

**An Integrated Project Evaluation Tool for  
Public-Private Partnership Projects**

**By**

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## ABSTRACT

The evaluation of a large infrastructure project is a critical activity for bidders and governments under traditional procurement or through Public Private Partnership. When a project requires huge capital investment, public-private partnership (PPP) is often sought as an alternative in cases of shortage of public funds. Nevertheless, the complexity of the PPP arrangement has constituted a dilemma for government authorities to balance the interests between the public and the private parties (stakeholders). High capital burdens in terms of PPP bidding cost, construction cost, and operation and maintenance cost are part of the major challenges for private sponsors to get involved in PPP projects. Meanwhile, PPP scheme projects, believed to deliver better value for money, have been criticised by many as the product of highest influence level from either political patronage or corporate political power.

There is an apparent need for a tool to help the government agency evaluate the delivery of value for money on PPP projects while still sustaining the interests of private parties. The aim of this research is to assist government agencies in evaluating bids and making decision efficiently for PPP seaport development projects through the use of an integrated project evaluation tool (IPET). A computer (MS excel program) based tool was developed to evaluate the project financial viability and negotiate the risk sharing mechanism of PPP Seaport Project at five different project stages. The stakeholders' expectations, financial indicators, financial risks, and mitigation measures are considered and developed into the following modules: (1) Financial viability module; (2) Financial risk analysis module; and (3) Financial risk mitigation module.

A triangulation strategy was justified with caution due to the possibility of error. A qualitative method (i.e. literature review and interview to explore stakeholders' expectation and preferred indicators of PPP financial models) was undertaken prior to performing a quantitative technique (i.e. questionnaire survey to narrow down the preliminary findings). Then, the proposed tool was validated by comparing the results with secondary data and interviewing experts regarding their opinion on its applicability.

The findings from the statistical analysis indicate that an efficient negotiation is possible if: (1) PPP financial models were used at the pre-proposal stage to examine the project's ability in generating enough cash flow; (2) All stakeholders know the most important expectations and the most preferred financial indicators of other stakeholders; and (3) IRR, NPV, Revenue, Operating Cost, and Principal Payback are not considered as the only financial indicators for evaluating PPP projects. By knowing the mutual agreement among stakeholders, any conflicting expectations can also be identified early and it may be possible to accommodate such expectations in the negotiation process.

The IPET has been confirmed that it has several implications: (1) possibility to facilitate an efficient negotiation and effective evaluation process; (2) applicability in evaluating PPP seaport projects; and (3) potentially to be extended to other sectors. However, the IPET is designed to be used with financial model, hence it will require an actual PPP financial model.

# **DEDICATION**

To

## **PALESTINA DORA**

My soulmate, teacher, wife and mother of two little angles:

### **Muhammad Ghaza Al-Farabi Kurniawan**

My son, the inspired striver

and

### **Nasyamah Azka Eydin Kurniawan**

My daughter, the purified soul

and

**For the use of mankind**

## **ACKNOWLEDGEMENTS**

*ALL THANKS AND PRAISE TO ALLAH THE ALMIGHTY,  
THE CHERISHER AND SUSTAINER OF THE WORLD,  
MOST MERCIFUL, MOST GRACIOUS.*

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# DECLARATION STATEMENT

## ACADEMIC REGISTRY Research Thesis Submission



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## GLOSSARY

AHP	Analytic Hierarchy Process
ANOVA	Analysis of Variance
BOO	Build Own Operate
BOOT	Build Own Operate Transfer
BTO	Build Transfer Operate
BOT	Build Operate Transfer
CADS	Cash Available for Debt Service
CAPEX	Capital Expenditure
DBFO	Design, Build, Finance and Operate
DEA	Department of Economic Affairs
DEA	Data Envelopment Analysis
DSC	Discounted Cash Flow
DSF	Decision Support Framework
DSCR	Debt Service Cover Ratio
EBITDA	Earnings before Interest, Tax, Depreciation, and Amortisation
FAST	Flexible Accurate Structured and Transparent
FTA	Fault Tree Analysis
GoAP	Government of Andhra Pradesh
GPL	Gangavaram Port Limited
IDA	International Development Association
IIFCL	India Infrastructure Finance Company
ISPL	International Seaports Pte Limited
IPET	Integrated Project Evaluation Tool
IRR	Internal Rate of Return
JNPT	Jawaharlal Nehru Port Trust
LLCR	Loan Life Cover Ratio
KDWP	Kakinada Deep Water Port
KMO	Kaiser-Meyer-Olkin
KSPL	Kakinada Sea Ports Ltd
MAC	Material Adverse Change
MCDM	Multi-criteria decision making
MCS	Monte Carlo Simulation
MGA	Minimum Guaranteed Amount



MIRR	Modified Interest Rate of Return
MRG	Minimum Revenue Guarantee
NPC	Net Present Cost
NPV	Net Present Value
NSICT	Nhava Sheva International Container Terminal
OPEX	Operational Expenditure
PCA	Principal Component Analysis
PERT	Program Evaluation and Review Technique
PFI	Private Finance Initiative
PLCR	Project Life Coverage Ratio
PPP	Public-Private Partnership
PPIAF	Public-Private Infrastructure Advisory Facility
PSC	Public Sector Comparator
RCP	Revenue Cap
RFP	Request for Proposal
RFQ	Request for Qualification
ROA	Return on Asset
ROE	Return on Equity
SLR	Self-Liquidation Ratio
SPC	Special Purpose Company
SPV	Special Purpose Vehicle
TAMP	Tariff Authority for Major Ports
TCE	Transaction Cost Economics
TEU	Twenty-feet Equivalent Unit
VFM	Value for Money
VGF	Viability Gap Funding

## LIST OF PUBLICATIONS

Kurniawan, F, Ogunlana, S and Motawa, I (2013) "Stakeholders' expectations in utilising financial models for public private partnership projects". *Built Environment Project and Asset Management*, 2013, (Accepted).

Kurniawan, F, Ogunlana, S, Motawa, I, and Dada, M (2013) *Public-Private Partnership Projects Implementation: Three Case Studies of Seaport Projects in India*, International Conference on PPP Body of Knowledge, Preston, 18-19 March 2013.

Kurniawan, F. (2010) "A Review: Exploring Stakeholders' Expectations from PFI Financial Modelling at Different Stages", paper presented at PMI India Conference 2010, Mumbai, 19-21 November 2010 .

Kurniawan, F, Ogunlana, S and Motawa, I (2010) An integrated project evaluation tool for PFI seaport projects. In: Egbu, C. (Ed) *Procs 26th Annual ARCOM Conference*, 6-8 September 2010, Leeds, UK, Association of Researchers in Construction Management, 1317-1327.

## CHAPTER ONE: INTRODUCTION

*“Read! In the Name of your Lord, Who has created (all that exists).  
He has created man from a clot (a piece of thick coagulated blood).*

*Read! And your Lord is the Most Generous.  
Who imparted knowledge by means of the pen.  
He has taught man that which he knew not.”*

(Quran 96: 1-5)

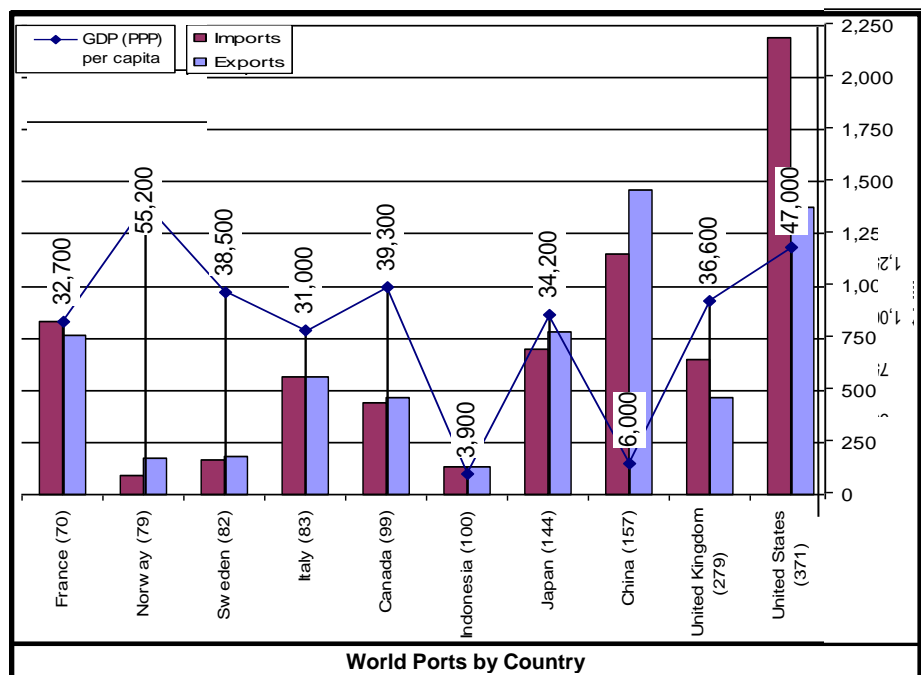
# Chapter 1: Introduction

## 1.1 Introduction

This chapter introduces the background and the problem statements which motivate this research to be undertaken. Research questions are addressed in this chapter, together with research aim, objectives, scope of the study, and a brief overview of the thesis structure.

## 1.2 Background

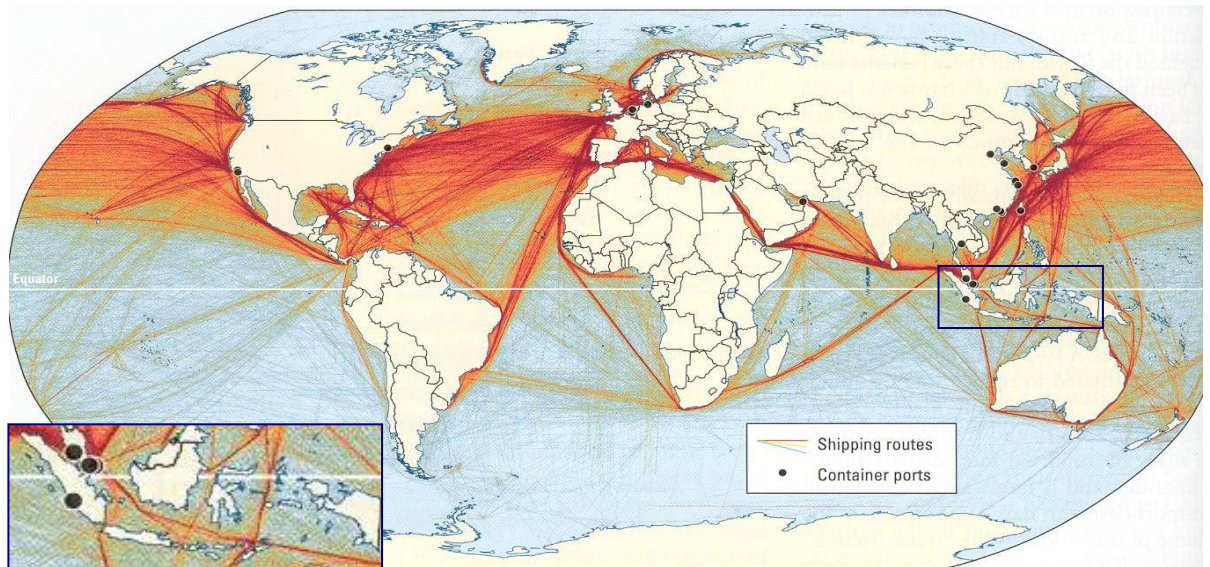
Government has the responsibility of providing public services; including infrastructure facilities. Various types of infrastructure constitute essential public services, for instance: transportation, energy, telecommunications, water, waste disposal, hospital, school, and housing facilities. In the context of the transportation sector, and specifically in the seaport sector, Kakimoto and Seneviratne (2000); Bichou and Gray (2005); Kulkarni and Prusty (2007) have meticulously described the role of port infrastructure as economic catalysts, promoter of seaborne trade activity and generator of benefits and socio-economic wealth in developing countries.



**Figure 1.1** The top 10 countries with the highest number of seaport

Sources: World Port Source (2008) and CIA (2004)

Indonesia is the largest archipelago country in the world. It has 17,508 islands which are mainly connected only by 100 seaports (World Port Source, 2008). Thus, it is very important for Indonesia to develop her seaport infrastructure since Indonesia is one of the countries with the lowest export and import capacities among top 10 countries with the highest number of seaports (see figure 1.1).



**Figure 1.2** Intensity of world shipping routes in 2004 and Indonesia (Inset)

*Source: World Bank (2009)*

The number of ports in each country will foster the development process of its country significantly. Figure 1 also shows the top 10 countries with the highest number of ports, with the majority having high GDP per capita while Indonesia has the lowest GDP per capita. Figure 1.2 shows the intensity of world shipping routes where Indonesia plays an important role in world shipping service routes. These facts justify the need for research into seaport infrastructure development especially for Indonesia. Seaports have contributed wide-ranging economic impacts and have been developed as an important transportation service for the world's transportation industry. For instance, Baird (1999) stated that 95% of all trades in UK rely on seaports to international markets. Alderton (2005) recorded that the capacity growth of containerisation and bulk carriage has been tremendously increased and continued since the 1950s to meet the growing demand.

Seaports, as the engine of the economy, are growing in line with the increasing demand on the shipping industries, collectively with up-surgng cost of construction and

maintenance, uncertain demand and world trade. Consequently, the financial viability of seaports should be carefully secured and examined from the preliminary project stage.

### **1.3 Problem statement**

When there is lack of infrastructure facilities in a country and national budgets are limited, private participation is considered as an alternative strategy thereof. This approach is known worldwide as Public-Private Partnership (PPP) which involves a long contractual relationship between a public sector authority and a private party. In 2010, 12 of the 63 developing countries under International Development Association (IDA) reached financial or contractual closure for 24 transport, energy, and water projects with private investment commitments of US\$7.5 billion. PPP provides the opportunities for the government such as: (1) provide more public service facilities; (2) the fact that the increasing number of PPP projects worldwide with its variants can enhance efficient services and value for money to some extent (Grimsey and Lewis, 2005; and Sadka, 2007). However, PPPs have been criticised by many due to its inability to deliver better value for money (VfM) and excessive profits for the private companies at the expense of taxpayer (e.g. Newberry and Pallot, 2003; Cartlidge, 2006; Shaoul *et al.*, 2006; Coulson, 2008; Shaoul *et al.*, 2010; and Shaoul *et al.*, 2011). Moreover, the complexity of project finance arrangement and the uncertainty over long term concession period have generated more risks not only to the government but also to the private parties (Dey and Ogunlana, 2004; Zhang, 2005a; Jin and Doloi, 2008; Fischer *et al.*, 2010). Thus, PPP projects require adequate allocation of the risks, associated with the complex financial, legal, organisational and socio-political structure, between the public sector authority and the private parties.

Numerous researches have been conducted to evaluate the PPP project from various perspectives (e.g. Grimsey and Lewis, 2005; Demirag *et al.* 2004; Jin and Zhang, 2011; and Alexander, 2011). However, few have concerned on the tendency to rely much on consultants in formulating and managing the policy on PPPs, which has been frequently practiced by public sector authorities. Shaoul *et al.* (2007) addressed this problem by using an example from UK's experience dealing with big four accounting firms such as PwC, Deloitte and Touche, KPMG, and Ernst and Young. Conflict of interests was, thus, revealed to exist not only within the stakeholder but also among stakeholders. For instance, when the firms also have an equity stake and/ or they are hired by the sponsor

companies on the same project, they prepare evaluative reports to favour their interest. Moreover, in the context of negotiating the project, the conflict of interests among the stakeholders predominantly has a tendency to be quasi-monopolistic pricing that reduces social welfare (Trailer *et al.*, 2004). Therefore, it is important to study how the public sector authority independently decides which PPP strategy is the best choice (if proven to have better value for money) based on the type, size and condition of the project.

The complexity of financial evaluation and long bidding process could make the bid either uncompetitive or unprofitable. Meanwhile, many government projects have suffered from time and cost overruns, quality issues, noneconomic allocation criteria, irregular cash flows from budgets, and shortage of competent people (African Development Bank, 2008). In this regard, an effective project evaluation tool is important to be developed in order to resolve these problems and to facilitate negotiation between the bidder or project company members and the government at the contract stage. Ozdogan and Birgonul (2000) developed a decision support framework (DSF) for helping the project company in the planning stage of a hydropower plant to check project viability against several predefined critical success factors. However, a further research needs to be undertaken to adopt and modify the previous DSF into an integrated project evaluation tool for a PPP seaport project. The proposed project evaluation tool also necessitates to be verified whether it can be practically used in worldwide seaports or not. Therefore, a research in developing a framework of an integrated project evaluation tool, which is combining the evaluation of the financial viability of the project and revealing the risks with possible options of financing strategies in a computer-based model, is important and beneficial to all of the project participants during the bidding period.

Primary data from several interviews, questionnaires to seaport risk managers, port authorities and PPP experts were planned to be conducted in the UK and Indonesia. However, the majority of the primary data was gathered in India because it was not possible to collect sufficient data about PPP seaport in the UK and Indonesia.

## **1.4 Motivations**

In regard to the necessity of developing infrastructure facilities coupled with the national budget pressures, PPP as an alternative procurement strategy shall not be overlooked. Even so, the public sector authority must be extra cautious in selecting the right strategy among the variance of PPPs for the project. From the background and the problem statements described earlier, there are several motivating factors in addition to the above for undertaking this research. The factors are as follows:

- Since all risks of the PPP projects could affect the financial viability of the project, the evaluation of the project from the perspective of financial implications is a very important subject to study.
- Project financing arrangements for PPP projects involve many participants with complex transactions and involve diverse interests. In order to accommodate all key interests of the stakeholders, financial model is one of the most common tools used for evaluating a new project and facilitating negotiations among the lenders, the sponsor(s) and the public sector authority (Khan and Parra, 2003). Therefore, it is important to study how financial models are used for negotiations between the public sector authority and the other stakeholders within reasonable time.
- Rigorous studies on how to evaluate the project financial viability and how to manage the risks in PPP projects have been carried out. However, there are no specific studies on how to use financial model not only as a tool for evaluating the project financial viability but also as a tool for negotiating the risk sharing mechanism and monitoring the PPP project over a long term concession period.

## **1.5 Research questions**

Developing large infrastructure projects either by using traditional procurement method or PPP strategy, the projects still encounter many risks in several aspects. Since the existence of risk cannot be eliminated, alternatively the expected risks can be mitigated by managing them. The main challenge of this research was to find out the best strategy on how the stakeholders manage the risks by using PPP financial models. This challenge was addressed with the following research questions:



- *Who are the stakeholders who are going to manage those risks?* The identification of the stakeholders in this study is limited to the user and developer of the PPP financial models.
- Since a PPP financial model is not only a tool for evaluating the project but also a tool for negotiating and monitoring the project over concession period, *what are the most important stakeholders' expectations in utilising PPP financial models?*
- As the exploration of the risks in this study was attributed to the identification financial risk variables. The subsequent research question was “*What are the financial risk variables within PPP financial models?*”
- In order to ensure that the stakeholders' expectation can be effectively reconciled through a PPP financial model, with reference to the Nash Equilibrium Theory (Gibbons, 1992), it is important to identify the risk related to financial risk variables that should be managed by each stakeholder. Therefore, the next research question was “*What are the possible risks related to the financial risk variables (input and output of PPP financial models)?*”
- When the term “managing the risks” means identify, evaluate, and respond to the risks by using PPP financial models, *how are those risks managed?*

## **1.6 Aim and objectives**

This research aims to ascertain the rationale of the public sector authority in evaluating PPP projects through an integrated project evaluation tool (IPET). This tool is expected to assist stakeholders in utilising PPP financial models at different project stages. The objectives set to achieve this aim are:

- To explore the concept of PPP and the use of PPP financial models.
- To explore risks and their mitigation measures in PPP projects.
- To develop an integrated project evaluation tool (IPET) fitted to PPP seaport project.
- To ensure that the IPET is valid in terms of applicability, comprehensiveness, practical relevance, and intelligibility through the evaluation process by academics and expert practitioners.

## 1.7 Scope of the study

The scope of the study is limited in order to allow the undertaken study completed within reasonable time and budget constraints. In the context to the partnership, there are many interpretations and an over use of partnership term for public-private partnership (PPP). Weihe (2008) identified that there are four approaches of partnership concept between public and private with different interpretations: 1) the urban regeneration approach; 2) the policy approach; 3) the infrastructure approach; and 4) the development approach. This research is limited to the infrastructure approach, where private investment is involved, and where different elements such as construction, operation and maintenance are integrated. In conjunction with previous descriptions, the study of PPP projects concentrates on the financial implications. Financial models are selected as the object of the study for identifying, evaluating, and managing the risks in PPP projects. Hence, the context of managing risks in this study is limited to the quantitative perspective.

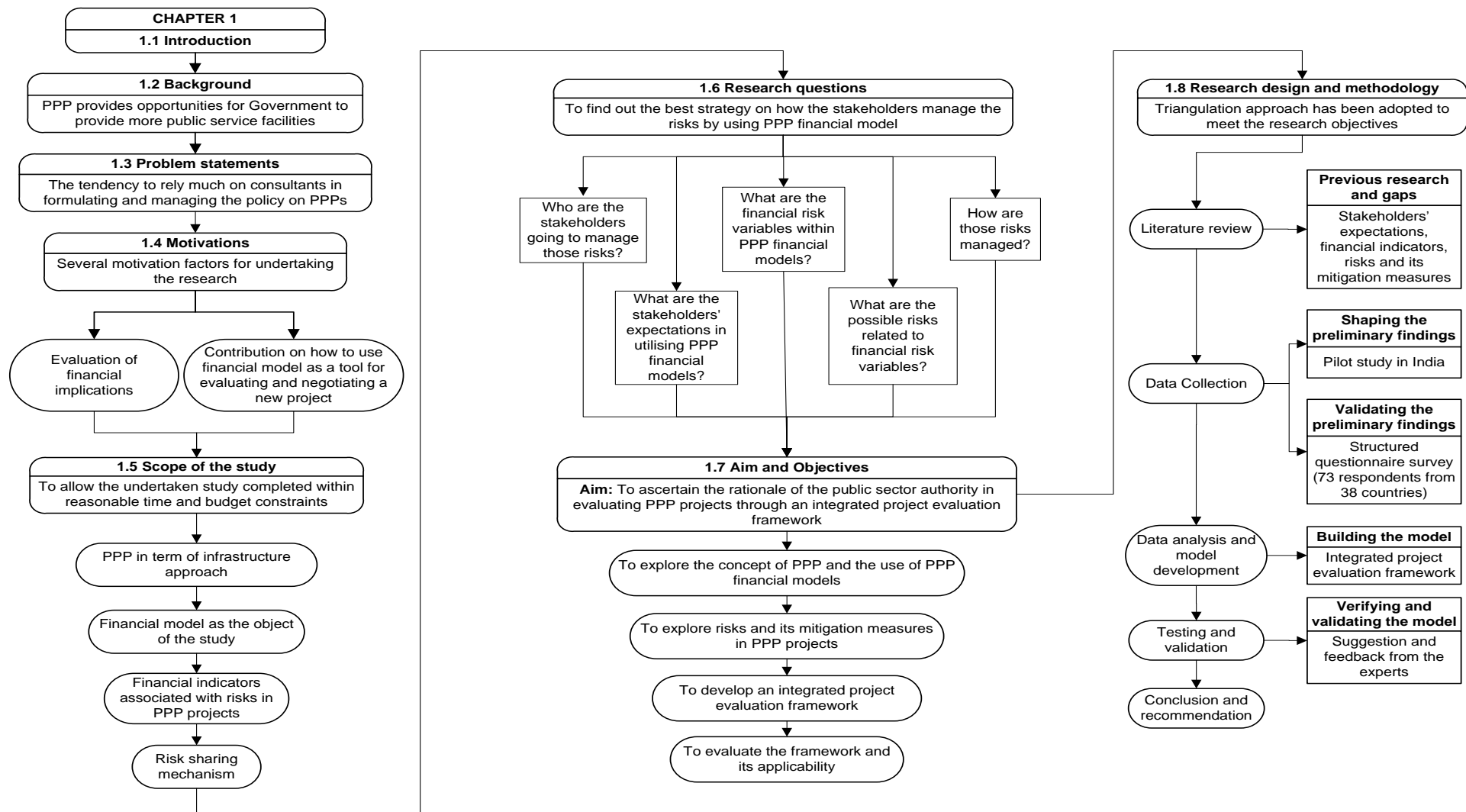
Although this research benefits from previous case studies on the identification of various risks in general PPP projects (e.g. Bing *et al.*, 2005; Schaufelberger and Wipadapisut 2003; Wang *et al.*, 2000; Xenidis and Angelis, 2005; Askar and Gab-Allah, 2002; Zhang, 2005c; etc.), it specifically reviews financial indicators of PPP financial model which are associated with the risks especially for PPP seaport projects. The exploration of the risks is attributed to the identification financial risk variables from PPP seaport financial models. Nevertheless, in order to gain different perspective over seaport development project, this research is not limited only to PPP seaport projects. By considering this approach, the risk sharing mechanism among the stakeholders can be determined comprehensively in any financial negotiation.

In this study, the definition of stakeholders is also limited to the actors (e.g. sponsor(s), lenders, government authority, consultant companies, insurance company, contractor, operator, etc.) who are using financial models as a tool for project evaluation, contract negotiation, appraisal report, tariff adjustment, and project performance monitoring.

## **1.8 Research design and methodology**

A research can be defined as a set of activities for the advancement of knowledge. In order to justify the truth to be believed as knowledge, a sound research should be designed in such a way through constant reasoning. Jonker and Pennink (2010) suggested that the first and foremost step in setting up a research is to determine the research paradigm of how the researcher views 'reality'. It was perceived that the problem (ontologically) belongs to nominalism reality. Meanwhile, the method employed to solve the problem was based on objectivist epistemology. As results, both positivism and interpretivism approaches were considered. This combination is called a pragmatic paradigm, which utilises combination of qualitative and quantitative techniques or triangulation technique (Jupp, 2006). A triangulation strategy has been adopted to meet the research objectives.

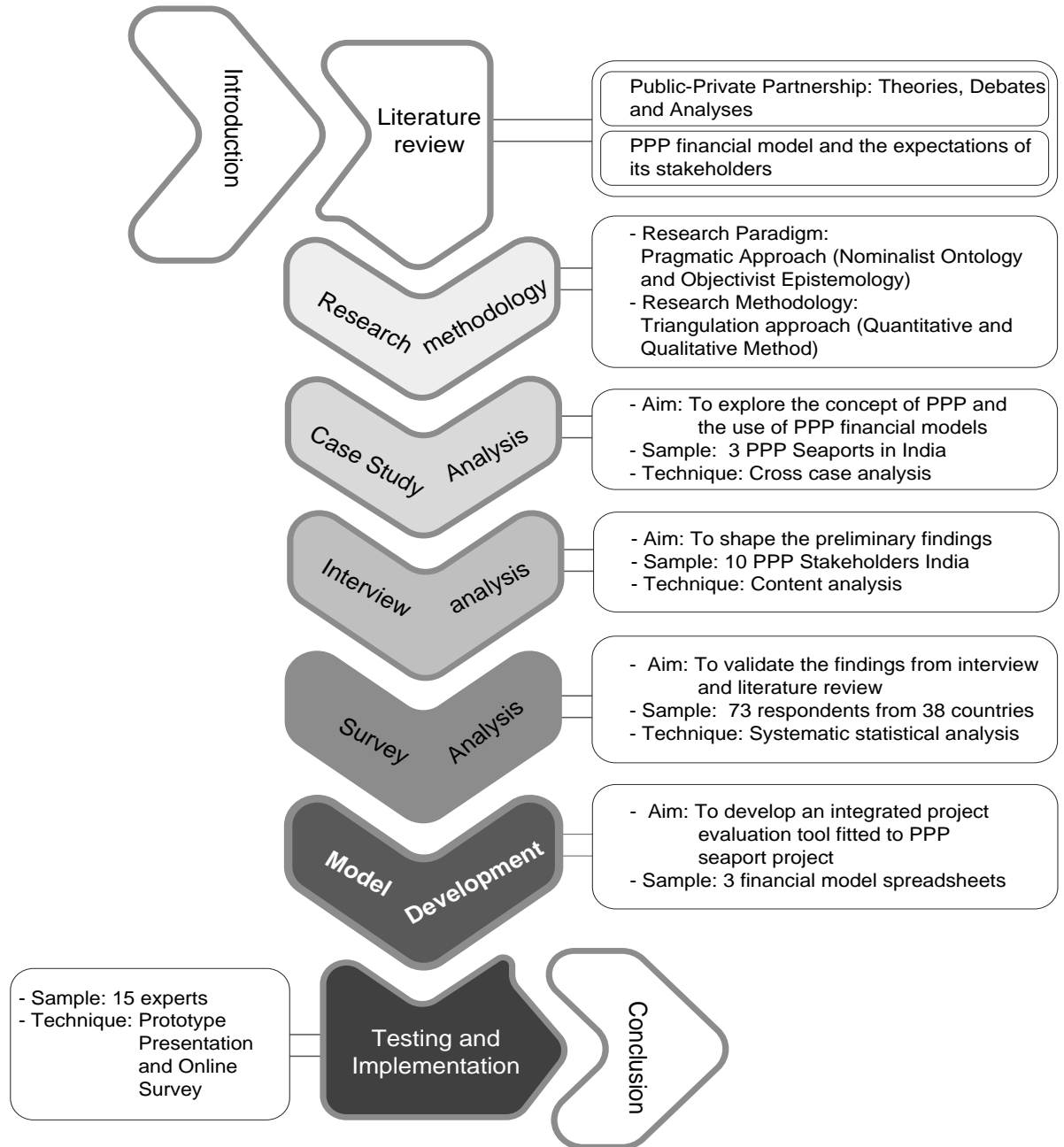
A literature review has been undertaken to identify previous research and gaps which needed to be studied and filled. A pilot study was conducted in India through a series of semi-structured interviews for shaping and validating the preliminary findings. Then, from the recommendations concluded from the pilot study, a structured questionnaire survey of international expert opinions was carried out to identify the most important stakeholders' expectations in utilising PPP financial model and the most important financial indicators. Based on the results from the survey, an integrated project evaluation tool (IPET) was developed to model the best PPP strategy based on stakeholders' expectations in utilising PPP financial model at different stages, and to produce the information needed for decision making, such as the most important financial risk variables, mitigation measures and its alternatives. The applicability of the proposed IPET was validated by using experts' opinion. The summary of sub-chapter 1.1 up to 1.8 is illustrated in figure 1.3.



**Figure 1.3** Summary of sub-chapter 1.1 up to 1.8

## 1.9 Structure of the thesis

The thesis consists of ten chapters, which is outlined in figure 1.4 below, and the chapters' overviews are structured as follows:



**Figure 1.4** Outline of the study

### Chapter One: Introduction to the thesis

This chapter introduces an overview to the background, the problem statements, the motivations, the scope of the study, the research questions, the aim and objectives, the research design and methodology, the research findings, and the structure of the thesis.

## **Chapter Two: Public-Private Partnership: Theories, Debates, and Analyses**

This chapter reviews the concept of Public-Private Partnership (PPP), discusses the rationale for PPP projects, reviews several theories underlying the partnership approach and addresses the debate on PPP. This chapter also deliberates on the important aspects and the problems in evaluating large infrastructure projects. A review of the risk management literature in terms of project evaluation tools and techniques used in the construction industry is presented as well.

## **Chapter Three: PPP financial model and expectations of its stakeholders**

This chapter explores stakeholders who utilise financial models in PPP projects and their expectations from PPP financial models are then presented. This chapter also highlights and discusses the most important ones.

## **Chapter Four: Research Design and Methodology**

This chapter presents the approach to discover a suitable research design and methodology (including research method, data collection, and data analysis) in answering the research questions and problems addressed in the literature review. This chapter also provides further emphasis and description of the data needed and the methodology selected for this research.

## **Chapter Five: Case Study Analysis and Discussion**

Chapter five reports the findings of cross case analysis of three PPP seaport projects in India. The primary aim of this chapter is to study the implementation of PPP seaport projects. In order to achieve the aim of this chapter, this chapter identifies typical procedures used for evaluating PPP seaport projects in India.

## **Chapter Six: Interview Analysis – Exploring Stakeholders’ Expectations**

This chapter provides information about the stakeholders’ expectations and then presents several analyses that are divided into two major parts: 1) PPP Stakeholders; 2) Stakeholders’ Expectations. The first part analyses the actor and the influence of PPP stakeholders who are identified from literature and interviews. Then, the next part

analyses the importance of the pre-determined 44 expectations, which are identified through literature and verified through semi-structured interview with key participants of PPP projects in India.

### **Chapter Seven: Questionnaire Survey Analysis**

This chapter follows up the findings from literature review, cross case analysis, and interview analysis. As part of the triangulation process, a structured questionnaire survey was also considered to be the second validation process of the preliminary findings from literature review and interview. The questionnaire aims to answer the second and third research questions: “*what are the most important stakeholders’ expectations in utilising PPP financial models?*” And “*what are the financial risk variables within PPP financial models?*” (see 1.6). To answer these questions, this chapter presents a systematic statistical analysis of the collected data.

### **Chapter Eight: Discussion and Framework Construction**

This chapter discusses the findings obtained from chapters six and seven. An integrated project evaluation tool (IPET) is developed based on the findings from literature review, interview, and questionnaire survey. This chapter also highlights the concept and development of the model framework.

### **Chapter Nine: Verification and Validation**

This chapter will verify and validate the proposed IPET into framework that can be generalised to the construction industry. This chapter begins with discussion of the deployed methods to verify and validate the research findings. Then, the verification and validation of IPET by using a hypothetical data of PPP financial model and online survey are presented in this chapter.

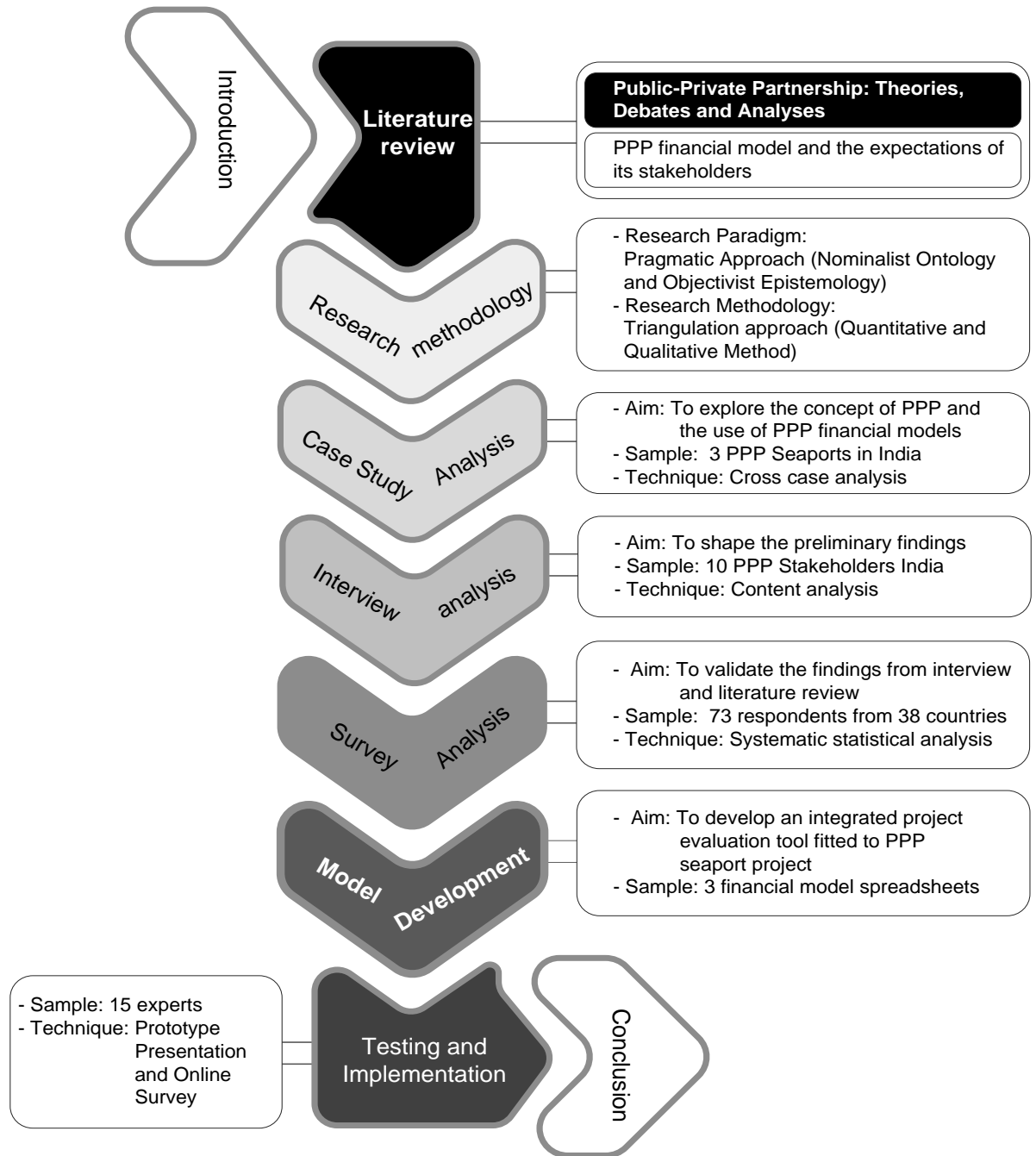
### **Chapter Ten: Conclusions and Recommendations**

The last chapter synthesises the research findings and the influence of the IPET in evaluating and negotiating projects effectively and efficiently. It concludes the research and the achievements of the research objectives. Limitation of this research and

recommendations for future research are presented in this chapter. This chapter also highlighted the contributions to the body of knowledge at the end of this chapter.



## CHAPTER TWO: PUBLIC-PRIVATE PARTNERSHIP: THEORIES, DEBATES, AND ANALYSES



## Chapter 2: Public-Private Partnership: Theories, Debates, and Analyses

*"Make things easy for the people and do not put hurdles in their way, and give them glad tiding, and don't let them have aversion (i.e. to make people to hate good deeds) and you both should work in cooperation and mutual understanding"*

Muhammad (570 – 632)

### 2.1 Introduction

Public-private partnership (PPP) has been widely adopted by governments to finance the acquisition of infrastructure assets and the operation of their facilities (Xu *et al.*, 2012; Auriol and Picard, 2011). PPP is an alternative procurement strategy that can enhance efficient services supplied before solely by government authorities (Sadka, 2007). Nevertheless, the implementation of efficient partnership concept between government authorities and private entities in PPP projects was not always necessarily delivered in practice (Diamond, 2006; Friend, 2006; and Jacobson and Choi, 2008). Several unsuccessful PPP projects<sup>1</sup> in many countries, especially in developing countries, have been recorded by many (e.g. Handly, 1997; Hayllar and Wettenhall, 2010; Bernardino *et al.*, 2010). These failures are a consequence of the complex arrangements and incomplete contracting in PPP projects, which have led to increased risk exposure for both public and private partners. Since the core of PPP is based on a partnership concept between public and private entities, this chapter reviews the rationalisation for PPP projects including several theories underlying the partnership concept, addresses the debate on PPP, and deliberates on important aspects in evaluating PPP projects.

### 2.2 Exploring the partnership concept

Various interpretations of partnership concept between public and private can be categorised into four approaches such as (1) the urban regeneration approach; (2) the policy approach; (3) the infrastructure approach; and (4) the development approach

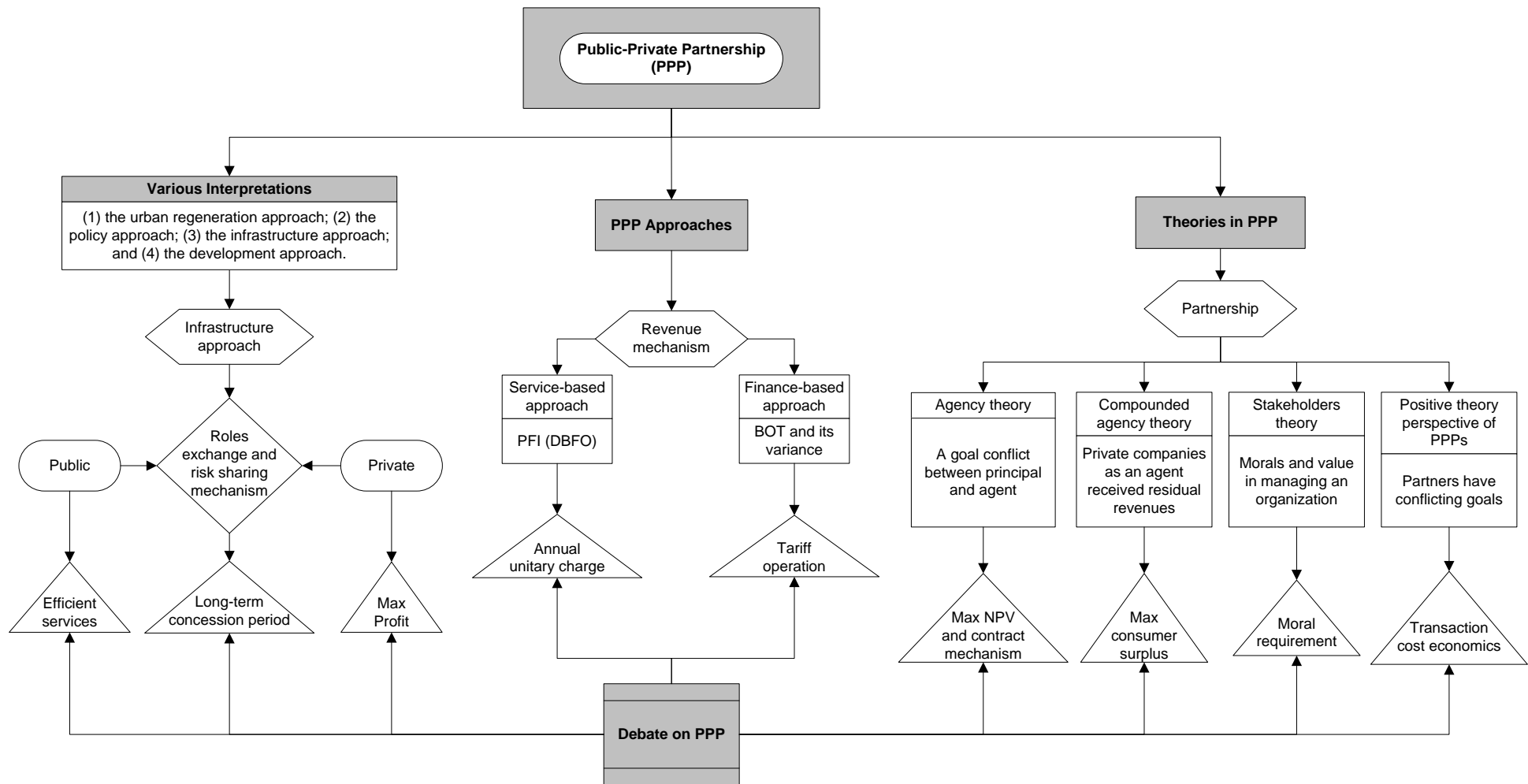
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<sup>1</sup> E.g. Pakistan's Hub Power Project, Thailand's Mass Transit System Project, India's Telecommunications and Power Project, China's Power Project, Thailand's Power Project, Indonesia's Power Project, Malaysia's Power project, England's National Health Service (NHS), Sydney Cross-City Tunnel PPP, Britain's Channel Tunnel Rail Link, etc.

