risks in PFI/PPP projects may be packaged in a bankable way to get the confidence of project financiers. The study also addresses concerns of over quantification of risk analysis in PFI/PPP appraisals and provides a relatable approach, useful for non-finance-oriented PPP practitioners.*

Social Implication: *This study addresses the social concerns of too much complexity and ambiguity in PFI/PPP structuring especially regarding factors that could make a project acceptable to lenders.*

Originality/Value: *The study proposes a "Bankability and Risk Qualitative Framework", which presents bankability information on critical risks in clear manner and represents critical parameters for winning lenders' approval for financing PFI/PPP projects.*

Key Words: Private Finance Initiatives (PFI), Public Private Partnership (PPP), Lenders' perspectives, Bankability, Risks.

Introduction

A central issue for lenders in Private Finance Initiative and Public Private Partnerships (PFI/PPP) contracts is the protection of project cash flows against risks and uncertainties. According to Burke and Demirag (2015), one of the most significant threats to the feasibility of PFI projects is the risk that the expected revenues might not be realised. Given the potential negative impact of risks on lenders' financial investment in PPPs (Delmon, 2017), bankability of projects (i.e. willingness of lenders to finance a project after due consideration of its related risks and returns) therefore remains a central issue for PPP loan approval (Özdemir, 2015).

Whilst a number of studies have identified diverse risks in PFI/PPPs i.e. political risk, currency risk, revenue risk, availability risk, performance risk among others (Lavasani et al., 2015; Yescombe, 2013; Demirag et al., 2011; Loosemore and Cheung, 2015). Other recent studies have contributed on critical success factors (CSFs) (Wibowo and Alfen, 2015; Osei-Kyei, and Chan, 2017; Liu *et al.,* 2016); risk modelling, simulation and evaluation (Kokkaew and Wipulanusat, 2014; Boateng *et al.,* 2015; Valipour et al., 2016; Owolabi *et al.,* 2018), including PPP mega projects (He *et al.,* 2015; Chan *et al.*, 2018). However, despite the contributions of these existing studies, there is a noticeable dearth of academic literature on financiers' perspectives to bankability of critical risks (i.e. construction and completion risk, operations, supply and demand risk) during PPP financial appraisals. According to Zou *et al.* (2008), critical risks in PPP are risk situations that can give rise to one or more other project risk-factors; and they often rank high on lenders' risk assessment ladder, due to their impact on the project success and revenue (Zhu and Chua, 2018).

Although numerous risk-factors may be considered critical to the success of a PPP project (Xu et al., 2015; Osei-Kyei and Chan, 2015), the focus of this study is to examine project financiers' bankability assessment of four critical risks in PFI/PPP projects (i.e. construction and completion risk, operations, supply and demand risk), from financiers' perspective. The selection of the four critical risk-factors hinges on studies like Oyedele (2013) and Osei-Kyei and Chan (2015) who highlighted the critical role of effective risk evaluation and

management at the construction and operational phases of PPPs. In addition, the selected risk-factors have huge relevance for successful project completion, demand/market as well as smooth operations of most PPPs.

Hence, this study continues and extends existing literature on credit risk, risk evaluation and bankability assessment in PPPs. It diverges from previous literature which are largely dominated by statistical methods, analytical models, and market methodologies. It presents a purely qualitative mind-map tool for evaluating the bankability of four critical risks (construction, operations, supply and demand risks) in PFI/PPP especially from financiers' perspective. As such, the study contributes to knowledge within PPP academic literature by providing day-to-day construction contractors, sub-contractors, SMEs and less statistically inclined PPP practitioners with critical parameters for packaging bankable risks in PPP financing proposals. The following objectives were identified for the study:

1. To identify suitable bankability criteria and risk mitigation strategies for evaluating construction and completion risk, operations risk, supply risk and demand risks respectively during PPP financing appraisal.
2. To understand the rationales and contexts under which lenders bankability requirements varies across PFI projects.
3. To develop a qualitative framework that present instant glance at the bankability of risks in PFI/PPP loan applications.

The next section of the study reviews extant literature on PFI/PPP procurement including lenders' risk exposures in PPPs. Section three presents a description of the four-initial case study PFI/PPP projects investigated in the study, while section four presents the methodology. In the fifth section, the qualitative findings from the study and validation processes were presented, including the proposed "Bankability and Risk" qualitative framework. Whilst the sixth section discusses the overall results, the final section concludes the study.

Project Finance in PFI/PPP and Lenders' Risk Exposures

In recent years the most common application of project finance is the Public Private Partnership (PPP) Scheme (Yescombe, 2013). Public Private Partnership has been described as collaboration between public and private sectors to deliver public projects (Delmon, 2011). According to Akintoye *et al.* (2003), the introduction of the UK version of PPP known as Private Finance Initiative (PFI) emerged in November 1992 and contributed to the wider acceptance of PPP globally. Private Finance Initiative (PFI) came against the backdrop of the need to reverse the huge public-sector debt and perceived inefficiencies in the UK public service (Oyedele, 2013). From the public sector's perspective, PFI offers government the opportunity to utilise private sector funds, including its technical and managerial competence to deliver infrastructures whilst ensuring equitable risk transfer among project parties (HM Treasury, 1997). As such, risk management is believed to play a crucial role in PFI/PPP arrangements.

Al-Bahar and Crandall (1990: p.534), defined risk as "the exposure to the chance of occurrences of events adversely or favourably affecting project objectives as a consequence of uncertainty." According to Smith *et al.* (2014), every project involves one form of risk or the other. However, the amount of risk exposure for lenders in PPP contracts are enormous, especially as many critical/important risk factors threaten project viability. For instance, according to Demirag *et al.* (2011), the negative effect of construction and completion risk can adversely impact on lenders' financial investments in PPPs. This is due to the high-risk exposure of lenders' funds during projects' construction period (Lavasani et al., 2015). Since most PPP projects are usually front-loaded in terms of huge loan drawdowns, lenders' investment is most vulnerable at construction stage (Grimsey and Lewis, 2002; Hoffman, 2008). In addition, studies by Valipour *et al.* (2016), and Grimsey and Lewis (2002) also suggested that, once a project commences operations, risks relating to the smooth running of the project usually becomes the most important risks. Operational risks could be caused by a number of factors, one of which may be incompetency in the maintenance regime of the project. In the event of any performance failures on such project, statutory deductions would

120 be made from the project's cash flows (Oyedele, 2013), which brings more volatility to project
121 revenue and loan repayments (Hoffman, 2008).