(Weihe, 2008). As described in the earlier chapter, this research is limited to the infrastructure approach, where private finance is involved, and where different elements such as construction, operation and maintenance are integrated. Figure 2.1 shows the conceptual framework of PPP that will be discussed in this chapter. Private involvement in developing public infrastructures implies contractual relationship between the government and the special purpose vehicle (SPV) company.

This contractual relationship is regarded as risks sharing mechanism and roles exchange between government authorities and private parties in delivering public services over long-term concession period. Furthermore, the partnership concept of PPP differs from traditional procurement in construction projects; PPP as partnership method denotes an equal power relationship between public and private parties, where majority of the project risks is transferred to the private parties. Traditional procurement entails a top-down relationship, where the private companies (e.g. contractors, operators, suppliers, etc.) work for and earn from the government with limited liability.

The term PPP is often mainly overlooked as a method of procurement. Cartlidge (2006) argued that PPP can also be seen as a method to raise finance off balance sheet, a strategy to achieve greater efficiency, and a politically motivated tool to drive a social change. However, PPP projects do not always demonstrate an efficient partnership concept into practice (Diamond, 2006; Friend, 2006; and Jacobson and Choi, 2008). The failure of the implementation of PPP projects is either contributed by the government authorities or private parties. Government authorities of the host country have jurisdiction over project initiation, construction process, and concession period, play a significant role in the success of PPP projects.



**Figure 2.1** Conceptual Framework of Public-Private Partnership addressed in chapter 2

In the history of PPP development, the policy initiatives undertaken by the government authorities do not always favour the private parties (Bing *et al.*, 2005; Schaufelberger and Wipadapisut, 2003; and Wang *et al.*, 2000). On the other hand, the influence from corporate political power towards government roles in delivering public services is prioritizing maximum profit for their business initiatives (Heald and Georgiou, 2000; Crane and Matten, 2003; Johnston, 2010; Beh, 2010; Siemiatycki, 2010; and Wilks, 2013). Commercialisation of public services is obvious evidence that ‘partnership’ is overly turned into a new business opportunity. Thus, the effectiveness of PPP as an alternative procurement strategy to deliver better value for money is open to question. In order to evaluate the effectiveness of the partnership concept, the next section briefly discusses how PPP approaches are used worldwide.

### **2.3 PPP approaches**

Though the involvement of private investment in public infrastructure can be traced back to the 18<sup>th</sup> century in European countries, there is no definite information about the exact period of time when the Public-Private Partnership (PPP) term was initially launched. Kumaraswamy and Morris (2002) stated that the earliest private investment was concession contracts to supply drinking water to Paris in 18<sup>th</sup> century. Nevertheless, Private Finance Initiative (PFI) as a type of PPP was introduced into the United Kingdom in 1992. Furthermore, numerous acronyms (such as BOT, BOOT, BTO, BRT, BLT, BOOM, DBOM, and DBFO) also have been used to describe PPP as its variations. Although PPP has various types of partnerships, each partnership concept is not always implemented effectively in every country.

In order to illustrate the effectiveness of the partnership concept, it is worth giving examples of PPP projects across the world. There are two approaches to PPP projects worldwide (Aziz, 2007): (1) Service-based approach; and (2) Finance-based approach. The first approach is private finance initiative (PFI). Design, Build, Finance and Operate (DBFO) is a variation of partnership strategy mostly used in the UK under PFI. PFI allows private parties to undertake the same activities like other PPP projects. However, the difference lies in the concept that the private company receives payment from the government based on the annual unitary charges for both the initial capital spent and the on-going maintenance and operation costs. This partnership approach has been criticised by many because of its ability to deliver better value for money and

excessive profits for the private companies at the expense of taxpayers (e.g. Newberry and Pallot, 2003; Cartlidge, 2006; Shaoul *et al.*, 2006; Coulson, 2008; Shaoul *et al.*, 2010; and Shoul *et al.*, 2011).

The second approach is Build-Operate-Transfer (BOT) Project Delivery and its variance. The BOT and its variance allow private companies to build and manage the project with private funds and collect revenue during the operation period to the users directly through tolls and/or other charges as a reward over their capital investment. Since the government is not obliged to pay the private companies for developing infrastructure projects, this partnership approach is mostly used in developing countries such as India, China, Thailand, Korea, etc. However, Algarni *et al.* (2007), investigated why some government authorities in United States avoided using BOT in their large projects. The main reasons were the availability of proven alternatives and enough funds, the existence of political barriers, and resistance to change both on the part of government agencies and private sponsors.

Based on the two major approaches of PPP projects worldwide, the selection of each approach should be customised according to the situation and condition of the host country. Therefore, it is essential to review partnership theories before selecting the best PPP approach. This will be discussed in the next section.

## **2.4 Theories in Public-Private Partnerships**

This section will discuss several theories underlying the partnership concept.

### ***2.4.1 Agency Theory and Compounded Agency Theory***

Ross (1973) introduced a theory in the agency relationship, in which an efficient alignment of principal and agent's interests will be ensured by selecting appropriate governance mechanisms between principal and agents. The main objective is to ensure that agents serve the interests of the principal, e.g. maximising firm Net Present Value, so that agency costs are minimised through an efficient contract mechanism. The essence of agency theory assumes that there is goal conflict between principal and agent-called an agency problem. Trailer *et al.* (2004) proposed a compounded agency view to add a new dimension to the agency theory applied to PPPs. They discovered that the agency problems exist in PPPs because the private companies as an agent

received residual revenues, which triggered conflict of interest with the public interest of maximising consumer surplus<sup>2</sup>.

#### **2.4.2 Stakeholder Theory**

In conjunction with agency problems, there is another theory that reviews the conflict of interests in different theoretical perspectives. In 1984, Freeman introduced stakeholder theory which addresses morals and value in managing an organization (Donaldson and Preston, 1995). Donaldson and Preston (1995) argued that “*the ultimate managerial implication of the stakeholder theory is that managers should acknowledge the validity of diverse stakeholder interests and should attempt to respond to them within a mutually supportive framework, because that is a moral requirement for the legitimacy of the management function*”. Despite of the fact that agency and stakeholder views are being seen as opposing ideological frameworks, Shankman (1999) argues that stakeholder theory is a logical conclusion of agency theory when: 1) recognition of stakeholders is included; 2) a moral minimum to be upheld; 3) consist of contradictory assumptions about human nature which give rise to the equally valid assumptions of trust, honesty and loyalty to be embedded in the agency relationship. While the implications for practice of agency theory in PPPs are to align interests between private parties and government agencies (i.e. taking actions to maximise the project’s NPV, and using efficient contracting mechanism to minimise agency costs), the practice’s implication of stakeholder theory is to balance the agency problems (i.e. adjusting its development strategies and management activities under the guidance of the national policies so that the interests or claims of all relevant stakeholders will be in conformity with rules and regulations).

#### **2.4.3 Transaction Cost Economics Theory and Positive Theory Perspective of PPPs**

The other theory related to the agency problems which can be viewed based on the transaction cost economics (TCE) is positive theory perspective of PPPs. Here, it is worth explaining the definition of TCE before discussing a positive theory perspective of PPPs. TCE is a theory that not only concerns the economisation of transaction costs, but is also related to the governance of ongoing contractual relations (Williamson, 2007). Transaction costs are the total costs of doing a transaction or making an

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<sup>2</sup> *Consumer surplus is an economic measure of consumer satisfaction, which is the difference between what consumers are willing to spend more for a good or service than the current market price (Investopedia, 2012).*

economic exchange, which consider energy and effort to evaluate and finalise the transaction. There are three kinds of transaction costs (Dahlman, 1979): search and information costs, bargaining costs, and policing and enforcement costs. These then, represent the initial estimate to practicable concept of transaction costs.

Vining and Boardman (2008) developed a positive theory perspective on PPP transaction costs recognizing that partners have conflicting goals. Accordingly, the PPP project is likely to incur high contract bargaining costs, opportunistic behaviour by one or both sides, failure to achieve goals, and partnership dissolution. Further, Jin (2010) identified the other possible resultant transaction costs stem from the divergence of goals such as additional costs for: (1) government authority of a higher contingency (or premium) included in the bid price from contractors; (2) government authority of more resources for monitoring the risk management work; (3) government authority and/or sponsor company of recovering lower quality work (i.e. the materialized or deteriorated risk) for a given price; (4) sponsor company of increasing safeguards (both ex ante and ex post) are against any opportunistic exploitation of one's own risk management service-specific assets by other parties; (5) sponsor company of the resources is dedicated to lodging claims related to the misallocated risk; (6) for both parties of dealing with the disputes or litigation related to the misallocated risk. Therefore, it is imperative to '*organise transactions so as to economise on bounded rationality*<sup>3</sup> while simultaneously safeguarding them against the hazards of opportunism' (Williamson, 1985). Based on a positive theory perspective on PPPs, Vining and Boardman (2008) proposed eight rules for government: 1) Establish a jurisdictional PPP constitution; 2) separate the analysis, Evaluation, Contracting/ Administrating and oversight agencies; 3) ensure that the bidding process is reasonably competitive; 4) be wary of projects that exhibit high asset-specificity, are complex or involve high uncertainty, and where in-house contract management effectiveness is low; 5) include standardised, low-cost arbitration procedures in all PPP contracts; 6) avoid stand-alone private sector shells with limited equity from the real private sector principals; 7) prohibit the private-sector contractor from selling the contract too early; and 8) have a direct conduit to debt holders.

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<sup>3</sup> *Bounded rationality means limited cognitive capabilities due to the limited information and the finite amount of time in the decision-making that make people seek a satisfactory solution rather than the optimal one (Selten, 2001).*



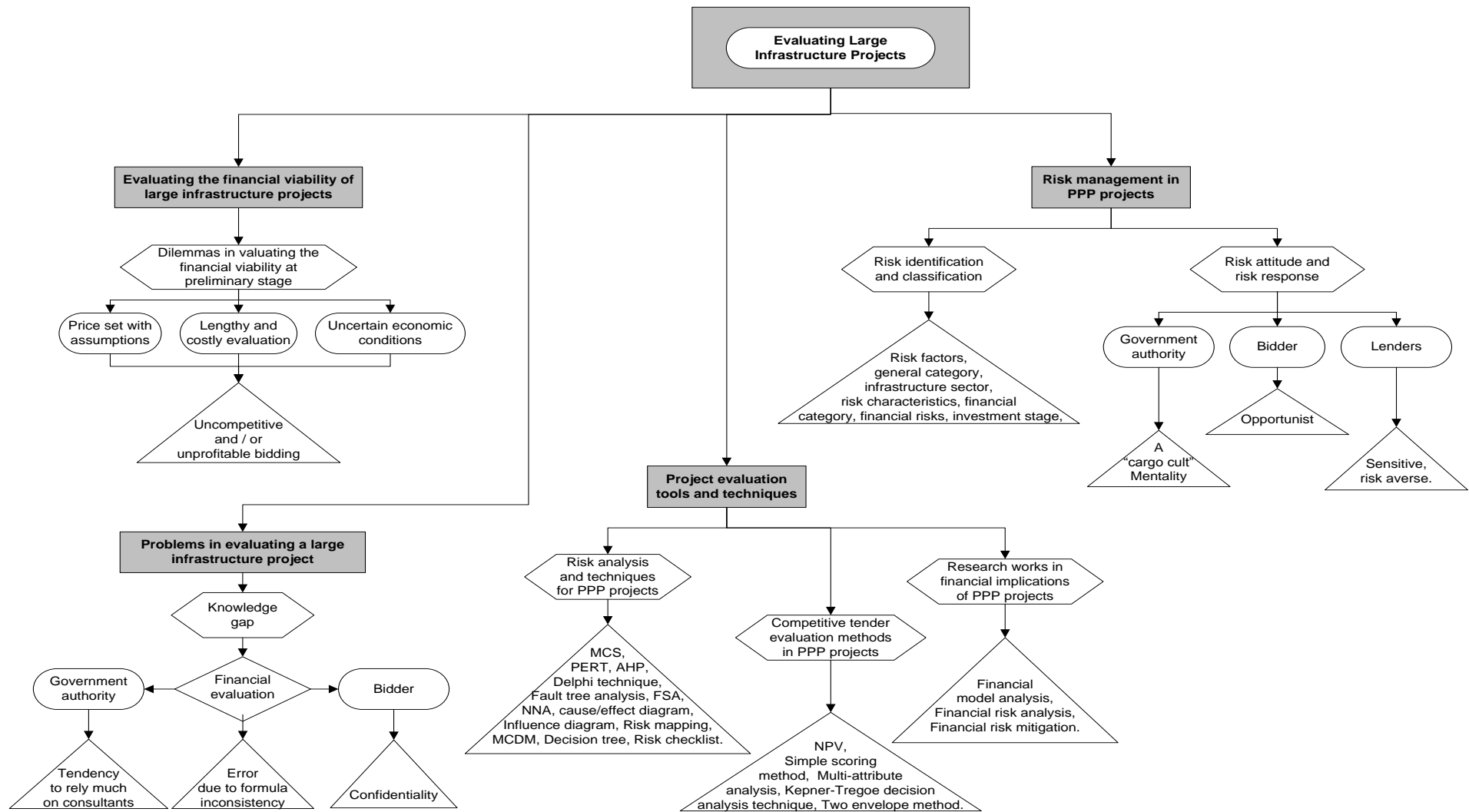
#### ***2.4.4 Incomplete Contract Theory***

Furthermore, there is another theory called theory of incomplete contracts, which is a specific part of transaction cost economics. Incomplete contract theory was pioneered by Hart and Moore (1988). Tirole (1999) summarises three main reasons of generating incomplete contracts. The first reason is not all future event or circumstance can be foreseen when the contract is signed. Secondly, even if both parties could anticipate all contingencies that should be included in the contract, they have to exchange the benefit of having a more comprehensive contract with extra time and cost of writing new clauses. Finally, the contract cannot be enforceable unless the contingent occurrences could be verified by a third party (e.g. an arbitration commission or a Regulatory Agency in the context of infrastructure "privatization" contracts). Furthermore, Solino and De Santos (2010) also addressed that the contractual arrangements of PPPs are inevitably incomplete in many relevant respects due to a long-term partnership (e.g. 25 or more years). Therefore, according to the incomplete contract theory, PPP should be preferred if the quality of service can be well specified in the initial contract while the quality of construction is difficult to specify (Hart, 2003).

These theories may help the stakeholders to understand the nature of PPP projects and to manage them properly. Thus, the evaluation of PPP projects can be undertaken efficiently. Since PPP projects generally are implemented in large infrastructure projects, the next section discusses the important aspects and the problems in evaluating large infrastructure project.

### **2.5 Evaluating the financial viability of large infrastructure projects**

Emerging from the theoretical review of PPP projects and its criticism in the preceding sections is that apparently managing a large infrastructure project is not an easy task. Proper project evaluation by each stakeholder is not enough to guarantee that the project can be successfully executed. Large infrastructure projects involve many stakeholders with their own interests and motivations towards the project. Nevertheless, in order to succeed and reconcile their objectives, a comprehensive project evaluation has to be well undertaken before embarking on detailed project planning. The rest of this chapter is summarised in figure 2.2.



**Figure 2.2** Conceptual Framework of Evaluating Large Infrastructure Projects

Before a large infrastructure project is managed, an extensive evaluation should be carried out during the bidding or preliminary stage of the project life-cycle. Since the implementation of a large infrastructure project needs robust financial support<sup>4</sup>, a sound financial evaluation is likely to be the most important part among other project evaluations. In this respect, Angelides and Xenidis (2009) summarized the critical issues with regard to financing successful PPP projects as follows: (1) lack of strong domestic capital markets; (2) limited raising of institutional funds; (3) non-dependable project revenue streams; and (4) improper assessment of the value of government guarantees.

The evaluation of the financial viability of a large infrastructure project is usually a very long and complex process. Generally, project finance assessment requires banks or other financial institutions to conduct full risk analysis, including technical/ engineering assessment of the project. Thus, the entire financing process is prone to take an extensive period before reaching financial closure. On the other hand, pre-transaction or contingent exposure during the preliminary project stage can be dangerous to the bidder or the company which proposes a new project to the government authority.

According to the African Development Bank (2008), this exposure results in change in prices or rates before the bidder knows the exact nature of the commitment (size and timing). Long bidding process and uncertain economic conditions could lead to the bid either being uncompetitive or unprofitable because the bidder sets a price for a new contract and makes certain assumptions in terms of exchange and interest rates and commodity prices.

Meanwhile, the bidder may or may not be successful with the bid which makes the bidding process time consuming and very costly. Considering the aforementioned risks, financial evaluation should be made to minimize the effect of these risks by incorporating risk analysis in the management process (RAMP, 2005). A sound financial evaluation can only be achieved if all important financial aspects have been analysed adequately. Meanwhile, another issue emerges when not all stakeholders

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<sup>4</sup>The supports' availability from both private sectors (e.g. Loan, Equity, Bank guarantees, etc.) and government authority (e.g. Guarantee, Subsidy, Subsidised subordinated debt, etc.) to the project will affect the financial viability of the project (Demirag, et al, 2010; Wibowo, 2006).

identify all important financial aspects properly due to the knowledge gap between bidder and government authority.

## **2.6 Problems in evaluating a large infrastructure project**

The knowledge gap between bidder and government authority, sometimes, leads to misconception in the result of financial evaluation (Chiang and Cheng, 2009). This takes place because government authorities usually employ consultants to help in making decisions without having sufficient expertise to use the results of financial evaluation effectively. Additionally, bidders are concerned regarding the confidentiality of the financial evaluation process. Thus, the results of financial evaluations are mostly lack transparency in explaining the output of the analysis. This situation creates various interpretations. Wrong interpretation of given information leads to a bad decision. In order to minimize misjudgement, sufficient explanation should be given along with output data. Whitelaw-Jones (2010) introduced FAST modelling standard for financial models in order to keep models flexible, accurate, structured, and transparent. Project evaluation tools should be able to reveal the hidden risks and assist project participants in choosing appropriate risk mitigation strategies (Ozdogan and Birgonul 2000). Although a project evaluation tool can be used to help in making decision faster and effectively, Alberdi *et al.* (2009) suggested that a decision should not merely rely on the result of an evaluation tool due to the possibility of tool errors. In the context of general financial model, Panko (2010) stated that 88% of 113 financial model spread sheet audited since 1995 contains errors due to formula inconsistency. The possibility of “garbage in garbage out” error can be minimized by giving more attention to the input data and the analysis process.

After exploring the general problems in evaluating a large infrastructure project, it is worth mentioning that a financial model utilizes several tools and techniques to evaluate a new project and facilitate negotiations among stakeholders. Therefore, the next sub-chapter reviews current researches in the context of project evaluation tools and techniques employed in the construction industry.

## 2.7 Project evaluation tools and techniques

Researchers have proposed numerous project evaluation tools and techniques to help companies or government agencies in making decisions. The main purpose of evaluating a project is to figure out the best strategy in managing the project based on the project's objectives and possibility of any threat or opportunity (RAMP, 2005). Project evaluation tools used for risk management can be classified into three evaluation stages: (1) risk identification and classification; (2) risk analysis; and (3) risk attitude and risk response (or risk allocation). A summary of various risk analysis tools and techniques for PPP projects have been made by Dey and Ogunlana (2004) as listed in the table 2.1.

**Table 2.1** Risk Analysis tools and techniques.

<b>Application and previous study</b>			
<b>Method</b>	<b>Keynotes</b>	<b>Who and when</b>	<b>Topic</b>
Influence diagram	Risk identification	Ashley and Bonner (1987)	Identification of political risks in international project
	Brain storming and Delphi Technique	Yingsutthipun (1998)	Identification of risks in transportation project in Thailand
Monte Carlo simulation (MCS)	Distribution form, Variables' correlation	Songer <i>et al.</i> (1997)	Debt cover ratio (project cashflow) in a tollway project
		Chau (1995)	Distribution form for cost estimate
		Wall (1997)	Distribution form and correlation between variables in building costs
Program evaluation & review technique (PERT)	Distribution form, Variables' correlation, Network scheduling	Dey and Ogunlana (2001)	Project time risk analysis through Monte Carlo simulation
		Hatush and Skitmore (1997)	Contractor's performance estimate for contractual purpose
Sensitivity analysis	Deterministic, Variables' correlation	Yeo (1990)	Probabilistic element in sensitivity analysis for cost estimate
		Yeo (1991)	Survey on use sensitivity analysis in BOT project in UK
		Woodward (1992)	
Multi-criteria decision making (MCDM)	Multi-objective, Subjectivity	Moselhi and Deb (1993)	Project alternative selection under risk
		Dozzi <i>et al.</i> (1996)	Bid mark-up decision making
Analytic hierarchy process (AHP)	Systematic approach to incorporate subjectivity, Consistency judgement	Dey <i>et al.</i> (1994)	Risk analysis for contingency allocation
		Mustafa and Al-Bahar (1991)	Risk analysis for international construction project
		Zhi (1995)	Risk analysis for overseas construction project
		Nadeem (2003)	Risk analysis for BOT project in Pakistan
Fuzzy set	Vagueness of	Kangari and Riggs	Risk assessment by linguistic

approach (FSA)	subjective judgement	(1989) Diekmann (1992) Lorterapong and Moselhi (1996) Paek <i>et al.</i> (1993)	analysis Combination of influence diagram with fuzzy set approach Network scheduling by fuzzy set approach Risk pricing in construction project through fuzzy set approach
Neural network approach (NNA)	Implicit relationship of variables	Chua <i>et al.</i> (1997) Boussabaine and Kaka (1998)	Development of budget performance model Cost flow prediction in construction project
Decision tree	Expected value	Haimes <i>et al.</i> (1990)	Multi-objective decision tree
Fault tree analysis	Accident analysis, Safety management	Tulsiani <i>et al.</i> (1990)	Risk evaluator
Risk checklist	From experiences	Perry and Hayes (1985)	Risk and its management in construction project
Risk mapping	Two dimensionality of risk	Williams (1996)	Two dimensionality of project risk
Cause/effect diagram	Risk identification	Dey (1997)	Symbiosis of organizational reengineering and project risk management for effective implementation of projects
Delphi technique	Subjectivity	Dey (1997)	Same as above
Combined AHP and decision tree	Probability, severity and expected monetary value	Dey (2001)	Decision support system for risk management

Source: Adapted from Dey and Ogunlana (2004)

Zhang (2004) also identified competitive tender evaluation methods that are commonly used in PFI projects such as Net present value method, Simple scoring method, Multi-attribute analysis, and Kepner-Tregoe decision analysis technique (see table 2.2). The identification of tools and techniques is important. However, knowing how and when to use them properly is considered to be more essential.

Research works in financial implications of PPP projects can be categorized into three major groupings: (1) Financial model analysis group, (2) Financial risk analysis group, and (3) Financial mitigation analysis group. These groups are detailed in table 3.3. The financial modelling group [e.g. Chang and Chen (2001) and Zhang (2005b)] is only concerned with financial feasibility of projects and addresses some risks in its financial parameters but they do not consider risk mitigation issues. The financial risk analysis group [e.g. Chee and Yeo (1995); Javid and Seneviratne (2000); Kakimoto and Seneviratne (2000); Seneviratne and Ranasinghe (1997) and Han *et al.*(2004)] emphasized on assessing the types and levels of financial risks from financial planning

through to the operation stage without introducing any mitigation measures. In the financial mitigation analysis group [e.g. Bing *et al.* (2005); Schaufelberger and Wipadapisut (2003); and Wang *et al.* (2000a)] recommended financial strategies for specific types and levels of risk but they do not evaluate the financial viability of a project.

**Table 2.2** Methods for evaluating competitive tenders

No.	Methods	Remarks
1	Simple scoring method	Determining the evaluation criteria and possible maximum scores with each assumed criterion to have equal importance. Each bidder is rated according to these criteria and the bidder with the highest total score is awarded the project.
2	Net present value (NPV) method	Selecting the bidder who offers the lowest NPV for the concession period (i.e. the lowest cost to the public). This method only considers the financial and economic aspects of each tender.
3	Multi-attribute analysis	Deciding the criteria in same way as for the simple scoring method, but each of these factors is divided into sub-categories with relative importance weights assigned. After multiplying the weights and the assigned scores of each bidder, the bidder with the highest maximum score is selected.
4	Kepner-Tregoe decision analysis technique	Evaluating proposals based on criteria identified as 'musts' and 'wants'. The 'musts' are the mandatory needs for the project and are expressed in the form of 'yes/no' questions. Bidders satisfying the 'musts' are then evaluated based on the 'wants' using a simple scoring or multi-attribute scoring method.
5	Two envelope method	Bidders are expected to submit two different envelopes; the first providing technical information with the second providing cost information. Initially the technical offers are evaluated and then, for those approved, the financial envelope is opened. If the cost is within the acceptable range as defined by the client, that bidder is chosen.
6	NPV and scoring method	Two different evaluations are undertaken. NPV is used for financial evaluation and the scoring method is then used for evaluation of any unquantifiable information.
7	Binary and NPV method	Bidders are first evaluated with 'musts' criteria and those passing this step are then evaluated according to their NPVs.

Source: Adapted from Zhang (2004)

**Table 2.3** Summary of Previous Works on Financial Analysis and Risk Management

<b>Group</b>	<b>Author(s) and Key Areas</b>	<b>Remarks</b>
Financial Model Analysis	Moreau (1986) studied financial planning model through case study of publicly-owned water and sewer utilities with several possibilities of objective functions.	The author discussed the efficiency of a financial planning model with a detail description in terms of a set of cash flow equations, parameters for projecting of demands, parameters for operating costs, matrix of coefficients in linear programming model. But, no risk analysis is presented.
	Crosslin (1991) developed and demonstrated a structured methodology, including quantitative simulation models for financial planning, evaluation, and cost justification through a case study for marina and golf course PPP development projects	The author focused on Pro forma financial statements, life-cycle cost models, and simulation and sensitivity analysis of management control and exogenous parameters. However, no risk analysis is presented.
	Chang and Chen (2001) introduced the financial model used by the Bureau of Taiwan High Speed Rail for its BOT projects. They conducted a scenario analysis to establish the relationships between changes of parameters and the results of evaluation.	The authors evaluated the financial planning with self-financing ability analysis and scenario analysis. However, actual risk analysis is not presented.
	Zhang (2005b) developed a methodology for capital structure optimization and financial viability analysis that reflects the characteristics of project financing, incorporates simulation and financial engineering techniques, and aims for win-win results for both public and private sectors.	The author introduced a framework and a solution algorithm that optimizes the capital structure and evaluates the financial viability of a project when the project is under construction risk, bankruptcy risk, and various economic risks. No risk mitigation is presented.
	Yun, et. al. (2009) introduced an optimised capital structure model for creditors and operators to achieve an agreement on a balanced capital structure that synchronise profitability and repayment capacity.	The authors developed a model with Monte Carlo simulation and multi-objective generic algorithm for drawing an optimal level of equity ratio. This model is limited to financial feasibility and risk analysis.
Financial Risk Analysis	Chee and Yeo (1995) employed a Monte Carlo simulation for risk analysis of a BOT power project. In analysing risks, three techniques are employed: probability analysis, sensitivity analysis and variance analysis.	The authors used probability analysis, sensitivity analysis and the variance analysis for risk analysis. However, no risk mitigation analysis is presented.



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	Javid and Seneviratne (2000) focused on sources of investment risk in airport parking infrastructure development and discussed the application of Monte Carlo simulation to estimate and understand the impacts of cash flow uncertainties on project feasibility.	The authors presented a framework for defining benefits and costs in the presence of uncertainty. Typical sources of risk are identified at the outset, and a financial model is constructed to evaluate NPV using Monte Carlo simulation. No risk mitigation analysis is presented.
	Kakimoto and Seneviratne (2000) demonstrated the application of Monte Carlo simulation for scrutinizing sources of uncertainty and their impact on investment risk using the Port of Colombo development project.	The authors demonstrated that Monte Carlo simulation permits financial risk of port infrastructure development to be readily assessed in relation to two measures: 1. the traditional probability measure of IRR being less than MARR, 2. a new measure introduced here termed risk elasticity. But, no risk mitigation analysis is presented.
	Seneviratne and Ranasinghe (1997) employed Monte Carlo simulation for financial viability and investment analysis of Colombo-Katunayake Expressway (CKE) under different financing options.	The authors tested the sensitivity of the project's financial returns and risk to variables governing cash flows under the four options using Monte Carlo simulation. No risk mitigation analysis is presented.
	Seung, et al (2004) focused on a financial portfolio risk management for international projects to integrate the risk hierarchy of both individual projects and at the corporate level, which applies a MCDM method to maximize the total value of firms.	The authors evaluated financial risk factors such as currency exchange, interest, and inflation rates. No risk mitigation analysis is presented.
Financial Risk Mitigation	Bing, et al (2005) identified three levels preferred risk allocations in PPP/PFI projects in the UK such as macro level risks; meso level risks and micro level risks.	The authors provided guideline for public sector clients in preparing a practical risk allocation framework and matrix for use in tendering documents, thus saving time in negotiation and contract transaction. No financial risk analysis is presented.
	Schaufelberger and Wipadapisut (2003) developed a decision model for BOT project financing which addresses three major challenges facing a prospective sponsor such as: estimation of project costs, projection of revenues during the concession period, and selection of an appropriate financing strategy.	The authors identified and examined the important considerations and financing strategies. A decision model was developed that can be used by BOT project sponsors in selecting appropriate financing strategies. No financial risk analysis is presented.
	Wang, et al (2000) identified list of unique or critical risks associated with BOT projects and mitigating measures for these risks on power projects in China.	The authors discussed the criticality of foreign exchange and revenue risks which include exchange rate and convertibility risk, financial closing risk, dispatch constraint risk and tariff adjustment risk. Although measures for mitigating each of these risks were discussed, no financial risk analysis was presented.

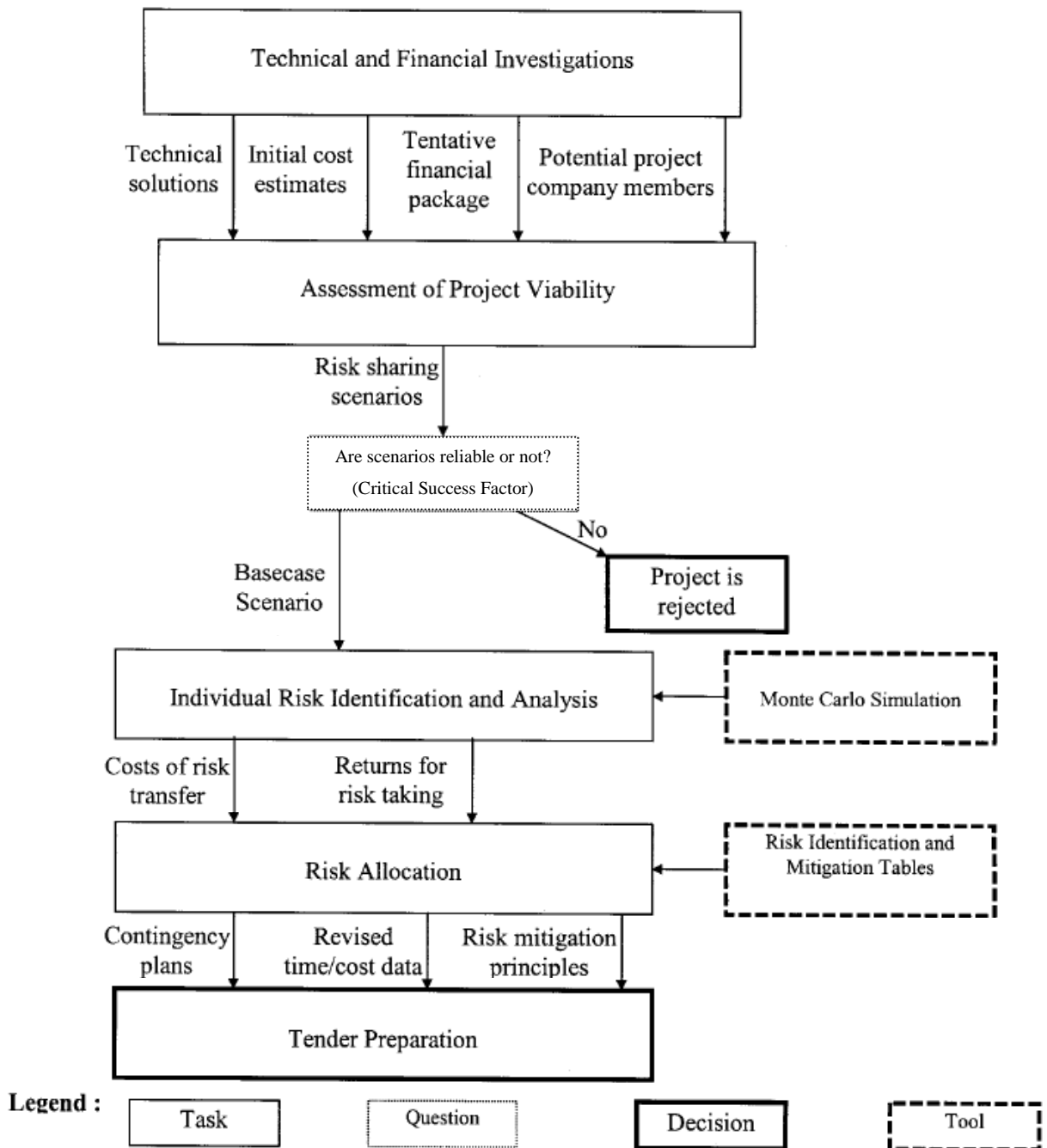
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Regarding seaport projects in particular, it is important to understand how a port investment project is assessed in respect of port-investment decisions and processes. The evaluation should consider the increasing flexibility and speed in investment decisions with comprehensive analyses in response to the rapid transformations of the market. The position of a seaport in the competitive market is also an important issue to be evaluated by using techniques such as: Data Envelopment Analysis (DEA) technique (Cullinane and Wang, 2007). DEA<sup>5</sup> model is a technique for evaluating the efficiency of a seaport among the other seaports in the world. The results of DEA model provide important information for port managers or policy makers to decide on the scale of production and estimate the efficiency of a container port at the beginning of any analysis.

Among all researches into project evaluation tools, only few researchers' combined financial feasibility, risk analysis and mitigation measures (e.g. Özdoğanm and Birgönül, 2000; and Fischer *et al.*, 2010). Özdoğanm and Birgonul (2000) appeared to develop a decision support framework (DSF) as a comprehensive project evaluation tool to help the project company in the planning stage of a hydropower plant. DSF model evaluates project viability against several predefined critical success factors within risk management perspective. DSF also defines the risk sharing scenarios under which a project becomes viable, by incorporating risks into cash flow analysis and risk mitigation strategies (see figure 2.3). However, not all stakeholders have the same attitude on risks in PPP projects. Fischer *et al.* (2010) developed an integrated risk management system (IRMS), which serves all stakeholders needs to conduct effective and successful risk management in PPP projects. In order to fully understand how risks are managed, the next section provides a brief rationalisation for risk management in PPP projects.

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<sup>5</sup> *Data Envelopment Analysis (DEA) is a technique to measure the holistic efficiency of a firm by comparing the DMU (Decision Making Unit) with other homogenous units that transform the same group of measurable positive inputs into the same types of measurable positive outputs (Cullinane and Wang, 2007).*



**Figure 2.3** Decision support framework (DSF) in the planning stage of a BOT project

*Source: Ozdogan and Birgonul (2000)*

## 2.8 Risk management in PPP projects

Dey and Ogunlana (2004) recognized that PPP projects are prone to risk. PPP projects require effective management of risks associated with the complex financial, legal, organizational and socio-political structure of the model. They also require adequate allocation of risks between government authority and members of Concessionaire

Company who have different perceptions and objectives (Ozdogan and Birgonul, 2000). Fischer and Alfen (2009) also asserted that the enforcement of contract terms related to control mechanisms (e.g. planning implementation, requests for approval, construction works, start-up and delivery of facility management services by the private contractors) has to be managed as well. Therefore, risk allocation requires certain abilities and knowledge by the project stakeholders.

**Table 2.4** Summary of risk classification in PPP projects

No.	Risk classification in BOT Projects	Perspective	Author(s) and Year
1	Construction risks, operation and maintenance risks, financial risks, force majeure risks, legal and contractual risks.	Tollway project	Abednego and Ogunlana (2006)
2	Engineering, finance, political and social.	Risk characteristics	Lam and Chow (1999)
3	Political risks, construction completion risks, operating risks, finance risks, and legal risks.	General category	Dey and Ogunlana (2004)
4	(a) Macro level risks: political and government policy, macroeconomic, legal, social, natural; (b) Meso level risks: project selection, project finance, residual risk design, construction, operation; (c) Micro level risks: relationship, and third party.	Risk meta-level	Bing et al (2005)
5	Political risks, construction risks, operating risks, market and revenue risks.	Risk factors	Askar and Gab-Allah (2002)
6	Political, financial, revenue and market, promoting, procurement, developmental, construction, and operating.	Main risks areas	Zayed and Chang (2002)
7	Political risks, construction risks, operating risks, market and revenue risks, financial risks, and legal risks.	General category	Wang <i>et al.</i> (2000a)
8	Legal risks, construction risks, and operation risks.	General category	Ozdoganm and Birgonul (2000)
9	Construction cost overrun, operation risks, market risks, currency risks, and regulatory/approval risks.	General category	Zhang (2005c)
10	Total investment risks: project risk, competitive risk, market risk.	Financial category	Seneviratne and Ranasinghe (1997)
11	Investment planning and preparation, asset creation, operation, and close-down.	Investment stage	RAMP (2005)
12	All sectors, power, transport: road, tunnel and bridge, rail, airport and port, process plant, telecommunication.	Infrastructure sector	Wang <i>et al.</i> (2000b)
13	State-rooted financial risks, concessionaire-rooted financial risks, and market-rooted financial risks.	Financial risks	Xenidis and Angelis (2005)

Before allocating risks, there are several stages in risk management that should be undertaken. Dey and Ogunlana (2004) divided the risk management process into four

stages: (1) Risk identification; (2) Risk classification; (3) Risk analysis (4) Risk attitude and risk response (or risk allocation). Numerous researches have been conducted to identify risks in PPP projects. Therefore, a summary of categorization with various perspectives of predefined risks in PPP projects is shown on table 2.4. However, the identification of risks should be followed by appropriate selection of mitigation measures. In responding the risks, appropriate mitigation measures or financing strategies should be evaluated to anticipate the upcoming risks.

A perception of risks in a PPP scheme is different from traditional method of contracting. In a PPP project, almost all the technical and financial risks are borne by the private promoter. Thus, the risk attitude in PPP projects is influenced by the perception of main participants. Dey and Ogunlana (2004) described the risk attitude in PPP projects from the perspectives of government, contractor or Concession Company, and bankers (as summarized in table 2.5).

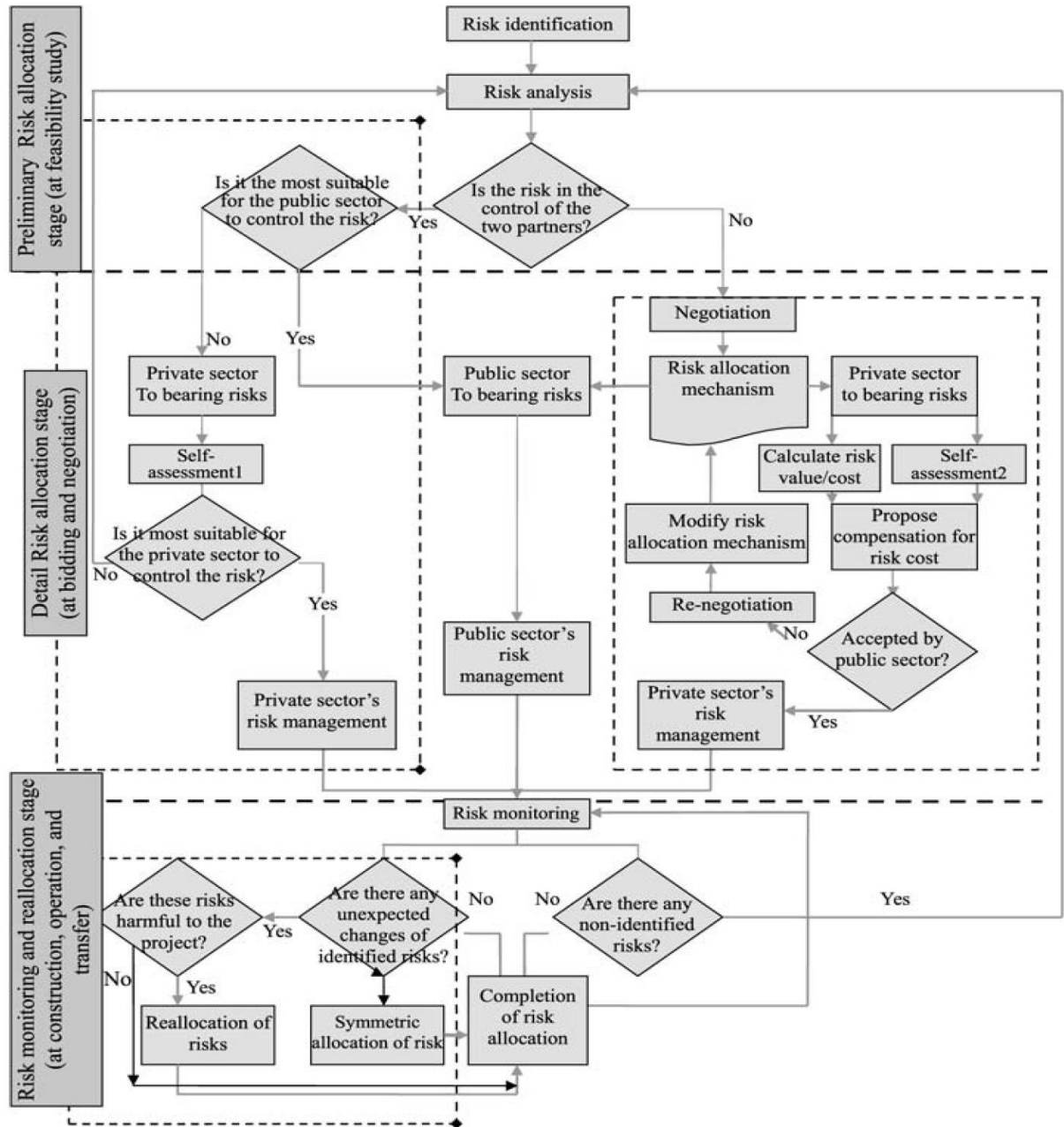
**Table 2.5** Risk attitude in PPP projects

<b>PFI Participants</b>	<b>Risk Attitude</b>	<b>Issue for concern</b>
Government	Expecting the private sector to take as many risks as possible and a ‘cargo cult’ mentality (i.e. PPP projects as a cost-less solution which happens without major government effort).	Additional cost of risk transfer
Contractor or Concession company	Achieving higher levels or return, a quick pay-back or achieving other spin-off benefits (development gains or business for other companies within their organisation).	Government willingness to take a positive stance on the subject.
Bankers	Maintaining a proactive role to the contractors or concession company not to be as the prime movers.	Availability of risk capital

Source: Adapted from Dey and Ogunlana, (2004)

Besides considering the nature of different risk attitudes, the risk management process should be carefully understood to facilitate good decision making. Fischer *et al.* (2006) confirmed that risk management process throughout its life-cycle could contribute a win-win-situation with cost savings and better services for the public sector and more earnings for the private partner. Zou *et al.* (2008) developed a life-cycle risk management framework for PPP infrastructure projects (illustrated in figure 2.4) comprising of three stages: (1) Preliminary risk allocation stage at feasibility study; (2) Detail risk allocation stage at bidding and negotiation; (3) Risk monitoring and reallocation stage at construction, operation and transfer. Though this framework helps stakeholders in managing the risks in PPP projects, the efficiency of evaluating the PPP

projects is still open to question. Hence, financial models are the only evaluation tool that can be used to facilitate risk sharing negotiations. In theory, evaluation based on win-win solution should be emphasised in order to achieve an effective negotiation. Practically, the evaluations of projects tend to be quasi-monopolistic pricing<sup>6</sup> that reduce social welfare (Trailer *et al.*, 2004).



**Figure 2.4** A life-cycle risk management framework for PPP infrastructure projects

Source: Zou *et al.*, (2008)

<sup>6</sup> Quasi-monopoly is a sort of monopoly which has similar competition nature of service/pricing offered to the customers (D'Aspremont and Gabszewicz, 1985).

## 2.9 Chapter Summary

This chapter has answered half of the first objective of this research by exploring Public-Private Partnership from the perspective of infrastructure approach. The roles exchange and risk sharing mechanism between public and private over long-term concession period have been debated and criticised by some researchers. The public expects that PPP is preferred due to efficient services promised by the private party. Meanwhile, a private company is mostly motivated by profit maximisation. Therefore, the public authority has to choose the best approach based on their policy and economic conditions. This suggestion raises a research question, which is also the knowledge gap that needs to be addressed in this study. Since the effectiveness of PPP as an alternative procurement strategy to deliver better value for money is still open to question, what then is the best PPP approach and how is the effectiveness of the partnership concept evaluated?

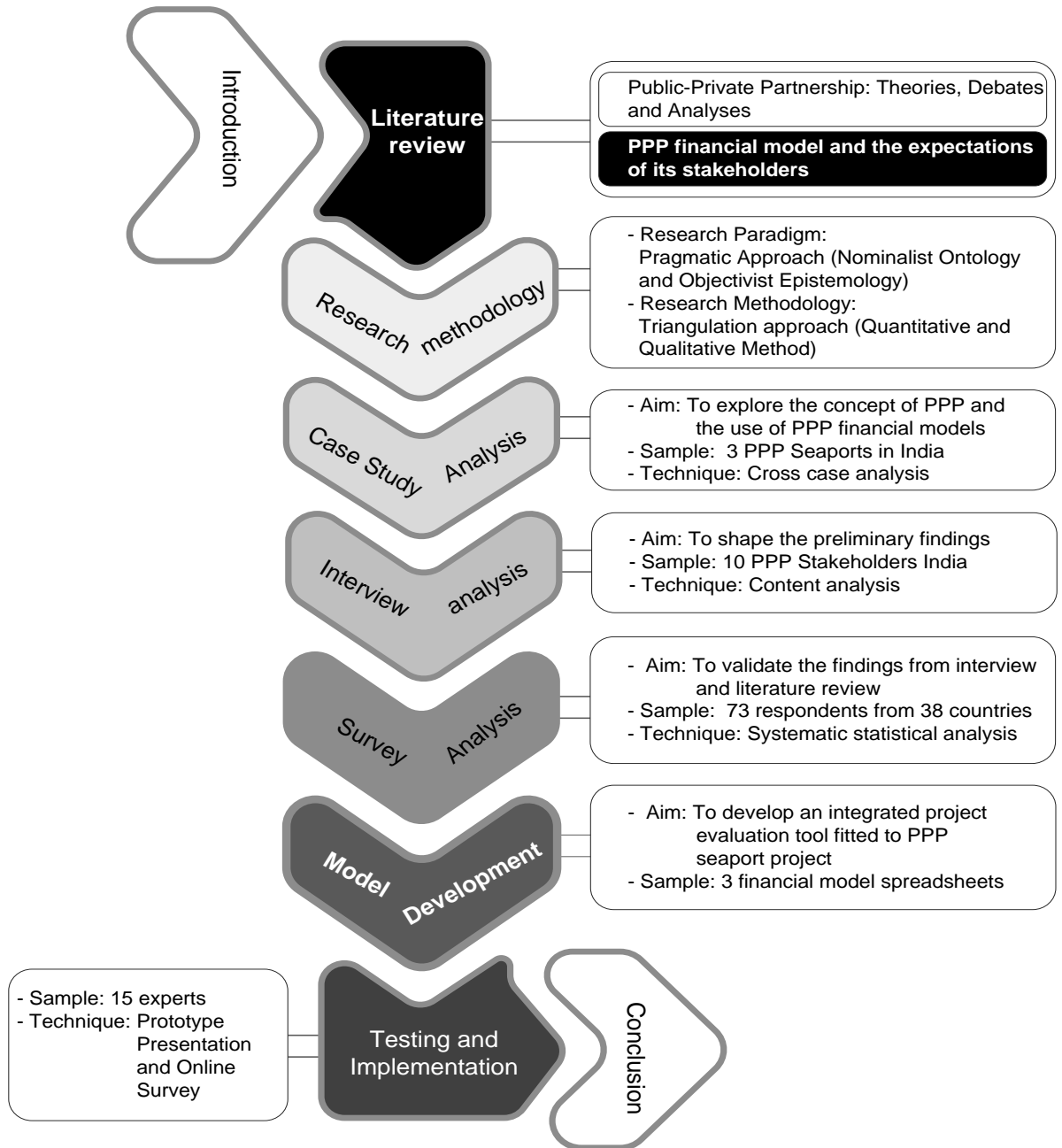
To determine the best approach, two main PPP approaches and some theories related to PPPs have been discussed. The PPP approaches can be viewed from the revenue mechanism. The first approach is the service-based approach, and the second is the finance-based approach. While revenue mechanism of the service-based approach is derived from annual unitary charge, the revenue mechanism of the finance-based approach is generated from tariff operation and ancillary revenues. Finding the best approach for a particular PPP project requires an extensive evaluation process. Since the revenue of PPP seaport project is generated from tariff ancillary revenues, the data used to develop IPET is based on the finance-based approach. This chapter has contributed several considerations related to large project evaluation (e.g. problems in evaluating large project, project evaluation tools and techniques, and risk management in PPP).

Agency theory addresses goal conflict between the agent and the principal i.e., the agency problem. The agency problem exists in PPPs because the private company as an agent receives residual revenues, which trigger conflict of interest with the public interest of maximising consumer surplus. Other theories (e.g. Stakeholder Theory, Incomplete Contract Theory, Transaction Cost Economics Theory and Positive Theory Perspective of PPPs) have been reviewed in order to mitigate the problems related to the Agency Theory. Awareness of the aforementioned considerations and theories related to PPP has helped this study in developing IPET. In order to find an answer for second

part of the first objective, the next chapter focuses on the introduction of PPP financial models and the identification of stakeholders' expectation in utilising PPP financial models.



## CHAPTER THREE: PPP FINANCIAL MODEL AND THE EXPECTATIONS OF ITS STAKEHOLDERS



## **Chapter 3: PPP Financial Model and the Expectations of its Stakeholders**

*“Seek first to understand, then to be understood.”*

Stephen R. Covey (1932 – 2012)

### **3.1 Introduction**

Project financing arrangements for PPP projects involve many participants with complex transactions and involve diverse interests. Therefore, negotiations between the public sector authority and the other stakeholders should be carefully undertaken within reasonable time. Since financial model is one of the most common tools used for evaluating a new project and facilitating negotiations among lenders, sponsor(s) and a government agency, this chapter begins with an introduction of financial model and continues to explore best practice of financial model. The stakeholders who utilise financial models in PPP projects and their expectations from PPP financial models are then presented. This chapter will highlight and discuss the most important ones.

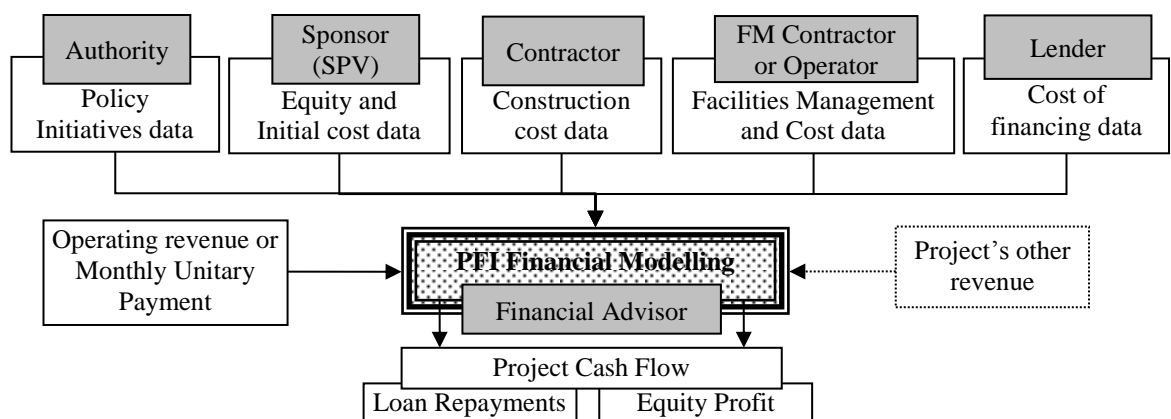
### **3.2 Financial Model**

The financial decision making model (often called as ‘financial model’) is one of the most common tools used for evaluating a new project and facilitating negotiations among lenders, sponsor(s) and a government authority. A financial model is a tool employed by lenders to conduct negotiations with the sponsor(s) and to prepare project appraisal report. Furthermore, a financial model can be used for preliminary due diligence, negotiations, and project performance monitoring.

In PPP projects, sponsor(s) generally organise a special purpose vehicle (SPV) or a concessionaire company to deal with lenders, investors, insurance providers, contractor and other parties especially government authority. Generally, a successful PPP project has mutual agreement and balance of risk sharing between government authority and sponsor(s) prior to financial close. Therefore, financial models are not only used as tools to win bids but also to assist in the risk sharing negotiation between government authority and sponsor(s).

A consultant firm can be appointed as a financial advisor by both or either, the government authority and/or the SPV Company for developing and utilising financial models. In developing a financial model, a financial advisor depends on other parties to specify all relevant data needed for the model (see figure 3.1).

Since the core aim of financial modelling is to forecast the performance of a project under uncertainty, economic and financial assumptions are made to predict the project performance. The government authority might provide policy initiatives data such as fiscal incentives scheme, retained responsibilities for the delivery of core services, governmental loan guarantee, royalty, tariff cap, etc. (Chang and Chen, 2001; Khan and Parra, 2003; Zhang, 2005; Kulkarni and Prusty, 2007; and Government of India, 2009). The SPV Company supplies initial cost of the project and its management cost. The Engineering, Procurement and Construction (EPC) Contractor gives construction cost and also Life Cycle Cost (LCC) on a monthly basis. Operation and maintenance costs data is provided by the operator company or facilities management contractor. The lenders will provide financial information related to the project financing. These inputs are adjusted in coordination and negotiation with the parties who provide the data. The financial advisor assembles all project costs estimation, and feeds them into model together with adjustments to the forecasted traffic volume and variable rates to correspond with the SPV target (Kaka and Al-sharif, 2009). Figure 3.1 also shows how the stakeholders can influence the development of PFI financial modelling at different stages.



**Figure 3.1** Current use of PFI financial modelling

*Source: Modified from Kaka and Al-Sharif (2009)*

Kulkarni and Prusty (2007) suggested that sophisticated financial model and sensitivity analysis, which incorporate all external post-bid factors as inputs and support mutual revenue-sharing, need to be developed. In addition, a successful bidder's strategy must be able to convince lenders for the project financial viability and the ability to generate cash flow to service the debt. According to the World Bank and PPIAF (2007), all scenarios of financial modelling must also be commensurate with the risk factors involved in port sector projects such as: construction risks, hand-over risks, operating risks, procurement risks, financial risks, and social risks (Kulkarni and Prusty, 2007). Thus, it is expected that financial modelling can help the government authority to measure the financial viability of projects by identifying the best bidder's strategy and facilitating risk sharing negotiation.

However, the elements and assumptions of a seaport financial model depend on the seaport objectives. Brooks and Cullinane (2007) summarised that there are three groups of seaports objectives: (1) the first group is solely non-economic objectives, including wider economic benefits (e.g. local economic development, cluster development, etc.); (2) the second group that has strictly economic objectives (e.g. profit maximisation and/or maximisation of return on investment); (3) and the third group has a mixture of both economic and non-economic objectives. Since PPP projects involve private parties in project finance, the elements and assumptions of the financial model are focused on the third group of objectives.

In conjunction with economic objectives, most developing countries need to promote their economic growth through infrastructure development<sup>7</sup>. While for the non-economic one, the authority should comfort the private parties in securing their interests related to the project. Therefore, a PPP financial model is needed to reconcile both objectives.

### **3.3 Developing the best practice of PPP financial models**

The complexity of project financing transactions and the diversity of stakeholders' interests are the major reasons that make financial models hard to understand and error prone. Hence, it is essential to learn the best practice of PPP financial models and audit

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<sup>7</sup>*Lack of infrastructure facilities has been a major hurdle to boost the economic growth.*

the model for error possibilities. In the context of general financial model, Panko (2008) stated that 88% of 113 financial model spreadsheet audited since 1995 contains errors due to formula inconsistency.

There are two methods of developing a financial model such as: bottom-up and top-down approaches. Siersted (2010) argued that input identification of financial model can help to find out where the variables can change the calculation process. The input identification can be done by mapping those variables and putting them into specific areas, so that most people can figure them out easily. This identification is a basic for formula consistency. Furthermore, transparency of the calculation formula can help the auditor and lender or other parties to keep the calculation flow and links on the right track. The majority of modellers adopts this strategy as bottom-up approach, whereby the input identification of the raw data along with basic calculations is a priority. Meanwhile, Swan (2008) suggested that a good financial model is started by designing the output first, and then identifying the output rather than input. This approach is called top-down approach. The purpose or objective of the financial model first is initially identified, followed by a consideration of the usage of the financial model. Without a clear plan or set of objectives, it is often quite complicated for the stakeholders to understand the model. In the absence of the model builder, it can also be roughly impossible to have full confidence that the model is really doing what it is supposed to do, and because the users or sponsors have not been involved in the development process, the results themselves may be unsatisfactory. In order to mitigate the aforementioned problems, the next part of this sub-chapter will identify the stakeholders' interests in utilising PPP financial models.

### **3.4 Stakeholders and their expectations in utilising PPP financial models**

Different stakeholders from diverse socio-economic and cultural backgrounds have their own motivation to accomplish project objectives (Toor and Ogunlana, 2008). In case of PPP projects, the uncertainties with long-term agreement and the complexity of the project financing arrangement generate more risks to all stakeholders (Zhang, 2005b). Therefore, the performance of a PPP project should be cautiously forecasted. It means that a PPP financial model should be well developed in representing the forecasted performance without creating additional problems as described in chapter 2.7.

In order to learn how to develop a comprehensive financial model, it is important to understand the use of financial model at different stages, and to know who the parties (stakeholders) involved in using financial model are. There are five stages when the model is used with different purposes; they are pre-proposal stage, contract negotiation stage, finance-raising stage, construction stage, and operation stage. Table 3.1 shows the use of financial model with the stakeholders in PPP Projects.

**Table 3.1** Stakeholders who are utilising financial models in PPP projects

Stakeholder	Description	Stage
Authority	Evaluate the estimated cost of two procurement either PPP or public sector comparator (PSC).	Pre-proposal stage
	Negotiate the risk sharing mechanism with the bidders and evaluate the competitive bidders' proposal.	Bidding and contract negotiation stage
	Evaluate a new tariff	Operation stage
Sponsor	Facilitate the submission of proposal	Pre-proposal stage
	Negotiate the risk sharing mechanism and capital structure of the project with other potential sponsor(s), lenders and the government authorities.	Bidding and contract negotiation stage
	Monitor and track the performance of the project.	Construction stage and operation stage.
	Negotiate a new tariff with the government authority	Operation stage
Lender	Modify the initial model into lender base case financial model in order to test the project's financial viability.	Finance-raising stage
	Maintain the financial model and monitor the project costs	Construction stage.
	Assess the impact of any annual operations budget submitted by the project vehicle to lenders	Operation stage
Consultant	Develop and audit the financial models. Assist the sponsor, the lender and the government authority in evaluating the project.	Proposal stage, contract negotiation stage, finance-raising stage, construction and operation stage.

Source: Adapted from Khan and Parra (2003); Hucknall (2010); and Kurniawan (2010).

Their expectations are mostly concerned about the ability of the project to generate enough cash flow over the concession period in order to attract or to comfort the investors towards their capital investment (Kurniawan, 2010). Meanwhile, the PPP scheme projects, which are believed to deliver better value for money, have been criticised by many as the highest influence level from either political patronage or corporate political power (Heald and Georgiou, 2000; Crane dan Matten, 2003; Beh, 2010; and Siemiatycki, 2010). Therefore, the reconciliation of their expectations is anticipated to control the achievement of value for money in PPP projects by utilizing

PPP financial models. The next section discusses how PPP financial models can be used to facilitate stakeholders for evaluating and negotiating projects efficiently.

### **3.5 PPP financial models as tool for evaluation and negotiation**

Since the main purpose of negotiation in a PPP project is trying to achieve consensus on the combination of tariff scheme, concession period, and rate of return of a PPP project (Ngee *et al.*, 1997; and Liou and Huang, 2008), a financial model is utilised as a tool for project evaluation and negotiation. Therefore, it is important to assure that the utilisation of PPP financial models engages an effective evaluation and efficient negotiation.

In conjunction with efficient negotiations, Schoop *et al.* (2010) argued that the quality of negotiation process should be measured by both its economic outcome (e.g. in terms of Pareto efficiency<sup>8</sup> and Nash equilibrium<sup>9</sup>) and communication quality. It means that an efficient negotiation is not only indicated by the agreed combination of financial scenarios but also shown by mutual understanding of the PPP concept. Consequently, in addition to conducting an effective evaluation, it is an imperative that the expectations of other stakeholders in utilising PPP financial models are to be understood in order to achieve an efficient negotiation. Nevertheless, it is worth mentioning that negotiated procedure in PPPs is proven to be more expensive and lengthy (Solino and De Santos, 2010). To anticipate high bidding cost and long bidding process, the exploration of stakeholders' expectations covers both the financial model and the process of using financial model itself.

Many researches mostly concentrate on identification of general expectations of the stakeholders in PPP project and how stakeholders' interests in PPP projects are managed. For instances, El-Gohary *et al.* (2006) presented the major concerns expressed by stakeholders in PPP projects; Fischer *et al.* (2010) developed a process model for risk management for each stakeholder; Jin and Doloi (2008) studied how public and private partners in PPP projects allocate risks between them. However, there is no specific research on identification of stakeholders' expectations in utilising PPP financial

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<sup>8</sup> *Pareto efficiency (or Pareto optimal) is an allocation concept that makes at least one individual (stakeholder) better off without making any other individual worse (Wibowo, 2005a).*

<sup>9</sup> *Nash Equilibrium is a solution concept of a (negotiation) game involving two or more players (or stakeholders), in which its success taking into account the decisions of the others (Gibbons, 1992).*

models. Next section explores the stakeholders' expectations predominantly at pre-proposal stage.

### **3.6 Stakeholders' expectations in using PPP financial models at pre-proposal stage**

At the pre-bid or pre-proposal stage, the sponsor initially develops a financial model to facilitate the submission of a convincing proposal or unsolicited proposal for securing the rights to build and operate a project. The sponsor also uses financial model as a tool to negotiate with other potential sponsor(s), investors and the government authority. The negotiation process will be faster if all expectations can be met proportionally.

Furthermore, Khan and Parra (2003) identified that the purpose of financial model at pre-bid stage may incorporate a few relatively "soft" information elements, which are from the assumptions made by the sponsors without due diligence verification. The soft information elements are as follows:

- (i) Determination of an acceptable hurdle rate for the project, including a reasonable margin to compensate for the "what could go wrong" scenario,
- (ii) "Rule-of-thumb" criteria for estimating construction and operating cost, perhaps amended to fit site and host country conditions,
- (iii) A capital structure consistent with the type of facility being built and fully reflective of the operating risks are to be assumed,
- (iv) Assumptions regarding the identity of the lenders, loan amounts, tenors, interest rate, grace period, upfront fees and payback structure.

The expectations of major participants, which are focusing on utilising financial models at pre-proposal stage, are as follows:

#### ***3.6.1 Avoiding winning unprofitable contract***

Kulkarni and Prusty (2007) evaluate the optimal revenue sharing figure to ensure proper assessment of the bidder's strategy for an Indian case. In a Build-Operate-Transfer (BOT) project, the bidder with the highest revenue share is likely to win the project. Therefore, before identifying the optimal revenue share figure, bidders shall employ the



financial model to estimate the project bankability based on various scenarios. By doing so, the chance of winning unprofitable contract is minimised. Furthermore, the sponsor always looks at the profitability ratios such as: ROA, IRR, ROE, etc.

### **3.6.2 *Competitive Pricing***

Financial model is not only used to reduce risk but also to evaluate the competitiveness of the bidding and to price a competitive tariff. Tiong (1996) observed that both the governments and the sponsors agree that the most important factor of winning a PPP contract is strength of consortium, which is indicated by preservative and financial strength for protracted negotiations. Furthermore, a competitive tariff depends on demand of the project. When the project revenue is driven by the demand, an imbalance of the project capacity within a region will influence the level of competition during the operation period. For example, an excess of project capacity will cause the sponsor company to aggressively compete for market share (e.g. Ports, Tolls). Sometimes this can lead to destructive pricing (World Bank and PPIAF, 2007).

Based on this expectation, a financial model at this stage should address tariff, royalty to Government / revenue share, market share / demand (traffic), revenue forecast (including ancillary revenue), project time lines, project cost, and economic assumptions related to global and domestic inflation or foreign exchange parity.

### **3.6.3 *Reflect the project and the financing terms***

Although a financial model eventually needs to be audited by the model auditor, the financial model audition process will be much efficient if the financial model provides relevant extracts from project and financing documentation, which are precisely described in the project agreements with an offering memorandum. This will help the stakeholders understand how to extract the relevant information from the financial model (Hucknall, 2010). There is also a need for assuring that the financial model reflects the project and financing terms such as "*usual clauses relating to increased costs, gross up, market disturbance, illegality, reimbursement of stamp duties and legal and other out of pocket expenses (including as referred to in the Lead Arranger's mandate letter), breakage costs, etc.*" (Khan and Parra, 2003). Hence, at the pre-proposal stage, a financial model should provide initial assumptions related to funding

and financing terms such as: financing options, loan amounts, tenors, interest rate, grace period, upfront fees, payback structure, etc.

#### ***3.6.4 Time and cost of bidding***

The complexity of PPPs raises the cost and duration of bidding process (Solino and De Santos, 2010). Therefore, it is essential to minimise these impediments through effective evaluation and negotiation. In order to speed up the negotiation process, PPP financial models should be used effectively to evaluate project and communicate their expectations. Thus, at the pre-proposal stage, a financial model should comprise the details of project time lines and transaction costs such as: duration of bidding process (or project evaluation) up to financial close, sponsor's staff costs and travel, advisory fees, and other fees related to the process of preparing bid or unsolicited proposal.

#### ***3.6.5 Transparency of the award process***

Financial transparency should be applied to all legislative proposals on the financing of infrastructure project and the award process (World Bank and PPIAF, 2007). Therefore, the evaluation by using financial models must be transparent in order to determine whether the PPP is the best value for money to the project or not. In addition, Coulson (2008) discussed on how the financial model at pre-proposal stage evaluates VFM in six key areas: '*the treatment of tax*'; '*transaction costs*'; '*lifecycle and residual costs*'; '*cost of capital*'; '*returns to holders of equity*'; and '*issues relating to the discount rate*'.

#### ***3.6.6 Attractive IRR***

Since the rate of return of a PPP project is one of the main considerations in the negotiation process (Ngee *et al.*, 1997; Liou and Huang, 2008; and Yuan *et al.*, 2010), a PPP financial model is utilised to run sensitivity analysis based on the given project's assumptions. If a PPP project demonstrates an attractive IRR (i.e. IRR is higher than corporate hurdle rate), the sponsor prefers to submit a proposal, or to bid, for the project (Khan and Parra, 2003).

### ***3.6.7 Competitive tender evaluation***

According to HM Treasury (2003), “The proper evaluation of bids for PFI projects is essential in securing value for money”. Therefore, it is imperative that the authority use a financial model to evaluate bids in a competitive tender. Lamb and Merna (2004) suggest that sufficient competition should be encouraged to attract robust financing. Furthermore, Tiong (1996) verifies that a strong consortium will be able to provide a sound and competitive proposal, which is determined by five cost drivers: 1) low construction costs; 2) acceptable tolls/tariff levels; 3) reasonably high equity to debt ratio; and 4) short concession period; 5) realistically high royalty or revenue share.

### ***3.6.8 Generate enough cash flow***

Since PPP projects are long-term contractual relationships funded by private finance, the project viability is determined by the ability of the project to generate enough cash flow for covering both the initial capital spent and the on-going maintenance and operation costs. Zhang (2005b) researched that economic viability is the most important factor for assessing the concessionaire’s financial capability, which is indicated by long-term demand for the products/ services to be offered by the project. It means that concession period, tariff, demand (traffic), and any other indicators influenced by the long-term demand should be considered carefully.

### ***3.6.9 Bankable***

Sponsor(s) must convince lenders that the project has a stable revenue stream and generates enough cash flow within fair and bankable contract agreements. The project must also generate enough cash flow so as to give lenders a margin of safety with respect to its debt service obligations (Khan and Parra, 2003). Therefore, financial model should contain debt cover ratios such as DSCR, LLCR, repayment cover ratio, drawdown cover ratio, etc. Lamb and Merna (2004) identified that the measurement ratios of bankability used in financial models are debt-service coverage ratio (DSCR) and loan-life coverage ratio (LLCR). Many planned PPP projects fail because their terms are negotiated without taking into account whether the project is bankable or not (World Bank and PPIAF, 2007). However, from the perspective of public expectation, a financial model should not be used merely to evaluate project bankability but also, most importantly, is to find the greatest overall benefits (Andersen and Enterprise LSE, 2000).

### ***3.6.10 Unsolicited proposal***

Sponsor(s) prefer unsolicited proposals with important innovations (e.g. a new type of project, or new solution to known problem, or new ways of defining performance standards) to solicited proposals. This is because they also provide more scope to participate in defining technical and commercial outlines of projects (Khan and Parra, 2003). Meanwhile, government authorities are forced by the public to use bidding to demonstrate fairness (Kurniawan, 2010). Thus, the proposed financial model should be able to prove that the idea contained in an unsolicited proposal is the best value for money.

### ***3.6.11 Value for money***

Financial model is used to compare the best value for money (VFM) between Public Sector Comparator (PSC) and PPP (Lamb and Merna, 2004). According to HM Treasury (2004), “*VFM is the optimum combination of whole life cost and quality (or fitness for purpose) to meet the user’s requirement, and does not always mean choosing the lowest cost bid. It should not be chosen to secure a particular balance sheet treatment*”. However, value for money is a relative concept. Shaoul (2005) expressed concern about the reliance on the complex financial modelling required for the value for money appraisal. The accuracy of the initial financial comparison is questionable. Either an estimate is showing the PSC cheaper than the PFI deal or PSC becoming slightly higher than the PFI price, the decision based on value for money might well have jeopardized the case (Grimsey and Lewis, 2004).

Value for money should not be the only consideration for selecting PPP option. In addition, Scott and Robinson (2009) argued that the VFM case for PFI in the UK cannot be truly tested before operational stage because payment to PFI contractors (or called unitary charge) usually referred to as capital expenditure (CAPEX) and operating expenditure (OPEX). Yet, the effectiveness of the payment mechanism cannot be assessed in terms of risk allocation and as an incentive to improve service delivery.

### ***3.6.12 Project's ranking under capital rationing***

Since a PPP project requires a huge capital investment, the sponsor with limited budget uses a financial model to determine project ranking under capital rationing or restricted amount for new project (Baker and Powel, 2005).

### **3.7 Stakeholders' expectations in using PPP financial models at contract negotiation stage**

Once the proposal is submitted to the government authority, the sponsor or the bidder quotes a percentage of their revenue to be shared with the government authority. Generally, the proposal with the highest percentage will be selected and continued for contract negotiation process (Kulkarni and Prusty, 2007). Nonetheless, the government authority also expects a reduced level of risk for the government and flexibility of national budget expenditure.

During this stage, the inputs of financial model will be amended due to negotiation and agreement among the involved stakeholders. The amendment of the inputs is a process of reconciling the conflict interests among the stakeholders. There are some reasons why inputs' alterations need to be done, such as: the lenders deem the project's capital structure too aggressive, the lenders determine the project's borrowing power, etc. However, the model's revenues are made consistent according to the advance market study.

By the end of contract negotiation stage, all project agreements are fully negotiated and initialled, and the project offering memorandum is completed and ready for distribution. The sponsor(s) should have developed fairly sophisticated and accurate models that portray the economic and financial feasibility of a project under a variety of scenarios and assumptions. For the economic feasibility, the best perspective is viewed from host government that seek 'value for money' in relation to government expenditure. The key issues that need to be concerned by three major parties in the economic feasibility of the project are described in table 3.2.

**Table 3.2** Key issues in the project economic feasibility (Adapted from Khan and Parra, 2003)

<b>Major participants</b>	<b>Key issues</b>	<b>Remarks</b>
Public sector	Financing costs	Balance between ROE & shorter debt tenor may result in a higher tariff for the users.
	Development costs	Legal fees, development fees and costs of conducting due diligence.
	Insurance	Costly insurance policies to mitigate construction, operation and certain specialised risks.
	Taxes	In many countries, the public sector does not pay taxes, or pays at a lower rate than the private sector does.
	Construction costs	The public sector rarely uses turnkey construction contracts in some cases and specifications.
	Operating & Management (O&M)	The private sector relies on very strict O&M practices.
Sponsor(s) and Lenders	Tariff or tolls of the infrastructure facility	Tariffs should be reviewed as reasonable over the longer term by the consumer serviced by the facility, given the foreseeable effects of future deregulation, sector reorganisation, competition, new technology and other similar factors.

While for the financial feasibility, the developers will focus on the level of projected distributions, their pace and timing, and the acceptability of the project's resulting internal rate of return (IRR). However, the lenders are concerned more on: (a) Projected revenues, operating expenses, CADS and distributions are consistent with project agreements; (b) Realistic estimates of future project revenues are sufficient to cover operating expenses and repay project debt with an acceptable margin of safety.

A brief description of stakeholders' expectations, which focuses on utilising financial models at contract negotiation stage are as follows:

### **3.7.1 *Knowing how much senior debt that the project is able to carry***

Before entering the finance-raising stage of project development, the lenders have to determine the project's borrowing power; which is based on the results of negotiation and project agreements along with the financial model. Once, the project's borrowing power is deemed to be sufficient, a mandate letter will be issued by an agent acting on behalf of several lenders to acknowledge their interest in supporting the project with a specified level of debt (Khan and Parra, 2003).

### ***3.7.2 Credit Committee requirement for approving the sponsor's credit application***

When the winning bidder is selected, the sponsor submits a credit application to the bank's credit committee for approval. This credit application includes a financial model with the base case and the results from the sensitivity analysis (Asenova and Beck, 2003). Further, the financial model is used to investigate different scenarios. These scenarios include anything from an increase in operational costs and rising inflation<sup>10</sup>, to construction delays and pessimistic life-cycle scenarios. In connection with the utilisation of financial model as a tool for evaluating the project, Arndt (2000) revealed that internal credit committees tend to focus on key risk issues and worst case events through spreadsheet-based scenario analyses rather than detailed numerical risk modelling.

### ***3.7.3 Reaching an agreement on forecast for CADS***

Sponsor(s) utilise the financial model for negotiating project agreements. During the contract negotiation stage, sponsor(s) makes various preliminary approaches to several lenders for testing their interest to participate in the project and seeking information related to market terms and conditions for debt (Khan and Parra, 2003). Since the lenders' main concern lies upon the project's borrowing power, it is essential to comfort lenders in the initial negotiation with sponsor(s). Moreover, investors commonly favour a company with a high Cash Available for Debt Service (CADS) ratio<sup>11</sup> as well. Therefore, the sponsor's expectation in utilising PPP financial model is to assist in reaching an agreement with the lender on the forecast for CADS.

### ***3.7.4 Transparency during the negotiation process***

Transparency and accountability are an integral part of PPP processes especially in the UK (Demirag and Khadaroo, 2011). The government authorities should maintain transparency during and after PPP procurement. At the contract negotiation stage, the sponsor and the government authority negotiate the project agreements; which normally

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<sup>10</sup> It generally assumes the price inflation in the financial model by 10%, 20%, or 30%. When the worst case indicates that the payment of senior debt could be affected by the inflation, the sponsor(s) will be required to increase its equity contribution (Asenova and Beck, 2003).

<sup>11</sup> "The higher the ratio, the more of a cash cushion the company has to fund its upcoming debt service payments. In other words, the higher a company's CADS ratio, the less likely the company will be to default on its debts, making owning its shares much safer for shareholders" (Investopedia, 2011).

include a concession and/or implementation agreement (IA), site purchase or lease agreement, EPC contract, operation and maintenance (O&M) agreement and possibly an input supply contract (Khan and Parra, 2003). These documents will affect the input assumptions of PPP financial models. In the context of utilising PPP financial model transparently, HM Treasury (2004) stipulated that “*The conclusions of the assessment, and the proposed project flow for the spending period should be summarised in existing, publicly available, documents such as departmental investment strategies*”. However, not all information is available due to either commercial confidentiality or prejudicing the public sector’s negotiating position. Further, the closed nature of the PFI decision making process opposes the principle of transparency and accountability. Therefore, the ability of the PPP financial model to reflect the provisions made and reached at in the project agreements, which also contains reasonable accurate assumptions with regards to cost financing, is open to question.

### ***3.7.5 Risk allocation through all project agreements***

PPP projects entail complex mechanisms under great uncertainties over long term concession period. For instance, uncertain changes in project’s cash flow or revenue, unexpected inflation, fluctuation of currency exchange, or maybe unexpected activities that could threaten the project’s viability. Although project agreements are prepared to anticipate these uncertainties, the proposed strategy in mitigating them does not always qualify the requirement of “fit for purpose”. Thus a PPP financial model can be used to evaluate the risk allocation strategies proposed in the project agreements.

The example of PPP financial model application in evaluating the risk allocation strategies is evaluating the financial impact of Minimum Revenue Guarantee (MRG) and Revenue Cap (RCP) agreements. Jun (2010) stated that the contingency level of MRG and RCP agreements in PPP projects can be best specified when the financial impact of these agreements are identified through proper financial evaluation; which can be based on the IRR (Internal Rate of Return), revenue, or traffic volume. This level would be fixed through the negotiation process between the government authority and the sponsor.



### **3.7.6 *An attractive IRR***

In the contract negotiation stage, both the public and the private parties expect a high internal rate of return (IRR) of the project over concession period. However, the attractiveness of IRR of the project should be properly examined due to the uncertainty factors. High IRR is not necessarily important, as long as IRR is still higher than interest rate of debt, then the project is still considered financially viable. At this stage, a PPP financial model should be able to assist the stakeholder in determining the attractiveness of IRR without undermining the impact of higher IRR. For an example, when the negotiated terms of the contract are dominated by excessive expectations, the proposed tariff rate will be above the normal rate (Zou *et al.*, 2008). Thus, the competitiveness of PPP project is questionable.

### **3.7.7 *Securing the project cash flows from the risks***

Since PPP projects are mainly structured on a nonrecourse basis where the debt investors or the lenders rely solely on the project cash flows and its assets for debt repayment (Wibowo, 2006), they utilise PPP financial model at the contract negotiation stage to exercise their right in the event of default (Kong *et al.*, 2008).

### **3.7.8 *Assurance that the lenders are only lending a reasonable amount (Debt Sizing).***

As the host authority, they need to secure the equity level that could satisfy the interests of equity holders, lenders, and the general public. However, if the authority failed to comfort the sponsor(s) and the lenders, the investment opportunity could be withdrawn by both or either parties. Debt financing is a common strategy used in PPP projects (Schaufelberger and Wipadapisut, 2003). Hence, the lenders need to assure that they are only lending a reasonable amount that the project can carry (Hucknall, 2010). Nevertheless, the company's success depends on investment decisions instead of the structure of the project capital (i.e. with equity only, or with equity and debt).

### **3.7.9 *Knowing whether the project needs a subordinated lender or not***

Besides determining how much senior debt that the project is able to carry, lenders also want to know whether the project needs a subordinated lender or not (Khan and Parra,

2003). Once the lenders are able to determine the maximum debt that can be provided by senior lenders based on PPP financial modelling effort, the sponsor will be informed about the required level of equity and the requirement of a subordinated lender. At this point, the sponsor will negotiate the level of equity required by the lenders. The discussion between the sponsor and the lenders will be related to revenues, expenses, CADs, upfront fees, interest rates, price of an interest rate swap and discount rate used, and the LLCR selected to determine the project's borrowing power. The sponsor, however, may argue successfully that if the project is able to secure the interest of a subordinated lender, which is recruited by the sponsor, they should contribute less equity accordingly.

### ***3.7.10 High equity level to minimise the debt repayment risk***

In contrary to sponsors, lenders require high equity level in order to minimise the debt repayment risk. Another important reason why lenders require a high equity level is the need of strong commitment of the sponsor to ensure the financial viability of the project (Zhang, 2005b). Due to its risky nature from the lender's viewpoint, government regulation also stipulates that the level of equity ratio should not be less than 20% (Yun *et al.*, 2009). Furthermore, government authority in Turkey favours high equity because more equity means less total project cost (Bakatjan *et al.*, 2003). Therefore, a PPP financial model plays an important role to assist in negotiating the best equity level for the project at contract negotiation stage. Nevertheless, the requirement of high equity ratio can be lowered if the credit rating of the host country is upgraded.

### ***3.7.11 Fiscal incentive or tax benefits from the government authority***

Since PPP is an alternative procurement used by government authority in cases of a shortage of public funds, fiscal incentives or guarantees are often given to attract private participations (Grimsey and Lewis, 2004). The government authority utilises PPP financial model to exercise the fiscal incentives. Kulkarni and Prusty (2007) stated that the government authority in India offers various fiscal incentives to private investors such as a ten-year tax holiday on port development, operation, and maintenance. Khan and Parra (2003) also addressed a range of commercial and fiscal incentives offered by government under concession agreement such as:

- (a) An exclusive right to service a particular area
- (b) Tax holidays
- (c) Political palatability of the tariff structure
- (d) Reduction in host country taxes, duties and levies

However, the financial impact of the fiscal incentives, or elimination, has to be considered in the contract negotiation so that tax or duty benefits extend to the contractor, operator and other main participants. Otherwise, such benefits of the fiscal incentives will not be equally enjoyed by all stakeholders.

### ***3.7.12 Anticipating project cost overrun***

There is a risk of both construction and operation cost overrun stemming from underestimating the project costs in the bid proposal (World Bank and Public-Private Infrastructure Advisory Facility, 2007). The common range of cost overrun is from 5% to even 300% of estimated costs (Tiong, 1990). Obviously, lenders need to be secured from this kind of risk by addressing mitigation measures such as fixed price turnkey contract, liquidated damages provision, performance and completion guarantees in EPC contract, stand-by loan arrangements, insurance provision, etc (Özdoğanm and Birgönül, 2000). The risk allocation to right party should be clear as well, whether government or contractor or operator or SPV company. Therefore, at the contract negotiation stage, PPP financial model is employed not only to quantify the impact of cost overrun, but also to trace the source of cost overruns. Consequently, the risk sharing negotiation, which is based on the financial impacts, can be effectively achieved.

### ***3.7.13 High risk premiums for a low equity level***

Meersman et al. (2010) argued that a successful PPP for a government is indicated by a greater cost efficiency in providing infrastructure, not so much at owning and managing the assets directly. In a PPP scheme, the sponsor(s) are allowed to “own” and manage the project over long term concession period within value for money concept. Andersen and Enterprise LSE (2000) meticulously described six determinants of value for money for evaluating a PPP project, such as: (1) risk transfer, (2) competition, (3) private sector management skills, (4) long-term nature of contracts (including whole-of-life cycle costing), (5) performance measurement and incentives, and (6) the use of an output

specification. Obviously, risk transfer and competition are deemed to be the most important factors in determining value for money (Grimsey and Lewis, 2005).

Once the most competitive bidder is selected, the next issue discussed at contract negotiation will be talking about risk transfer. As risk transfer is one of the major motives in adopting the PPP strategy, government authority intends to lower the project risks linked to building a new infrastructure. The higher the risk perceived by the government, the higher risk premium required by the private partner will be expected from the government. Meanwhile, lenders may require high risk premiums for a low equity level provided by the sponsor (Zhang, 2005b). Eventually that high risk premium will increase the cost of the project. Therefore, PPP financial model is expected to assist in determining the risk premiums at the contract negotiation stage.

#### ***3.7.14 Committing the lowest level of equity possible***

Sponsor(s) tends to contribute less equity level because the main objective is to achieve highest profit with minimum investment. By committing the lowest equity level, sponsor will gain better profitability ratios such as increased project IRR, ROA and ROE (Khan and Parra, 2003). Nevertheless, lenders are concerned more on the safety and return of their money, which is reflected by a prudent and self-sustaining project capital structure. Kulkarni and Prusty (2007) stated that the debt-equity ratio of the project depends on the financial strength of the sponsor in arranging debt funding from financial institutions. Lower level of equity financing does not guarantee that the profit generated by the project can be higher. The discussions and negotiations on these issues are time consuming and arduous. Therefore, it is important to utilise PPP financial model to assist in finding an appropriate ratio between equity and debt.

#### ***3.7.15 Insurance for any material error in the model resulting in the debt not being repayable***

At the contract negotiation stage, the stakeholders expect that any financial losses attributed to the financial modeller's negligence, such as misrepresentation, violation of good faith and fair dealing, and inaccurate advice, should be insured and stipulated in the contract. Hucknall (2010) stated that lenders require an insurance that there is someone to sue if a material error in the financial model resulting in the debt not being

repayable. However, current professional indemnity insurance is not sufficient to ensure that there will be someone to pay out any future claim. Furthermore, professional indemnity insurance is not always available and likely to be very expensive (HM Treasury, 2007). Therefore, government authority in UK acknowledges that this insurance should not be included as a required insurance in the Standardisation of PFI Contract (SoPC 4).

### **3.8 Stakeholders' expectations in using PPP financial models at finance-raising stage**

The finance-raising stage is initiated when an underwriter or a club of lenders expresses an interest through a mandate letter to the sponsor(s) because the project is sufficient to cover the debt needs. At this stage, government authority reviews and approves broad financing terms of the project. Since the sponsor's main objective is to achieve financial closing on acceptable terms and construction start, from the initial model, the sponsor(s) and the lenders (modelling bank) develop a *Lender Base Case* financial model in order to undertake due diligence of the project's financial viability. After all, due diligence procedure for PPP projects, with a relative high investment volume, is a time consuming process (Daube *et al.*, 2008). By knowing what and how the lenders' main concerns are allocated properly, the due diligence process can be shortened.

A brief description of stakeholders' expectations, which focuses on utilising financial models at finance-raising stage are as follows:

#### ***3.8.1 Conducting sensitivity analysis for key commercial issues as needed***

After issuing a mandate letter to the sponsor, the lenders receive the initial PPP financial model, the operation and maintenance (OM) agreement and also the project agreements from the sponsor. Following their receipt, the lenders conduct due diligence for evaluating key technical, legal, insurance, environmental, market, modelling and other similar issues. During due diligence phase, sensitivity analysis is used for evaluating key commercial issues based on the project documents through the PPP financial model (Woodward, 1995). Although each project is different, there are generic concerns common to all projects in a series of sensitivity tests such as: (a) *cost overruns, based on unanticipated change orders or delays in commissioning*; (b) *adequacy of delay and*

*performance-based liquidated damages (LDs) in EPC; (c) rise in short-term interest rates as well as forward yield curve before financial close; (d) unanticipated rise in operating costs; and (e) interruption of construction or operations due to force majeure (FM).* Once due diligence is launched, the sponsor's PPP financial model can be converted into a lenders base case model (Khan and Parra, 2003).