122 Moreover, risks relating to supply of raw materials to projects is another critical risk in PPPs.
123 As argued by Finnerty (2013), adequate supply of raw materials to projects is crucial at both
124 construction and operation stages as it ensures smooth project delivery and operations. As
125 such, any unplanned interruptions to a project's supply chain portend danger to successful
126 project completion, its continuous operations and predictability of project cash flows
127 (Hoffman, 2008). Additionally, demand risk is another major risk in PPPs, and it usually
128 emanate from absence of a reliable purchaser to buy sufficient volumes of a project's outputs
129 at profitable prices (Valipour *et al.*, 2016). In most circumstances, demand risk, (which is also
130 referred to in other contexts as market risk, purchase risk, or demand risk) may plunge PPP
131 projects into revenue crisis, with adverse impact on Cash Flow Available for Debt Service
132 (CFADS) to lenders. Considering the likelihood of the above discussed critical risks and their
133 potential adverse effects on PFI/PPPs, determining bankability of risks must be the starting
134 point for lenders' during PFI/PPP financing appraisals. As such, earlier techniques for risk
135 and bankability assessment in PPP have relied on the use of experts' judgement among other
136 risk evaluation approaches. However, the last three decades (between years 1998-2013) have
137 seen more project financiers shift towards risk quantification techniques such as Monte Carlo
138 simulation, Decision Analysis, Scenario Models, Case-Base Models; including more recent
139 techniques like Fuzzy Synthetic Approach, Fuzzy Fault Tree method, Hybrid Fuzzy
140 Cybernetic Analytic etc. (Zhang, 2004; Akbiyikli, 2006; Ameyaw and Chan, 2015; Lavasani,
141 *et al.,* 2015; Valipour et al., 2016; Owolabi et al., 2018) etc.

142 However, despite the seeming effectiveness of many quantitative models, protecting lender's
143 investments in PPP projects remains shrouded in uncertainty. Bankability of projects is said
144 to be contextual and differs based on nature of projects and associated risks (Rolstadås *et al.,*
145 2011). In addition, the financial crisis of 1992 and 2008 which led to the introduction and
146 subsequent refinements of BASEL I and II banking regulations have exposed the weaknesses
147 in banks' current practices of counterparty risk quantification and assessment, especially on

asset classes such as the PPPs (Please See Table 1 below for existing lenders' assessment methods and regulations for PPP projects including their shortcomings). According to Perold (2004) and Bertram *et al.* (2012), most studies on actuarial risk modelling suffer similar shortcomings of over reliance on forecast variables, as against the reality of risk occurrence. This is because; mathematical models do not take into consideration, contextual factors influencing lenders bankability decisions. In addition, most risk models are incapable of practically quantifying the probability of risk exposure (Rolstadås *et al.,* 2011), and in many cases, the application of risk model itself may constitute additional risk, especially where weakness in the model leads to wrong decision (Bertram *et al.,* 2012). Overall, current credit risk evaluation practices of financiers have only created market opportunity for big-time financial experts to exploit, at the expense of ordinary PPP contractors (and sub-contractors, SMEs etc.) with limited capacity for high-level financial engineering at the pre-contract phase. As a result, the need to address these neglected population of construction/PPP practitioners becomes very germane.

Table 1: Existing lenders' assessment criteria/techniques for PPP projects and their shortcomings

Methodology

This study adopted "multiple-case study strategy" to explore lenders' perspectives on bankability of critical risks (i.e. construction and completion risk, operations, supply and demand risk) in PFI projects. The selected cases consisted four projects from road infrastructure sector and another four in the education sector of the U.K economy. The first phase of the case study exploration involved two PFI projects from the education sector. Similarly, the study used two additional PPP projects from the education sector to compare and validate the initial case studies. Using a similar approach to the earlier phase, the second-phase of case study exploration also involved two PFI projects from UK's road sector, with additional two road projects used for literal validation of the cases. Going further, it is important to note that, the selection of PPP projects from UK's transport and education sectors was based on Government's official data (Private Finance Initiative &Private Finance

2 Projects, 2017 Summary Data) which showed the two sectors among the top-four sectors with the highest number operational PPP projects. As such, the selected sectors and projects have huge relevance to a wide range of PPP audiences within the UK context and provided easier access to data for the research team. However, whilst its' worth clarifying that, this study has not compared PPP projects in the road sector with projects in education sector; the two sectors were only used as contexts to investigate the research problem. Furthermore, the PPP projects investigated were those where participants showed willingness and cooperation to discuss and support the research team with documentary evidences. Going further, the sampling strategy for case study selecting in this literature is purposive sampling. This technique facilitated access to suitable participants, case study projects as well as less-sensitive loan documents under a non-disclosure and anonymity agreement. Instructively, the selected sampling approach has been adopted in some existing PFI/PPP literatures such as Grimsey and Lewis (2002), Meng and McKevitt (2011) and Oyedele (2013).

Four case studies were initially selected as the main-case studies for in-depth investigation. These comprised two PFI road projects – one located in Northern Ireland and the other in South West of England. The two school PFI projects selected include a library project in South East of England and a PFI school project in the Midlands. Another set of four projects were then used to validate findings from the four main case studies. These include, a PPP road project located in Wales, a DBFO road project in South West of England, BSF school project in North East of England and BSF school project in the South West of England respectively.