### ***3.8.2 Achieving financial closing on acceptable terms and construction start***

Stakeholders, at the finance-raising stage, utilise the model with an expectation of achieving financial close on acceptable terms and construction start (Khan and Parra, 2003). However, there is a tendency of the lenders to revisit issues previously agreed by sponsor and government authority for securing their interest on risk management (Cartlidge, 2006). Consequently, the lenders' influence might annoy the other stakeholders in PPP projects. The sponsor will have to manage the expenditure and the timing of payments, which could have a substantial effect on the working capital arrangements. Besides that, the sponsor faces the risks of the availability of finance in the markets, and/or the dramatically shifting terms required to access loans. The project's capital structure is also affected by the current situation of financial market environment (World Bank and Ministry of Construction Japan, 1999). Moreover, the sponsor cannot commence the construction until all the financing required by lenders are fully mobilised to commission the facility. Thus, lenders base case financial model is a very important tool to assist in achieving an agreement between sponsor and lenders. Once the lenders are satisfied, the project proceeds to financial close and the construction can be started soon.

### ***3.8.3 Amending the model to reflect the results of the negotiation of commercial issues***

Upon the receipt of initial PPP financial model from the sponsor, the lenders identify any discrepancies in information provided by the sponsor such as the operation and maintenance (OM) agreement and also the project agreements. Therefore, the lenders' expectation in utilising PPP financial model is amending the model inputs, calculation

and output worksheets in order to reflect the results of the negotiation of commercial issues<sup>12</sup> affecting the model's output (Khan and Parra, 2003).

This expectation becomes more prominent as any changes in design and capacity might have significant impact not only on the project's funding requirements, but also on the calibration of the payment and performance mechanism. Accordingly, the sponsor and the lenders should satisfy themselves that the changes within the PPP financial model are realistic, consistent with the results of negotiation of commercial issues (HM Treasury, 2007).

#### ***3.8.4 Verifying the accuracy of formulae used in the model in collaboration with the model auditor***

Hucknall (2010) argued that the stakeholders should not only rely upon professional indemnity insurance to ensure that there will be someone to pay out any future claim. Since professional indemnity insurance is very expensive and not always available, it is more essential to assure that the PPP financial model reflects the project and the financing terms. Consequently, collaboration between the stakeholders and model auditor is needed in verifying the accuracy of formulae used in the model in accordance with a scope of work to be agreed before financial close (Khan and Parra, 2003).

#### ***3.8.5 Assessing the issues that affect tariff, availability, quality, or transportation thereof***

A competition among transportation infrastructure facilities such as airports, ports, bridges, tunnels, etc. provides a balance between consumer affordability and project's financial viability. However, Mols (2010) addressed that PPP procurement often takes place in which there is limited competition. Whilst government authority is challenged to increase competition in markets, lenders and sponsor(s) are likely to secure the project cash flow through limited competition facilities. Thus, at the finance-raising stage, lenders expect that the lender base case financial model can be used to assess the competitiveness of the project relative to local, regional or international competing

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<sup>12</sup> There are three commercial issues negotiated by using financial model, such as: (1) capital structure; (2) loan profiling; and (3) quantitatively driven covenants (Khan and Parra, 2003).

facilities, which affects tariff, availability, quality, or transportation thereof (Khan and Parra, 2003).

### ***3.8.6 Having joint control with the modelling bank over amended inputs and outputs of financial model transformation.***

Since initial PPP financial model is developed by sponsor(s), in the process of transforming financial model to lender base case financial model, sponsor(s) is expecting to have a joint control with the modelling bank over amended inputs and outputs of the PPP financial model. Khan and Parra (2003) described that the activities involved in this effort may be characterized as follows:

- Familiarisation. The modelling bank, as a part of lenders' roles in transforming the model into the lenders base case, examines the initial financial model in order to determine what changes are needed to assist in negotiations or completion of a formal due diligence. During the development of a lender base case financial model, the modelling bank examines the architecture of the model, the accuracy of inputs, integrity of the formula used in the calculation worksheets, loan profiling assumptions (*e.g. loan commitment, schedule of disbursement, loan repayment schedule, interest and fees, assumptions related to the interest rate hedge*).
- Updating. Some of the model's inputs will be modified during the due diligence process as a result of :
  - (a) The recommendations of expert opinion, such as: *project costs, agreed capital structure, revenues and expenses forecasts (if too optimistic or unrealistic), and erroneous formulae in the calculation worksheets, etc.*
  - (b) Or changing circumstances, such as: *fees, interest or swap costs associated with the debt, economic assumptions related to global and domestic inflation or foreign exchange parity.*
- Testing sensitivity as part of due diligence. The purpose of the sensitivity analysis is to measure the impact on some, or all, of the cover ratios [*e.g. Project Life Cover Ratio (PLCR), Loan Life Cover Ratio, (LLCR), Drawdown Cover Ratio (DCR), Historic Debt Service Cover Ratio (HDSCR), Projected Debt*



*Service Cover Ratio (PDSCR)]* of certain events that have adverse potential for the facility.

- Incorporating agreements. Eventually, any changes related to the financial model have to be negotiated with the sponsor in order to reach agreement on a series of specific issues such as: *(a) the project's capital structure; (b) loan profile; (c) cost overrun mitigation; (d) resolution of quantitative covenants that are to govern the ability on the part of the lenders to declare an event of default (EOD) as well as on the part of the borrowers to pay dividends).*

### ***3.8.7 Studying market of the product or service***

As part of due diligence process, lenders employ PPP financial model to assess the proposed current and future tariff structure of the facility and the corresponding tariff sensitivities of its consumers, including a fairly detailed study of demand and tariff elasticity (Khan and Parra, 2003). Meanwhile, the attractiveness of the project, for the investors in the global capital markets to ensure ample funding, also needs to be assessed as well. By considering both consumers and investors in the due diligence analysis of the project's future cash flows, it shall foresee realistic market values of project securities (e.g. project bonds and preferred stocks) with varying claims on future cash flows (Chen and Kubik, 2007).

### ***3.8.8 Expanding the project input, calculation and output worksheet***

Since the initial PPP financial model is used for submitting and evaluating the competitive bids, the project input assumptions made by the sponsor and the government authority have to be expanded and verified by lenders (modelling bank) in order to determine an accurate project's borrowing power based on the outcome of negotiations. Furthermore, the modelling bank usually is the prime candidate to take over the role of an inter-creditor agent to monitor the project during construction and operation periods. Hence, the architecture of PPP financial model based on lender's perspective is also meant to monitor and report the progress of the project during construction *(e.g. cost overruns and other events that may have a material and adverse effect on DSCR or LLCR)* and track its compliance with the loan covenants during operations (Khan and Parra, 2003).

### **3.9 Stakeholders' expectations in using PPP financial models at the construction stage**

Once the lenders are satisfied, the project proceeds to financial close and the construction can be started soon. During the construction stage, the government authority manages and adjusts regulatory structure to create stable market conditions, and participate in commissioning tests of facility. The sponsor(s) use the financial model to monitor and track the performance of the project. The lenders appoint an inter-creditor agent, usually the modelling bank, for maintaining the financial model and monitoring the project costs and other issues such as:

- (1) Disbursements of debt and equity by the stakeholders;
- (2) All financing costs, including the upfront fees, hedging costs, funding of required reserves, and interest roll-up due to loan disbursement.

A brief description of stakeholders' expectations, which are focusing on utilising financial models at construction stage, follows.

#### ***3.9.1 Ensuring the impact of cost overrun and other events does not have adverse effect on DSCR or LLCR.***

Schaufelberger and Wipadapisut (2003) stated that cost overruns will increase the financing costs, thus, bring an impact to the profitability of the project. However, since cost overruns commonly take place in the public projects (ranging from 5% to even 300% of estimated costs<sup>13</sup>), the inter-creditor agent and Independent Engineer (IE) will see carefully the impact of cost overrun on the DSCR or LLCR (Khan and Parra, 2003).

Furthermore, the government authority in the UK is required to pay a higher premium in order to ensure that the PFI projects is built to budget and on time (Shaoul *et al.*, 2006). Therefore, the main purpose of calculating DSCR and LLCR through PPP financial model is to ensure that no defaults have taken for failure to meet debt service cover and that the project vehicle is entitled to pay dividends to the sponsor, if other conditions for doing so are met.

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<sup>13</sup> Studies were undertaken by many (e.g. Flyvbjerg *et al.*, 2002; MacDonald, 2002; and HM Treasury, 2003).

### ***3.9.2 Anticipating to claim the declaration of the loan agreement breaching***

Since construction risks are primarily related to delays in completion and cost overruns, the sponsor needs to select an appropriate financing strategy to mitigate any construction risks. The selection of financing strategy has to be agreed by the government authority and the lenders as well. However, Schaufelberger and Wipadapisut (2003) reminded that many lenders are reluctant to take the construction risks. Thus, in some cases, the sponsor cannot obtain a long-term nonrecourse debt financing before completing the major construction. Accordingly, the sponsor possibly will use equity to fund the major construction costs.

Since the sponsor's interest is about keeping the equity level as low as possible, the rest of total project costs are covered by debt. Obviously, without loan withdrawal at the construction period, equity will be exhausted before the end of construction. However, it is common that the sponsor withdraws the debt during loan availability period<sup>14</sup>. In order to comfort the lenders that the contractor will not abandon the project and enforce all commitments to complete the project, the lenders require sponsor to provide between 30% and 40% of its total equity obligation prior to first loan draw. In that case, the inter-creditor agent on behalf of lenders utilise PPP financial model<sup>15</sup> to monitor the project and anticipate any potential material adverse effect at the construction period. A failure of the project to maintain DSCR above a certain level (in practice is set a level that is greater than 1.0), lenders may be able to claim the declaration of loan agreement breach, which is based on a material adverse change (MAC) or some other similar covenant (Khan and Parra, 2003).

### **3.10 Stakeholders' expectations in using PPP financial models at the operation stage**

Once satisfactory completion of the facility is achieved, the sponsor will be able to generate revenue from the operating facilities. The sponsor also commences to pay capital gains taxes and repayments to lenders (Shen *et al.*, 2002). The lenders, generally, will opt for the first scheduled repayment date to the next six months. However, at times the revenues collected until (or even after) the sixth month may be insufficient to meet debt service (Khan and Parra, 2003). Thus, it is imperative to utilise PPP financial

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<sup>14</sup> Loan availability period starts at financial closing and ends at the initial operation stage.

<sup>15</sup> This version should be agreed by the stakeholders in any case of declaring a breach.

model in order to follow up the mitigation measures, or declare a clause breach, which are agreed in the concession contract and/or the other agreements (i.e. grace period, tax holiday, tariff adjustment, concession period extension, etc.).

A brief description of stakeholders' expectations, which are focusing on utilising financial models at operation stage, follows:

### ***3.10.1 Securing the operational cash flow***

Unlike traditional procurement project, where lenders have recourse to the assets of the project sponsor, a PPP project is non-recourse financing, which relies only on operational cash flow to repay its debt. An optimum trade-off between limited recourse and credit support are needed to satisfy lenders with the credit risk and operation risk (Farrell, 2003). On the other hand, PPP project should be able to demonstrate value for money throughout the delivery of services (Robinson and Scott, 2009). Therefore, performance monitoring is very important in PPP projects as it ensures (a) value for money; and (b) credit and operational risks are anticipated earlier, so that the risks will be kept manageable. In this regard, the purposes of a PPP financial model during the operation stage for the stakeholders (e.g. government authority, sponsor, and lenders) are to assist in ensuring that no defaults have taken place for failure to meet performance standards, debt service cover and dividend's obligations.

### ***3.10.2 Making the financial model to represent reality***

Derman (2009) stated that financial models are merely models that fall short of reflecting the complex reality of the projects. The failure of financial models is mainly resulted from taking the models<sup>16</sup> too seriously without considering the humans behind the equations. Nevertheless, an effort has to be made to model the PPP project, which is a complex procurement option. Of course, it is only a simplified statement for representing a complex reality of the project.

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<sup>16</sup> *Financial models are built with assumptions, which at times can be wrong and enormously inaccurate (Derman, 2011).*

Since all assumptions are made prior to the operation stage, it is important to update those assumptions<sup>17</sup> in order to allow the financial model to represent reality and track the performance expected from initial design. It is also worth noting that a successful financial model must have limited scope with simple analogies (Derman, 2011).

### ***3.10.3 Understandable financial model for stakeholders***

In conjunction with simplification attempt of developing PPP financial model, it is imperative to allow the stakeholders understand the mechanism of the financial model utilisation at the operation stage. Tjia (2009) suggested that a financial model should be built from the user's point of view, which is accurate, robust, fast, easy to debug, and easy to use. Thus it implicitly defines that the stakeholders do not have to think about how to run it, but simply use it in order to get the desired results. Moreover, government authority needs to understand where public money is going, how it is being used, and the extent of future commitments and liabilities, through the PPP financial model at the operation stage. The essential information needed (e.g. *unitary charges, any performance deductions in each service area, public entity's costs of monitoring the project and an explanation of why actual cost differs from that expected and set out the previous year*), is necessary to understand the full cost of the project and compare the actual cost as planned in the case for selecting PPP (Shaoul *et al.*, 2010).

### ***3.10.4 Assessing the impact of annual operations budget***

Lenders use PPP financial model during operation period as a tool to approve/disapprove the annual operational budget<sup>18</sup> submitted by the SPV Company for next fiscal year, if its implementation otherwise may possibly be anticipated to lead to a problem (Khan and Parra, 2003). It is vital that the lenders oblige the SPV Company to maintain the project and to meet the projected operating budget. Therefore, PPP financial model is also employed to review the proposed operations whether sufficient funds have been allocated properly, for the operations and maintenance, or not (UNESCAP, 2011).

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<sup>17</sup> *There are three major concerns for the operation assumptions: (a) supply of an input; (b) demand for the product or service; and (c) the delivery of the product or service (Khan and Parra, 2003).*

<sup>18</sup> *Annual operating budget is a proposed projection of all estimated income and expenses based on annual forecasted revenue (BusinessDictionary.com, 2011).*

### ***3.10.5 Monitoring the ability of the SPV to meet conditions related to the payment of dividends***

Schaufelberger and Wipadapisut (2003) stated that lenders and investors consider the revenues generated from the project as the source of dividends on equity and repayment of debt. Accordingly, the stakeholders expect that PPP financial model can be used to monitor the ability of the SPV to meet conditions related to the payment of dividends and repayment of debt. However, there is a question concerning how to assure both investors and lenders that their dividends and money will be remitted. Proper mitigation measures should be considered and negotiated before reaching financial closure.

### ***3.10.6 Easy to update the financial model***

When it comes to the operation stage, all assumptions have to be updated based on the real information of project input. It means that the stakeholders do not have to think about how to update the model, but simply replace the input assumption with the real information in order to get the desired results. Once all information replaced with the newest version, it is crucial to ensure that all numbers are recalculated before reviewing the results (Tjia, 2009). Otherwise, it will lead to wrong judgement based on misleading information. And thereupon, PPP financial model should not be overly used in making decision. Instead, it should be used with cautions because anything can be wrong. Derman and Wilmott (2009) warned that financial model should be questioned due to its failure to make accurate forecasts. Further they asked the following questions about any model “*What does it ignore, and how wrong is it likely to be?*”

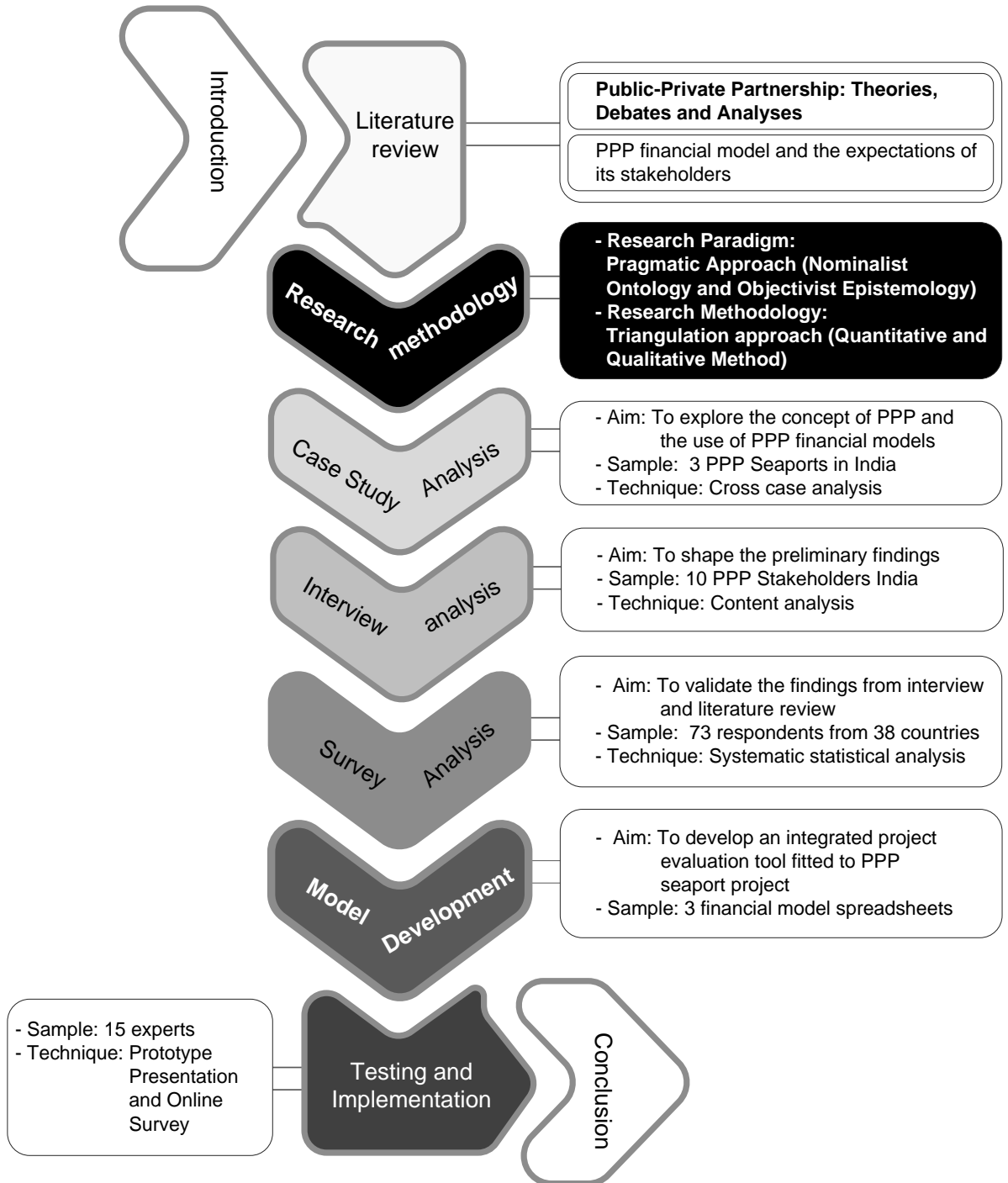
### ***3.10.7 Reasonable tariff***

HM Treasury (2004) addressed that a reasonable tariff charged by SPV company is imperative to a PPP scheme. The importance of a reasonable tariff for a PPP project is proven by many through questionnaire surveys (e.g. Ng et al., 2010; Zhang, 2005d; Tiong, 1996). Thus, an adjustment of a new tariff proposed by Sponsor Company should permit the project not only to recover eventually the unanticipated investment, but also to take into account the user’s affordability. However, there is a question in determining the reasonable tariff when the actual revenue is far below the initial projection. To what extent the user’s affordability is determined? A PPP financial model should be able to assist in anticipating this risk and address its mitigation measures.

### 3.11 Chapter Summary

Evaluating a large infrastructure project requires extensive collaboration among project stakeholders. A financial model has been identified in this chapter as one of the most common tools used for evaluating a new project and facilitating negotiations among lenders, sponsor(s) and a government agency. However, the complexity of project financing transactions and the diversity of stakeholders' interests are major reasons that make financial models hard to understand and error prone. These problems have been discussed to identify the knowledge gaps on PPP financial models and the stakeholders who are using them. Although the following research questions, "*Who are the stakeholders using PPP financial models? How can understandable financial model be developed with minimum error?*" and "*What are the most important stakeholders' expectations in utilising PPP financial models?*" were addressed and discussed in attempt to fill the knowledge gaps, further research investigation is still needed to confirm its validity. The findings of this chapter have contributed clear information about the users of the proposed IPET, and the expectations of the stakeholders in evaluating PPP seaport projects. For instance, the stakeholders' expectations from PPP financial models that have been explored in this chapter were validated by using triangulation approach. The rationale of research design and methodology employed in this study will be presented in next chapter.

# CHAPTER FOUR: RESEARCH DESIGN AND METHODOLOGY





## Chapter 4: Research Design and Methodology

*“‘Google’ is not a synonym for ‘research’.”*

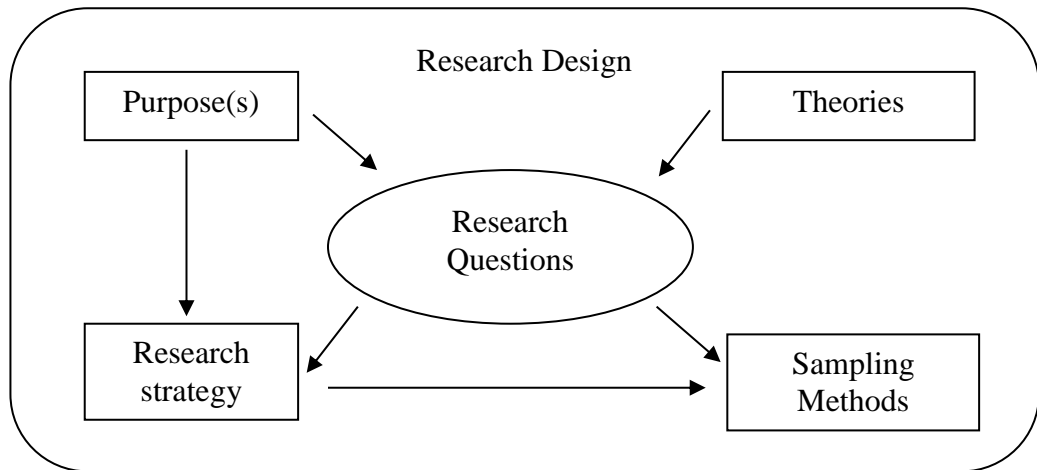
(Dan Brown 1964 - )

### 4.1 Introduction

The preceding chapter discussed the concept of Public-Private Partnership (PPP), rationalisation for PPP projects, several theories underlying the partnership approach, and critical points in evaluating large infrastructure projects. A review of the risk management literature in terms of project evaluation tools and techniques used in the construction industry was presented as well. Then, this chapter elaborates on the research design and methodology. Since the research methodology is selected in accordance with the nature of the problem being addressed in this study, this chapter presents the approach to derive a suitable research design and methodology (including research method, data collection, and data analysis) in answering the research questions and problems addressed in the literature review. This chapter also provides further emphasis and description of the data needed and the methodology selected for this research. Given the aim and the objectives of this research, the process of developing an integrated project evaluation tool (IPET) and its validation will be described in this chapter as well.

### 4.2 Understanding research methodology: research design, strategy, and method

A research can be defined as a set of activities for the advancement of knowledge. In order to justify the truth to be believed as knowledge, a sound research should be designed in such a way through a constant reasoning. Thus, a research design is important to be justified before conducting a research project. Research design has been defined by some as follows: 1) *“A research design is a grand plan of approach to research topic”* (Greener, 2008); and 2) *“a design that describes a (flexible) set of assumptions and considerations leading to specific contextualised guidelines, which connect theoretical notion and elements to dedicated strategy of inquiry supported by methods and techniques for collecting empirical material”* (Jonker and Pennink, 2010). In order to justify the research design, it is also important to define the elements of research design as shown in figure 4.1: purpose(s), theories, research questions, research strategy, and research methods and techniques (Robson, 2002).

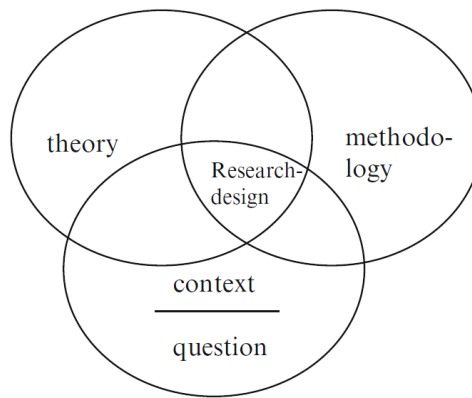


**Figure 4.1** Research Design Framework

*Source: Robson (2002).*

Research questions are derived from the purpose of research (e.g. exploratory, descriptive, and explanatory) and the underlying theories from literature review. Once the research questions have been determined, decision of an appropriate research strategy can be made such as case study, survey, or experiment strategy. The sampling methods (e.g. observation, questionnaire survey, interview, and data review) are also selected according to the research questions and selected research strategy.

There are two major categories of research design that are justified based on the nature of research situation, circumstances, or experience of participants (manipulation); subsequently they are experimental and non-experimental research designs. The first category (experimental research design) is also called fixed research design because all experiments are fixed before collecting data. A researcher needs to find the best way to measure the variables that can be used in examining the cause and effect relationship; or to find which method will be the most appropriate to answer the research question; or to test existing theories or new hypotheses under specified situation and circumstances. The second category (non-experimental research design) is the opposite of the first category. In order to identify the relation of one variable to another, non-experimental research design does not manipulate the situation, circumstances or experience of participations. Therefore, non-experimental research, which is also called as flexible research design, allows much flexibility during data collection. It is worth noting that fixed designs do not have to be quantitative while flexible designs need not be qualitative. These are further discussed in the research methodology decision section, where mixed design was used in this research.



**Figure 4.2:** The relationship among research design, methodology, theory, question, and context

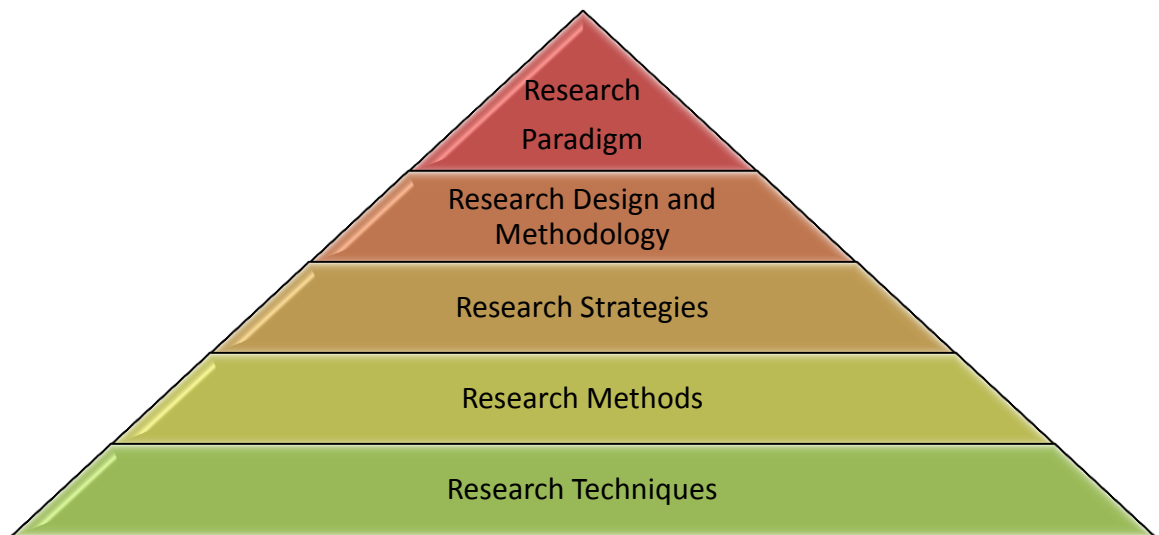
*Source: Jonker and Pennink (2010)*

According to Jonker and Pennink (2010), a research design covers theory, questions and its context, and selected methodology to undertake scientific research (as illustrated in figure 4.2). Since the theoretical background, research questions and its context have been discussed earlier, it is also important to justify the selection of research methodology. A methodology is defined as a guideline system for solving a problem or answering the question based on a set of premises, (theoretical) considerations and practical conditions. Jonker and Pennink (2010) remarked that a ‘methodology’ is (often) incorrectly associated with drawing up a research plan. A methodology should be presented as a form of thinking and acting, rather than limited as a form of writing a questionnaire, collecting a limited set of data and learning to apply some simple statistics. It implies that a researcher should be able to justify the reasons for the choice of a specific (research) approach and make sensible choices based on different requirements of a particular question.

A research is started by identifying the research question, which is translated from the problem ‘created’ by people through their interpretation of a reality that they are operating in. Therefore, a problem should be defined as the interpretation of a (empirically) ‘labelled’ situation, condition, phenomenon or function of an organisation which is problematically experienced by those involved (stakeholders) that it requires (some) research to determine a (possible) solution.

A proper methodology is reflected by transparent activities in showing comprehensible alternatives, providing arguments and demonstrating the reasons for what have been

done. In order to justify the transparency of a guideline system, Jonker and Pennink (2010) introduced four research action levels called research pyramid, as shown in figure 4.3. This pyramid is a (logical) chain of interconnected events ranging from an abstraction (on the paradigm level) to very concrete data collection instruments (on the technique level).



**Figure 4.3** The Research Pyramid

*Source: Jonker and Pennink (2010)*

The first and foremost step in setting up a research is to determine the research paradigm of how the researcher views 'reality'. The researcher should decide on which ontological (what knowledge is) and epistemological (how we know it in order to believe it to be true) perspectives when a reality is discovered as something that really exists. In the construction management research, there are three methodological paradigms such as: positivist, interpretivist, and pragmatic approach (Falqi, 2011). According to Johnson *et al.* (1984), positivist paradigm perceives that a reality exists independently of human consciousness and cognition (realist ontology) through 'the eyes of the researcher' or based on individual experience and test results (objectivist epistemology). Whereas interpretivist (constructivist) paradigm refers to nominalism reality (nominalist ontology), which is simply a product of our minds, a projection of our consciousness and cognition, with no independent status. Interpretivist paradigm believes that a reality is perceived in different ways through the eyes of someone else (subjectivist or idealist epistemology). Pragmatic approach combines both positivism and interpretivism.

The second step is to specify a research design and methodology or ‘a way’ in conducting the research that is tailored to the philosophical research paradigm as illustrated in table 4.1.

**Table 4.1** Fundamental Beliefs of Research Paradigms in Social Sciences (adapted from Wahyuni, 2012)

Fundamental Beliefs	Research Paradigms			
	Positivism (Naïve Realism)	Post positivism (Critical Realism)	Interpretivism (Constructivism)	Pragmatism
Ontology: the position on the nature of reality	External, objective, and independent of social actors	Objective, exist independently of human thoughts and beliefs of knowledge of their existence, but is interpreted through social conditioning (critical realist)	Socially constructed subjective, may change, multiple	External, multiple, view chosen to best achieve an answer to the research question
Epistemology: the view on what constitutes acceptable knowledge	Only observable phenomena can provide credible data, facts. Focus on causality and law-like generalisations, reducing phenomena to simplest elements	Only observable phenomena can provide credible data, facts. Focus on explaining within a context or context	Subjective meanings and social phenomena. Focus upon the details of situation, the reality behind these details, subjective meanings and motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating perspective to help interpret the data
Axiology: the role of values in research and the researcher’s stance	Value-free and etic Research is undertaken in a value-free way, the research is independent of the data and maintain an objective stance	Value-laden and etic Research is value laden; the researcher is biased by world views, cultural experiences and upbringing	Value-bond and emic Research is value bond, the researcher is part of what is being researched, cannot be separated and so will be subjective	Value-bond and etic-emic Values play large role in interpreting the results, the researcher adopting both objective and subjective points of view
Research Methodology: the model behind the research process	Quantitative	Quantitative or qualitative	Qualitative	Quantitative and qualitative (mixed or multi method design)

Based on Saunders et al. (2009, p.119), Guba and Lincoln (2005), and Hallebone and Priest (2009)

While a research design administers a framework for collecting and analysing data (Bryman, 2012); Cobuild (1987) described the definition of methodology, in more everyday language, as a system of methods and principles for doing something. Thus, the selected methodology should be constructed in such a way that it can be applied in all possible situations. It is not only about a direction of using specific methods, but also more on how the researcher justifies the selection of alternative methods in order to achieve the research goal. In other words, methodology is all about defining and defending the justification of research methods and techniques in a reasonable way.

Identifying the specific steps or actions (research methods) which needs to be undertaken in a certain (rigorous) order is the third step of research action levels. It is essential to define a logical order of specific steps to be taken during the research. For instance, the researcher should consider the best way to collect the data prior to the analysis. Therefore, it is impossible to analyse data before it is available.

The last step is identifying the research techniques as practical ‘instruments’ or ‘tools’ for generating, collecting and analysing data. Since research techniques concern the way in which data is generated, collected, classified and analysed, the selection of research techniques depends on the nature of the data. Data can be classified, based on its nature, into four: (1) linguistic data (*e.g., transcription of a conversation*), (2) numerical (in figures) data (*e.g., a company’s profit and loss account*), (3) textual data (*e.g. document*), and (4) visual data (*e.g., drawings, pictures, photos, rich pictures, etc.*).

### **4.3 Research design and methodology decision**

Before justifying an appropriate research design and methodology, it is necessary to review the philosophical concepts related to research in construction management. Runeson (1997) argued that construction management is a set of functions where various scientific theories and techniques are employed. The main cause is a lot of research into construction management is scientifically directed towards finding better work practices or improving decision making (i.e. finding causal relationships, establishing general relationships, verification, etc.). From the philosophical concept, Runeson’s argument falls under positivist paradigm. However, Seymour *et al.* (1998) contended that construction management is a sub-branch of management studies. Hence, management is the study of human activities, which is fundamentally different

from the study of physical phenomena. It implies that construction management can be sought from the interpretivist paradigm,

In order to justify the selection of research paradigm, the main problem has been identified to be the knowledge gap between the private and government representatives. To minimise the knowledge gap in evaluating project financial viability, a proper guideline system (or methodology) with relevant tools and techniques should be determined. Among the tools and techniques used in evaluating PPP projects, a financial model (due to its rigorous combination<sup>19</sup>) is the only evaluation tool that can be employed to facilitate risk sharing negotiation. Since an efficient risk sharing negotiation reflects minimum knowledge gap, PPP financial model was selected as the object of this study. Therefore, the select research paradigm should be able to accommodate the reality that the knowledge gap (as a problem) may be minimised if PPP financial model is properly utilised. This problem (ontologically) belongs to nominalism reality because knowledge gap is related to human cognitive ability. In this context, knowledge gap is caused by different interpretation of every person. Meanwhile, the proposed strategy in minimising the knowledge gap through proper use of financial model has to be verified and validated. A knowledge is assumed to be valid (or true) when empirical evidence is provided (Larraín, 1979). This assumption refers to positivist paradigm which adopts objectivist epistemology in obtaining and verifying the knowledge.

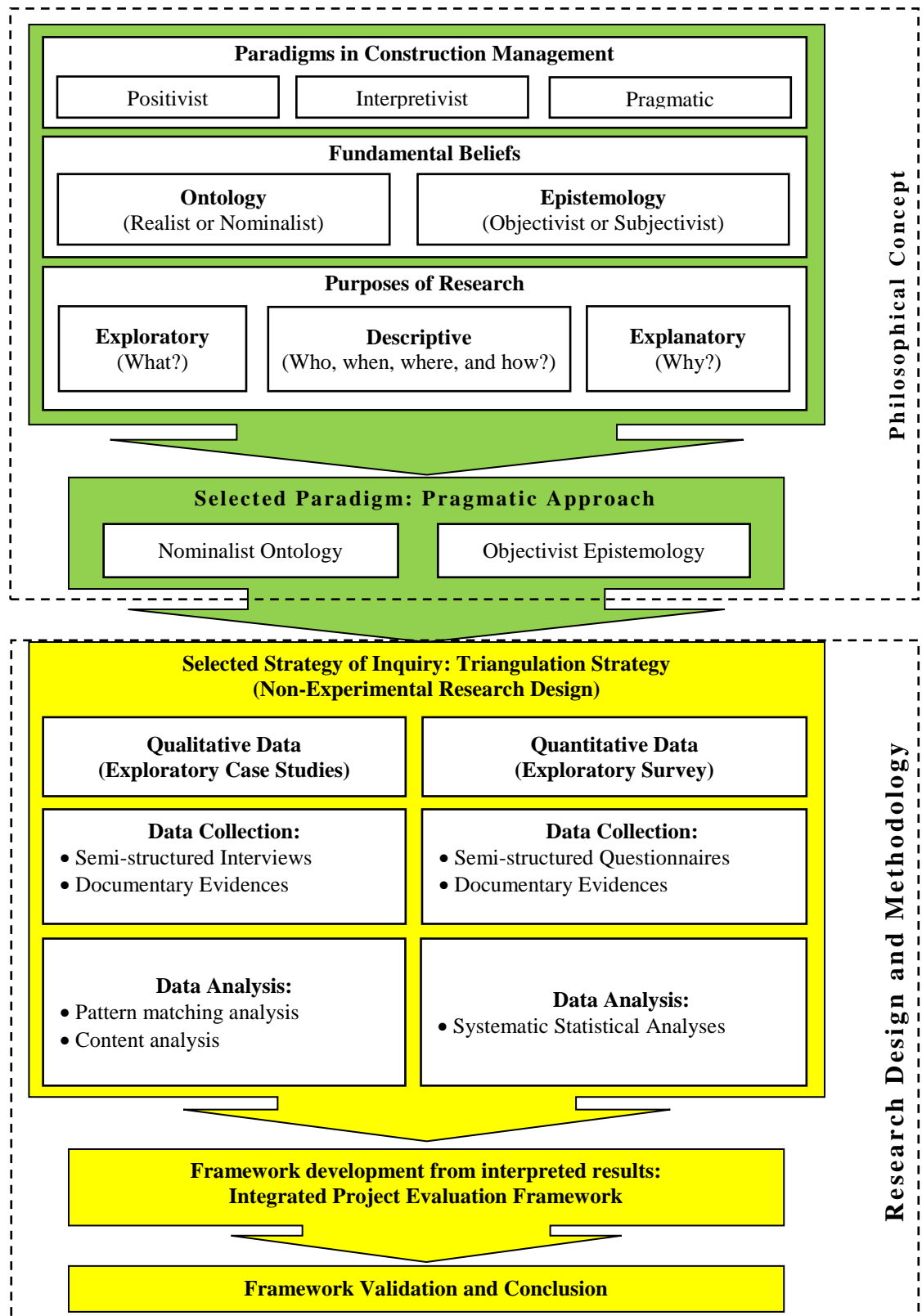
Instead of forcing one paradigm in construction management research, both paradigms (positivist and interpretivist) can be applied in one piece of research. This combination is called pragmatic paradigm. It utilises combination of qualitative and quantitative techniques or triangulation technique (Jupp, 2006). Hence, pragmatic paradigm is considered the best approach for this study, as illustrated in figure 4.4.

Since the underlying philosophical paradigm of this study requires qualitative and quantitative approaches, this research adopts a non-experimental research design that

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<sup>19</sup> A financial model comprises a rigorous combination of evaluation methods and techniques which provides a sound financial evaluation, such as: NPV method, financial ratio method (e.g. DSCR and LLCR), cash flow analysis (e.g. FCF and CADS), Monte Carlo simulation, Score Index (e.g. IRR and ROI), Sensitivity analysis, etc. (Khan and Parra, 2003).

combines both approaches. The aim of this research is to ascertain the rationale of the public sector authority in evaluating PPP projects (as discussed in the chapter 1).





#### **Figure 4.4** Research design and methodology framework

The research decided to explore the problems occurred in practice through a qualitative approach (case study strategy). Although some researchers (positivists<sup>20</sup>) argue that qualitative methods fail to provide scientific explanations and rather vague (e.g. Mays and Pope, 1995; Field, 2009), other groups (interpretivists<sup>21</sup>) recognise that qualitative methods (e.g. interviews, pilot study) suit best for understanding the meanings, which contextualise human experience attached to phenomena (e.g. values, beliefs, actions, decisions, etc.) within their social worlds (e.g. Snape and Spencer, 2003; Seidman, 2006). Furthermore, a qualitative method, which is often equated to a grounded theory<sup>22</sup>, gives flexibility in undertaking data collection and analysis.

Besides the foregoing, a quantitative approach (questionnaire survey strategy) was also deemed essential to be undertaken because the development of an integrated project evaluation tool (IPET) requires an empirical data that support the research questions. Therefore, a combination of qualitative and quantitative approaches, which is referred to as triangulation strategy (Harden and Thomas, 2005), provides a holistic analysis<sup>23</sup> that enhance the validity and applicability of the proposed tool. Mason (2002) revealed that it is common in observation-based research studies to use a range of other methods (including quantitative) to generate cross-referential data. Nevertheless, a precautionary measure was considered in implementing a triangulation strategy because it is possible that the findings of quantitative and qualitative methods will conflict in some way (Perlesz and Lindsay, 2003).

#### **4.4 Research Strategy**

Since the research paradigm of this study uses pragmatic approach, this research is designed to use more than one research strategy. Table 4.2 below illustrates that there

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<sup>20</sup> *Positivists generally assume that an objectivity should be able to be hypothesised and tested (Wiggins, 2011).*

<sup>21</sup> *Interpretivists assume that reality is formed by interpretation and it only be known by attending to interpretive meanings. For further discussion about qualitative and quantitative methods see Wiggins (2011).*

<sup>22</sup> *Grounded theory is an inductive research to generate a theory from a variety of data sources such as: interviews, review of records, observation and surveys (Martin and Turner, 1986).*

<sup>23</sup> *Financial models involve human as modeller (to develop quantitative equations based on assumptions) and user (to use qualitative interpretations based on experiences). Therefore, a combination of both quantitative and qualitative approaches is essential for the analysis.*

are five research strategies available based on the nature of research questions, control of behavioural events, and contemporary events (Yin, 2003).

This research focuses much on identifying the stakeholders' expectations toward PPP financial model, so that the knowledge gap can be minimised between stakeholders. Thus, case study and survey research strategies are employed because they do not require control over the stakeholders' expectations and focus on contemporary events.

**Table 4.2** Various Forms of Research Methods (Adapted from Yin, 2003)

Research Strategy	Form of Research Question	Requires control of behavioural events	Focuses on contemporary events
Experiment	How? Why?	Yes	Yes
Case Study	How? Why?	No	Yes
History	How? Why?	No	No
Survey	Who, what, where, how much, how many?	No	Yes
Archival Analysis	Who, what, where, how much, how many?	No	No/Yes

The attention of this topic has also been gained from the study of phenomenon addressed in construction management literature. A literature review, as the first research step, does not only help to understand the concept of PPP especially in the PPP financial modelling within a risk management framework, but also to address accurate research questions related to the utilisation of PPP financial model. It gives a clear direction of the study and the chosen research strategies (case study and survey). A framework of research process has been designed in a logical order to allow the research to be undertaken within a realistic time span as illustrated in figure 4.5. The next section discusses the two research strategies employed in this research, case study and survey strategies.

#### **4.4.1 Case Study Strategy**

Among three types (exploratory, descriptive, or explanatory) of case study (Amaratunga *et al.*, 2002), this research employs an exploratory case study type due to the fact that little information is available on how stakeholders use financial models to evaluate PPP projects, and why financial closure delay is likely to happen to most PPP projects. Therefore, the case study strategy aims to study the implementation of PPP seaport projects in India through an in-depth analysis of three case projects via published

materials such as newspapers, magazine articles, websites, journal papers, government releases, etc.

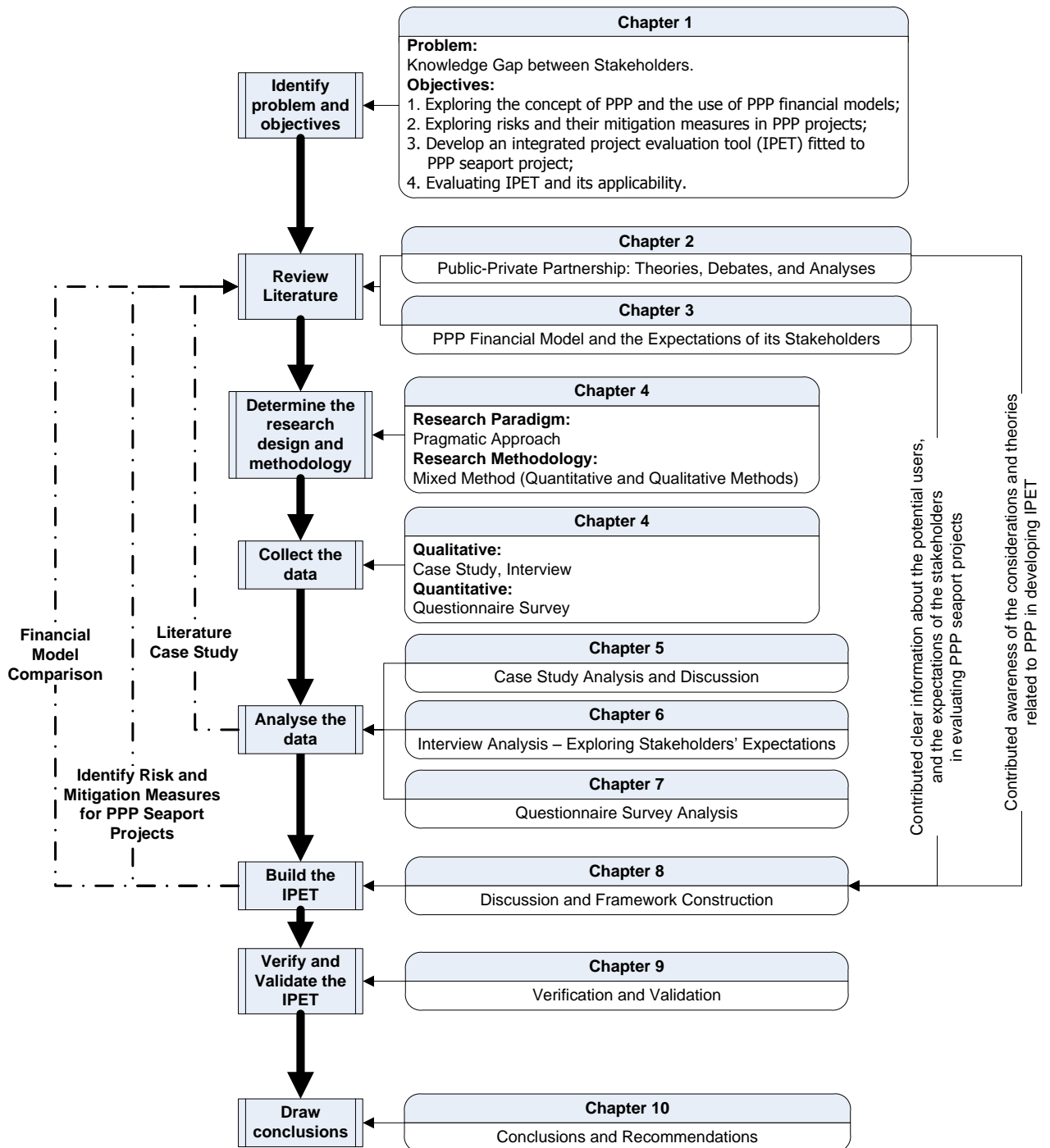


Figure 4.5 Research process framework

Unlike single exploratory case study, multiple exploratory case studies are preferred because it facilitates deep investigation of a real-life contemporary phenomenon in its natural context by using replication logic (Yin, 2003). Three cases, which are: Nhava Sheva International Terminal (NSIT), Gangavaram Port, and Kakinada Deep Water Port (KDWP) are selected to investigate a contemporary phenomenon of typical procedures used for evaluating PPP projects. They are selected because they are three of the most phenomenal PPP projects in India which were available online (see table 4.3).

**Table 4.3** Three selected PPP Seaport Projects in Indian case studies (DEA, 2012)

Case Study No.	Project	Sector	PPP Project Structure	State / Year Contract Signed	Project Cost	Concession Period
1	Nhava Sheva International Container Terminal	Ports (Major)	BOT (includes Design and Finance)	Maharashtra (1997)	Rs. 733 crores	30 years
2	Gangavaram Port	Ports (Minor)	BOOT (includes Design and Finance)	Andhra Pradesh (2003)	Rs. 1,696 crores	30 years (extendable by additional 2 periods of 10 years each)
3	Kakinada Deep Water Port	Ports (Minor)	OMST/BOT (includes sharing of revenue with Govt)	Andhra Pradesh (1998)	Rs. 330 crores (4th Berth including offshore jetty)	20 years (extendable by 12 periods of 5 years each). Later extended to 30 years (extendable by 2 periods of 10 years each)

Although a case study has its own limitations that should be tackled such as time consuming, result in lengthy documents, subjectivity and bias in the research interpretation and presentation. Consequently, this research considers four standard tests, as shown in table 4.4 below.

**Table 4.4** Case Study Tactics for Four Design Tests (Adapted from Yin, 2003)

Tests	Case Study Tactic
Construct validity: Tests whether the research measures what is intended to measure	Use multiple sources of evidence Establish chain of evidence Have key informants review draft case study report
Internal validity: Examines the extent to which a research finding is valid	Do pattern-matching Do explanation-building Address rival explanations Use logic models

External validity: Defines the domain to which a study's findings can be generalised. Looks at whether the research results can be applied to settings of interest.	Use theory in single-case studies Use replication logic in multiple-case studies
Reliability: Demonstrates repeatability	Use case study protocol Develop case study database

#### **4.4.2 Survey Strategy**

Since the underpinning questions of survey research strategy are who, what, where, how much, how many (Yin, 2003), It is important to know who the stakeholders are, what the expectations are, and how much stakeholders differ in their expectations. The survey strategy also helps to explore the relationship between stakeholders' expectations and financial risk variables. A survey research strategy is a non-experimental research design that has its limitations. There is no causal relationship which can be identified in the relation of one variable to another because there is no manipulation of the situation, circumstances or experience of participants. In addition, there are also four types of errors related to statistical analysis that should be anticipated as follows: Type I error "rejecting the null hypothesis when it is true"; Type II error "accepting the null hypothesis when it is false"; Type III error "correctly rejecting the null hypothesis for the wrong reason"; Type IV error "the incorrect interpretation of a correctly rejected hypothesis" (Betz and Gabriel, 1978). The research will make effort to avoid the errors.

#### **4.5 Data Collection Method**

According to the research methodology decision, a triangulation research method was selected to accomplish the aim and the objectives of the research. Since a triangulation approach has its limitation (as addressed by Perlesz and Linday, 2003), qualitative data collection was undertaken earlier. By combining primary data (e.g. interview) and secondary data [e.g. financial models which are derived from World Bank and PPIAF (2007), Khan and Parra (2003), and Kulkarni and Prusty (2007)] in the qualitative approach, this approach has helped in understanding the problems encountered by the stakeholders in evaluating PPP projects especially through a PPP financial model. In addition, qualitative approach provides experts' insight in the field and the variety of

stakeholders' understanding about financial model utilisation and its features<sup>24</sup>, and uncovers a contemporary phenomenon of typical procedures used for evaluating PPP projects through detailed stories and descriptions (e.g. case study).

Moreover, in conjunction with the purpose of developing an integrated project evaluation tool (IPET), which is to assist in evaluating the project and negotiating the risk sharing mechanism, it is essential to explore the reconciliation of variables from PPP financial models. The stakeholders' expectations in utilising PPP financial models at contract negotiation stage are in Nash Equilibrium if each stakeholder is making the best decision they can, taking into account the other stakeholders' decision. Their decisions are reflected in the preferred indicators of PPP financial models. These indicators are also useful to test its Pareto efficiency, which represents the risk-sharing arrangement among the stakeholders. Therefore, these preferred indicators were identified from interviews, review of records, and surveys.

It was revealed that qualitative data is not enough to develop an applicable project evaluation tool. Hence, a quantitative technique was employed to enhance the validity and the applicability of the proposed tool. The qualitative data<sup>25</sup> gathered was analysed and categorised into several groups of variables. These variables were pilot tested during the field study in India. Then, a structured questionnaire survey of international expert opinions was carried out to validate the preliminary findings. Once systematic statistical analyses were applied to the validation process, the proposed integrated project evaluation tool (IPET)<sup>26</sup> was developed and ready to be tested. The last step of data collection was intended to seek feedback from the experts on its applicability. The detailed data collection process and its administration will be explained in the next sub-chapters.

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<sup>24</sup> *The features of financial model are determined by the strategy of developing a financial model. There are two strategies in building a financial model: (1) bottom-up approach; and (2) top-down approach. Both approaches use either input or output of financial model to start developing the model (Swan, 2008).*

<sup>25</sup> *In this research, the qualitative data covers the stakeholders' expectations in utilising PPP financial models and the preferred indicators of PPP financial models, as described briefly in the literature review.*

<sup>26</sup> *An integrated project evaluation tool (IPET) is based on the combination between qualitative data and validated survey findings.*

#### **4.5.1 Qualitative Data Collection Method**

##### **4.5.1.1 Literature review**

Literature review is not only as a means of gathering information but also reviewing in greater detail about a specific array of previous studies directly related to the topic of study, method and data source. A rigorous literature review must be subsequently able to demonstrate a researcher's mastery over the literature (Yin, 2011). In order to conduct a rigorous literature review, reliable sources of information have been meticulously selected such as peer-reviewed journal papers, textbooks, guidelines and government reports, theses and papers published in conferences and scientific meetings. However, any other sources (e.g. magazines, newspapers, blogs, internet database, and other self-published sources) were considered with caution because its content is not always properly tested nor independently reviewed. It is worth noting that "*no testimony is sufficient to establish a miracle, unless the testimony be of such a kind, that its falsehood would be more miraculous, than the fact, which it endeavours to establish; and even in that case there is a mutual destruction of arguments, and the superior only gives us an assurance suitable to that degree of force, which remains, after deducting the inferior*" (Hume and Millican, 2007).

In conjunction with David Hume's statement about the perception of fact, Henkel and Mattson (2011) conducted a research about the importance of using reliable sources in order to prevent people from believing falsehoods. Their study concluded that there is no significant effect of source reliability (whether it is reliable or not) on validity or recognition. It means that "*the more often people are exposed to falsehoods, the more likely they are to believe them, even if they believe the source is not reliable*" (Henkel and Mattson, 2011).

By considering the fact that reading means believing, there was a problem which had been encountered during the literature review especially when there was lack of reliable sources in a new topic (i.e. literatures upon stakeholders' expectations in utilising PPP financial models). Of course, this is a generic problem in the research. Yin (2011) stated that the challenge of starting a research is to come up with a new topic that will collect and use primary data. In other words, an original study means a study that has not been done before. Accordingly, the aim of collecting data from literature was to study the implementation of PPP seaport projects in India with the view of offering suggestions

for the improvement of the PPP process – especially the stakeholders’ expectations and financial evaluation of such projects. In order to assure the validity of the other sources used in the literature review, the preliminary findings were discussed with the experts and tested in a pilot study and further validated through a structured questionnaire survey.

#### ***4.5.1.2 Interview and pilot study***

To validate the findings of literature review, several interviews were conducted prior to and during the pilot study<sup>27</sup> in India. Literature review is aimed to collect secondary data pertaining to stakeholder expectations in utilising PPP financial model. McNamara (2006) stated that interview as a method for qualitative technique is particularly useful for obtaining primary data such as the story behind a participant’s experiences (in utilising PPP financial models including their preferred financial indicators). The preliminary results from literature review were formulated into the list of questions for the interviews (see appendix 1). There was no requirement for the interviewees to answer all of the questions. Hence, a semi-structured interview could give flexibility in addressing the questions but still in the right direction. There were also several informal discussions undertaken at various occasions (e.g. Port of Liverpool in the UK, PPP/PFI Financial Modelling Conference in the UK, PMI India Conference in India, etc.) with the experts in PPPs, financial modelling, and seaports. These discussions have benefited this study especially in shaping the research direction and anticipating the research problems and limitation as shown in table 4.5.

Although the research problems, and limitations, and necessary actions have been taken to minimise their impact, there was another problem in conducting interviews and pilot study in India. Before going to India, all participants were contacted through e-mails and postal letters. However, due to confidentiality issues and lack of access to information, only few responded at the last minutes. This problem was resolved by seeking diplomatic help from the embassy of Indonesia to contact the key participants in India. Finally, several government bodies and private institutions could be approached for an interview. Interviews ended when all of the information have been collected. This was indicated by only little information from the interviewee could contribute more to

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<sup>27</sup> *The purpose of pilot study is to validate the preliminary findings and to prepare a questionnaire survey.*



the research topic. With a reduced number of the stakeholders' expectations and the preferred financial indicators, a structured questionnaire was ready to be distributed worldwide in order to validate the preliminary findings from literature review and pilot study.

**Table 4.5** Research problems, limitations and necessary actions

No.	Problems	Actions Taken
1	The confidentiality of data (e.g. financial model) of PPP seaport projects.	Using risk management documents which cover risk management process plan, risk register, risk response strategy, risk response plan, and risk review plan for financial implications of PPP seaport projects. Sought permission and confirmation from the authority which provided the data.
2	The availability of data (e.g. financial model, concession agreement, etc.) of PPP seaport projects.	Using free port reform tools from the World Bank (World Bank and Public-Private Infrastructure Advisory Facility, 2007), an example financial model from reference book (Khan and Parra, 2005), and official government websites (Department of Economic Affairs, 2011). The concession agreement was given by Mumbai Port Authority in India.
3	Selecting a PPP seaport project as case study for developing comprehensive integrated project evaluation tool.	Gathering sufficient information from seaport authorities and seaport operator companies through interviews and document analyses.
4	Verifying the proposed tool before validating it with the user and the experts.	Sending the questionnaire, about the importance of variables used in the proposed tool, to the experts and the relevant parties.

No.	Limitations	Actions Taken
1	Different original purpose (e.g. wording, categories, motives in evaluating project, project procurement policy) documents as seaport authorities and seaport operator companies prepared the documents for their own purposes.	Confirmation and clarification with the selected seaport authorities and seaport operator companies.
2	Definitional categories in risk management, project evaluation tools (e.g. financial model) and project procurement policy documents may be inconsistent or compromised.	Defining the stakeholders' expectations and financial indicators in PPP seaport projects, the mitigation measures based on type and source of risk and etc.
3	Inherent measurement problems (identify the benchmark of financial indicators upon PPP financial model and effective project evaluation process).	Setting out type of project evaluation process involves in embodied standardization of financial indicators, and common practices in project evaluation.

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4	Access and analysis problems to risk management information	Using appropriate spread sheet or data sheet or software / to access and analyse the proposed project evaluation tool.
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## **4.5.2 Quantitative Data Collection Method**

### **4.5.2.1 Questionnaire survey and Hypotheses**

Once the recommendation obtained from a pilot study in India, the next data collection process was a structured questionnaire survey instrument for opinions of experts worldwide and practitioners from government authorities, sponsor companies, consultant companies and financing institutions. As part of the triangulation process, a structured questionnaire survey was considered to be the second validation process<sup>28</sup> for the preliminary findings. The survey was meant to find out the most important stakeholders' expectations and the most important indicators of PPP financial models. Since the expectation and the indicators' preference of each stakeholder are not always the same to the other stakeholder, the questionnaire survey was designed to test the following hypotheses:

**Hypothesis 1:** All stakeholders agree on the importance of expectations in utilising PPP financial model.

*Ho: The mean significance of each expectation is equal between two stakeholder groups and within stakeholder groups.*

*Ha: The mean significance of each expectation is different between two stakeholder groups and within stakeholder groups.*

**Hypothesis 2:** Stakeholders' preference on indicator of PPP financial model is equal.

*Ho: The mean significance of each indicator is equal between two stakeholder groups and within stakeholder groups.*

*Ha: The mean significance of each indicator is different between two stakeholder groups and within stakeholder groups.*

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<sup>28</sup> The first validation was interviews and pilot study in India.

If the significant variance of  $p$  value is at some critical level (less than 0.05), it means that the null hypothesis ( $H_0$ ) should be rejected in favour of the alternative hypothesis ( $H_a$ ).

A structured questionnaire survey (see Appendix 2) of international expert opinions was carried out from May 2011 through July 2011. The respondents were selected based on their expertise in managing PPP projects and/or have been involved in using PPP financial models.

Although only the important expectations were included in the questionnaire survey based on the recommendation from pilot study, problems were still encountered during the survey. A problem that surfaced during the questionnaire distribution was that only 2 respondents participated in the survey in spite of the fact that 66 online questionnaires were initially sent out individually to email addresses. Subsequently, more questionnaires were completed after using LinkedIn.com, a social network for professionals to contact potential respondents. Survey invitations were sent to several groups which provided an open access to communicate with the experts and professionals in PPP projects, such as '*PPPs IN EMERGING MARKETS*'; '*Project Finance International (PFI)*'; '*Public Private Partnership Research*'; '*Global Infrastructure & Project Finance*'; etc.

It is worth noting that PPP projects have several characteristics in common such as long term concession period, funding by equity and debt financing, non-recourse financing, service provided by private parties, etc. Moreover, the architecture of PPP financial models is also relatively identical (Khan and Parra, 2003), including pro forma financial statements (e.g. income statement, balance sheet and cash flow statement) in any type of PPP projects. The only distinction between one to another type of PPP projects is the details on project revenues and expenses. Therefore, in order to explore the stakeholders' expectations in utilising PPP financial models and the preferred indicators of PPP financial models, the respondents' experiences were not limited into a specific type of PPP project.

#### **4.6 Data Analysis**

Since the rationale for selecting research methods is based on the literature reviewed in the previous chapters, it is imperative to ensure that the link between the findings of the

literature review and the choice of research design is clearly defined. Thus, several research questions and the research strategies were identified prior to the data collection stage.

- (a) *Who are the stakeholders going to manage the risks related to developing large infrastructure projects?* The identification of the stakeholders in this study is limited to the user and the developer of PPP financial models.

*Tool(s) and approach(es):*

This research question was addressed by conducting literature review and interviews on evaluation of large infrastructure project and PPP projects.

- (b) Since a PPP financial model is not only a tool for evaluating the project but also a tool for negotiating and monitoring the project over concession period, *what are the most important stakeholders' expectations in utilising PPP financial models?*

*Tool(s) and approach(es):*

The stakeholders' expectations were identified by undertaking literature review, verified by a pilot study, and validated through a structured questionnaire survey.

- (c) Since the exploration of the risks in this study concerns the identification of financial risk variables, the subsequent research question was "*What are the financial risk variables within PPP financial models?*"

*Tool(s) and approach(es):*

This study focused on the most critical risks. Hence, the most important indicators of PPP financial models were defined as financial risk variables. The importance of financial risk variables were identified from the literature review

and then consolidated into five most important indicators of each input and output of PPP financial model (according to each stakeholder's point of view).

- (d) In order to ensure that the stakeholders' expectation can be effectively reconciled through a PPP financial model, with reference to the Nash Equilibrium Theory, it is important to identify the risk related to financial risk variables that should be managed by each stakeholder. Therefore, the next research question was "*What are the possible risks related to the financial risk variables (input and output of PPP financial models)?*"

*Tool(s) and approach(es):*

Since financial risk variables were identified after collecting the data, the identified financial risk variables were further analysed by conducting another additional literature review to identify the related risks.

- (e) Since the term "managing the risks" means identify, evaluate, and respond to the risks by using PPP financial models, the last research question was "*How are those risks managed?*"

*Tool(s) and approach(s):*

This question was addressed through further literature review, interviews, discussions, and document analysis.

#### **4.6.1 Qualitative Data Analysis**

In order to answer the abovementioned research questions, data analyses were undertaken. Literature review was conducted from the beginning of the study up to the end of thesis write-up. The collected data has been verified by reviewing in greater detail about a specific array of previous studies directly related to the topic of study, method and data source. In addition, the materials that were believed to show a true reflection of the situation on the three selected case studies were also retrieved and analysed through pattern matching analysis. Pattern matching analysis is one of five techniques (e.g. pattern matching, explanation building, time-series analysis, logic

models, and cross-case synthesis) that were used for analysing across the case studies (Yin, 2003). Pattern matching was selected in this study because it does not require experiment (as needed in time series analysis), a series of iterative process of the case (for explanation building), sequential stages (as required in logic models), and a strong argumentative interpretation on large numbers of individual case studies (as for cross-case synthesis). The findings and conclusions from the analysis of the case studies are presented and discussed in chapter 5.

While literature review (including an in-depth analysis of three case projects) aimed to collect secondary data pertaining to stakeholders' expectations and project evaluation by using PPP financial models, interview was employed for obtaining primary data such as the story behind a participant's experiences (in utilising PPP financial models). The next step was analysing the gathered data from interviews and a pilot study in India.

<b>Highly Qualitative</b>	<b>Combination</b>	<b>Almost Quantitative</b>
eg thematic and comparative analysis	eg discourse and conversational analysis	eg content analysis
reflexive intuitive takes place throughout data collection	uses a combination of reflexivity and counting	code and count mechanical can be left until end of data collection

**Figure 4.6** Qualitative data analysis continuum

*Source: Dawson (2007)*

In order to facilitate ease of data analysis, the recorded interviews were transcribed. Dawson (2007) advocates five types of qualitative data analyses as positioned on continuum, e.g. thematic analysis, comparative analysis, discourse analysis, conversational analysis, and content analysis (see figure 4.6). The themes / categories are not set in the four qualitative data analyses techniques, and the number of themes is not predetermined. Unlike other qualitative data analysis techniques, content analysis requires predetermined categories to be analysed to see what the data from various participants says about each of the categories. Fellows and Liu (2008) defines that content analysis is an analytical approach involving a scrutiny of discussions to

establish meanings and intentions of the data. Therefore, content analysis was used to study the stakeholders' expectations on PPP financial models. The content analysis approach has also been used in construction research by some, e.g. Chinyio and Akintoye (2008), Holzmann and Spiegler (2011), and Edkins *et al.* (2007). Since financial models involve human as modeller and user, it is regarded important to study their views of the financial model utilisation and its financial risk variables. Accordingly, additional information (including the opposing information) was found to be helpful for developing an integrated project evaluation tool. Any additional information and/or discrepancy between the findings of literature review and the pilot study would be a very interesting issue to explore further.

However, not all discrepancies were analysed and discussed. Any discrepancies on stakeholders' expectations considered to be unimportant (based on pilot study) were removed from the study. Seidman (2006) advocated that content analysis technique is connecting threads and patterns among the excerpts within the predetermined categories. Content analysis organises and compresses excerpts from the transcripts into fewer content categories based on explicit rules of coding (Stemler, 2001). Contents regarding different aspects of stakeholders' expectations and PPP financial indicators were interpreted and corroborated in a similar and progressive fashion where construct validity was used to ground the findings (Chinyio and Akintoye, 2008). Then, they were selected for structured questionnaire survey. Furthermore, the case study findings (from cross case and interview analyses) are also useful for supporting the findings of quantitative analysis. This strategy was adopted in response to the triangulation problems addressed by Perlesz and Linday (2003).

#### ***4.6.2 Quantitative Data Analysis***

The last step is applying systematic statistical analyses of the survey responses by using Statistical Package for Social Sciences (SPSS) software. Adapted from Zhang (2005), these can be done through five analyses: (1) Sampling adequacy test of the questionnaire survey by using Kaiser-Meyer-Olkin (KMO); (2) Principal Component Analysis (PCA) to find the important stakeholders' expectations and to classify them based on similar dimension of variance; (3) Validity analysis (Pearson bivariate correlations) and reliability analysis (Cronbach alpha) to examine the quality of the questionnaire survey and the soundness of the principal component analysis; (4) One-

Way ANOVA test and Post Hoc test to find the significant variance and compare mean significance indexes as rated by each stakeholder to determine the agreement level in the rating of the importance of stakeholders' expectations; (5) Analysis of the significances of the expectations to identify the most important ones in different dimensions of stakeholders' expectations. The survey analysis is discussed in chapter 6 and the analyses' results of SPSS software are attached in appendix 3.

#### **4.6.2.1 *Sampling adequacy test with kaiser-meyer-olkin (KMO) test***

Sampling adequacy test is needed to decide whether the sample is sufficient for factor analysis or principal component analysis (PCA). The Kaiser-Meyer-Olkin (KMO) is chosen to examine the sampling adequacy of the questionnaire survey. This examination was tested in every stage. The KMO values for the stakeholders' expectations at five stages and financial indicators (Input and Output) are shown in table 7.2 (the details in SPSS are shown in appendix 3). These values indicate that the data is adequate for principal component analysis because it is greater than 0.5 (see Field, 2009).

#### **4.6.2.2 *Principal component analysis (PCA)***

To determine the important stakeholders' expectations and to classify them based on similar dimension of variance, principal component analysis (PCA) was selected in this study. PCA is more appropriate analysis than factor analysis when the primary goal is to reduce the number of data (Field, 2009). PCA extracts highly correlated expectations into a small number of key components (dimensions) of financial model utilisation. There are two main results of PCA: (1) the total variance explained by the extracted components, and (2) the rotated component matrix. Since the stakeholders' expectations in utilising PPP financial models are not always identical at every stage, the PCA was conducted for each stage.

#### **4.6.2.3 *Validity analysis***

When the emergent components are derived from PCA, the relationships between stakeholders' expectations should be examined to ascertain whether they are positively correlated with the other expectations or not. In this analysis, the importance of stakeholders' expectations in utilising PPP financial models and the preferred financial



indicators is measured by using a Likert scale. Although the categorisation of Likert scale remains debatable (Norman, 2010)<sup>29</sup>, previous researches in the same area assume it as an interval scale (e.g. Chan et al., 2001; Zhang, 2005; Zhang and Jia, 2009; and Chan et al., 2009).

Since the exploration of the relationship between stakeholders' expectations and financial indicators is also included in the analysis, both Pearson bivariate correlation (parametric) and Spearman's rank correlation (non-parametric) analyses are selected for this analysis. Therefore, all valid correlations among stakeholders' expectations and relationship between stakeholders' expectations and financial indicators are entirely covered<sup>30</sup>. A two-tailed test is also selected because the nature of the relationship is unknown. When the coefficient of correlation is very low (close to zero), there is no relationship between variables. However, low coefficient value ( $r > 0.1$ ) should not be undermined because it is lower when more samples are gathered (Field, 2009).

To figure out the significance of the stakeholders' expectations relationship<sup>31</sup>, the p value of each correlation (within each principal component) must be less than 0.05. When all stakeholders' expectations are significantly correlated within each component, they contain valid stakeholders' expectations.

#### **4.6.2.4 Internal consistency reliability analysis**

After validating the relationship between stakeholders' expectations and the preferred financial indicators, the internal consistency or the repeatability of the agreement scale should be ensured at certain level. If the agreement scale (ranging from 1-6) for measuring the importance of each expectation and financial indicator yields relatively the same result over time, its measurement consistency is reliable. Cronbach alpha is selected to test the internal consistency reliability of the agreement scale.

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<sup>29</sup> While a Likert scale is assumed to be ordinal scale (non-parametric test is preferred), parametric tests such as the analysis of variance can also be applied by assuming the scale as an interval scale (Norman, 2010).

<sup>30</sup> After testing both methods, it is shown that the findings between Pearson bivariate correlation and Spearman's rank correlation analyses are not always identical.

<sup>31</sup> The relationship means a correlation among stakeholders' expectations in utilising PPP financial models. However, it should be noted that correlation does not imply causation (Aldrich, 1995; and Kothari, 1997).

Although the higher value of Cronbach Alpha (above 0.6 or close to 1) is better, yet the emergent value should be cautiously interpreted. Field (2009) stated that when the number of variables on the scale increases, Cronbach Alpha will also increase. In order to test the internal consistency reliability of the agreement scale, multiple tests must be applied with one of the variables deleted. When the results are below or slightly above the original Cronbach Alpha, and Corrected Item-Total Correlation test is higher than 0.2 or 0.3, the internal consistency reliability is achieved (Everitt, 2002 and Field, 2009).

#### ***4.6.2.5 Agreement Analysis One-Way ANOVA test, Post Hoc Test and Means Plot***

The survey is intended to test the hypotheses which have been stated earlier. Since there are more than two groups of respondents, One-Way ANOVA test is selected to determine whether the mean significance of each expectation and each financial indicator are equal across all stakeholders in utilising PPP financial models. The following procedure was considered before testing the hypothesis:

- The first step of variance analyses is calculating the number of responses, mean, standard deviation, standard error of the mean, minimum, maximum, and 95% confidence intervals for each dependent variable for each group. Typically, in the comparison procedures such as ANOVA or T-tests, the group sizes are assumed equal (or homogeneity of variance is assumed) to make sure that the resulting F-test is valid. However, when the homogeneity of group sizes is unknown, the homogeneity of group variance should be tested.
- Therefore, the second step is to test the homogeneity of group variances by using the Levene's test<sup>32</sup>. This test confirms whether the variances of the group sizes are different or not. If Levene test is significant or the population variances are unequal (p-value is less than 0.05), alternative modified procedures (Welch and Brown-Forsythe) should also be considered .
- The third step is the ANOVA test to establish significant variance of  $p$  values.

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<sup>32</sup> Levene's test is frequently employed before conducting ANOVA and T-tests. It tests the equality of variances in different samples.

At this step, the significance of variance is tested with caution<sup>33</sup>.

- In the absence of homogeneity, the fourth step is to test the results of the  $p$  value associated with standard ANOVA  $F$  Statistic by using Robust Tests of Equality of Means (Brown and Forsythe, 1974). It is noteworthy that, as with the standard  $F$  statistic, the Welch statistic is more powerful than the standard  $F$  or Brown-Forsythe statistics when sample sizes and variances are unequal.
- The fifth step is to identify which group differs from another group by using Post Hoc Test. When the sample sizes and variances are unequal or equal variances are not assumed, Dunnett's T3 and Games-Howell are multiple comparison tests that are mostly used. Note that when the sample sizes are small (i.e. fewer than 50 per group), Dunnett's T3 should be chosen instead of Games-Howell procedure (Maxwell and Delaney, 2004).

In order to test the aforementioned hypotheses, this procedure has been implemented in every stage of PPP financial model utilisation. Further details of ANOVA tests are shown in appendix 3. However, it is worth applying another method (Means Plot) to see the means variance of all stakeholders on the variables (stakeholders' expectations and financial indicators). Although the significance of variance is determined in the ANOVA tests, the means plot is useful to visually identify which group differs from another group.

#### **4.7 Model development**

In order to assist government agencies in evaluating bids and making decision efficiently, an integrated project evaluation tool (IPET) has been developed for PPP seaport projects by considering stakeholders' expectations, financial risk variables, financial risks, and mitigation measures with the following modules: (1) Financial

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<sup>33</sup> The validity selection of the standard ANOVA  $F$  Statistic depends on the homogeneity of group sizes.

viability module<sup>34</sup>; (2) Financial risk analysis module<sup>35</sup>; and (3) Financial risk mitigation module<sup>36</sup>. These three modules are discussed in detail in Chapter Eight.

To develop an integrated project evaluation tool (IPET), all stakeholders' expectations have been investigated through literature review and case studies. As a result, IPET can be used to assist the stakeholders in evaluating the project at five different PPP project stages: (1) Pre-proposal stage; (2) Contract negotiation stage; (3) Finance-raising stage; (4) Construction stage; and (5) Operation stage.

#### **4.7.1 *The pre-proposal stage***

The plan is that all preliminary assumptions at pre-proposal stage will be calculated by using financial viability module. This module will assess the financial viability of the project. While this module can be used by sponsor(s) to facilitate the submission of a convincing proposal or unsolicited proposal for securing the rights to build and operate a project, the government authority can also use this module to test the ability of the project to deliver value for money.

Once the project's proposal is deemed to deliver best value for money, the second module (financial risk analysis module) can be used to identify risk from the results of base case scenario analysis. The link between the financial risk variables and the related risks is established by Influence diagram method. The second module also analyses the project risk level through Monte Carlo simulation with 500 iterations. The outcome of the simulation are the upper and lower values of financial indicators at 95% confidence level (e.g. ROA, ROE, NPV, IRR, DSCR min, LLCR min, Interest Covering Ratio, and Payback Period). A single simulation with random probability of future events can also be used in the second module in order to reveal the possible financial risks. In other words, a single simulation randomly creates different combination of financial input indicators (i.e. when land acquisition cost is significantly increased while traffic volume is also below the projection, it is possible that DSCR min, IRR, and NPV fall below the acceptable rates). The last module (financial risk mitigation module) arranges the

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<sup>34</sup> *The 1<sup>st</sup> module is developed in the form of a financial model to evaluate project financial viability and compare input bidding data associated with financial risk sharing scenario from the bidders.*

<sup>35</sup> *The 2<sup>nd</sup> module utilizes Influence Diagram method to identify risk from the results of base case scenario analysis and Monte Carlo Simulation to analyse the risk level.*

<sup>36</sup> *The 3<sup>rd</sup> module provides the information of identified risks along with risk response. This module also analyses the possibility of secondary risks with further risk mitigation exercises.*

alternative mitigation measures toward the identified type of risks based on the financial risk variables.

At the end of the preliminary evaluation with IPET, the financial and economic outcomes are accompanied by the information on risks and its mitigation measures. When the financial risks and its mitigation measures are linked to the financial indicators at the pre-proposal stage, the government authority will be able to determine whether PPP is the best option for the project or not. The sponsor(s) will also have greater confidence to a convincing proposal or unsolicited proposal.

#### **4.7.2 The contract negotiation stage**

It is of merit reminding readers that PPP projects require adequate allocation of the risks associated with the complex financial, legal, organisational and socio-political structure, between the public sector authority and the private parties involved. Negotiation of risk sharing mechanism should be effective and efficient because the longer the negotiation period, the more transactions or financing costs will be incurred on the project. There are four procurement procedures (Open procedure, Restricted procedure, Competitive dialogue, and Negotiated procedure) that are different in nature regarding the negotiating of the risk sharing mechanism (Solino and De Santos, 2010). Regardless of the type of procurement procedure, risk sharing mechanism has to be communicated either before or after submitting the proposal. Thus, an integrated project evaluation tool (IPET) can be used to assist in negotiating the risk sharing mechanism at the contract negotiation stage.

However, an IPET is limited to facilitating the negotiation for the risks related to the financial viability of the project. When both sponsor(s) and government authority have their own financial models coupled with risk management strategies, which are identified from IPET at the pre-proposal stage, the negotiation process will be much efficient in achieving consensus on the combination of several key important parameters<sup>37</sup>. In conjunction with efficient negotiations, Schoop *et al.* (2010) argued that the quality of the negotiation process should be measured by both its economic outcome (e.g. in terms of Pareto efficiency and Nash equilibrium) and communication

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<sup>37</sup> *The use of financial model for a negotiation is intended to achieve consensus on the combination of tariff scheme, concession period, and rate of return of a PPP project (Ngee et al., 1997; and Liou and Huang, 2008).*

quality. It means that an efficient negotiation is not only indicated by the agreed combination of financial scenarios but also shown by mutual understanding of the PPP concept.

The procedure of employing IPET at the contract negotiation stage is similar to the pre-proposal stage. The difference is that whilst the sponsor(s) and the government authority use IPET to evaluate the project independently at the pre-proposal stage, both parties can utilise IPET to evaluate the project together and discuss the risk sharing mechanism at the contract negotiation stage. Thus, by using the same evaluation framework through IPET, it is expected that a mutual understanding of the PPP concept will be achieved before agreeing the combination of financial scenarios.

#### ***4.7.3 The finance-raising stage***

The finance-raising stage is initiated when an underwriter or a club of lenders expresses an interest through a mandate letter to sponsor(s) because the project is sufficient to cover the debt needs. At this stage, the initial financial model is modified into a *Lender Base Case* financial model in order to undertake due diligence of the project's financial viability. However, due diligence procedure for PPP projects, with a relative high investment volume, is a time consuming process (Daube *et al.*, 2008). There is a tendency for lenders to revisit issues previously agreed by sponsor and government authority for securing their interest on risk management (Carlidge, 2006). An IPET can be employed to assist in shortening the due diligence process because the stakeholders' expectations (including lenders' expectations) have been considered by using IPET since from the pre-proposal stage. For that reason, it should not require very long discussion before reaching an agreement between sponsor(s) and lenders.

The procedure for utilising IPET at finance-raising stage is a little bit different compared to the pre-proposal and the contract negotiation stages. At this stage, IPET will assist sponsor(s) in collaborating with lenders in the process of transforming the initial model to the lender's base case financial model. IPET provides information about some input data (in the financial viability module) linked to the information about the possible risks (in the financial risk analysis module) and its mitigation measures (in the financial risk mitigation module), which will be modified due to the recommendation of expert opinion and/or any changing circumstances.

#### ***4.7.4 The construction stage***

At the construction stage, an IPET can be employed to assist in monitoring and tracking the performance of the construction project. By updating the input data (in the financial viability module) based on the schedule of debt and equity disbursements and the financing costs, IPET displays information about the possible risks (in the financial risk analysis module) and their mitigation measures (in the financial risk mitigation module).

#### ***4.7.5 The operation stage***

The first six months after commencing the operation stage is a very critical period for a PPP project. At times, the revenues collected until (or even after) the sixth month of the operation period may be insufficient to meet debt service obligations (Khan and Parra, 2003). It is imperative that the operational risks should be clearly anticipated in the concession contract and/or the other agreements. Since an integrated project evaluation tool (IPET) contains information about all possible risk and its mitigation measures related to the important financial indicators (financial risk variables), it is very useful to assist the stakeholders in monitoring the operation performance and anticipating the operational risks. The procedure for employing IPET at the operation stage is simply updating the input data with the real data (in the financial viability module). Then, IPET will show the information about the possible risks (in the financial risk analysis module) and its mitigation measures (in the financial risk mitigation module).

### **4.8 Verification and validation**

An integrated project evaluation tool (IPET) consists of three modules, developed by considering the stakeholders' expectations in utilising PPP financial models. In order to ensure that the proposed tool meets stakeholders' expectations, it has to be verified and validated in a holistic manner. Boehm (1984) succinctly expressed the difference between verification and validation. Verification is defined as an enquiry whether the product is built in the right way or not. However, an evaluation process to determine whether it is the right product is called validation. Therefore, IPET was verified and validated in three stages.

The first stage was identifying stakeholders' expectations and preference on the financial model variables through literature review. Their expectations are very useful to verify the direction of developing IPET. It is also essential to ensure that every expectation and preference indicator is valid, and its results can be taken into consideration with confidence in the development process. Systematic statistical analyses of the survey responses were applied to validate the stakeholders' expectations and their preference indicators by using the Statistical Package for Social Sciences (SPSS) software. These analyses are discussed in chapter seven.

Additionally, the findings were further verified by comparing the input and output indicators of financial model with three samples of financial models (Kulkarni and Prusty, 2007; World Bank and PPIAF, 2007; Khan and Parra, 2003). The results of these analyses are discussed in chapter eight. Once IPET was developed at the third stage, the proposed tool was tested and validated. The model testing should be tested by using real data. Although numerous attempts were made to access data from real PPP projects (i.e. field trip to India, online search, written statement not to disclose any confidential information, etc.), the real data anticipated could not be obtained. Therefore, hypothetical data was used in the first strategy to test the tool and check the output against any error or discrepancies by comparing the output of IPET with a sample financial model from Khan and Parra (2003). In this research, only the financial viability module was tested separately. The other two modules are complimentary to the first module; testing and validation of the proposed tool were done in an integrated manner. Subsequently, experts who have experience in the field of PPP projects reviewed the effectiveness and the applicability of the tool. Swan (2008) stated that a good model is tested by knowing how the users respond to it. The results of these tests are discussed in Chapter Nine.

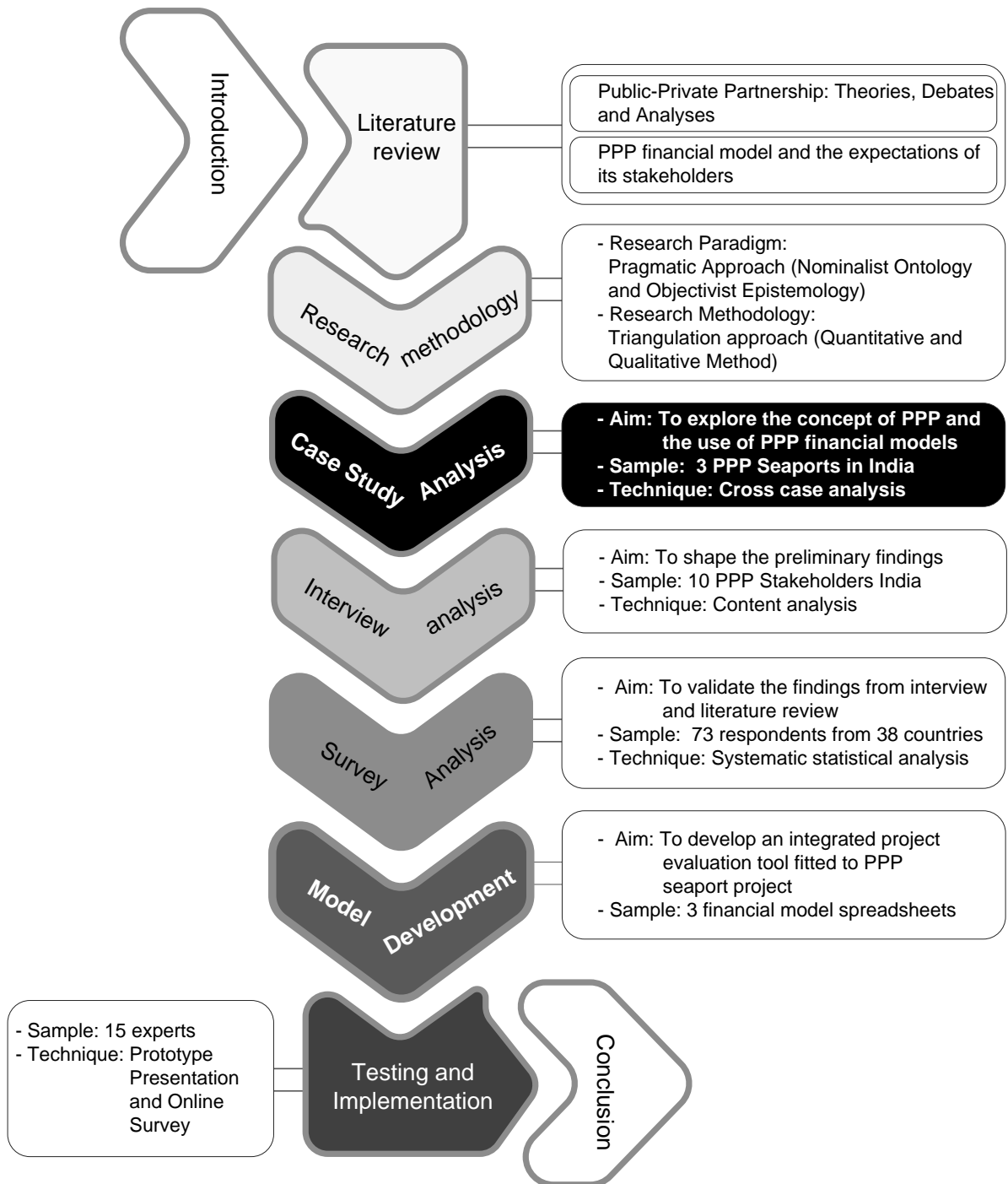
#### **4.9 Chapter Summary**

The main rationale of the research methods justification was underpinning on how to develop an integrated project evaluation tool that can be used effectively to assist in evaluating the project and negotiating the risk sharing mechanism for PPP projects. This chapter has discussed the selected approach to conduct the research, to collect data, to develop and validate the proposed tool. A triangulation strategy was justified with caution due to the possibility of error. A qualitative method (to explore stakeholders'



expectation and preferred indicators of PPP financial models) was followed prior to performing a qualitative technique (to narrow down the preliminary findings). Then, the proposed tool was then validated qualitatively by comparing the results with secondary data and asking experts for their opinion regarding its applicability.