The field study commenced with a two-way research approach consisting unstructured interviews and document analysis. Fifteen (15) individual interviews were conducted with participants selected from UK-domiciled projects financiers', all with experiences in PFI project financing averaged 13.5 years. The interview participants comprised three senior credit analysts, one senior loan manager, three structured finance experts, four risk managers and four investment bankers among others. The interview sessions were open-ended with participants freely commenting on what makes a project bankable from lenders perspective. The information provided were then corroborated with less-sensitive project loan

documentations obtained from the lenders and the findings therein. Considering that PFI loan appraisals often involve higher-level technical and statistical evaluations (actuarial risk evaluations), the research team obtained loan reports containing a "Rule-Based Model" approach to loan evaluation. Rule-based model, also known as "Judgement Scoring Model" (Li et al., 2017), is the traditional credit scoring method often introduced by lenders at intermediate stage of loan appraisals. This usually comes before the construction of rigorous statistical models. With judgement scoring approach, participants were able to subjectively assign numerical scores to important loan criteria, based on perceived significance towards fulfilling bankability requirements. These scores were awarded by interview participants on a scale of 1 to10, with 10 indicating = highest favourability and 1= indication, lowest favourability of the criterion as a bankability factor. All the interview sessions lasted an average of 248 mins. However, in order to further strengthen the external validity of the case study findings, two new focus group discussions (FGD) involving 14-participants (drawn from lending institutions), were carried out. The selection of participants followed a purposive sampling approach and only financiers with prior PPP project finance experience were approached via existing contact networks. The FDG participants also supported with useful information on validation case studies (more details of focus group is found in the analysis section).

Description of Selected Case Study PFI/PPP Projects

This section presents the main case study projects investigated in the study. The cases were briefly described with focus on important features and nature of the projects. Results from the case studies are presented in the next section.

Case Study X.Y.Z

PFI Road Project in Northern Ireland

This project is a 125km road project in Northern Ireland delivered using the PFI scheme. The project is valued at £250million and will be paid for under a unitary payment method. The project was contracted under a 30year concession agreement in which a team of private sector

consortium was responsible for the design, build, finance and operate (DBFO) of the road. The project involved the upgrade of 20.5km of existing roads, construction of 12.1 km of new dual lane carriageway, construction of new bypass routes, provision of four grade-separated junctions, 2 over bridges and 2 underpasses. The closure of the central reserve crossovers in the immediate vicinity of graded junctions was also included in the project plan. Also included in the project is the upgrading of existing infrastructure such as drainage, surfacing, street lighting, signing, white lining and footways and many more.

Case Study A.P.R

PPP Link-Bridge in South West of England

This project is a 948-meter long link bridge in South West of England that serves its surrounding environment. The project was procured using Public Private Partnership (PPP) arrangement, in which private sector consortiums was responsible for the designing, build, finance and operate (DBFO) the project. With the project valued at about £330 million, the consortium runs the project as a shadow toll payment arrangement with government paying the concessionaire, a determined rate based on actual road use, for a period to last for 30 years. As part of the contract, the project company will review the toll rate yearly. The construction phase of the project took a period of four years and the remaining 26 years of operation will see the consortium responsible for the overall maintenance and repairs of the link bridge.

Case Study Q.H.A

Library Project in South East of England

This project is a new central library procured using the PFI model under a 25-year concession agreement. Remuneration arrangement under this contract is through unitary charge payment, based on service availability and performance. The edifice, which is valued at £15million, stands on a 5000 sq. meter land mass. The project provides a wide range of quality library services to its' surrounding environment including delivery of cultural, educational and recreational resources, ICT facilities, learning center, conference rooms and exhibition spaces. The library project also parades a very efficient energy management system with its

heating, cooling, lighting and ventilation systems, all developed in conformity with environmentally sustainable standards.

Case Study P.K.W

PFI School Project in the Midlands

This project is a secondary school project in the Midlands delivered using the PFI scheme. The project was planned as a 30-year concession agreement that includes the design, build, finance and operate (DBFO) of the facility throughout the project lifecycle under a unitary charge payment arrangement. The school facility, which admits about 1500 pupils of 11 to 18 years of age, was built at a value of £24 million. The college is designed with much attention to Information Communications and Technology (ICT) facilities, given its status as a designated business and enterprise college. Asides the main educational facilities, the new college also boasts leisure and sporting centre (incorporating a 25m four-lane swimming pool), dance and drama studios, gymnasium, sports stadium, four multipurpose playing courts and a learning resource centre.

Analysis of Findings from Case Studies

With the aid of thematic analytical technique, interview data transcripts and loan documents from the four-initial case study projects were coded using Nvivo10. During the coding exercise, the researcher was able to pinpoint and record various patterns or themes across the dataset, resulting in the identification of different bankability criteria and risk mitigation strategies. After painstaking sorting of data, the analysis uncovered 36 relevant bankability criteria frequently used by lenders to evaluate the identified critical risks (supply risk, construction, demand and operations risks), especially during financing appraisal (please see Table 2 below). For each identified criterion, the study obtained the associated bankability scores as assigned by interview participants through judgement scoring method. Other risk mitigation strategies typically proposed by project sponsors to alleviate lenders' bankability requirements were also identified and shown in column 2 of Table 2. In addition, the thematic analysis also helped uncover various other sub-risk elements, which are usually associated with the critical risks during due diligence appraisal (Please see Column 2 of Table 2 below).

These sub-risk elements represent the different variants of the examined critical risks, and in most cases, they add to the complexity of the risk evaluation execrcise. Kindly see Tables 2&3 below for key findings from case study PFI/PPP projects).

Table 2: Rule-Based Model Scores for Lenders' Bankability Criteria Employed in the Case Study Projects.

Table 3: Risks and other Emerging Sub-Risk Components in PFI/PPP Projects.

Following the initial qualitative data analysis and findings, the study proceeded to validate the extracted results with new data from additional focus group discussions. This validation was necessary and aligns with the perspective of Yilmaz (2013, pp.321), who suggested that "the credibility of a qualitative study is affected by the extent to which systematic data collection procedures, multiple data sources, triangulation, etc. are used for producing trustworthy data". Based on this conclusion, two new focus group discussions (FGD) were conducted with another set of 14-participants (drawn from lending institutions), who were selected through purposive sampling technique. As such, participants with prior PPP project finance experience were carefully identified and approached using existing contacts in other financial institutions different from the ones initially sampled. The first FGD consisted of 8 participants comprising; 3 Senior finance managers, 2 infrastructure loan managers and 3 risk analysts respectively. Similarly, the second FGD consisted 6 participants comprising; 4 credit risk managers and 2 structured finance analysts.

Going further, in order to validate the earlier case studies, in line with Yin (2017), the study also identified and examined four new case study PPP projects via convenience sampling method. This was made possible, by asking FGD participants to comment on past PPP projects which they have been involved. Hence, participants commented on four different PPP projects in which they have played significant roles especially during the deal-preparation stage. The four projects are currently in operation and delivered using the DBFO and BOT models respectively (See Table 4 below for description of the validation case

studies). During the FGDs, participants were encouraged to comment on their PPP experiences and the data presented to them. Participants were also requested to evaluate the relevance of earlier findings using their own experiences in project finance. The average years of experience of the FGD participants in PFI projects is 8.3years and both sessions lasted a cumulative total of 95mins. The FGD sessions were tape-recorded and transcribed. After careful reading of interview transcripts, the new data was thematically analysed to identify similarities and correlations between existing data and the newly collated subjective opinions of the FGD participants.

Table 4: Framework Validation using Four PPP Case Studies

Finally, haven established strong correlation between the initial findings and new FGD data, the study relied on the validated findings, to directly peer each risk factors (including their sub-risk elements) with corresponding mitigation strategies presented by sponsors and the associated bankability criteria that lenders were interested in. This information was then used to develop a qualitative framework for evaluating "Bankability of Critical Risks" in PPP funding proposals (Please See Fig.1 below).

Meanwhile, in order to ensure that the developed framework is in-line with the expectation of PPP financiers, the risk and bankability-framework was sent back to eight (8) project finance specialists (with between 5-12 years' experience in PPP transactions) within the UK project finance industry. These practitioners were requested to confirm the relevance of the framework in terms of its usefulness as a tool for quick bankability evaluation of critical risks in PPPs. In their response via emails, all the experts contacted confirmed that the sequence of treatments presented by the framework provides an easy-to-follow mind-map needed for quick evaluation of the four investigated critical risks. Based on this feedback, the study therefore presents a conceptual tool and bankability framework that is useful for everyday construction-PPP practitioners in order to aid their understanding and decision-making when considering PPP project financing.

Fig.1: Risks-Bankability Framework for Evaluating Critical Risks in PPPs

Discussion of Findings

This section discusses findings from the investigated case study projects.

Supply risk and associated bankability criteria

Evidences from interviews and loan documentations, as indicated in Table 2 above, revealed that supply risk is inherent in the eight cases examined in the study. As pointed out by some of the interview participants, an important bankability criterion for lenders in examining supply risk, is the existence of price hedge contract for project supplies (raw materials). This is confirmed by evidences from Table 2, showing that lenders assigned high judgement-scores (20 and above) to hedging of project supply prices across all the case studies (except for case study P.K.W). The above view was encapsulated in the views of one of the participants who argued that:

> *"In most cases, what happens is that lenders want project sponsors to ensure that strong pricing arrangement for inputs is in place to ensure predictability of cash flows…and this is mostly done through supply price hedging" (Participant 13, individual Interviews, April 3rd, 2018).*

This opinion succinctly captures the view of Mills (2010) who both argued that supply price hedging allows the SPV to purchase its storable raw materials in advance for a determined price and therefore avoids any sudden hike in price of inputs. According to Hoffman (2008), with a hedging contract, the project company is able to pass the risks associated with commodity price fluctuations to a third party (hedger). Further evidences from participants' opinions as shown in Table 2, revealed that, another important criterion for assessing the bankability of supply risk in PFI loan application is the existence of reliable and experienced raw material supplier. Most participants consented to the significance of this criterion in mitigating supply risk. This is reflected in Table 2, where the bankability scores in most of

371 the case studies examined were higher than the minimum score (20), denoting its' importance
372 from lenders point of view. As summarised with the views of one of the participants:

373 *"You need a dependable long-term supplier for such type of projects when*
374 *evaluating supply risk in loan applications. It helps when contractors*
375 *maintain database of trusted suppliers (Participant 4, Individual Interview,*
376 *April 3rd, 2018).*

377 The above perspectives confirm earlier studies such as Finnerty (2013) who argued that the
378 need to ensure constant supply of adequate volumes of raw materials at affordable prices to
379 projects is very essential in PPPs. Since the construction and operations of PFI projects are
380 input dependent, any possibility that a project will not receive the required raw materials
381 may lead to project collapse (Burke and Demirag, 2015).

382 **Demand risk with associated bankability criteria**

383 Evidences from the qualitative study, as represented in Table 2 above indicate that demand
384 risk or traffic risk, as may be called in other contexts, was very crucial for consideration in
385 the investigated cases studies. In examining demand risk in PFI loan applications,
386 interviewees suggested that, the predictability of projected cash flows is essential for its
387 bankability. The above table revealed high bankability scores for this criterion, across the
388 case studies examined. As captured in the analysis of one of the participants:

389 *"I must say that one of the factors that will sway lenders decision is the cash*
390 *flow profile of the project. Of course, every lender wants to lend to lucrative*
391 *businesses, and in that respect, sponsors have got to simply demonstrate how*
392 *viable their projects are from a commercial point of view" (Participant 15,*
393 *Individual Interview, April 25th, 2018).*

The above perspective was emphasized in studies such as Burke and Demirag, (2015), Hoffman (2008), and Akbiyikli *et al*. (2006). According to Akbiyikli *et al*. (2006), one of the fundamental assumptions behind project financing via PFI/PPP is the ability of projects to make revenue and repay private investments. Finnerty (2013) argued that, identifying projects with strong revenue potential is crucial to lenders' financial propositions in project finance. This becomes necessary to guarantee optimum protection to depositors' funds being invested in projects by banks (Hoffman, 2008).

From the perspectives of most interview participants, the severity of demand risk in PPP loan applications is often hinged on who is accepting the risk between the client (government) and the project company. Evidences shown in Table 2 revealed that, for the PFI school projects (cases Q.H.A and P.K.W), the client (public sector) pays the project SPV for using the school facilities through monthly unitary charges, which are based on project's availability and performance. As such, demand risk is minimised as long as the operational performance of the project is kept at optimum (this explain why bankability scores are a bit low for long-term purchase contract). However, the situation is different if the context is a PFI toll road projects.