## CHAPTER FIVE: CASE STUDY ANALYSIS AND DISCUSSION



## Chapter 5: Case Study Analysis and Discussion

*“Be studious in your profession, and you will be learned. Be industrious and frugal, and you will be rich. Be sober and temperate, and you will be healthy. Be in general virtuous, and you will be happy. At least you will, by such conduct, stand the be.”*

(Benjamin Franklin 1706 – 1790)

### 5.1 Introduction

Chapter 5 reports the findings of cross case analysis of three PPP seaport projects in India. The primary aim of this chapter is to study the implementation of PPP seaport projects. In order to achieve the aim of this chapter, this chapter identifies typical procedures used for evaluating PPP seaport projects<sup>38</sup> in India. The structure of this chapter is divided into five sections.

The first section is introduction of the chapter. Then, the brief background information of the PPP seaport projects in India is presented in the second section. The third section discusses the implementation and evaluation procedure of PPP seaport projects in India with three case studies. In this section, the cross case analysis finishes off with the presentation of the commonality patterns and other factors that influence the implementation of PPP seaport projects in India.

### 5.2 Public private partnership seaports in India

Government has the responsibility for providing public services including infrastructure facilities. Various types of infrastructure constitute essential public services, for instance: transportation, energy, telecommunications, water, waste disposal, hospital, school, and housing facilities. Public-Private Partnership (PPP) offers many potential advantages for the government in providing infrastructure facilities (Askar and Gab-Allah, 2002). Although Cheung and Chan (2009) remarked that PPP is not always the best option to procure infrastructure projects, 12 of 63 developing countries under International Development Association (IDA) reached financial or contractual closure for 24 transportation, energy, and water projects with private investment commitments of US\$7.5 billion in 2010 (Perard, 2011).

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<sup>38</sup> *The projects were basically selected for practical reasons i.e. their availability.*

In the context of the transportation sector, Kakimoto and Seneviratne (2000), Bichou and Gray (2005), and Kulkarni and Prusty (2007) have meticulously described the role of port infrastructure as economic catalysts for promoting seaborne trade activity and generating benefits and socio-economic wealth in developing countries. India, one of the fastest growing among developing countries, has attractive policies in favour of private participation in infrastructure provision with varying degrees of success.

The seaports in India have tremendous scope for international maritime transport both for cargo handling and passenger. With 12 major ports (see figure 5.1) and 187 minor ports, 7,517 km long, Indian coastline plays a pivotal role in the maritime transport serving in the international trade. Since 2010, Department of Economic Affairs Infrastructure under the Ministry of Finance, Government of India has been heavily involved in PPP research. The government of India has an innovative program called PPP capacity building programme, which developed a PPP toolkit to assist decision-making for infrastructure PPPs in India and to improve the quality of on-going PPP projects. The toolkit was developed under a non-lending technical assistance co-financed by the World Bank, AusAID South Asia Region Infrastructure for Growth Initiative and the Public Private Infrastructure Advisory Facility (PPIAF). The PPP Toolkit was designed with a focus on helping decision-making by Project Officers across India at the Central, State and Municipal levels through four phases comprising: Project identification, Full feasibility, PPP procurement, and PPP contract management and monitoring.

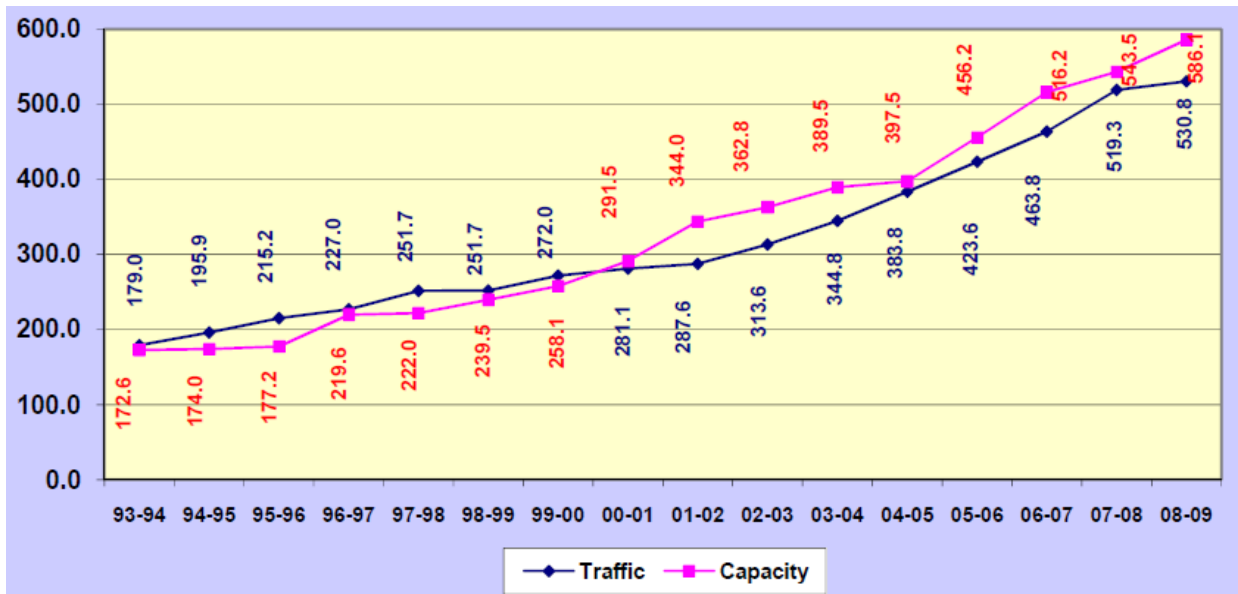


**Figure 5.1** Indian map seaport

Some constraints being faced by the Government of India in promoting PPP, i.e.: insufficient instruments to undertake long-term equity and financial liability required by infrastructure projects, much hindrance in enabling a regulatory framework, inability of the private sector to fit into the risk of investing in diversified projects, lack of credibility of bankable infrastructure projects used for financing the private sector, and inadequate support to enable greater acceptance of PPPs by the stakeholders (DEA, 2012). Therefore, next section discusses a brief background of public private partnerships in Indian seaport sector.

### 5.2.1 Background of public private partnerships in Indian seaport sector

The Indian port sector has been plagued by several problems due to inadequate capacity and operational inefficiency. The 12 major ports in India had capacity over-utilization, which handled about 179.02 million tonnes of traffic in 1993-94 compared to total cargo handling capacity of 172.59 million tonnes at major ports, as illustrated in figure 5.2 (TRW, 2010).



**Figure 5.2** Indian major seaports capacity and traffic (in million tonnes)

*Source: Transport Research Wing (TRW, 2010)*

As a consequence of the capacity inadequacy, the Indian seaport operations also lagged behind foreign counterparts (Ray, 2005). The operational inefficiency of Indian seaports resulted in higher through-put and sea transport costs, which means that cargo shipped from Indian seaports were 45%-50% costlier than the norm, thus becoming non-competitive in the international market (World Bank, 1995). In order to overcome the above problems coupled with need for provision of cost-efficient service to customers, especially for the public sector ownership of ports that created the usual problems of accountability and inefficiency, the Government of India decided to encourage private sector participation. The first guidelines for private sector participation in major seaports were announced by the Ministry of Surface Transport in October 1996 (MoST, 1996). Since then PPPs have been promoted for implementation of infrastructure projects in India (DEA, 2012). The following sections will discuss the detailed procedure for evaluating PPP seaport projects in India.

### **5.3 Procedure for evaluating PPP seaport projects in India**

The government of India has an innovative program called PPP capacity building programme, which develops a PPP toolkit to assist decision-making for infrastructure PPPs in India and to improve the quality of the on-going PPP projects. This program has been developed by the Department of Economic Affairs (DEA), Ministry of Finance, and Government of India with funding support from the World Bank, AusAID South Asia Region Infrastructure for Growth Initiative and the Public Private Infrastructure Advisory Facility (PPIAF). Since this research focuses on how stakeholders use PPP financial model in the PPP process, the next section will briefly discuss the procedure for PPP financial model utilisation in the Indian PPP toolkit.

#### ***5.3.1 Major activities in the PPP Process***

The procedure for evaluating PPP seaport projects in India is best presented based on the major activities of PPP process and also limited to the utilisation of the PPP toolkit. The Indian PPP toolkit is a set of tools designed to assist the analysis and decision making of potential PPPs. The PPP toolkit comprises six tools as follows:

- **PPP Family Indicator Tool:** A starting indication tool for selecting the right PPP mode for the particular project in the sector.
- **PPP Model Validation Tool:** A risk allocation analysis tool for choosing the best PPP model for the project.
- **The PPP Suitability Filter:** A PPP suitability test tool is used in Phase 1 for the selected project.
- **PPP Financial Viability Indicator Model:** A financial analysis tool examines the key questions of financial viability and the “what-if” scenarios used in Phase 1, Phase 2, and Phase 3.
- **VFM Indicator Tool:** A value-for-money (VFM) analysis tool in an extended analysis from the outcome of PPP Financial Viability Indicator Model for highlighting the uncertainty by using a range of VFM values. This means the indicator can incorporate uncertainty into the result and give a better indication of how likely the PPP is to deliver VFM.
- **Readiness Filter:** A checklist is used in all phases for all the important steps that should be followed.

Amongst the above 6 components of the PPP toolkit, this research focuses only on two financial related tools namely PPP Financial Viability Indicator Model and VFM Indicator tool. Since the PPP toolkit was first introduced in 2010, the two financial related tools were not available in the three case studies. Nevertheless, the investigation of three PPP projects will aid the understanding of the background of PPP toolkit development and help in proposing a number of suggestions to improve the quality and effectiveness of the evaluation procedure for PPP seaport projects.

Project stakeholders or PPP practitioners can use the PPP toolkit at four phases in the PPP process as illustrated in figure 5.3.

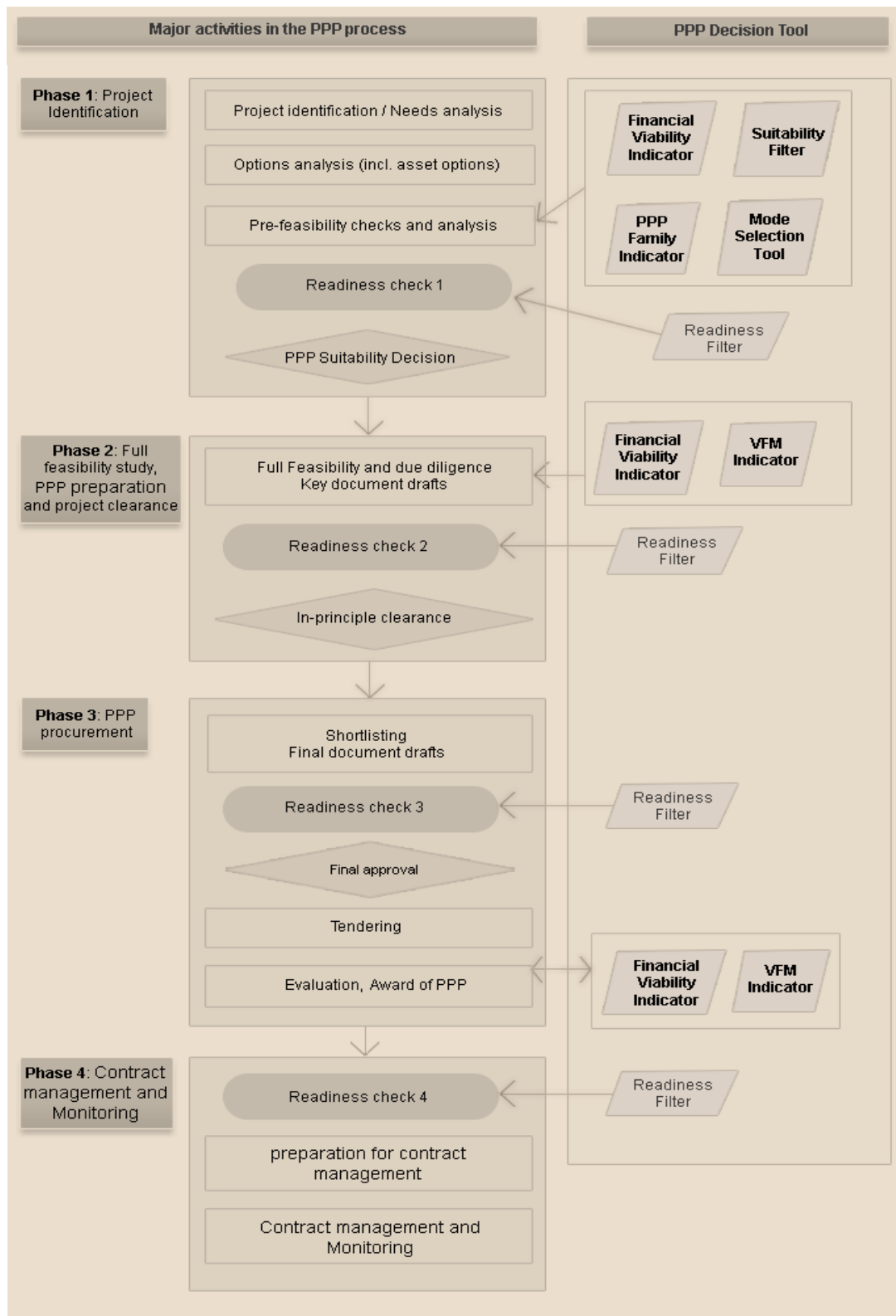
- Phase 1: PPP identification, covering strategic planning, project pre-feasibility analysis, PPP suitability checks, and internal clearance to proceed with PPP development
- Phase 2: Full feasibility, PPP preparation and project clearance, covering project appraisal including a full feasibility study, PPP preparation including draft documents, and in-principle clearance
- Phase 3: PPP procurement, covering procurement, final drafts of bidding documents, final approval and project award
- Phase 4: PPP contract management and monitoring, covering project implementation and monitoring over the life of the PPP

The main goal of phase 1 is to identify the project's quality for development and the project's suitability for PPP. At phase 1, the Sponsoring Authority (e.g. ministry(s) for Central-level projects, sponsoring department(s), Urban Local Body, or other statutory or public sector corporate entity as appropriate to the case) will be responsible for identifying and testing projects.

Since the process at phase 2 requires more resources in the form of people, time and money, projects must pass phase 1 checks before they enter phase 2. The heart of phase 2 is a full feasibility study. Preparation for the procurement process also begins in this phase, including selection of the best procurement method and first drafts of the bidding documents. The Sponsoring Authority (e.g. ministry(s) (Central-level projects), sponsoring department(s), or statutory or public sector corporate entity, as appropriate to the case) will be responsible for conducting full feasibility study with support from



dedicated PPP agencies, such as a PPP Cell or Project Development Agency. The final step in phase 2 is an application for In-principle Clearance by the Appraisal/Clearance Authority.



**Figure 5.3** The PPP process and decision tools  
*Source: Department of Economic Affairs (DEA, 2012)*

Projects that are granted In-principle Clearance can move to the Procurement Phase (phase 3). The Sponsoring Authority (e.g. ministry(s) for Central-level projects, sponsoring department(s), Urban Local Body, or other statutory or public sector corporate entities as appropriate to the case) will be responsible for selecting the best qualified private sector partner for the PPP and concluding the concession agreement. At the completion of this phase, the project will have completed its development as a PPP and will be ready to enter the contract management and monitoring phase (phase 4) that continues throughout the life of the PPP.

### ***5.3.2 PPP financial viability indicator model and vfm indicator tool***

The financial viability of a PPP project in India is examined quantitatively by addressing the key questions of financial viability and the “what-if” scenarios in three phases: phase 1, phase 2, and phase 3. The outcome of PPP financial viability indicator model is further analysed by using a value-for-money (VFM) analysis for highlighting the uncertainty by using a range of VFM values. Therefore, the indicator can incorporate uncertainty into the result and give a better indication of how likely the PPP is to deliver VFM. The VFM Indicator tool combines qualitative and quantitative approaches in assessing VFM. This tool is used in phase 2 and phase 3.

To study how Indian government employ a financial model in assessing the project financial viability and value for money, the financial model utilisation was explored under small number of specific activities to understand which activity involves financial analysis.

#### ***5.3.2.1 Financial viability indicator model utilisation at phase 1***

Phase 1 is a PPP identification phase, which covers several activities such as: strategic planning, project pre-feasibility analysis, PPP suitability checks, and internal clearance to proceed with PPP development, as illustrated in figure 4. This research focuses on each activity that requires financial analysis such as project pre-feasibility analysis.

The preliminary financial and economic viability of the proposed project is best seen from the perspective of private sector (i.e. the analysis looks at after tax returns

compared to expected after-tax ROE for a commercial developer), which includes an assessment of:

- The cost recovery/income generation assumptions of the project
- Likely private sector interest in the project
- The overall project cost (capital + operations + maintenance costs)
- Possible financial risks
- Identification of likely economic benefits generated by the project

To help the project sponsor in making their own assessment of the PPP project, a simplified Financial Viability Indication model is formed in a spreadsheet that runs in Microsoft Excel. The Financial Viability Indicator can be used at this stage to make a preliminary assessment of the likely viability of the project for the private sector, including any requirements for public sector support, and to assess ‘what-if?’ scenarios. This tool allows:

- An assessment of the level of user charges or other payment is needed to make the project attractive to the private sector
- An initial test of whether and how much government support is likely to be needed (for example, through VGF funding)
- ‘What-if?’ tests of different project designs and alternative project outcomes

In order to keep the applicability of the financial viability model across sectors and projects, the complexity of the financial viability model has been deliberately reduced. Moreover, the reduced level of detail can be helpful as a tool for assisting the Project Officers focus on the fundamental issues affecting the project. Nevertheless, all of the key financial inputs and variables are still retained to highlight the key project details to Project Officers in a way that is most accessible.

The model contains six main sheets as follows:

*Set up and information input sheets:*

1. **Set up sheet:** It contains background assumptions such as type of PPP, the project life and macroeconomic information (e.g., inflation) that should be provided by the users.
2. **Demand sheet:** The users provide the information about the initial cargo traffic

and forecast traffic growth rates on this sheet.

3. **CapEx sheet:** If the project has Capital Expenditure, the planned capital investment and structure should be filled on this sheet.
4. **Costs sheet:** The users provide information about the expected operating expenditure (OpEx) and License fees related to the project on this sheet.
5. **Revenue sheet:** All charges to port users (e.g., usage fees, annuity payments, etc.) are provided on this sheet.

*Output sheet:*

6. **Viability analysis sheet:** An overall summary of the project's financial viability from a private investors' perspective shows project cash flows and key financial ratios such as NPV, IRR, Debt service coverage, Loan life cover, Net profit margin, etc.

There are three steps in using financial viability model at this stage. The first step is setting up the analysis by entering the required data to describe the project. The second step is reviewing the results provided on the Viability Analysis sheet. This step should be repeated with different combination to find the viable option that meets project objectives. This repetition is called 'what-if' analysis (the third step). In this analysis, some key inputs (e.g., revenue levels, grant funding, concession length, etc) are changed with different scenarios. From the output on Viability Analysis sheet, the project's viability can be determined whether it meets the project objectives or not. If it is not viable, two options should be made either redesign or to be dropped.

After completing the pre-feasibility analyses and PPP suitability checks, the Sponsoring Authority shall obtain a well-defined description of the proposed project such as its general scope, identified resettlement and environmental issues and requirements, any identified project risks, preliminary cost estimates, income generating opportunities, initial financial viability, private sector opportunities, and what further actions are required to complete the project preparation and by whom.

The results of the pre-feasibility analysis would be drawn together into the Pre-Feasibility Report (PFR). The summary of pre-feasibility report checklist for financial and economic viability is shown in table 5.1.

**Table 5.1** Financial and economic viability checklist (DEA, 2012)

Pre-feasibility task		Completed: yes/no?
D.	Financial and economic viability	
1	Have all major project cost components (capital, operations, maintenance) of the technical scope of the project been estimated?	
2	Are the assumptions on major project cost components reasonable, can they be justified based on a rationale?	
3	Has a preliminary market demand analysis been done? (Tariffs, Volume)	
4	Are the assumptions on tariff/ prices reasonable, can they be justified based on a rationale? Will the users be willing to pay the proposed tariff/ prices?	
5	Are the assumptions on volume/ quantity of usage reasonable, can they be justified based on a rationale?	
6	Have similar projects that were done in the past been analysed for project cost, tariff/ prices and volume/ quantity of usage?	
7	Are the assumptions in the proposed project comparable to similar projects that were done in the past? If not, then can the assumptions be justified on sound economic rationale?	
8	Has a financial analysis model, such as the Financial Viability model in the PPP toolkit, been used to assess the financial viability of the project?	
9	Have preliminary financial projections been prepared?	
10	For a project that is to be developed with private sector participation, has an estimate of required financial support from the public sector been made?	
11	Have the key financial ratios been computed? (e.g., NPV, IRR, etc.)	
12	Have the major financial and commercial risks to the project been identified?	
13	Have the impact and management strategy of the financial and commercial risks to the project been prepared?	
14	Has a sensitivity analysis been undertaken?	
15	Does the preliminary financial analysis demonstrate that the Sponsoring Authority will recover its investments along with a reasonable return under reasonable scenarios?	
16	Have the likely economic benefits generated by the project been identified?	
17	Based on the preliminary analysis, does the Sponsoring Authority consider the Project Concept to be financially and economically viable?	
18	Has a strong rationale and recommendation been made by the Sponsoring Authority in the preliminary assessment?	

### ***5.3.2.2 Financial viability indicator model and vfm indicator tool utilisation at phase 2***

At phase 2, it is assumed that the proposed PPP project is sufficiently developed and adequately justified to make the costs of preparing a full Feasibility Study worthwhile. The next stage of analysis at Phase 2 incorporates a full feasibility study and PPP due diligence. The full feasibility study is an expansion of the preliminary scoping in the Pre-Feasibility Report, which enables a more thorough assessment of project costs, benefits and risks, and further refines its development as a PPP. The Sponsoring Authority will assess and describe the technical, environmental, legal, social, financial, economic, and risk characteristics of the project; and produce a project implementation schedule. For the projects that require capital expenditure, a more comprehensive analysis is required.

At this stage, Financial Viability Indicator model is updated for a PPP due diligence analysis, the impact reassessment of changing parts of the project design, and verification of the feasibility study model results. The VFM Indicator Tool is also used to test the likelihood of achieving Value for Money that is based on the results of the feasibility study and the experience and knowledge of the analytical team. Since India currently has limited data on previous project outcomes, qualitative inputs based on the Project Team and Advisors' experience is very important. Thus, the ability to use the tool in full may be a subject to availability of past data.

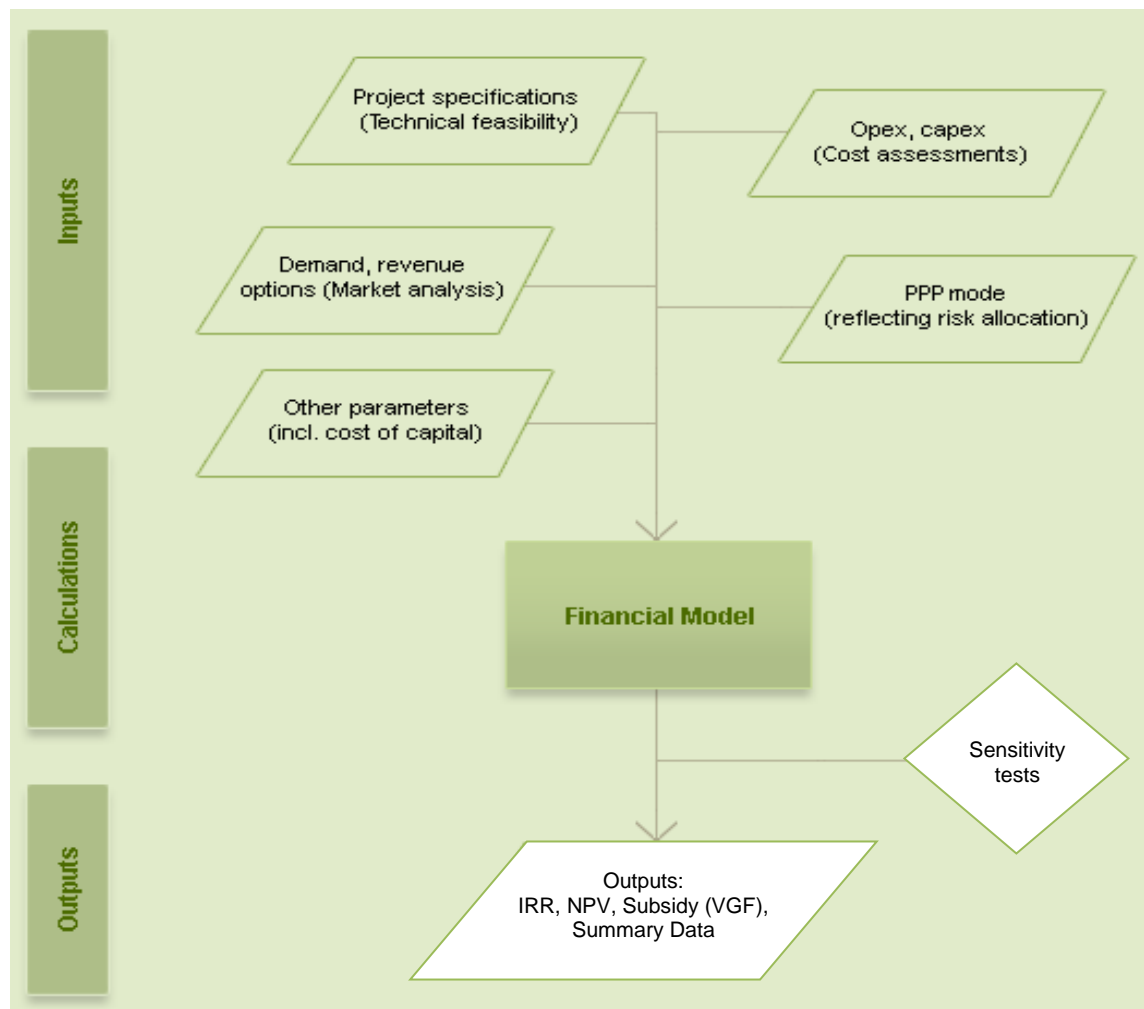
Although there are three tools (PPP Financial Viability Indicator Model, VFM Indicator Model, and Readiness Filter) used in this phase, the results of the Full Feasibility Study and VFM analysis would be important inputs to the application for In-principle Clearance to procure the project as a PPP. Therefore, the project's financial viability and ratio analysis cover Financial Structure Ratios, Debt to Equity Ratio (DER), Annual Debt Service Cover Ratio (ADSCR), Loan Life Coverage Ratio (LLCR), and Project Life Coverage Ratio (PLCR). It is also worth describing the general contents of a full feasibility study in India as follows:

- **Market analysis and project scope**, to assess the need for an appropriate scope of the project, and to build on the work already done at the strategic planning and pre-feasibility stage. This would include:

- *Needs analysis* – does the project meet an end-user need? Does it contribute to meeting the objectives of the sponsoring authority? Who will the users be?
- *Options analysis* – what is the best option for meeting the service need: a no-asset solution, existing assets, or new assets?
- *Define the output* – what services will the project provide?
- *Estimate and forecast demand* – what level of demand is there for the outputs / services from the project, and how much are users willing to pay (what is the value of the demand)?
- **Social and environmental feasibility**, including the requirements for impact assessments and for the associated mitigations.
- **Technical feasibility and technical parameters based on the market analysis**, including specification of required facilities and scenarios of project size, for use in preliminary project design.
- **Risk studies and refined PPP mode** – Assessment of the risks associated with the project, study of which party is best able to bear each risk, and refinement of the PPP mode selected at the pre-feasibility stage.
- **Preliminary cost assessment**, within a sufficient  $\pm\%$  range based on the technical specification and assessed project risks.
- **Financial analysis and due diligence**, incorporating projected revenue structure (e.g. Proposed tariff, required annuity) and assessing any need for financial support from the public sector.
- **Economic feasibility** – Assessment of overall net economic benefit of the project, incorporating estimated project benefits and costs including non-market factors such as those from the social and environmental assessment.
- **Other PPP due diligence activities**, including value-for money analysis if data is available.
- **Project implementation schedule**, including an outline of the proposed PPP procurement and award process through to technical and financial close, an outline of the construction schedule and target operation date, and any phasing that is planned for project extensions or on-going development.

Among the contents of full feasibility study, the financial viability indicator model and VFM indicator tool are heavily involved in the financial analysis and due diligence. A quantitative analysis of the financial feasibility of the project allows an assessment of likely Viability Gap Funding (VGF) or other public-sector financial assistance

requirements [e.g., India Infrastructure Finance Company (IIFCL) or state-level PPP finance vehicles]. Both financial viability indicator model and VFM indicator tool use information gained from the demand forecasts, technical feasibility, and cost estimates (including demand and cost scenarios). Figure 5.4 shows a typical structure and information flows in a financial model.



**Figure 5.4** Typical Structure and information flows in Indian PPP financial model

*Source: Department of economic affairs (DEA, 2012)*

In general, the inputs to the detailed financial analysis of Indian PPP financial model include the following:

- The life-cycle costs of the project and their timing. These include the estimated capital costs and operating and maintenance (O&M) costs identified in the cost assessment and a depreciation schedule for physical assets.
- Project specifications (e.g. investment timing, lifetime etc.)
- Revenue options and the associated forecast revenue stream. This will include



tariffs (where user-charges are possible), and secondary revenue sources from the project.

- Forecast demand including scenario ranges from the feasibility study.
- Assumed capital structure (debt - equity mix) of private sector investment vehicle.
- Debt and repayment schedule.
- The discount rates for the public sector and private investor consistent with the capital structure and allocation of project risks.

The discount rate (or required rate of return) is an important input that is used to undertake present value analysis. There are two different discount rates that should be used separately. To determine what a commercial investor would require for their investment activity, a realistic assessment of commercial discount rate should be used in the first analysis. When the government is willing to participate in obtaining loan from the bank, the second discount rate that is used in the second analysis may be lower than that applied for private sector investors. However, the discount rates are a subject to the borrower's credit rating.

It is also important to reduce optimism bias by considering different range of sensitivities on its assumption for probable outcomes. The typical outputs of the Indian PPP financial model, which are also parts of the quantitative assessment of PPP financial viability indicator model as follows:

- Expected returns from the project illustrated by the NPV and IRR.
- An assessment of subsidy or viability gap funding requirements where there is a viability gap between the revenue requirement and the revenues that can be raised from users
- Summary financial information including ratio analysis

### ***5.3.2.3 Financial viability indicator model and vfm indicator tool utilisation at phase 3***

Once the best-suited procurement method for the project has been decided, PPP financial viability indicator model and VFM indicator tool are used by Procurement and Evaluation (P&E) team to evaluate the financial components of bids. In order to keep

the fairness of the bidding evaluation, an Independent Monitor team is invited to be present for all evaluation meetings.

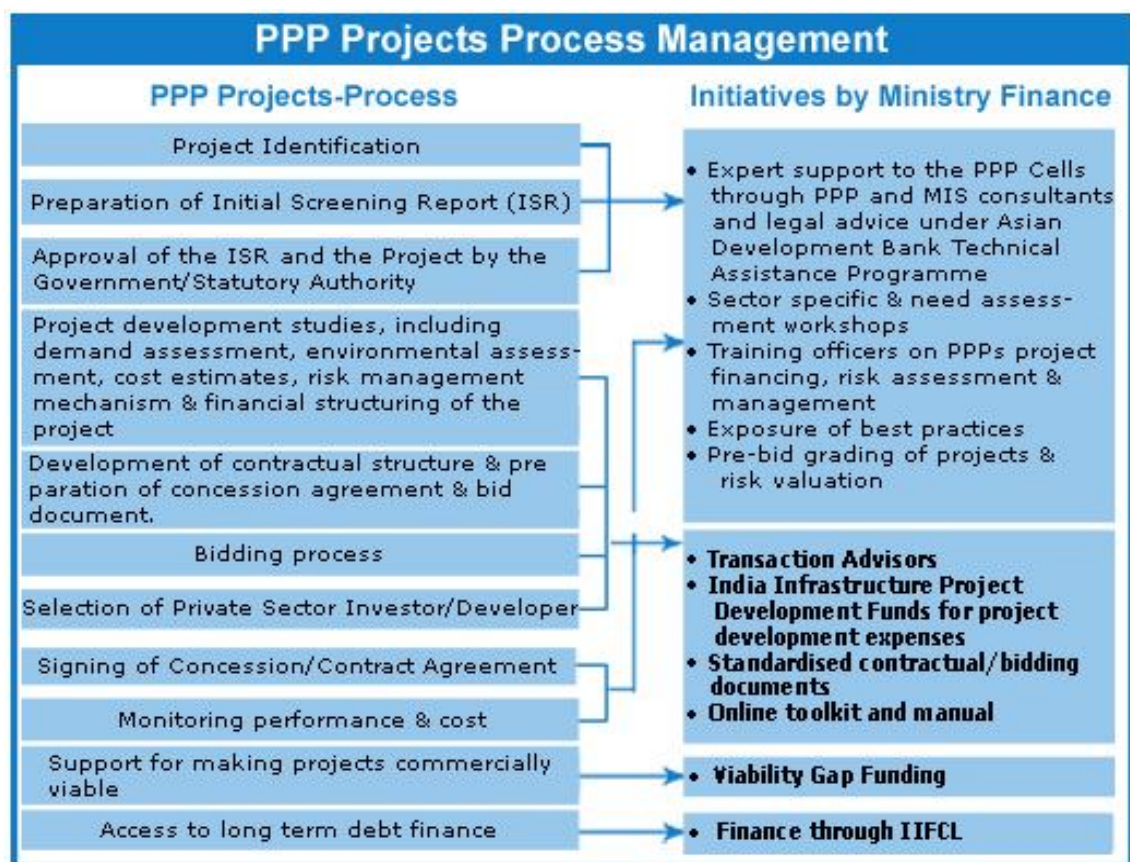
The bidders that conform to the minimum requirements on the lead member of a bid consortium, such as the minimum equity share, are invited to submit their bid. In order to be selected for a further financial evaluation, the submitted proposal should pass the minimum technical requirements or beat the cut-off score that have been clearly specified in the RFP. Then, the financial components of the Indian PPP seaport bids are entered into the financial model for the project or into the Financial Viability Indicator tool and analysed against the financial criteria. The P&E team provides relatively easy bid presentation instructions for the evaluation team to enter the financial details into the model.

The Indian government considers the bidder with the best financial offer (e.g. lowest price, highest concession fee payment etc) that will be selected as the preferred bidder. The other considerations such as: the whole-of-life costs, payments in the bid, and Net Present Value are calculated to enable comparison between bids with different cash flow timing. Nevertheless, the submitted financial bid can be categorised as speculative bid when the bidder offers a price that is below what they are actually willing to honour. Thus, the financial model and the benchmark cost, which were prepared in the phase 1 and 2, are used to guide an indication of a reasonable range of realistic cost savings.

A realistic cost saving is one of value for money (VFM) indicators for the public sector. Generally, when the PPP has been well prepared and well-designed during phase 1 and phase 2, the project will have a good chance of delivering value for money. The central inputs to the VFM test are the risk acceptances made in the technical bid and the financial offers. The challenges of quantifying VFM are the availability of data on past cost experiences [e.g. previous project costs, both the budgeted costs and the actual costs (including overruns)] from similar projects to the one being tendered. Since the required data is limited, the P&E team must judge the likelihood of VFM in the particular project using a mix of qualitative and quantitative factors. The next section will discuss the several case studies to study the implementation of PPP seaport projects in India.

## 5.4 Case Studies

In this section, three PPP seaport projects in India are selected to investigate a contemporary phenomenon of typical procedures used for evaluating PPP projects. Figure 5.5 shows the PPP project process and initiatives by the Ministry of Finance, which may help to identify the involvement of the most influential actors when evaluating PPP projects. Hence, the evaluation procedure of PPP process will be presented in the form of chronological structure. Figure 5.6 illustrates important milestones in the three PPP seaport projects in India, which also demonstrates five PPP project stages.



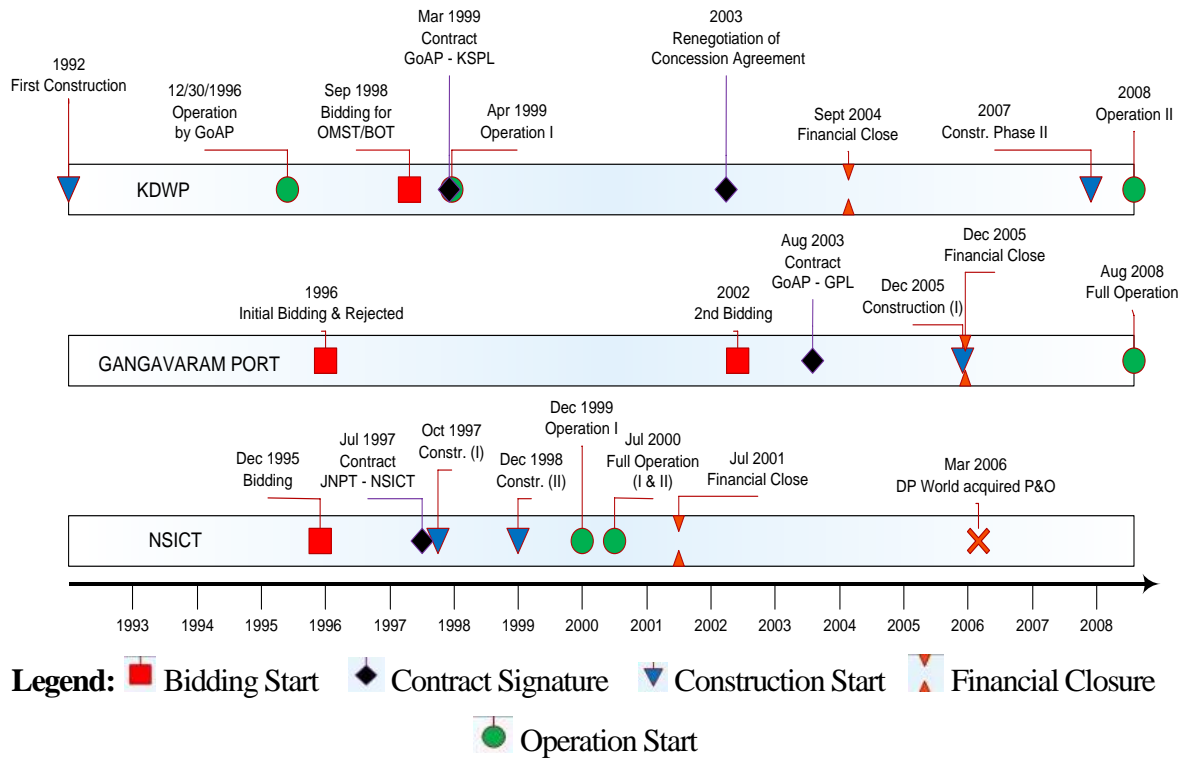
**Figure 5.5:** PPP projects process management in india

*Source: Department of economic affairs (DEA, 2012)*

### 5.4.1 The Nhava Sheva International Container Terminal

The Jawaharlal Nehru Port Trust (JNPT) was established in 1989 and equipped with modern container and bulk handling facilities to overcome the existing port's deficiencies and the anomalies characterizing the Indian port sector. However, the JNPT failed to live up to the expectations it had generated regarding its performance since its

inception right up to 1994. The JNPT also suffered from some of the drawbacks inherent in the Indian port sector in the pre-reforms era, especially in terms of capacity that prevented it from achieving world standards of port efficiency and performance.



**Figure 5.6** Important milestones of three PPP seaport projects in India

Subsequently, the Port administration soon realized the urgent need to upgrade and augment the port's equipment to ensure larger cargo handling capability. The JNPT took the initiative to introduce private participation in ports for the first time in India. In January 1994, tender documents were initially prepared for contracting out the container terminal at JNPT to private operators. However, in 1995, the proposal was amended and it was decided to invite private participation in creating a new container terminal while retaining the existing one under government ownership and operation. After issuing a global tender, the Nhava Sheva International Container Terminal (NSICT) was appointed in 1997 to construct a new two-berth container terminal of 600-meter quay length on Build-Operate-Transfer (BOT) basis for thirty years. Detailed information about the project and the main stakeholders, are shown in table 5.2.

**Table 5.2** Main Stakeholders in the PPP Seaports Projects in India

Case Study No.	Project	Stakeholders			
		Government / Sponsoring Authority	Independent Regulator	Private Sector Promoter / Sponsor / Consortium Members	Lenders
1	Nhava Sheva International Container Terminal	Jawaharlal Nehru Port Trust	Tariff Authority for Major Ports (TAMP)	P&O Australia Ports Pty Limited, Konsortium Perkapalan Berhad and Trans Impex Private Limited (P&O Ports subsequently taken over by Dubai Ports World Limited (DP World))	A consortium of lenders led by ICICI Bank, ANZ Investment Bank, HSBC and Standard Chartered
2	Gangavaram Port	Government of Andhra Pradesh (No VGF has been provided to the project)	Tariff Authority for Major Ports (TAMP)	D.V.S. Raju of VisualSoft Technology (80% of Equity) & Dubai Port Authority, was later replaced by Integrax Berhad (20%), Warburg Pincus and the Andhra Pradesh Infrastructure Investment Company (APIIC)	A consortium of 13 Banks (State Bank of India, IDBI, Punjab National Bank, State Bank of Hyderabad, State Bank of Patiala and Oriental Bank of Commerce) led by SBI Capital Markets arranged term senior & subordinate loans of Rs.
3	Kakinada Deep Water Port	Government of Andhra Pradesh	Tariff Authority for Major Ports (TAMP)	Larsen & Toubro Ltd, India, Stevedoring Services of America, USA, Precious Shipping Company, Thailand, Konsortium Perkapalan Berhad, Malaysia	Asian Development Bank

#### 5.4.1.1 Management of PPP project process

The preparation for the procurement process of a new container terminal by JNPT Port Planning and Development Department took a long time. Earlier involvements of the World Bank, Ministry of Surface Transport (MoST) and other ministries, from the inception and procurement stages, did not guarantee a smooth evaluation process in finalising the bid documents. The procurement process was delayed by about 2 years.