Participants further argued that, the existence of Government guarantee in any PFI contract would definitely convince lenders to back the loan. Results in Table 2 revealed that, in road PFI projects bankability scores are very high (between 35 and 50). As encapsulated in the analysis of one of the interviewees:

> *"Lenders will almost jump at a contract that has a credible government guarantee backing, especially considering that most OECD nations have reasonably strong sovereign credit ratings" (Participant 1, Individual Interview, May 16th, 2018).*

It is important to note here that, both unitary payment approach and government guarantee arrangements, significantly improve project bankability by leveraging the sovereign credit rating of the government. Both approaches mitigate lenders' revenue concerns by guaranteeing reliable cashflow predictability and project revenue.

O& M risk with associated bankability criteria

Going by findings from the interviews and documentary evidences as reflected in Table 2, operations and maintenance (O&M) risk is inherent in all the case studies examined in the study. As reflected in the high bankability scores awarded across all the case studies investigated (20–34), lenders will consider long-term O&M contract for evaluating operations risk in loan applications. As summarized in the views of one of the participants:

> *"You definitely want to have long term operations and maintenance (O&M) contract with a reliable operator. However, there are times when lenders might be more comfortable with having an independent O&M contractor to handle the project." (Participant 7, Individual Interview, May 2nd, 2018).*

The above assertion supports studies such as Finnerty (2013), Meng, and McKevitt, (2011) who both argued that, engaging a reliable but independent O&M contractor gives lenders more assurances that, sponsors will not compromise the smooth operations of the facility for obscure motives. Further findings from participants suggest that, the record of accomplishment and overall competence of the O&M operator will be crucial to lenders' financing decision. This goes further to confirm the high bankability scores awarded this criterion by lenders, as reflected in Table 2, where bankability scores for O&M competence in all case studies ranged from 20 to 35. As encapsulated in the views of one of the participants:

> *"Banks will look at the technical competence, performance track record in similar PPP projects and financial strength of the O&M contracting*

company. Sometimes, contractors' familiarity with the technology to be used on the project may also be important especially in large projects" (Participant 14, Individual Interview, 25th, 2018).

This opinion supports Grimsey and Lewis (2002) who argued that once PPP projects moves to the operations phase, the failure or success of the project will largely depend on the competency during operations regime. According to Hoffman (2008), regardless of how well designed or constructed a project might be, the operator requires sufficient expertise and experience to run the project at the levels needed to generate cash flows.

Construction and completion risk with associated bankability criteria

Going by results from Table 2, construction and completion risk is inherent in all the eight case studies investigated. According to a unanimous view of participants, the larger and complex a project is, the higher the risks associated with construction and completion of such projects. Therefore, in order to examine the bankability of construction risk in a PFI loan application, financiers will look at the construction contractor's competence. This is reflected in the high bankability scores assigned across the eight cases (scores above minimum of 20), as shown in Table 2. One of the participants captured the entire perspectives by arguing that:

"You don't want to commit lenders funds, in the range of 70% to 80% of project cost into the hands of an incompetent and inexperienced construction contractor, who may not complete the job on time and within budget" (Participant 5, Individual Interview, May 4th, 2018).

This assertion confirms studies such as Zhang (2004), Zhu and Chua (2018). As Zhu and Chua (2018) rightly puts it, the technical competence and record of accomplishment of construction contractor is key for evaluating completion risk in PFI projects. The construction stage of projects is considered most critical for financiers, considering that huge funds are committed and interests on loans are only capitalized (Demirag et al., 2011). Additionally,

further findings also revealed that lenders will require project sponsors to engage an independent technical expert for technical due diligence on the business case. This confirms results shown in Table 2 where evidences reveal high bankability scores the criterion, based on lenders' perception. As summarised in the views of one of the participant:

> *"Project sponsors must engage the services of an independent technical consultant to give advice on the suitability of the project technology and the likely downside factors in the project" (Participant 11, Individual Interview, June 1st, 2018).*

Conclusion and Implication for Practice

This study examined the bankability of four critical risks in PFI/PPP projects namely; supply risk, demand, O&M and construction risks respectively. Results from the study identified 36 relevant bankability criteria suitable for evaluating the identified risks, especially at the pre-contract phase of lenders' financing appraisal. The study also uncovered the subjective importance of each factor/criterion as they influence the bankability decision of lenders using 'rule-based scoring approach'. Based on the findings from the study, it was evident that a key success factor for getting lenders' support in PFI/PPP arrangements is to understand the necessary bankability conditions motivating lenders. The results also showed that such motivating factors are not entirely quantitative in nature but comprise other expert judgement-based factors which has impact on bankability decisions. The result also revealed the relative bias (as suggested by Pantelias & Roumboutsos, 2015) in the existing handling of counter-party risk assessment of PPP lenders due to disproportionate on risk as the construction phase as against risk in other important project phases. The over-reliance of PPP lenders on projects backed by government (i.e. via unitary charge payment or guarantees), as against projects structured on pure commercial basis, was also revealed in this study. By offering incomplete information on factors driving counter-party risk evaluation in PPPs, existing knowledge of project bankability may be deemed insufficient to aid ordinary PPP practitioners. These findings have significant implications for potential project sponsors and public-sector clients looking for long-term finance for critical

infrastructure projects. Considering the current apathy from lenders towards long-term, limited-recourse projects, achieving bankability for PPP projects will be much less tedious, if ordinary PPP contractors and potential sponsors approach their own internal project evaluation from lenders' perspective, by relying on key factors that motivates lenders and mitigate risk. Hence, the study advocates better understanding of critical parameters for packaging bankable risks in project financing proposals in order to win lenders loan approval. This is essential as evidences from several HM Treasury reports have shown that, many laudable public-private projects have failed to materialise due to poor structuring of projects' bankability and viability, thereby denying deserving communities of critical infrastructures, as government cuts back on public spending. As such, if the UK government is to achieve her target of 50% public-private project financing, out of the estimated £483 billion project investment targeted by 2020-21, better understanding of structuring bankable projects with well-mitigated risks, will be an important panacea.

In addition, findings from the study also indicated that bankability of risks in PPP is not static but contextual, and often vary based on a number of prevailing factors important to lenders. For instance, whilst a factor such as 'government guarantee support' may not raise much concern for lenders in a PPP school project due to less complexity and scale. It is very much likely to be an important bankability factor in a PPP toll-road project due to large scale and capital-intensive nature of such projects, including the high-probability of revenue risk or other country-related risk factors. Hence, lenders will attach much favourability to a government guarantee-backed PPP project, as it reflects sovereign-support and assures project revenue, including returns on investment. By implication, PPP promoters must therefore be creative and pro-active with the project to ensure long-term commercial viability and bankability of their projects. This will require constant re-evaluation of projects' strengths, weaknesses and characteristics at key stages, in order to ensure acceptable mitigation strategies are evolved for addressing emerging threats to project bankability.

This study therefore offers a relatable and simple schema for understanding bankability of critical risks in PFI/PPP projects, particularly for less statistically inclined PPP practitioners

who require the much-needed private finance for facilitating important PPP infrastructure projects.

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List of Tables

Table 1: Existing lenders' assessment criteria/techniques for PPP projects and their shortcomings

S/N	Source & Year	Primary Aim/s	Methodology	Shortcomings
1	Basel I (1988) also known as Basel Accord	Focus is on minimum capital requirements (capital adequacy) that banks & other international lenders must hold to mitigate default risk (credit risk).	Credit Risk analysis using Risk Weighted Average (RWA). Banks to hold capital/assets (i.e. Tier 1, Tier 2 and Tier 3 assets) equal to 8% of RWA. Total Capital ratio = Capital/Asset Value – All Risk Weight Average.	Basel-I provided no rule that considers the quality of the Counterparty (i.e. credit worthiness of big organisations i.e. a big company like IBM, Google, GE, Apple). Only focused on credit risk of the customer. Counterparty credit worthiness is essential for determining sponsors' risk in PPP as part of overall risk evaluation
2	Basel II (introduced in 1992)	(1) Requires banks to earmark sufficient capital to mitigate credit risk, market risk and operational risk. (2) Emphasizes banks risk management practices (measurement) & Internal Capital Adequacy Assessment Process (ICAAP), (3) (3) Regulatory reporting of bank's risk practices & (3). Market discipline via disclosure requirements.	Retains capital adequacy requirement at 8% of RWA. Segmented some risk-free asset class into to Govt. bank & corporate bonds at (0%,20% & 20%) respectively. Provided framework for managing residual risks in assets or investments.	(1) Internal risk models of banks performed poorly and understated risk exposure and could mislead investors as well. (2) Many PPP Contractors (especially less financially savvy construction & engineering contractors) lack the high-level of technical understanding of risk quantification & modelling. (3) Complex nature of BASEL regulations makes it hard for ordinary PPP practitioners & contractors to connect with.

3	Basel III (2010 - 2013)	Strengthens bank's capital adequacy by increasing liquidity & reducing bank's leverage: (1) Introduced a non-risk-based measure for minimum capital requirements (2) Introduced minimum leverage ratio (liquidity cover ratio (LRC) & net stable funding ratio (NSFR) (3) Introduced capital requirements for counterparty credit risk using Credit Value Adjustment (CVA) etc.	(1) Retains RWA at 8%. (2) Increase of 2.5% capital conservation buffer bringing common equity requirements of banks to 7.5%. (3) Banks to now hold 10.5% of risk-weighted assets. (4) Leverage ratio fixed at 3% of banks' tier 1 capital/banks' av. total consolidated assets etc.	(1) Complex nature of BASEL III regulations makes it hard for ordinary PPP practitioners & contractors to easily connect with and created over-reliance financial experts' consultants during PPP structuring & development, which is costly and overall contributes to higher project cost.
4	Carbonara et al. (2015)	(1) Provided guidelines for public & private parties for identifying significant risks in PPPs including suitable mitigation strategies. (2) Focused on risks associated with PPP development phase, construction, O&M and transfer phases including life cycle risks.	Mixed method by combining delphi survey with multiple case studies	(1) Study focused only on risk & mitigation strategies without revealing bankability criteria which project financiers will be interested in before approving loan. (2) Availability of mitigation strategies for risks does not necessarily guarantee bank funding approval, since many other situational factors can swing lenders' decision.
5	Moody's (2016)	(1) Presents rating methodology for construction Risk in privately-financed public infrastructure. (2) Explains Moody's approach to assessing credit risk in PFI/PPP/P3 projects in construction globally.	(1) Focuses on projects where Government pays either at the completion of key milestones or via unitary payments. (2) Methodology uses a Grid approach and developed a 5-Grid factor for assessing and weighing credit risk in construction PPP (i.e. Construction risk allocation between public & private parties, project complexity, consortium experience & project readiness, resilience of constructor to cost overrun, resilience of project to schedule overrun).	(1) This methodology does not account for projects financed purely on commercial terms, as it leans more towards government-backed projects (sovereign credit rating) due to the guarantee of more stable streams of income. Hence, projects with no such terms requires more information than has been put forward in Moody's rating methodology. (2) The methodology agreed it had not been exhaustive of all factors considered by internal evaluators, indicating insufficient information for contractors to rely on. This also plays into the criticism of secrecy in PPP lending arrangements that dominates the literature.