In December 1995, JNPT finally issued the international tender for a new container terminal on “Build, Operate and Transfer” basis for 30 years. Although 30 firms from

India and abroad purchased the bid document, of which five consortia submitted proposals, the tender evaluation criterion used was too simplistic. The bidder with the highest NPV of Royalty payment was selected, which was a consortium led by P&O Ports Australia Pvt. Ltd. including DBC Port Management and Konsortium Perkapalan Berhad. The royalty was based on Twenty-foot Equivalent Unit (TEU) handled traffic, which ranged from about 2% in the initial years to about 50% of the Minimum Guaranteed Royalty payment in the terminal year. The concession agreement between JNPT and the Special Purpose Vehicle (SPV) Company led by P&O Ports (now Dubai Ports) was finalised and signed in January 1997.

#### **5.4.1.2 Financial viability analysis**

The cost of terminal project development was Rs. 733 crores, funded without Viability Gap Funding (VGF) support from the government. The financial structure proposed by the SPV was 50% debt and 50% equity. A consortium of lenders led by ICICI Bank loaned around Rs. 190 crores (26% of project cost) to the SPV under a guarantee provided by P&O Ports, Australia. The remaining debt of Rs. 177 crores was raised from other financial institutions. The cost of debt is 10.5%. The financial viability analysis showed that the estimated project IRR was 18% and the NPV based on the winning consortium's bid was Rs. 224.59 crores.

Although the project was considered financially viable, the lack of a methodology in evaluating the royalty payout to JNPT and the failure to anticipate problems arising from the relations of the royalty with the tariff level triggered several issues in the following operations phase. There were two interpretations on whether royalty payment should be considered as an expense or a share in the profit in the SPV's accounts while determining the port tariff. Eventually, the Tariff Authority of Major Ports (TAMP) allowed royalty to be considered as a cost in the tariff computation for bids received prior to July 29, 2003. This revision resulted in a reduction in NSICT's tariff by 12%. However, it still imposed excess burden on port users. Therefore, in 2005, TAMP recognised the principle that royalty would be paid out of the Operating Surplus (i.e. Profit) of the concessionaire in the latest revised guidelines.

### **5.4.1.3 Value for money (VfM) analysis**

In the absence of a database of previous project costs such as budgeted costs and actual costs (including overruns), the VfM analysis at the inception phase could not be conducted. Nevertheless, the post facto VfM analysis shows that NSICT is a classic case of a successful PPP process implementation in terms of time efficiency and cost over-runs in public works.

### **5.4.2 The Gangavaram Port**

The Gangavaram Port was first conceptualised in 1994 as all weather, multipurpose, deep water port, capable of handling Super Cape size vessels of up to 200,000 DWT. The first round of bids in 1996 was rejected by Government of Andhra Pradesh (GoAP) because the evaluation revealed speculative concerns regarding the validity and practicality of the market assumptions (traffic and tariff) and the underlying viability of the projections. In order to follow up the initial master plan that has a provision for 29 berths with a capacity of 200 MTPA to be developed in three phases over 15-20 years, the GoAP corrected the shortcomings of the first round and appointed an independent consultant to prepare a comprehensive feasibility study and manage the tender process in 2001. After conducting an international tender process, the consortium of Gangavaram Port Limited (GPL) led by Mr. D.V.S. Raju was selected to develop the port on BOOT basis in 2002. Then, concession contract was signed in 2003 (see Table 4.3).

#### **5.4.2.1 Management of PPP project process**

The procurement process of Gangavaram port privatisation started with a number of shortcomings due to unrealistic traffic projections prior to tendering, vague bid criteria, and thus created unsustainable speculative offers. The bid criteria gave separate weights for Minimum Guaranteed Amount (MGA), revenue share and investment commitments. In consequence, higher scores could be disproportionately achieved by giving larger investment commitments, though unrealistic. After much deliberation, the GoAP decided to inevitably terminate the bid process in 1996. A second feasibility study with robust bidding preparation for the second round of global tender was prepared in 2001. Eventually, after the GoAP corrected the shortcomings in the first bidding, the concessionaire (GPL) was selected in 2002 through comprehensive evaluation criteria.

However, the contract finalisation was a long drawn process that culminated with the signing of the concession agreement on Build-Operate-Own-Transfer (BOOT) basis in August 2003.

#### **5.4.2.2 Financial viability analysis**

The total project costs, which were estimated at Rs. 1,696 crores, were funded without VGF. The financial structure of the project comprises 31% equity and 69% debt. A consortium of 13 Banks led by SBI Capital Markets arranged term senior & subordinate loans of Rs. 1,170 crores for the phase I development. GPL successfully obtained an attractive rate of under 9% p.a. for the 14 year loan facility. The financial viability analysis showed that the estimated project IRR (post tax) was 22% while the Equity IRR was 30%. The project also demonstrated a very strong ability to pay interest and principal with an average Debt Service Coverage Ratio (DSCR) of 2.2. It is worth noting that higher DSCR reduces risks for lenders. Bakatjan, *et al.* (2003) stated that the range of 1.10 to 1.25 for DSCR is bankable, the range between 1.30 and 1.50 is satisfactory, and above 1.50 is preferable.

#### **5.4.2.3 Value for money (VfM) analysis**

The VfM analysis for this project is limited due to the absence of the financial model by the private port operator, since this is not in the public domain. Therefore, a *post facto* VfM analysis is presented in the comparison form between what was planned in the feasibility study and what has been achieved by the private operator based on publicly available information. Table 5.3 shows the summary of *post facto* VfM analysis of the Gangavaram Port project.

In general, the Gangavaram Port project has demonstrated value for money. Although the actual project cost was higher than the estimated cost, the actual unit cost of each berth (Rs.340 Cr/berth) is much cheaper than the estimation (Rs.382 Cr/berth). In other words, the capital expenditure efficiency achieved in project cost is 11%. Another contributing factor to the efficiency in capital expenditure was the ability of the concessioner company to negotiate better financing terms with the lenders. Since interest rates are a function of prevailing market conditions, a lower interest rate (9% as compared to 15.5%) and longer tenor of debt (from 10 years to 14 years) would have



been a fortuitous timing in the investment cycle that could have contributed to this efficiency.

**Table 5.3** Post facto VFM analysis of Gangavaram Port project (DEA, 2012)

<b>Variable</b>	<b>Feasibility Study</b>	<b>Actual Achieved</b>
Project Cost	Rs. 1528 Cr	Rs. 1700 Cr
Berths	4	5
Maximum vessel size	120,000 DWT	200,000 DWT
Cargo in Year 1	10 MTPA	8 MTPA
Interest Rate	15.50%	9%
Tenure	10 years	14 years
Efficiency in Project Cost [% Savings in Average Capex per Berth Achieved]		11%

### **5.4.3 The Kakinada Deep Water Port**

The Kakinada Deep Water Port (KDWP) was developed by the Government of Andhra Pradesh (GoAP) from 1992 to 1996. The master plan for further development of 3 existing berths with 15 additional berths required an investment of over Rs. 1,500 crores. Being under deprived circumstances, such as limited capacity to develop the full infrastructure and inefficient operation, the GoAP decided to privatise the port operations under the PPP route in 1999. Kakinada Seaports Limited (KSPL) was appointed to operate the KDWP with OMST/BOMST (Operate Maintain Share and Transfer/Build Operate Maintain Share and Transfer) PPP model (see Table 4.3 and 5.2).

#### **5.4.3.1 Management of PPP project process**

The GoAP issued an international competitive bidding for the development of Kakinada Deep Water Port (KDWP) in September 1998. Although 14 parties participated in the prequalification (RFQ) stage, only four consortia submitted detailed proposals at the Request for Proposal (RFP) stage. Since one of the four consortia withdrew their proposal because errors had been found in the proposal, only three proposals were considered for further evaluation. Three financial parameters were used to evaluate the bids across the following parameters: (1) Minimum Guaranteed Share of Income

(MGA) for 50% of weight; (2) Percentage Share of Income to be paid to the GoAP with 30% of weight; and (3) 20% of weight for Investment Planed in phase 1 development.

The procurement process of KDWP was faster than the previous two case studies. The consortium of International Seaports Pte Limited (ISPL) was awarded the contract in December 1998. Shortly after the award, the contract on the Operate-Maintenance-Share-Transfer (OMST)/Build-Operate-Maintenance-Share-Transfer (BOMST) format was signed on the 19<sup>th</sup> of March 1999. The consortium ultimately floated a special purpose vehicle (SPV) company, the Cocanada Port Company Ltd (CPCL), which was renamed as Kakinada Sea Ports Ltd (KSPL) for managing the port operations.

#### **5.4.3.2 Financial viability analysis**

The construction costs of three berths at KDWP were Rs. 293 crores, which existing project were constructed by GoAP and funded by a loan of Rs. 242 crores from the Asian Development Bank. KSPL was responsible for operation and maintenance of the three berth facility and for the fourth berth development. The cost of fourth berth development including an offshore jetty was Rs. 330 crores. The development comprised two phases. Phase 1 of the development, on the existing 3 berths, involved an investment of Rs. 175 crores, which had an equity contribution of Rs. 60 crores and debt funding of Rs. 115 crores. *Infrastructure Development Finance Corporation* (IDFC) was the lead lender providing Rs. 60 crores of the debt. The loan had tenure of 11 years. The financial viability analysis showed that the estimated project IRR (post tax) for phase 1 and phase 2 was 18.46%. However, the project was not likely to be viable due to over-estimated traffic and high component of MGA that the KSPL had to pay to the GoAP. Therefore, KSPL was unable to meet the obligation of the MGA. Only after KSPL requested the government to withdraw the MGA clause, did KSPL achieve financial closure for the phase 1 development in September 2004.

#### **5.4.3.3 Value for money (VFM) analysis**

Again, due to the limited financial information available in the public domain, post facto VfM analysis was carried out on basis of the benefits from this project. The first benefit was the ability of KSPL to ensure adequate traffic to take up the development of the fourth berth. Secondly, the GoAP enjoyed a steady revenue stream by way of revenue share and lease payments from KSPL. Third, KDWP paved the way for other

port projects to be taken up on the PPP route. And the last is a substantial improvement in terms of port performance.

#### ***5.4.4 Findings from the Case Studies***

This section comprises two main findings which are derived from cross case analysis and discussion. Three cases are examined by using cross case analyses with three units of analysis analyses: 1) Management of PPP project process; 2) financial viability analysis; and 3) value for money analysis. The commonality patterns were identified within each unit of analysis in three case studies. In addition, some important factors within each pattern will also be discussed.

##### ***5.4.4.1 Cross case analysis***

###### ***5.4.4.1.1 Management of PPP project process***

From the three case studies, the implementation of PPP project requires extensive project preparation and management in order to achieve an efficient procurement process. However, the procurement process for a brownfield project is faster than a new project in general. As demonstrated by KDWP, the procurement process was faster than in the two other cases because KDWP has an advantage of having historical information that could be used for realistic traffic projection. Without comprehensive preparation, the procurement process tends to be longer.

The three case studies also demonstrated that the main stakeholders should consider the interests of the other stakeholder's interest in order to manage the risks in a PPP project. The same pattern of these cases is independent regulator (e.g. TAMP) played an important role in protecting the interest of lenders by scrutinising the capital expenditure on port terminals for the purpose of tariff setting.

###### ***5.4.4.1.2 Financial viability analysis***

The project financial viability is determined by a robust financial model that examines the key questions of financial viability and the "what-if" scenarios used from project preparation up to operation stages. The three cases demonstrate that PPP financial models were utilised in their evaluation. It also emerged that there are several important financial indicators that they have been using; such as: Tariff, Royalty, Debt to Equity Ratio, NPV, IRR, and DSCR.

Two matched patterns from the three cases demonstrated as follows:

- Unrealistic traffic projections resulted in cancellation of tendering (e.g. first round tendering for the Gangavaram Port) and tariff setting issues in the subsequent operation phase (i.e. An excess tariff burden on NSICT port users and inability of KSPL to meet obligation of the MGA).
- The concessionaire could not achieve the required financial closure within 180 days (plus a grace period of 120 days) from the date of the agreement due to poor project preparation at the pre-bid stage.

#### ***5.4.4.1.3 Value for money analysis***

Since the spirit of PPP project is based on the ability of the project to deliver VFM, it is essential to ensure that the project offers more benefits than the traditional project does. The three cases have successfully demonstrated the ability to deliver value for money in terms of time efficiency, cost overrun anticipation, traffic performance, attractive interest rates and tenor of debt.

### ***5.4.5 Discussion***

#### ***5.4.5.1 Leveraging the roles of the main stakeholders in managing risk***

Initially the host government starts identifying a project that needs private sector participation. This process requires pre-feasibility analysis including demand assessment, environmental assessment, cost estimates, risk management mechanism and financial structuring of the project. Without a comprehensive project preparation, the procurement process will be longer than expected or may even be rejected as demonstrated in NSICT and Gangavaram Port cases. Once the project is ready for the bidding process, private companies are invited to participate in the tender. Given that one of the shortlisted bidders of KDWP case had to withdraw their proposal due to error, it is of paramount importance that the proposal is double checked before being submitted. Then, the prospective bidder is selected. However, it is also important to be realistic in accepting the bidder's proposal. The KDWP case proved that higher MGA was not a good parameter in evaluating bidders' proposals. Consequently, the GoAP had to withdraw the MGA clause in favour of KSPL. After signing the concession agreement, lenders are invited to participate in funding the project. On the condition that lenders are satisfied, financial closure can be achieved. Otherwise, delay in reaching

financial closure is likely to happen as shown in all the three cases. Finally the construction and operation of the project can be started. In the operation stage, the independent regulator plays an important role in balancing stakeholders' interests. TAMP has the authority to scrutinise the capital expenditure of the three cases and allow or disallow certain expenditure to be included under the heading of 'allowable expenditure' for the purpose of tariff setting. Therefore, these processes need extensive evaluation procedures that should be followed by all participants.

#### **5.4.5.2 *Realistic traffic projection***

Although optimism bias is a common phenomenon in most public projects, it is essential to be realistic in assessing the market of a project. This is so because traffic projection is the key input in tariff setting and it is directly linked to the revenues against which cost and returns are set off. In the absence of robust project preparation, the three cases faced various problems that are linked to unrealistic traffic projection. For instances: TAMP had to cut NSICT's tariff by 12% because of excessive revenue, the GoAP had to withdraw MGA clause in favour of KSPL, and the GoAP had to reject speculative offers that were unsustainable. We suggest giving attention to the projection of traffic volume and avoidance of unduly optimistic traffic forecasts.

#### **5.4.5.3 *Financial closure period***

Theoretically, a good PPP project is indicated by a short financial closure period. When a project has sufficient revenue stream and strong commitment support from the host government, the project is financially viable. However, having those criteria is not good enough for procuring large infrastructure projects. It is argued that a robust evaluation procedure should be present in order to speed up the due diligence process. When lenders are convinced of the financial viability of the project, the due diligence process becomes faster. Otherwise, financial closure delay is likely to happen as revealed in all the three cases. Therefore, one of the indicators of a good PPP project is a short financial closing period.

If we focus on the financial closing period, we cannot overlook the importance of PPP financial model as a tool for evaluating a project. PPP financial model is not just a tool for evaluating the project but also for negotiating the risk sharing mechanism. Back to

the project evaluation at pre-bid phase, PPP financial model is used to assess the project's financial viability in terms of project cost, traffic, tariff, and revenue. When proper project evaluation is undertaken, the project will be ready for the next stage. The next stage is a contract negotiation between the prospective bidder and the host government. Without a comprehensive financial model derived from pre-bid stage, it is unlikely that the negotiation process will be undertaken within a short period. A comprehensive financial model generally contains all the important information needed by both stakeholders. However, there is usually a misconception from the government side. They tend to assume that when PPP is used in procuring large infrastructure projects, all the risks and the responsibility related to financial viability of the project fall on the private parties including the lenders. Unfortunately, this misconception still exists, with some government representatives being reluctant to enter into contract negotiation with the private parties. From the interviews and the literature on the Indian case, they prefer to simplify the process of procuring PPP projects by selecting the prospective bidders without considering the prospective lenders who are willing to support the project funding. Lenders are part of the private parties that also play an important role in achieving a successful PPP project as most PPP projects are funded mainly by loans from lenders or financial institutions and with less funding from private equity investors. As such, they should be given due consideration in the selection process in order to ensure quick closure.

#### ***5.4.5.4 Independent regulator***

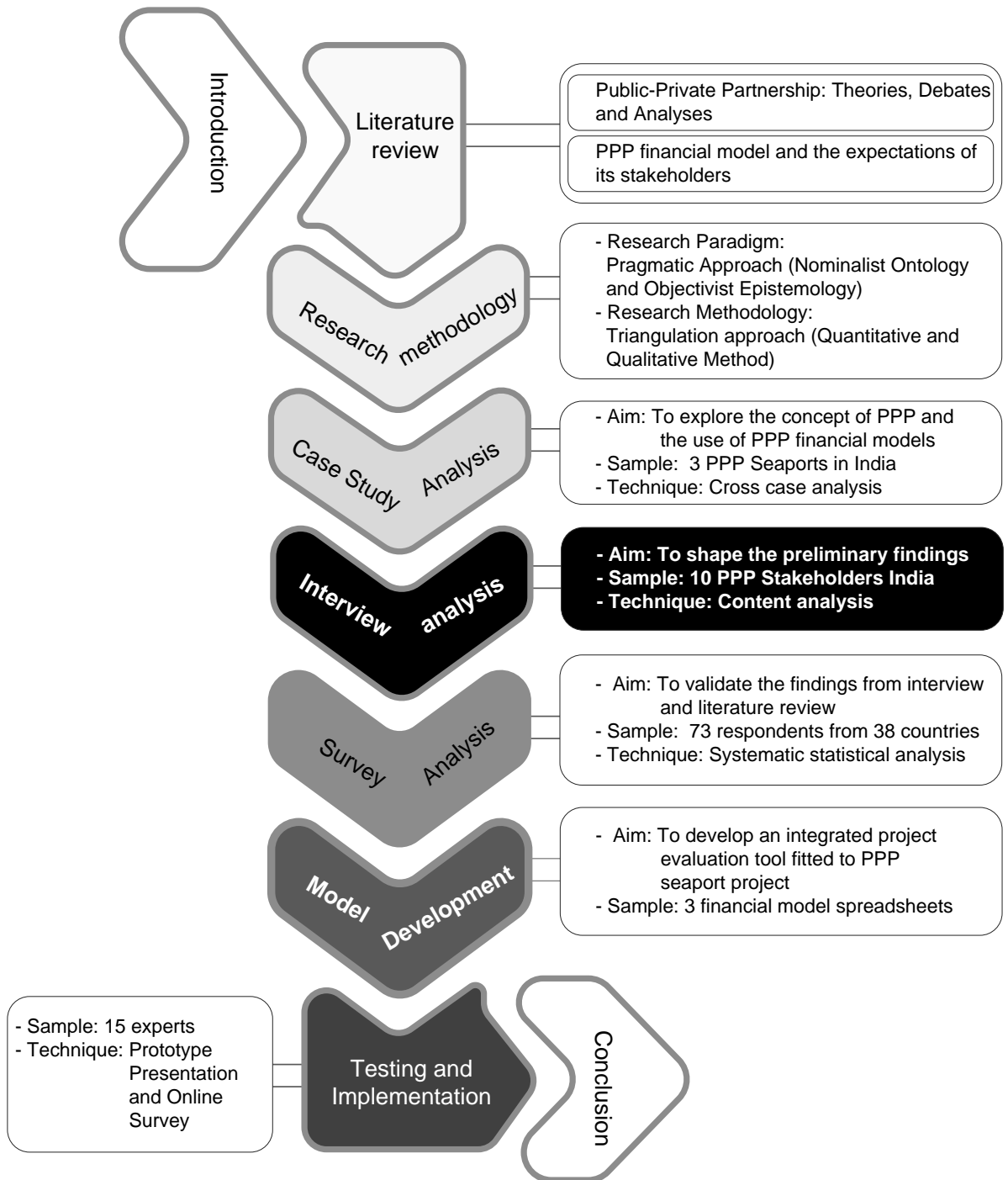
Since a PPP project has a long concession period, an independent regulator is needed to balance the interests between public and private that are represented by licensor and concessionaire. This is considered necessary because the licensors sometimes have an authority to manage their own port facilities (e.g. Post Trust). In this case, TAMP is an independent regulator for controlling the tariff issued by private ports and port trusts in India. In order to do their job, TAMP scrutinises the capital expenditure of the port terminals and allows or disallows certain expenditure to be included under the heading of 'allowable expenditure' for the purpose of tariff setting. Moreover, TAMP also monitors the project's financial performance and ensures that audited results reflect the true performance of the port rather than under-reporting of profits. Such an authority is a must for good practice.

## 5.5 Chapter Summary

The advent of PPP as an alternative procurement strategy offers opportunities and challenges to and private sectors. Some common problems such as time and cost overruns, low productivity, and operational inefficiency, have been experienced by public sector asset managers. Meanwhile, in the same domain, the private sector has demonstrated higher productivity and efficiency for the sake of profit maximization. Private participation in public projects should be comprehensively evaluated in order to achieve successful PPP projects.

The study shows that there have been major drawbacks in the evaluation and implementation process of PPP projects as influenced by some important actors in India. With the use of cross case study for in-depth investigation, some commonality patterns have emerged from the study. First, the independent regulator played an important role in protecting lenders' interest by scrutinising the capital expenditure of port terminals for the purpose of tariff setting. Second, unrealistic traffic projections resulted in cancellation of tendering and tariff setting issues in the operation phase. Third, concessionaires could not achieve the required financial closure within 180 days (plus a grace period of 120 days) from the date of the agreement due to poor project preparation at the pre-bid stage. Therefore, it is suggested that PPP stakeholders devote sufficient time to pre-project planning as a means of ensuring success in early project closure. And the fourth commonality shows that three cases have successfully demonstrated the ability to deliver value for money in terms of time efficiency, cost overrun anticipation, traffic performance, attractive interest rates and tenor of debt. These lessons can be learned by other developing economies. The study also shows that Indian government has successfully developed a PPP toolkit based on the experience from previous PPP projects.

## CHAPTER SIX: INTERVIEW ANALYSIS – EXPLORING STAKEHOLDERS' EXPECTATIONS





## Chapter 6: Interview Analysis – Exploring Stakeholders’ Expectations

*"When you develop your opinions on the basis of weak evidence, you will have difficulty interpreting subsequent information that contradicts these opinions, even if this new information is obviously more accurate."*

Nassim Nicholas Taleb (1960 –)

### 6.1 Introduction

In order to understand the stakeholders’ expectations in utilising PPP financial models, it was appropriate to conduct exploratory research through a number of case studies, interviews, and questionnaire. The previous chapter presents the findings of literature cross case study analysis, which allows in depth investigation within the research subject (Fellows and Liu, 1997). Such an exploratory research helps to understand the nature of a problem in depth and produces fruitful results. It is also important to compare the theoretical information as baseline data from the findings of the literature case study with the actual expectations of PPP financial models at various project stages. The procedure for evaluating PPP seaport projects, which specifically on financial model utilisation in India was reported in the previous section.

Although stakeholders’ expectations in using PPP financial models were identified through literature review, the identified expectations need to be further examined for veracity. Thus, it was decided to conduct semi-structured interviews in Indian case study. This chapter presents analysis and discussion of the stakeholders’ expectations in India. Among five research questions (see 1.6), two research questions are addressed in this section. The first question is: *who are the stakeholders going to manage the risks related to developing large infrastructure projects?* This question is limited to the stakeholders who are using PPP financial models. And the second question is: *what are the stakeholders’ expectations in utilising PPP financial models?* To answer those questions, the following five project stages were investigated: 1) pre-proposal stage; 2) contract-negotiation stage; 3) finance-raising stage; 4) construction stage; and 5) operation stage.

This chapter provides information about the stakeholders’ expectations and presents several analyses that are divided into two major parts: 1) PPP Stakeholders; 2)

Stakeholders' Expectations. The first part analyses the actor and the influence of PPP stakeholders who are identified from literature and interviews. Then, the following part analyses the importance of the pre-determined 64 expectations, 26 financial input assumptions and 16 output indicators, which are identified through literature and verified through semi-structured interview with key participants of PPP projects in India.

## **6.2 Research Approach and Technique**

Research approach and technique adopted in a research study depend on the nature of research problem and research aim. As described earlier in the chapter 4, the aim of this research is to ascertain the rationale of the public sector authority in evaluating PPP projects. It was also found that knowledge gap between public and private is the problem related to human's cognitive abilities. Hence, a qualitative approach is more suitable because it is concerned with processes, rather than outcomes or products (Falqi, 2011). A qualitative data gathered from interview has to be analysed for PPP financial model development. Financial models involve human as modeller and user. Since the aim of the interview is to study the stakeholders' expectations about PPP financial models, content analysis was used in this research. Their views of the financial model utilisation and its financial risk variables were given coded allocations to categories. And groups of stakeholders from whom the data were obtained are fitted to these categories, so that a matrix of categorised data against groups could be obtained. Seidman (2006) advocated that a content analysis technique is connecting threads and patterns among the excerpts within the predetermined categories. Content analysis organises and compresses excerpts from the transcripts into fewer content categories based on explicit rules of coding (Stemler, 2001). Content analysis technique also allows qualitative data to be converted into quantitative data (Erdener and Dunn, 1990). Then, they were selected for structured questionnaire survey. Next section will address a content analysis related to PPP Stakeholders.

## **6.3 Content Analysis: PPP Stakeholders Identification**

In order to carry out a content analysis on a qualitative data gathered from interview, PPP stakeholders are divided into two groups: 1) private party; 2) public party. Several

key participants of PPP projects from private and public institutions (see table 6.1) were approached for an interview.

**Table 6.1** Participating Institutions for Interviews in India

No	Institution	Type	Location
1	Beckett Rankine India Pvt Ltd	Seaport Consultant Company	Mumbai, India
2	Gammon Infrastructure Projects Ltd	Seaport SPV Company	Mumbai, India
3	Mumbai Port Trust	Seaport Authority	Mumbai, India
4	Knowledge Infrastructure System Pvt Ltd	Seaport Consultant Company	Mumbai, India
5	F1F9	Financial Modeller Company	New Delhi, India
6	Ministry of Shipping	Asian Development Bank Representative	New Delhi, India
7	Ministry of Shipping, Road Transport and Highway	Central Authority	New Delhi, India
8	Jawaharlal Nehru Port Trust	Seaport Authority	Mumbai, India
9	Indian Port Association	Port Association	New Delhi, India

The purpose of semi-structured interviews was to complement and corroborate initial observations with the findings of the literature review as they arose. The semi-structured interviews allow the research to focus on PPP stakeholders' identification in a timely manner.

**Table 6.2** Experts Participants of PPP projects

No	Position	Years of experience	Highest Academic Qualification
P1	Jr. Accounts Officer (public)	5-10 years	Master Degree
P2	Sr. Vice President (Private)	> 10 years	Master Degree
P3	Deputy Manager (Public)	> 10 years	Master Degree
P4	Head – Port Development (Private)	> 10 years	Master Degree
P5	Finance officer – Port Development (Private)	> 10 years	Master Degree
P6	Under Secretary (Public)	> 10 years	Master Degree
P7	Managing Director (Private)	> 10 years	Master Degree
P8	CEO (Private)	> 10 years	Master Degree
P9	PPP Expert (Public)	> 10 years	Master Degree
P10	Senior Manager (public)	> 10 years	Master Degree

Each interview lasted between 30 and 70 minutes. Notes were recorded during the interviews, which were conducted between November and December 2010. Most of the participants have experience more than 10 years in PPP projects and hold a master

degree qualification (see table 6.2). Therefore, they are deemed to have sufficient knowledge in the topic, which is limited to PPP and financial model utilisation.

### ***6.3.1 Stakeholder's perception toward PPP financial modelling***

This research highlights the importance of financial model in PPP projects. Since the preliminary findings imply that there is a knowledge gap between public and private in PPP project, it is vital to see the stakeholder's perception toward PPP financial modelling. The first question was about the perception of the participant toward the importance of PPP financial modelling to their projects. Given three alternative answers such as: very important, important, and not important; the findings show that all participants from private party perceive that PPP financial modelling is very important with the following comments:

*P2: "Our kind of work is very complex work, it's not that you want to buy diary and you go to market, and you decide that I want to buy diary with so many pages and this colour and then you get the cheapest you can buy. In our work, everything cannot just be quantified; people have to look holistic manner".*

*P4: "It's very important because unless you get the modelling right, private party will not be attracted. Private party is always looking at the return on the capital. Unless you know the project is reliable without a grant or without subsidy, then you always shooting in the dark. You can't only bring viable project in the PPP scheme".*

*P8: "...it's helping the developer raise finance in way that's competitive economical and viable, to make the project viable"*

However, some interviewees from public party argued that financial modelling is important but not very important.

*P1: "...from Indian prospect, considering seaport and their financial status and condition, I think it's important but not very important..."*

*P9: "It is important to the extent that we should be able to decide whether project is profitable or not, whether it is doable on PPP model or not, how much profitability exactly is not much important ..."*

Meanwhile, participants from the public parties, who think that PPP financial modelling is very important, argue that a strong financial modelling will be appealing to the investors.

*P3: "Financial modelling is very important because unless PPP financial modelling is very strong, you cannot attract any investor..."*

*P6: "Financial modelling is limitation otherwise the project cannot survive. Most institution will not come forward to finance the project. Most projects are financed by the public institutions. If the financial modelling cost a lot, they will not come forward with the project. We award the project only if IRR minimum is 12% and the threshold criteria and NPV are met".*

It is clear that some stakeholders from public party have mixed opinions regarding the importance of PPP financial modelling. The findings confirm that the knowledge gap between public and private does exist.

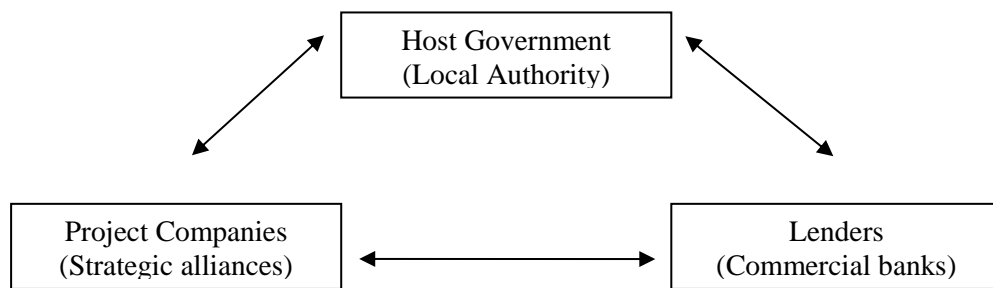
### **6.3.2 Stakeholders' involvement in using PPP financial models**

After knowing the stakeholders' perceptions upon the importance of PPP financial modelling, the next question was intended to figure out the stakeholders who are involved in the PPP financial models utilization. Although each participant was given option to select the parties involved in using financial model at their project, they were allowed to suggest the other relevant participants. Ten participants gave their answer as follows: Sponsor, Authority, Other potential sponsor, Investor, Lender, Independent Engineer, Advisory Agency, Modelling bank, Inter-creditor Agent, Consultant, and Transaction adviser.

All the respondents also agree with the stakeholders' involvement in developing PPP financial model. For example, the financial model is based on the perspective of the

private (e.g. the sponsor) at the pre-bid and contract negotiation stage. And for the finance-raising stage, the lender's perspective is taken into account instead. At last, for the operation stage, it is down to the sponsor's perspective.

In order to analyse the PPP stakeholders, the participants were also asked to choose the most influential parties in making the project successful. Their answers were ranked into top three. Overall, the top three influential participants based on individual experience of the participants are sponsor, lender and authority. These findings support that a successful PPP project is determined by the ability of main stakeholders in managing the involved risks in PPP projects under a long-term partnership. This partnership is a complex set of relationships that require effective coordination among all participants in a PPP project. Cheng (2010a) illustrated the structural relationships of the most important participants into three major actors' triangle in a PPP project (see Figure 6.1).



**Figure 6.1:** The Triangle of Major Actors in a PPP Project

*Source: Cheng (2010a)*

#### **6.4 Content Analysis: Stakeholders expectations from PPP financial modelling**

After reviewing the literature related to stakeholders' expectations, the preliminary results from literature review were formulated in the list of questions for an interview. This section will discuss the interview findings by analysing the story behind participants' experiences (in utilising PPP financial models). The questions are divided into two sections. The first section is related to the purpose of PPP financial model at every stage of PPP project. Afterwards, the second stage is about their expectations from PPP financial models.

#### 6.4.1 Stakeholders expectations at the pre-proposal stage

In this section, respondents were asked to confirm whether a PPP financial model was used to facilitate the submission of a proposal at the pre-proposal stage. All participants agree with the purpose of PPP financial model.

*P8: "...yes, definitely it is requirement (from the government) to use PPP financial model (at the pre-proposal stage); otherwise you could not submit a bid...they want to know how much is revenue share, government is having with it, how much capital contribution there government have to give, subsidy or how much to be. That is coming from financial model".*

*P4: " Correct, before you bid out any project, you have to capture all aspects of the project for internal decision making. No company no private company put its money unless you have full understanding of the number. They can be some sort of assumptions which is basically there risks you make assumption, you always have financial earnings, clear financial understanding."*

Further, when I said that the assumption will be easier if it is reflected in the financial model, the participant from SPV Company (P4) confirmed that it had to be quantified. The quantified assumptions are discussed in the interview analysis of financial indicator section.

Beside asking the purpose of PPP financial model at the pre-proposal stage, 18 predetermined expectations from using PPP financial model were presented to the interviewees for their opinion. Some participants have chosen the most important expectations. Top three of the most expectations were selected in the questionnaire survey as shown in table 6.3.

**Table 6.3** Participants' expectations at the pre-proposal stage

Stakeholder (Participant)	Expectations
Sponsor (P4)	1. IRR is higher than the corporate hurdle rate; 2. Bankable; 3. Avoiding the sponsor to win a project that makes a loss.

Authority (P1)	<ol style="list-style-type: none"> <li>1. Competitively pricing a bid to assist winning a contract;</li> <li>2. Transparency of the award process;</li> <li>3. Using a financial model to evaluate the bids in a competitive tender.</li> </ol>
Authority (P9)	<ol style="list-style-type: none"> <li>1. IRR is higher than the corporate hurdle rate;</li> <li>2. Assurance that the financial model reflects the project and the financing terms;</li> <li>3. The project must generate enough cash flow so as to give lenders a margin of safety with respect to its debt service obligations.</li> </ol>
Authority (P10)	<ol style="list-style-type: none"> <li>1. Competitively pricing a bid to assist winning a contract;</li> <li>2. Reducing time and cost of bidding;</li> <li>3. Transparency of the award process.</li> </ol>
Consultant (P7)	<ol style="list-style-type: none"> <li>1. Competitively pricing a bid to assist winning a contract;</li> <li>2. Assurance that the financial model reflects the project and the financing terms;</li> <li>3. IRR is higher than the corporate hurdle rate.</li> </ol>
Consultant (P8)	<ol style="list-style-type: none"> <li>1. Competitively pricing a bid to assist winning a contract;</li> <li>2. Transparency of the award process;</li> <li>3. Ensuring the most competitive price based on the required rate of return.</li> </ol>

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#### ***6.4.2 Stakeholders expectations at the contract negotiation stage***

Since there is no contract negotiation allowed in India, PPP financial model is not employed for negotiating the contract. All of our respondents in India confirmed about this policy.

*P8: "It is there but not so much in India, contract negotiation is at the UK but not in India.."*

*P4:" That one I'm not really sure what you mean by that. To assist in the negotiation of project agreements by considering the economic and financial feasibility of a project under a variety of scenarios and assumptions. That one I don't understand...We don't use financial model here".*

Nevertheless, participants from concessionaire (P4) and consultant companies (P8) agree that pre-bid financial model can be used as a negotiation tool. During this stage, the inputs of financial model will be amended due to negotiation and agreement among the involved stakeholders. The amendment of the inputs is a process of reconciling the conflict interests among the stakeholders. The following comments were provided by the interviewees:

*P4:" Yes, to that extent what you are saying, I agree that when you made pre-bid model. We have made certain detail assumptions of how much is it we are going cost*



you. Let say, civil construction we know all those numbers, when we go for negotiation we always look back again to those number and said ok this is plus minus 5%.”

P8:” So, financial modelling help you to identify the additional condition of concession agreement or modify it or modify its condition so it becomes viable calculation ratio for whole concession agreement or additional condition”.

Apart from asking the purpose of PPP financial model at the contract negotiation stage, 25 expectations from using PPP financial model were presented to the interviewees. Top three expectations were selected by some participants as shown in table 6.4.

**Table 6.4** Participants’ expectations at the contract negotiation stage

<b>Stakeholder (Participant)</b>	<b>Expectations</b>
Sponsor (P4)	<ol style="list-style-type: none"> <li>1. Anticipating the cost overrun with the agreed fixed EPC contract (Turnkey Contract);</li> <li>2. Committing the lowest level of equity possible (less private investment);</li> <li>3. IRR is higher than interest rate of debt.</li> </ol>
Authority (P1)	<ol style="list-style-type: none"> <li>1. Securing the project from the risks (e.g. revenue risk, political risk, change in law, etc.) that can jeopardise its cash flow or financial viability;</li> <li>2. Transparency during negotiation process;</li> <li>3. IRR is higher than interest rate of debt.</li> </ol>
Consultant (P7)	<ol style="list-style-type: none"> <li>1. Reaching an agreement on forecast for cash available for debt service (CADS) over project loan life;</li> <li>2. Fiscal incentive or tax benefits from the government authority (e.g. tax holiday, tax reduction or exemption, etc.);</li> <li>3. IRR is higher than interest rate of debt.</li> </ol>
Consultant (P8)	<ol style="list-style-type: none"> <li>1. Securing the project from the risks (e.g. revenue risk, political risk, change in law, etc.) that can jeopardise its cash flow or financial viability;</li> <li>2. Reaching an agreement on forecast for cash available for debt service (CADS) over project loan life;</li> <li>3. High equity level to minimise the repayment debt risk (i.e. DSCR is higher than the minimum level of annual DSCR).</li> </ol>

### **6.4.3 Stakeholders expectations the finance-raising stage**

Respondents were asked for their opinion on the purpose of financial model at the finance-raising stage such as to facilitate due diligence, negotiation of commercial issues, forecast of the financial performance of the project, and project appraisal report. Moreover, lender modifies the initial model into lender base case financial model in order to test the project’s financial viability.

*P7: “It’s very important because you have to make a good model to make the project bankable”.*

10 alternatives expectations were presented to the participants, only the most important expectations were selected for further analysis (as shown in table 6.5).

**Table 6.5** Participants’ expectations at the finance-raising stage

<b>Stakeholder (Participant)</b>	<b>Expectations</b>
Sponsor (P4)	<ol style="list-style-type: none"> <li>1. Achieving financial closing on acceptable terms and construction start;</li> <li>2. Having joint control with the modelling bank over amended inputs and outputs of financial model transformation;</li> <li>3. Amending the model to reflect the results of the negotiation of commercial issues affecting the model’s input.</li> </ol>
Authority (P1)	<ol style="list-style-type: none"> <li>1. Achieving financial closing on acceptable terms and construction start;</li> <li>2. Examining great details of all issues at the global or national level that affect availability, price, transportation and quality of the input;</li> <li>3. Studying market of the product or service, including a thorough assessment of its proposed price structure, including elasticity analysis.</li> </ol>
Consultant (P7)	<ol style="list-style-type: none"> <li>1. Achieving financial closing on acceptable terms and construction start;</li> <li>2. Conducting sensitivity analysis for key commercial issues as needed;</li> <li>3. Amending the model to reflect the results of the negotiation of commercial issues affecting the model’s input.</li> </ol>
Consultant (P8)	<ol style="list-style-type: none"> <li>1. Achieving financial closing on acceptable terms and construction start;</li> <li>2. Conducting sensitivity analysis for key commercial issues as needed.</li> </ol>

Besides selecting the given options, P4 proposed other expectation at the finance-raising stage.

*P4:”Interested in getting cheapest finance available, more extended credit period, repayment tenor, and a good moratorium period to allow the project to kick start”.*

#### **6.4.4 Stakeholders expectations the construction stage**

At the construction stage, all participants agree that PPP financial model is used for ensuring that the impact of cost overrun does not influence debt service cover and the ability of the project vehicle to pay dividends to the sponsor.

*P4:” There will be various project review software, primavera is there, a lot people can charge in simply tools, you have the budget so you control your budget”.*

*P9:”At the construction phase, we rely on financial model prepared by the lender because ...it is more realistic and more reliable on performance measurement”.*

#### 6.4.5 Stakeholders expectations the operation stage

Although financial model at the operation stage is not the same with the model used at the previous stages, respondents were asked for confirming the purposes of PPP financial model at this stage.

*P4: " Yes, that is very important. But the financial model will keep on changing, like pre-bid proposal and finance proposal will be more or less. The finance proposal will be very detail but they broadly the same escalated. When it comes to the construction, it's totally different. When it comes to the operation, it's totally different".*

*P7: " See once you know, you have done the project, at different stage you have different model. The same model cannot work here, so the model that you started initially is not used here".*

Most of respondents agree that PPP financial models are used to monitor and track the performance of the project, to assess the impact of any annual operations budget submitted by the project vehicle to lenders, to negotiate a new tariff. However, the respondent from public party (P9) does not agree with the third purpose of financial model.

*P9: "... as a tool to negotiate a new tariff, this is not allowed... we fix the tariff upfront, but we allow some inflation rate adjustment changes (to the tariff)".*

On a different occasion, the other public party (P1), eventually, agree that PPP financial model can be used as a tool to set up a reasonable tariff. Among 9 expectations, the most important expectations were selected by the participants (as shown in table 6.6).

**Table 6.6** Participants' expectations at the operation stage

Stakeholder (Participant)	Expectations
Sponsor (P4)	<ol style="list-style-type: none"> <li>1. Easy to update the financial model;</li> <li>2. Monitoring and tracking project performance;</li> <li>3. Assessing the impact of annual operations budget.</li> </ol>
Authority (P1)	<ol style="list-style-type: none"> <li>1. Monitoring and tracking project performance;</li> <li>2. Reasonable tariff;</li> <li>3. Understandable financial model for stakeholders.</li> </ol>

Consultant (P7)	1. Securing the operational cash flow; 2. Monitoring and tracking project performance; 3. Making the model to represent reality.
Consultant (P8)	1. Monitoring and tracking project performance; 2. Reasonable tariff.

#### **6.4.6 Content analysis: most important financial indicators of PPP financial model in India**

The interview related to stakeholders' expectations in utilising PPP financial models gave me some insight into the model that should be developed. The next interview was asking the stakeholders' preference on financial indicators of PPP financial model. In order to undertake a content analysis, the predetermined financial indicators were prepared before the interview. Then, the interviewees' comments about the predetermined financial indicators were transcribed. Some relevant comments from the interviewees were highlighted as follows:

##### **6.4.6.1 Input assumptions**

Input assumptions in a financial model worksheet generally comprise of various assumptions (e.g. project timelines, economic assumptions, technical data, capital cost, loan commitment, tenor, grace, loan type, interest rate and fees, repayment structure, target of equity, ROE, tax information, working capital and reserves, etc.), which are derived from the project documents or from other relevant sources. These input assumptions were presented to the interviewees for their opinion.