6	Pantelias & Roumboutsos, (2015)	(1) Investigated credit worthiness assessment of transport infrastructure PPP projects. (2) Examines credit risk analysis and methodology of credit rating agencies (CRA). (3) challenged over-emphasis placed on construction phase of PPPs including omission of key transport sector contextual factors necessary for credit analysis.	Proposed a framework for evaluating credit risk in transport PPP projects involving considerations for contractual agreements describing the risks considered, the individual assessment of each risk and their allocation. The framework is based on generic classification of risk encountered in PPP lifecycle. Suggested the need for project credit risk.	The study lumps together credit risk evaluation with other risk analysis in PPP. The study treated credit risk/default risk more or less like the source of other risks in PPP, which is not the case. Although, credit risk is only the 1st risk evaluation conducted by lenders, however, credit worthiness of projects can change during the project life cycle due to the emergent of other critical risks.
7	Credit Rating Agencies (i.e. S&P, Fitch, Moody's)	Step-by-step Analysis of project credit worthiness including financial analysis and sensitivity. Combines qualitative and quantitative risk modelling & analysis.	Sensitivity analysis, risk modelling & qualitative appraisals.	There is an observed bias of placing disproportionate emphasis on risks at construction phase as against other phases in the project life cycle (Pantelias & Roumboutsos, 2015). Most evaluations leverage sovereign credit ratings to the exclusion of projects not enjoying such.
8	Statistical & analytic Models	Leverages statistical inferences to derive suitable relationship for decision making	Build quantitative models i.e. Monte-Carlo, Fuzzy Models etc. to simulate project risk	Many PPP Contractors (especially less financially savvy construction & engineering contractors) lack the high-level financial engineering knowledge involved with such statistical modelling. Asides big contractors who are able to pay for hiring internal or independent financial experts, SME contractors hoping to penetrate PPP market will cannot afford the cost involved in such pre-contract due diligence

Table 2: Rule-Based Model Scores for Lenders' Bankability Criteria Employed in the Case Study Projects

Risk Factors (RF)	Risk Mitigation Strategies Proffered by Project Sponsors	Lenders Bankability Criteria for Project Appraisal	Case Study for Model Development				Case Study For Model Validation			
			Road Sector Projects		*Education Sector Projects*		*Road Sector Projects*		*Education Sector Projects*	
			Case study	*Case study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*
RF.1 Supply Risk	Supply price hedging	**Existence of fair hedge contract on supplies** of	***20****	***25****	***22****	*18*	***27****	***20****	***21****	***23****
	Long-term supply contract with reliable suppliers	**Supply contract with a reliable and experienced input supplier**	***25****	*15*	***20****	***25****	***20****	***31****	***20****	***21****
	Accurate estimate of bill of quantity	Accurate estimate of bill of quantity for supplies	*8*	*6*	*7*	*9*	*4*	*14*	*8*	*11*
	Supply contract with only one supplier	Existence of multiple raw material suppliers	*10*	*5*	***20***	*5*	*10*	*23*	*10*	*12*
	None existences of supply default penalty	**Non-Supply Penalty to supplier**	***32****	***35****	***28****	***19***	***30****	***33****	***29****	***35****
RF2. Demand Risk	Long term offtake/traffic/revenue contract	Long term purchase contractual arrangement with reliable purchaser	*5*	*5*	*15*	*17*	*15*	*20*	*5*	*6*
	Predictably robust project cash flows	**Predictably robust project cash flows**	***40****	***40****	***38****	***40****	***45****	***41****	***40****	***37****
	Accurate revenue/market forecast and analysis	**Traffic/revenue forecast from an independent**	*15*	***30****	*10*	*13*	***32****	***36****	***25****	***22****
	Existence of Shadow toll contractual arrangement	**Existence of Shadow toll contract arrangement**	*5*	***37****	-	-	***50****	***45****	-	-
	Not provided	Existence of Pass-Through Contract	*6*	*7*	*7*	*5*	*9*	*4*	*9*	*7*
	Not provided	**Government Guarantee of cash flow shortfall.**	***50****	***38****	*5*	*5*	***45****	***35****	*15*	*11*
	Long-term Operations and Maintenance (O&M) contract	**Long-term Operations & Maintenance (O&M) contract**	***30****	***25****	***20****	***28****	***30****	***34****	***30****	***27****

Risk Factors (RF)	Risk Mitigation Strategies Proffered by Project Sponsors	Lenders Bankability Criteria for Project Appraisal	Case Study for Model Development				Case Study For Model Validation			
			Road Sector Projects		*Education Sector Projects*		*Road Sector Projects*		*Education Sector Projects*	
			Case study	*Case study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*
RF.3 Operation & Maintenance Risk	O&M contractor with competence and robust financial status	**O&M contractor's competence and financial strength**	***20****	***20****	***35****	***21****	***20****	***23****	***25****	***27****
	Financial strength of project SPV towards project maintenance	**Experienced and skilled operation and Maintenance staff within the SPV**	***23****	***20****	***20****	*15*	***20****	*17*	*15*	*19*
	Existence of Lender right to remove O&M operator and revoke contract due to	**Existence of Lender right to remove O&M operator and revoke contract due to**	***22****	***25****	***22****	*18*	***20****	***20****	***20****	***24***
	Existence liquidated damages and penalties contract (Performance Failure Deductions etc.)	**Performance Based Contract.**	***20****	***21****	***18***	***23****	***21****	***30****	***30****	***28****
	Incentives to O&M Operator for maintaining high efficiency levels	Incentives to O&M Operator for maintaining high efficiency levels	*10*	*12*	*6*	*8*	*7*	*9*	*7*	*7*
	Not provided	**O&M operator's familiarity with the project technology being used**	***20****	***23****	*15*	***20****	*10*	*15*	*10*	*12*
	Not provided	O&M Operator's Guarantee from Parent Company	*9*	*5*	*8*	*7*	*9*	*5*	*5*	*9*
	Not provided	Existence of experienced and independent O&M contractor rather than self-maintenance by SPV	*6*	*8*	*5*	*7*	*7*	*6*	*4*	*5*
	Not provided	Sponsor to maintain a "Maintenance Reserve Account"	*4*	*9*	*8*	*5*	*7*	*4*	*7*	*7*
	Robust cover ratios (Annual Debt Service Cover Ratio and Loan Life Cover Ratio).	**Robust cover ratios (Annual Debt Service Cover Ratio and Loan Life Cover Ratio).**	***50****	***35****	***40****	***42****	***44****	***42****	***43****	***48****

Risk Factors (RF)	Risk Mitigation Strategies Proffered by Project Sponsors	Lenders Bankability Criteria for Project Appraisal	Case Study for Model Development				Case Study For Model Validation			
			Road Sector Projects		*Education Sector Projects*		*Road Sector Projects*		*Education Sector Projects*	
			Case study	*Case study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*
	Construction contractor's competence	**Construction contractor with years of experience of successful completion of project finance**	***35****	***32****	***30****	***35****	***25****	***27****	***35****	***30****
	Construction contractor with strong financial standing	**Construction contractor with financial strength.**	***30****	***25****	***25****	*19*	***21****	***35****	***31****	***26****
	Existence of an Independent technical expert	**Sponsor to engage Independent Technical Consultant (ITC)**	***20****	***31****	***20****	***20****	***23****	***34****	***27****	***24****
	Tried-and Tested Technology for the construction of project delivery.	**Tried-and Tested technology for the construction of project.**	***20****	***20****	*15*	*18*	***21****	***24****	***20****	*19*
	Contract on pre-estimated liquidated damages for project deficiencies	Not Considered	*7*	*5*	*4*	*6*	*11*	*5*	*8*	*11*
	Periodic construction mile stone reports	Not Considered	*5*	*4*	*8*	*9*	*13*	*6*	*6*	*8*
	Short Notice, close supervision and monitoring of Construction works.	Not Considered	*4*	*9*	*9*	*7*	*7*	*7*	*5*	*6*
	Contractor's liability insurance cover contractor's all risk	**Construction contractor with a liability insurance cover.**	***15***	***20****	***31****	***27****	***30****	***25****	***29****	***25****
	Pre-completion guarantee or full financial guarantee from the Sponsor to the lender.	**Pre- completion guarantee or full financial guarantee from the sponsor at construction**	***21****	***25****	***30****	***28****	***20****	***21****	***20****	*15*
	Fixed Price Turn Key (FPTK) contract	**Fixed Price Turn Key (FPTK) contract.**	***30****	***28****	***35****	***30****	***26****	***38****	***29****	***32****
	Not provided	Contractor's acceptance of Full Technology Wrap for the proper functioning of all project assets	*7*	*6*	*4*	*6*	*10*	*11*	*7*	*7*
	Not provided	**Delay in start-up insurance**	***20****	***20****	***21****	***26****	***21****	***23****	*15*	***21****

Risk Factors (RF)	Risk Mitigation Strategies Proffered by Project Sponsors	Lenders Bankability Criteria for Project Appraisal	Case Study for Model Development				Case Study For Model Validation			
			Road Sector Projects		*Education Sector Projects*		*Road Sector Projects*		*Education Sector Projects*	
			Case study	*Case study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*	*Case Study*
RF.4 Construction &Completion Risk	Not provided	Single -Point responsibility from main contractor to be responsible for other subcontractors.	*2*	*9*	*5*	*9*	*9*	*10*	*8*	*5*
	Not provided	Contractor bonding through Bank Guarantee	*3*	*5*	*4*	*7*	*11*	*7*	*9*	*11*
	Not provided	Additional equity requirements from the sponsors in case of cost over run	*5*	*8*	*8*	*4*	*8*	*8*	*6*	*8*
	Not provided	Debt Buy Out arrangement	*6*	*7*	*6*	*3*	*10*	*5*	*11*	*7*
	Not provided	Acceptance by the contractor of responsibility for every aspect of construction and design	*8*	*5*	*9*	*7*	*7*	*4*	*9*	*6*
		Total Scores	**668**	**705**	**633**	**611**	**755**	**797**	**653**	**659**
		Lenders' Minimum Bankability	**600**	**600**	**525**	**550**	**650**	**700**	**550**	**520**

Table 3: Risks and other Emerging Sub-Risk Components in PFI/PPP Projects.

Major Risk Factor	Concurrent Risks emerging	Types of projects where they are common
Supply Risk	Volume Risk Price Risk Reserve Risk	Most Gas propelled power plants Oil field explorations Infrastructures Waste management facilities
Demand Risk	Price Risk Volume Risk	Road Concessions Power Projects Air ports Oil and Gas Rail Concessions etc.
Operations and Maintenance Risk	Performance Risk Availability Risk	Common to most project finance contracts
Construction/Completion Risk	Technology Risk Cost Overrun Time Overrun	Common to most project finance contracts

Notes: Qualitative evidences showed that, the existence of certain critical risks automatically results in other smaller chain of sub- risk components in PFI projects. This explained the need for project stakeholders to be well equipped and be able to anticipate such concurrent relationships among risks during due diligence appraisals.

Table 4: Framework Validation using Four PPP Case Studies

A brief description of PPP projects' case studies used for validating the framework model focused on essential features of each of the project.

Four Case Studies for Model Validation			
Case Study A (Road Project)	***Case Study B (Road Project)***	***Case study C (School Project)***	***Case Study D (School Project)***
The project, located in Wales, is a 32km dual carriage way designed, built, finance and operate under a 30-year concession agreement. Awarded under PFI/PPP scheme in 1998, the project is valued at £125million and involved maintenance of additional 12km existing road and two bridges. As part of the concession contract, the project company was also responsible for ecological and landscape design of the road. The road project was completed within 24months and started operations in the early part of year 2002 under a shadow-toll arrangement.	This project is one of the early set of Design, Build, Finance and Operate (DBFO) road projects in the UK and is located in South West of England. Valued at £125million, the 33-year concession involved the upgrade of two major link roads of approximately 52km, to dual carriageway status. Concessioned in the late 1990s, the project also involved improvement and maintenance of three additional trunk roads of 6km, 10km, and 9km respectively. The construction phase of the project was completed within 20months and the project had since commenced operations towards the end of year 2000.	This project is part of the "Building School for the Future" (BSF) project of the UK government and is located in the North East of England. With a project value of £55million, the project was concessioned to private sector under a 25-year contract that involved a combination of build, remodel/refurbish of 6 secondary schools. The PFI project also included facility maintenance services up to the tune of £20million for three of the PFI schools. Awarded as a DBFO in 2009, the construction of the project took 17months and had since being in operation as at year 2013.	This project involved the Design, Construction, Finance and Operation of four new secondary schools in the South West of England. The project value was put at £119m and was contracted under a 25-year concession. The schools were designed to accommodate 945 pupils of 11 to 16 years of age. As part of the PFI arrangement, the private sector contractor was responsible for refurbishment and maintenance of the facilities, while also providing ICT, catering, security, fitness centre, dance studio and all weather pitches with floodlights etc. The project was delivered within 24months and is currently up and running.