*P7: "Basically all of these input over there (e.g. capital expenditures, operating assumptions, capital structure, tax, and working capital) are the fundamental costs and the input of calculating the fare, the cash flow, and the profitability. They also help you to describe the cash flow and the return of the project. Maybe some of them are not very attractive, and then you integrate your model"*

Comments of some predetermined financial input assumptions were given by interviewees. The following are the most important financial input assumptions:

- **Project timelines**

One of the respondents from government authority (P1) stated that a penalty should be imposed when the sponsor could not achieve an agreement within the specified time (i.e. concessionaires could not achieve the required financial closure within 180 days plus a grace period of 120 days).

*P1: "Prolonged negotiation period ... timeframe should be fixed, if there is a delay it should be some penalty".*

- ***Capital expenditure (Capex)***

Operating expenditure (OPEX) and capital expenditure (CAPEX) are used in the sensitivity analysis to anticipate Operating and Maintenance cost overrun (Grimsey and Lewis, 2004). Sponsor (P4) confirmed the importance of CAPEX by pointing several key variables to be addressed within CAPEX.

*P4: " Yes, one will be Capex, capital expenditures, capital expenditures will be very detail, capital expenditures will have all the detail in term of construction that has to be done, in term of mechanical, in term of electrical, power distribution, soft cost, environmental management, safety, cost of funding, utilities, staff, welfare related issues".*

- ***Volume/ traffic***

A port authority or port operator will have higher probability to attract risk capital and obtain loans when the prospective investors perceive that the traffic and financial forecasts are accurate and reliable (World Bank and PPIAF, 2007). That was the reason why authority (P1) preferred to hire some independent and reliable consultant.

*P1: "Errors in forecasting the demand ... some independent and reliable consultant should be there".*

However, high degree of uncertainty associated with medium- or long-term projections of port activity contributes potential shortfalls in projected traffic.

*P4: "The risk is your estimate, can go sometimes wrong because when you are one of the bidder in PPP, you may not have that much time information to spend*

*time and money to assess everything in detail. So you may encounter something that you actually start doing, something which is totally out of the water”.*

*P4: “...competing facilities, or the demographic change, or the law of the country change, or the economic down can happen, all of these have impact on your traffic. I think traffic estimate will have the most severe effect and vice versa also. You can also announce your project profitability better or not much better than your estimate”.*

- ***Operating cost***

Although unanticipated rise in operating costs is one of the generic concerns that are used in a series of sensitivity tests (Khan and Parra, 2003), one of the interviewees (P4) thought that there was not much risk with operating cost due its nature which was predictable and not much fluctuation.

*P4: “Operating cost is not so much risk because it is more predictable and there is no fluctuation”.*

- ***Financing cost and interest rate***

Financing cost is the cost of raising funds to finance the project; principally the cost of interest payments (Kelly, 2009). The sponsor (P4) opined financing cost was very important one because it carried interest rate risk. In order to anticipate this, government subsidies for the SPV’s interest payment should be set in such a way as to keep overall financing costs at the predetermined levels (World Bank and Ministry of Construction Japan, 1999)

*P4: “Financing cost carries some amount of risk ... Interest rate risk per se”.*

*P4: “Financing cost will have a lot of input, what is your moratorium period to be, what are your rate of interest to be at the pre-construction and post construction, how much your debt equity is going to be. And you are going to decide the leveraging. Then you have possibility of refinancing if you have. You will have multiple inputs”.*

- ***Inflation rate and revenue share / minimum revenue guarantee***

The inflation rate fluctuation is believed to have impacted the project. The interviewee from government authority (P1) confirmed that it had an effect on the revenue share. Furthermore, the sponsor (P4) perceived that inflation fluctuation below 4 percent would not affect the project.

*P1: "Revenue share, from the government point of view the fluctuation of inflation rate is affecting the revenue share".*

*P4: "2 to 4 percent changes will not affect your project but more than five percent will have significant effect. Inflation risk is covered by forward contract".*

- ***Return on equity***

Participant from authority (P1) argued that return on equity should be calculated based on annual rate of return.

*P1: "Rate of return restriction, it should be from actual rate of return (strategy)".*

- ***Tax***

Although Tax holiday has been regulated in Indian PPP project, one of the respondents from Indian seaport authority indicated that this policy was not put into practice.

*P1: "Tax holiday in Indian PPP seaport project is not yet implemented. In order to attract private investors, tax holiday should be there".*

- ***Project cost***

Authority (P1) argued that the project cost could be reduced by taking into consideration of design cost and bidding cost.

*P1: "High design cost, high bidding cost ... that should be taken care of when you're deciding the bidding document. It will cut the project cost."*

- ***Capital structure***

Lenders are concerned more on the safety and return of their money, which is reflected by a prudent and self-sustaining project capital structure. Kulkarni and Prusty (2007) stated that the debt-equity ratio of the project depended on the financial strength of the sponsor in arranging debt funding from financial institutions. Nevertheless, government authority in India (P1) did not interfere the debt to equity ratio of the project.

*P1: "...Government does not have debt that much; debt and equity are the crucial issues in regards to private. Debt and equity are important but not the crucial issues for the government".*

#### **6.4.6.2 Financial output indicators**

An overall summary is shown on output worksheet to help the reader see the financial viability of the project, which includes pro forma financial statements (e.g. income statement, balance sheet and cash flow statement) and key ratios such debt service coverage ratio (DSCR), loan life cover ratio (LLCR), net present value (NPV), interest rate of return (IRR) and return on equity (ROE). In order to gain more insight of financial output indicators, the interviewees were asked for their opinion about the predetermined financial output indicators. The following comment is the most important financial output given by one of the participants.

*P7: "Revenue, operating cost, interest rate, CADS, Free cash flow to equity, DSCR, IRR, ROE, Payback, and shareholders return are the most important output".*

Comments of some predetermined financial output indicators were given by interviewees. The following are the most important financial output indicators:

- ***Project IRR***

Some interviewees strongly agreed that project IRR was one of the most important financial output.

*P1: "IRR should be at least 15%".*



*P7: "IRR should be more than the opportunity cost of the company".*

Notwithstanding the importance of IRR in evaluation financial viability of PPP project, it should used only for evaluating a single project rather than comparing mutually exclusive projects. Higher IRR does not guarantee that the project is more attractive than the other project is (Kelleher and MacCornack, 2004). Further, one of the participants from sponsor (P4) stated that IRR should not be used alone in relation to PPP projects. As supported by Cuthbert and Cuthbert (2012), they argued that IRR utilisation understates the true opportunity cost of PPP finance to public sector and the potential profit earned by private sector.

*P4: "Then you may end up not securing your project if you only IRR focus and if your benchmark of your an IRR is very high".*

- **NPV**

Lohmann (1988) stated that IRR and NPV are the most common and essential economic decision measure used in evaluating a project. In a PPP project, NPV is used to determine value for money by comparing the NPV between PPP and PSC. Thus, it was pertinent that government authority (P1) expected a higher NPV.

*P1: "NPV should be the highest value".*

- **DSCR**

DSCR and LLCR are commonly employed by lenders to evaluate the project's ability to meet its debt service (Lamb and Merna, 2004). Consultant (P7) suggested that an acceptable DSCR should be more than 1.

*P7: "For the Debt Service Coverage Ratio (DSCR) should be greater than 1".*

- **Payback**

A project is acceptable if its payback is less than the maximum cost recovery time established by the analyst (Boussabaine, 2006). Some interviewees

revealed that they have different expectation on payback period. Authority (P1) expectation was longer than consultant (P7) upon payback period.

*P1: "Payback period should be 15 to 20 years".*

*P7: "shorter payback, ok. But some people depend upon what is the rate, the structure, people want coverage ratio, people want so many other things. It's not really matter".*

*P7: "Probably concession given, normally concession year is 30 years. But people will expect that payback will be something like from 10 to 15 years".*

## **6.5 Content analysis findings**

This section addresses the answers of two research questions stated earlier. The first question is: *who are the stakeholders going to manage the risks related to developing large infrastructure projects?* This question is limited to the stakeholders who are using PPP financial models. Ten participants gave their answer as follows: Sponsor, Authority, Other potential sponsor, Investor, Lender, Independent Engineer, Advisory Agency, Modelling bank, Inter-creditor Agent, Consultant, and Transaction adviser. And the second question is: *what are the stakeholders' expectations in utilising PPP financial models?* To answer the second question, the importance of the pre-determined 64 expectations in five project stages was analysed, 42 expectations have been selected in the questionnaire (see table 6.7). The most important financial input assumptions and output indicators were identified (see table 6.8).

**Table 6.7a** The expectation of major participants at the pre-proposal stage

Major Participants	Stakeholders' Expectations (Critical Success Factors)	Literature	Interview	Questionnaire
Sponsor(s) and other potential sponsor	Avoiding winning unprofitable contract.	√	√	
	Competitively pricing a bid to assist winning a contract*.	√	√	√
	Assurance that the financial model reflects the project and the financing terms*.	√	√	√
	Assurance that the financial model can be used to determine the project's ranking under capital rationing.	√	√	
	Reducing time and cost of bidding*.	√	√	√
	Transparency of the award process*.	√	√	√
	Unsolicited proposal with important innovations (e.g. a new type of project, or new solution to known problem, or new ways of defining performance standards).	√	√	
	IRR is higher than the corporate hurdle rate*.	√	√	√
	Preferring to submit unsolicited proposal because provide more scope to participate in defining technical and commercial outlines of the project.	√	√	
	Bankable*	√	√	√
Getting involved in the long-term considerations for having a presence in one country.	√	√		
Government authority	Checking the project's ability to deliver value for money (VFM).	√	√	
	Quick process of awarding the unsolicited proposal, due to the urgent demand of the facilities provided from the project, with a reduced level of risk for the government.	√	√	
	Robust operational experience and financial strength of the bidder during request for qualification (RFQ) process.	√	√	
	Using a financial model to evaluate the bids in a competitive tender*.	√	√	√
Investors / lenders	The project must generate enough cash flow so as to give lenders a margin of safety with respect to its debt service obligations*.	√	√	√
Advisory agencies	Ensuring the most competitive price based on the required rate of return.	√	√	
	Avoiding the sponsor to win a project that makes a loss (e.g. if an error understates costs, thus bidding too low a price)*.	√	√	√

\* The most important expectations according to interview

**Table 6.7b** The expectation of major participants at the contract negotiation stage

Major Participants	Stakeholders' Expectations (Critical Success Factors)	Literature	Interview	Questionnaire
Sponsor(s)	Anticipating the cost overrun with the agreed fixed EPC contract (Turnkey Contract)*.	√	√	√
	Committing the lowest level of equity possible (less private investment)*.	√	√	√
	Securing the project from the risks (e.g. revenue risk, political risk, change in law, etc.) that can jeopardise its cash flow or financial viability*.	√	√	√
	Shorter negotiation process, longer concession period and shorter payback period.	√	√	
	Fiscal incentive or tax benefits from the government authority (e.g. tax holiday, tax reduction or exemption, etc.).	√	√	√
	Lower guarantee fee or credit enhancement fee (maximum annual fee rate: 1.5%) paid by the sponsor.	√		
	Transparency during negotiation process*.	√	√	√
	IRR is higher than interest rate of debt*.	√	√	√
Advisory agencies (e.g. underwriter)	Guaranteeing that the debt being sought will be successfully placed.	√	√	
	Taking the risk of a successful syndication by making up whatever shortfall there is between debt being sought and that successfully placed.	√	√	
Government authority	Shorter concession period, low total project life-cycle cost and low equity level.	√		
	Longer payback period to secure a good project management practices and a long-term commitment of the sponsor(s).	√		
	Securing the equity level could satisfy the interests of equity holders, lenders, and the general public.	√		
	Securing the government's affordability in supporting the project.	√	√	
	Knowing whether the government should provide subsidies in order to promote private investment in the project or not, if the self-liquidation ratio (SLR) is less than 1.	√	√	
	Minimizing the level of subsidise or compensation if the project revenue is less than expectation or if the contract is terminated.	√	√	
Lenders	High equity level to minimise the repayment debt risk (i.e. DSCR is higher than the minimum level of annual DSCR).	√	√	√
	High risk premiums for a low equity level.	√		√
	Knowing how much senior debt that the project is able to carry.	√		√

Knowing whether the project needs a subordinated lender or not (the minimum range of required LLCR for a container port is between 1.50 and 1.90 in order to determine subordinated loan).	√		√
Reaching an agreement on forecast for cash available for debt service (CADS) over project loan life*.	√	√	√
Expecting that all project agreements are structured in such way to remove risk from the project vehicle and allocate it to someone else in a better position to absorb it.	√	√	
Assurance that the lenders are only lending the amount the project can support (“Debt Sizing”).	√	√	√
Insurance that there is someone to sue if there is a material error in the model resulting in the debt not being repayable.	√		√
Credit Committee requirement.	√	√	√

\* The most important expectations according to interview

**Table 6.7c** The expectation of major participants at the finance-raising stage

Major Participants	Stakeholders’ Expectations (Critical Success Factors)	Literature	Interview	Questionnaire
Sponsor(s)	Achieving financial closing on acceptable terms and construction start*.	√	√	√
	Having joint control with the modelling bank over amended inputs and outputs of financial model transformation*.	√	√	√
Modelling bank	Expanding the project input, calculation and output worksheet.	√	√	√
	Amending the model to reflect the results of the negotiation of commercial issues affecting the model’s input*.	√	√	√
	Conducting sensitivity analysis for key commercial issues as needed.	√	√	√
	Verifying the accuracy of formulae used in the model in collaboration with the model auditor.	√	√	√
Independent Engineer	Examining great details of all issues at the global or national level that affect availability, price, transportation and quality of the input*.	√	√	√
Marketing Expert	Analysing global and regional trends affecting the product or service that will be offered.	√	√	√
	Assessing the issues that affect price, availability, quality, or transportation thereof.	√	√	√
	Studying market of the product or service, including a thorough assessment of its proposed price structure, including elasticity analysis*.	√	√	√

\* The most important expectations according to interview

**Table 6.7d** The expectation of major participants at the construction stage

Major Participants	Stakeholders' Expectations (Critical Success Factors)	Literature	Interview	Questionnaire
Sponsor(s), Inter-creditor agent and Independent Engineer	Ensuring the impact of cost overrun does not influence debt service cover and the ability of the project vehicle to pay dividends to the sponsor*.	√	√	√
Lenders	Anticipating to claim the declaration of the loan agreement breaching*.	√	√	√

\* The most important expectations according to interview

**Table 6.7e** The expectation of major participants at the operational stage

Major Participants	Stakeholders' Expectations (Critical Success Factors)	Literature	Interview	Questionnaire
Sponsor(s)	Securing the operational cash flow*.	√	√	√
	Understandable financial model for stakeholders*.	√	√	√
	Useable financial model by SPV managers.	√	√	
	Easy to update the financial model*.	√	√	√
Inter-creditor agent	Monitoring and tracking the project performance (e.g. cover ratio, outturn shareholder IRRs, etc.)*.	√	√	√
	Making the model represents a reality.	√	√	√
Government authority	Reasonable tariff*.	√	√	√
	Significant port performance compared to pre-reform and other ports.	√	√	
Lenders	Assessing the impact of annual operations budget*.	√	√	√

\* The most important expectations according to interview

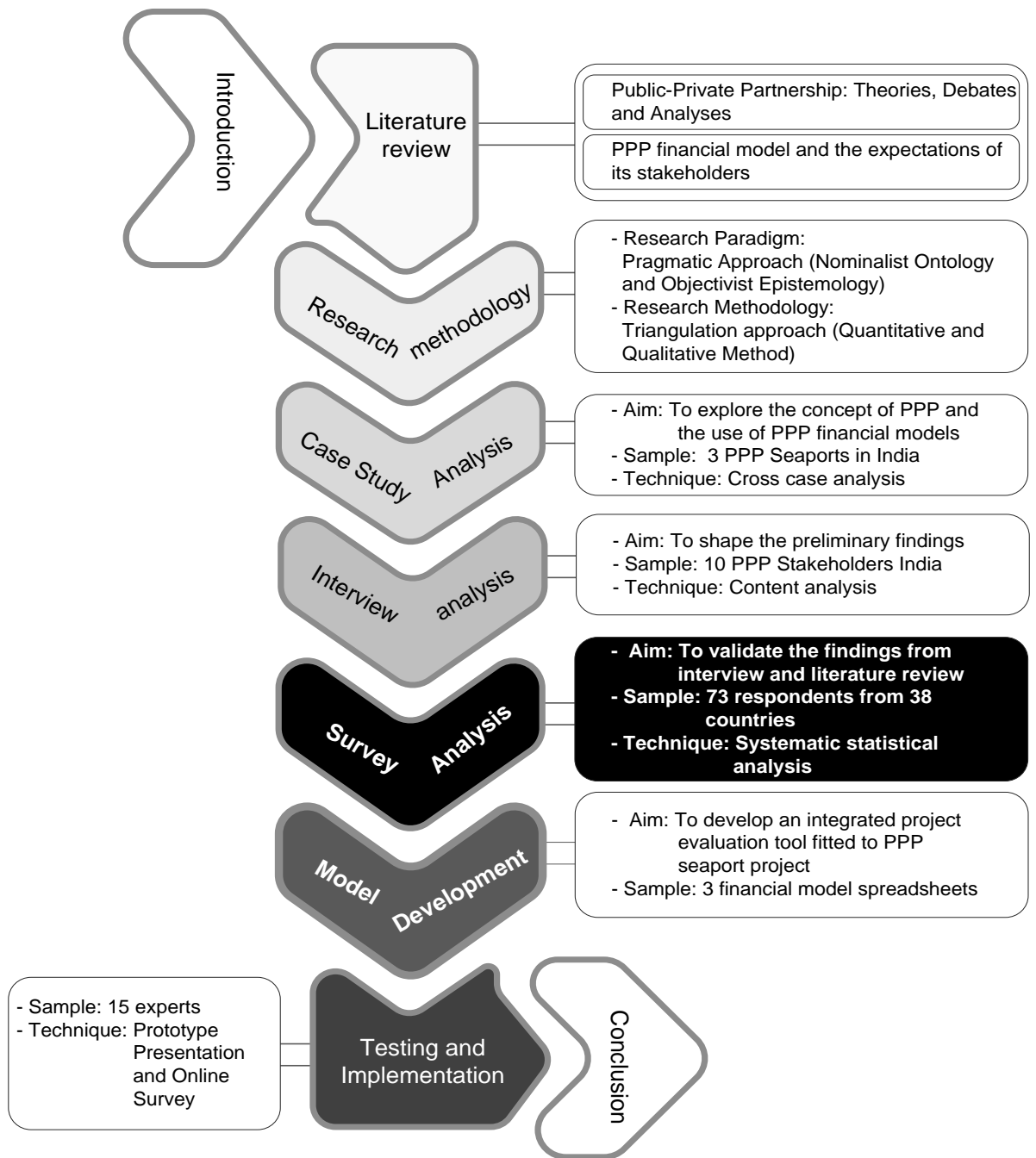
**Table 6.8** Participants' Preferred Financial Indicators

Stakeholder (Participant)	Most Important Financial Indicators	
	Input	Output
Sponsor (P4)	<ol style="list-style-type: none"> <li>1. Capex</li> <li>2. Volume/ traffic</li> <li>3. Operating cost</li> <li>4. Financing cost</li> </ol>	<ol style="list-style-type: none"> <li>1. IRR</li> <li>2. NPV</li> <li>3. Payback</li> <li>4. Margin/operation margin</li> <li>5. DSCR</li> <li>6. Interest covering ratio</li> <li>7. EBITDA</li> </ol>
Authority (P1)	<ol style="list-style-type: none"> <li>1. Project timelines</li> <li>2. Inflation rate</li> <li>3. Revenue share / minimum revenue guarantee</li> <li>4. Operating assumptions</li> <li>5. Debt</li> <li>6. Interest rate</li> <li>7. Return on Equity</li> <li>8. Tax</li> <li>9. Working capital</li> </ol>	<ol style="list-style-type: none"> <li>1. Revenue</li> <li>2. IRR</li> <li>3. Payback</li> </ol>
Authority (P9)	<ol style="list-style-type: none"> <li>1. Project cost</li> <li>2. Traffic assumptions</li> <li>3. Tariff</li> </ol>	<ol style="list-style-type: none"> <li>1. PLCR</li> <li>2. Revenue</li> <li>3. Operating cost</li> <li>4. ROE</li> </ol>
Consultant (P7)	<ol style="list-style-type: none"> <li>1. Capex</li> <li>2. Operating assumptions</li> <li>3. Capital structure</li> <li>4. Tax</li> <li>5. Working capital</li> </ol>	<ol style="list-style-type: none"> <li>1. Revenue</li> <li>2. Operating cost</li> <li>3. Interest rate</li> <li>4. CADS</li> <li>5. Free cash flow to equity</li> <li>6. DSCR</li> <li>7. IRR</li> <li>8. ROE</li> <li>9. Payback</li> <li>10. Shareholders return</li> </ol>
Consultant (P8)	<ol style="list-style-type: none"> <li>1. Traffic</li> <li>2. Tariffs</li> <li>3. Interest rate</li> <li>4. Capex</li> </ol>	<ol style="list-style-type: none"> <li>1. IRR</li> <li>2. Coverage Ratio</li> <li>3. LLCR</li> <li>4. PLCR</li> <li>5. Revenue Share</li> <li>6. Subsidy</li> </ol>

## 6.6 Chapter summary

This chapter discusses the findings from the interviews in India. Content analysis technique was employed in analysing the interview findings. Contents regarding different aspects of stakeholders' expectations and PPP financial indicators were interpreted and corroborated in a similar and progressive fashion where construct validity was used to ground the findings. The findings were also prepared for questionnaire survey for further analysis.

# CHAPTER SEVEN: QUESTIONNAIRE SURVEY ANALYSIS





## Chapter 7: Questionnaire Survey Analysis

*“Question is the beginning of thought”*

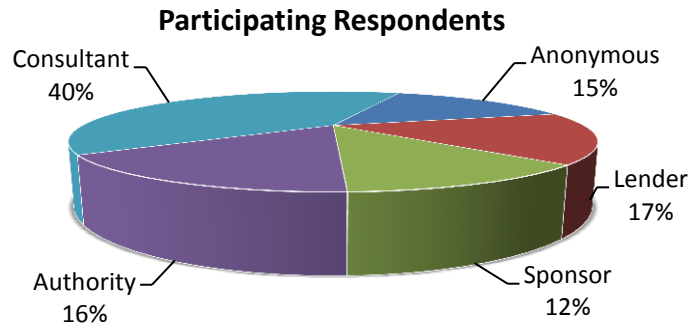
Felix S. Cohen (1907 – 1953)

### 7.1 Introduction

This chapter follows up the findings from literature review, cross case analysis, and interview analysis. Stakeholders’ expectations and the evaluation procedure by using PPP financial model have been identified in the previous chapters (chapter 3 and chapter 5 respectively). This was followed by several semi-structured interviews whereas face-to-face interviews serve as a crosscheck and, sometimes, unexpected information may be given during the interviews (Kothari, 1988). Then, questionnaire survey, as one of the most cost-effective ways to involve a large number of people in the process, was conducted in order to achieve better results. As part of triangulation process, a structured questionnaire survey was also considered to be the second validation process of the preliminary findings from literature review and interview. The questionnaire aims to answer the second and third research questions: *what are the most important stakeholders’ expectations in utilising PPP financial models? And what are the financial risk variables within PPP financial models?”* (see 1.6). To answer these questions, this chapter presents a systematic statistical analysis of the collected data. The analysis is divided into main sections: 1) Statistical Analyses (e.g. Sampling Adequacy Test, Principal Component Analysis, Validity Analysis, Reliability Analysis, and Agreement Analysis); and 2) Summary of chapter.

### 7.2 Sampling Adequacy Test

In total, four hundred questionnaires were distributed. Seventy-three respondents completed the whole questionnaire. Many of the respondents were from organizations that had rich experience, knowledge, and expertise in PPPs as illustrated in figure 7.1. and table 7.1.



**Figure 7.1** Participating respondents by percentage

**Table 7.1** Participating respondents and their organisations.

N	Respondents	Organizations
29	Financial consultant companies	KPMG, ECORYS, Ernst & Young, CPCS Transcom, Rebel Group Advisory, Accenture, PPP Solutions Limited, Global Assimilate, G&K Wing-Lun Pty Ltd, Kumar Associates, Moreland Advisors, LLC, Instrivas Pte Ltd, Altra Capital, and United Nations Development Programme.
12	Government authorities	Egyptian Ministry of Transport , Infrastructure Project Development Facility (Pakistan), Public Private Partnership Unit (Pakistan), Ministry of Economic Planning & Investment Promotion (Zimbabwe), General Secretariat of the Government of Romania, National Database & Registration Authority (Pakistan), Egyptian Ministry of Investment, and Invest Lithuania.
12	Financing institutions	International Finance Corporation, West LB, Bayern LB, Bank Muscat, Zenith International Bank, Bank of Ireland, Macquarie Group Limited, Natixis, and Evergreen Investments.
9	Sponsor companies	DP World, APMT, Shanghai International Port Group SHOST, Aljabor Group Holdings, Moncada Energy Group, TTS Port Equipment, and Kharafi National.
11	Anonymous	Not available
73	Total respondents from 38 countries	

Sampling adequacy test is needed to decide whether the sample is sufficient for factor analysis or principal component analysis (PCA). The Kaiser-Meyer-Olkin (KMO) is chosen to examine the sampling adequacy of the questionnaire survey. This examination was tested in every stage. The KMO values for the stakeholders' expectations at five stages and financial indicators (Input and Output) are shown in table 7.2 (the details in SPSS are shown in appendix 3). These values indicate that the data is adequate for principal component analysis because it is greater than 0.5 (see Field, 2009).

**Table 7.2** KMO measure of sampling adequacy

No.	Group of Variables	KMO Measure of Sampling Adequacy
1	Pre-proposal stage	0.661
2	Contract negotiation stage	0.602
3	Finance-raising stage	0.842
4	Construction and operation stage	0.732
5	Input	0.827
6	Output	0.818

### **7.3 Principal component analysis**

To find the important stakeholders' expectations and to classify them based on similar dimension of variance, principal component analysis (PCA) was selected in this study. PCA is more appropriate than factor analysis when the primary goal is to reduce the number of data (Field, 2009). PCA extracts highly correlated expectations into a small number of key components (dimensions) of financial model utilisation. There are two main results of PCA: (1) the total variance explained by the extracted components, and (2) the rotated component matrix. Since the stakeholders' expectations in utilising PPP financial models are not always identical at every stage, the PCA was conducted according to each stage.

#### ***7.3.1 An example of pca for stakeholders' expectations at the pre-proposal stage***

Since PCA is used to extract highly correlated stakeholders' expectations into a small number of key components (dimensions) of the financial model utilisation, the principal components are extracted by specifying eigenvalues<sup>39</sup> greater than a specific value. Here is the rule, only principal components have a large percentage of variance with Eigenvalue more than 1 (as shown in table 7.3) are selected for further analysis.

In table 7.3, the eigenvalues are shown in "Total" column. The percentage of component's variance is placed in the "% of variance" column. Thus, three components cumulatively explain 61.72 % of the total variance. In addition, there is another way to determine how the minimum Eigenvalue should be chosen. The aforementioned extraction of principal components can be supported by visual graphic analysis

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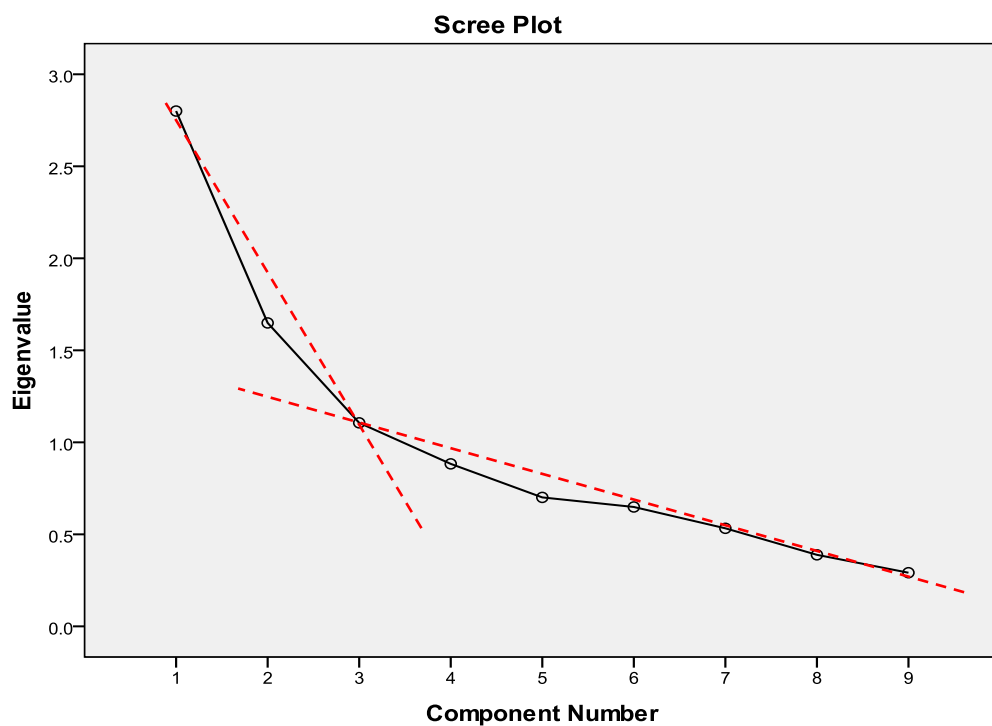
<sup>39</sup> "Eigenvalues are the variances of the principal components" (Zhang, 2005d).

(drawing two regression lines to find the crossed section) as appears in figure 7.2. Component 3 is the point of inflexion between imaginary vertical and horizontal (red dashed) lines.

**Table 7.3** Total variance explained at the pre-proposal stage

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.800	31.113	31.113	2.800	31.113	31.113
2	1.649	18.320	49.433	1.649	18.320	49.433
3	1.106	12.287	61.720	1.106	12.287	61.720
4	.883	9.811	71.531			
5	.701	7.785	79.317			
6	.649	7.208	86.524			
7	.533	5.919	92.444			
8	.389	4.319	96.762			
9	.291	3.238	100.000			

Extraction Method: Principal Component Analysis.



**Figure 7.2** Scree plot for principal component analysis.

**Table 7.4** Rotated component matrix<sup>a</sup>

Stakeholders' expectations	Component		
	1	2	3
Generate enough cash flow	.750		
Reflect project and financing term	.749		
Bankable	.712		
Competitive pricing	.550		
Avoid winning an unprofitable project	.533		
Transparency		.873	
Competitive tender evaluation		.779	
Reducing time and cost		.753	
Attractive IRR			.864

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

Since the stakeholders' expectations are assumed to be independent, the Varimax method is selected to rotate the principal components. Table 7.4 shows the results of orthogonal rotated component matrix, which determines relative importance among the stakeholders' expectations into similar components. Each component indicates the level of variance. The first component has the largest variance compared to the other components. As shown in table 7.4, the 9 expectations are grouped into three components. Furthermore, the number of expectations can be reduced by selecting the highest correlation score within each component. Hence, "Generate enough cash flow" represents component I (0.750). "Transparency" represents component II (0.873). And Component III (0.864) is represented by "Attractive IRR". However, these results have to be further analysed for validity and reliability.

### 7.3.2 The results of PCA for stakeholders' expectations at all stages

As described earlier, the process of PCA for determining the total variance is explained by the extracted components. The rotated component matrix was identical at all stages. The summary of these results are shown in table 7.5.

**Table 7.5** Summary of PCA at all stages

No.	Total variance explained (%)	Principal component's representative	Stage
1	61.720	Generate enough cash flow, Transparency, Attractive IRR.	Pre-proposal stage
2	64.627	Transparency, project's borrowing power, lowest equity, high equity, subordinated lender determination.	Contract negotiation stage
3	55.859	Details examination at the global or national level, formulae verification.	Finance-raising stage
4	60.412	Close to reality representation, claim anticipation, securing the operational cash flow.	Construction and operation stage

Although these results were pertinent for selecting the representative (based on each principal component) of stakeholders' expectations at every stage, its validity<sup>40</sup> was untested yet. The subsequent section analyses the validity of principal components.

## 7.4 Validity Analysis

When the emergent components are derived from PCA, the relationships between stakeholders' expectations should be examined whether they are positively correlated with the other expectations or not. In this analysis, the importance of stakeholders' expectations in utilising PPP financial models and the preferred financial indicators are measured by using a Likert scale. Although the categorisation of Likert scale remains debatable (Norman, 2010)<sup>41</sup>, previous researches in the same area assume it as an interval scale (e.g. Chan *et al.*, 2001; Zhang, 2005; Zhang and Jia, 2009; and Chan *et al.*, 2009).

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<sup>40</sup> Stakeholders' expectations are considered valid when they are correlated with the other expectations.

<sup>41</sup> While a Likert scale is assumed to be ordinal scale (non-parametric test is preferred), parametric tests such as the analysis of variance can also be applied by assuming the scale as an interval scale (Norman, 2010).

Since the exploration of relationship between stakeholders' expectations and financial indicators is also included in the analysis, both Pearson bivariate correlation (parametric) and Spearman's rank correlation (non-parametric) analyses are selected in this analysis. Therefore, all valid correlations among stakeholders' expectations and relationship between stakeholders' expectations and financial indicators are entirely covered<sup>42</sup>. A two-tailed test is also selected because the nature of the relationship is unknown. When the coefficient of correlation is very low (close to zero), there is no relationship between variables. However, low coefficient value ( $r > 0.1$ ) should not be undermined because it is lower when more samples are gathered (Field, 2009).

To figure out the significance of the stakeholders' expectations relationship<sup>43</sup>, the p value of each correlation (within each principal component) must be less than 0.05. The results, as shown in table 7.6 (the pre-proposal stage), and appendix 3 (the contract negotiation, finance-raising, and construction and operation stages), indicate that all stakeholders' expectations are significantly correlated within each component. It means that each component contains valid stakeholders' expectations.

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<sup>42</sup> *After testing both methods, the findings between Pearson bivariate correlation and Spearman's rank correlation analyses are not always identical.*

<sup>43</sup> *The relationship means a correlation among stakeholders' expectations in utilising PPP financial models. However, it should be noted that a correlation does not imply causation (Aldrich, 1995; and Kothari, 1997).*

**Table 7.6** Stakeholders' expectations correlations at the pre-proposal stage

Stakeholders' Expectations	Correlation Tests	Stakeholders' Expectations	Input	Output
Generate enough cash flow (PP – 8)	Pearson Correlation	PP – 2 (0.491**); PP – 6 (0.465**); PP – 1 (0.275*); PP – 9 (0.25*).	Project cost (0.442**); Project time lines (0.267*); Royalty (0.404**); Traffic (0.357**); Initial working capital (0.296*); Financing cost (0.389**); Refinancing (0.39**); Capital structure (0.25*); Revenue forecasts (0.41**); Tariff (0.27*); Loan commitment (0.292*); Schedule of disbursement (0.253*); Operating cost (0.376**); Maintenance cost (0.367**).	IRR (0.256*); NPV (0.306*); DSCR (0.352**); Interest covering ratio (0.286*); CADS (0.326**); LLCR (0.271*).
	Spearman's rho	PP – 2 (0.509**); PP – 6 (0.423**); PP – 7 (0.247*).	Project cost (0.474**); Project time lines (0.251*); Royalty (0.375**); Traffic (0.404**); Initial working capital (0.322**); Financing cost (0.414**); Refinancing (0.373**); Capital structure (0.323**); Revenue forecasts (0.445**); Inflation (0.246*); Tariff (0.315*); Loan commitment (0.338**); Schedule of disbursement (0.264*); Operating cost (0.406**); Maintenance cost (0.407**).	IRR (0.3*); NPV (0.318*); DSCR (0.369**); Interest covering ratio (0.316*); ROE (0.309*); CADS (0.339**); LLCR (0.284*).
Reflect project and financing term (PP – 2)	Pearson Correlation	PP – 8 (0.491**); PP – 6 (0.356**); PP – 1 (0.302*); PP – 9 (0.253*).	Revenue forecasts (0.287*); Inflation (0.279*); Tariff (0.348**); Interest or swap costs associated with the debt (0.328**); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.31*); Interest rate hedge (0.317*); Maintenance cost (0.453**).	Interest covering ratio (0.305*); PLCR (0.349**).
	Spearman's rho	PP – 8 (0.509**); PP – 6 (0.392**); PP – 1 (0.312*); PP – 4 (0.260*); PP – 9 (0.262*).	Traffic (0.262*); Capital structure (0.254*); Revenue forecasts (0.336**); Inflation (0.295*); Tariff (0.327*); Interest or swap costs associated with the debt (0.349**); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.278*); Schedule of disbursement (0.271*); Interest rate hedge (0.289*); Maintenance cost (0.448**).	Interest covering ratio (0.261*); PLCR (0.336**); LLCR (0.283*).
Bankable (PP – 6)	Pearson Correlation	PP – 8 (0.465**); PP – 2 (0.356**); PP – 1 (0.306**); PP – 9 (0.341**).	Royalty (0.28*); Refinancing (0.327**); Capital structure (0.259*); Loan commitment (0.299*); Maintenance cost (0.333**).	DSCR (0.27*); Interest covering ratio (0.346**); ROE (0.263*); CADS (0.253*).
	Spearman's rho	PP – 8 (0.465**); PP – 2 (0.356**); PP – 1 (0.306**); PP – 9 (0.341**).	Traffic (0.263*); Initial working capital (0.249*); Refinancing (0.336**); Capital structure (0.327**); Revenue forecasts (0.255*); Loan commitment (0.362**); Maintenance cost (0.369**).	IRR (0.264*); DSCR (0.293*); Interest covering ratio (0.344**); Revenue (0.276*); ROE (0.282*); CADS (0.266*).



**Table 7.5** Stakeholders' expectations correlations at the pre-proposal stage (continued)

Stakeholders' Expectations	Correlation Tests	Stakeholders' Expectations	Input	Output
Competitive pricing (PP – 1)	Pearson Correlation	PP – 8 (0.423**); PP – 2 (0.392**); PP – 9 (0.300*).	Project time lines (0.308*); Royalty (0.384**); Initial working capital (0.329**); Inflation (0.310*); Loan commitment (0.371**); Maintenance cost (0.330**).	Net operating cost (0.257*); IRR (0.375**); NPV (0.318*); Repayment period (0.316**); LLCR (0.265*).
	Spearman's rho	PP – 3 (0.374**); PP – 2 (0.312**); PP – 9 (0.376**).	Project time lines (0.301*); Royalty (0.384**); Initial working capital (0.362**); Tax information (0.276*); Capital structure (0.258*); Inflation (0.382**); Exchange rate parity (0.248*); Tariff (0.327*); Interest or fees (0.258*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.271*); Loan commitment (0.397**); Interest rate hedge (0.275*); Maintenance cost (0.331**).	Net operating cost (0.273*); IRR (0.389**); NPV (0.318*); Repayment period (0.372**); DSCR (0.261*); ROE (0.263*); Principal payback (0.299*); LLCR (0.288*).
Avoid winning an unprofitable project (PP – 9)	Pearson Correlation	PP – 8 (0.250*); PP – 2 (0.253*); PP – 6 (0.341**); PP – 1 (0.404**).	Project time lines (0.259*); Refinancing (0.336**); Maintenance cost (0.258*).	Operating margin (0.31*); EBITDA (0.342*); LLCR (0.275*).
	Spearman's rho	PP – 2 (0.262**); PP – 6 (0.300*); PP – 1 (0.376**).	Refinancing (0.33**); Maintenance cost (0.261*).	Operating margin (0.282*); EBITDA (0.33*); LLCR (0.32*).
Transparency (PP – 4)	Pearson Correlation	PP – 7 (0.485**); PP – 3 (0.584**).	Initial working capital (0.289*); Target of equity (0.271*); Tax information (0.287*); Working capital (0.275*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.299*); Loan commitment (0.333*).	Net operating profit (0.387**); NPV (0.256*); Repayment period (0.285*); EBITDA (0.262*); PLCR (0.347**); Revenue (0.315*); Operating cost (0.408**); Principal payback (0.382**).
	Spearman's rho	PP – 7 (0.426**); PP – 2 (0.260*); PP – 3 (0.452**).	Tax information (0.283*); Exchange rate parity (0.298*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.321*); Loan commitment (0.26*).	Net operating profit (0.385**); NPV (0.256*); Repayment period (0.253*); PLCR (0.368**); Revenue (0.265*); Operating cost (0.335**); Principal payback (0.384**).

**Table 7.6** Stakeholders' expectations correlations at the pre-proposal stage (continued)

Stakeholders' Expectations	Correlation Tests	Stakeholders' Expectations	Input	Output
Competitive tender evaluation (PP – 7)	Pearson Correlation	PP – 4 (0.485**); PP – 3 (0.463**).	General construction index (0.273**); Initial working capital (0.303*); Target of equity (0.271*); Refinancing (0.505**); Tax information (0.286*); Working capital (0.306*); Capital structure (0.327**); Tariff (0.286*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.504**).	IRR (0.313**); Operating margin (0.389**); EBITDA (0.390*); PLCR (0.389**); Revenue (0.3*); Operating cost (0.285*); Principal payback (0.342*); LLCR (0.261*).
	Spearman's rho	PP – 8 (0.247*); PP – 4 (0.426**); PP – 3 (0.378**).	General construction index (0.333**); Refinancing (0.495**); Tax information (0.306*); Tariff (0.254*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.491*).	IRR (0.355**); Operating margin (0.361**); EBITDA (0.293*); PLCR (0.345**); Revenue (0.26*); Principal payback (0.309*).
Reducing time and cost (PP – 3)	Pearson Correlation	PP – 4 (0.584**); PP – 7 (0.463**); PP – 5 (0.334**).	General construction index (0.332**); Initial working capital (0.515**); Target of equity (0.4**); Pre-defined ROE (0.354**); Tax information (0.309**); Working capital (0.397**); Inflation (0.254*); Exchange rate parity (0.353**); Interest and fees (0.271*); Interest or swap costs associated with the debt (0.304*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.362*); Loan commitment (0.406**).	Net operating profit (0.502**); NPV (0.438**); Operation Margin (0.421**); Repayment period (0.486**); PLCR (0.274*); Revenue (0.283*); ROE (0.283*); Operating cost (0.334**); Principal payback (0.525**).
	Spearman's rho	PP – 1 (0.374**); PP – 4 (0.452**); PP – 7 (0.378**); PP – 5 (0.419**).	General construction index (0.383**); Royalty (0.273*); Initial working capital (0.479**); Target of equity (0.354**); Pre-defined ROE (0.34**); Tax information (0.353**); Working capital (0.32*); Inflation (0.254*); Exchange rate parity (0.355**); Tariff (0.264*); Interest and fees (0.28*); Interest or swap costs associated with the debt (0.257*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.36*); Loan commitment (0.45**).	Net operating profit (0.499**); NPV (0.438**); Operation Margin (0.397**); Repayment period (0.379**); ROE (0.278*); Principal payback (0.509**).

**Table 7.6** Stakeholders' expectations correlations at the pre-proposal stage (continued)

Stakeholders' Expectations	Correlation Tests	Stakeholders' Expectations	Input	Output
Attractive IRR (PP – 5)	Pearson Correlation	PP – 3 (0.334).	Project time lines (0.373**); General construction index (0.307*); Royalty (0.295*); Initial working capital (0.41**); Target of equity (0.35**); Pre-defined ROE (0.333**); Tax information (0.296*); Working capital (0.342**); Inflation (0.282*); Exchange rate parity (0.331*); Tariff (0.391**); Interest and fees (0.26*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.262*); Loan commitment (0.296*); Maintenance cost (0.318*).	Net operating profit (0.292*); NPV (0.316*); ROE (0.265*); Principal payback (0.457**).
	Spearman's rho	PP – 3 (0.419).	Project cost (0.263*); Project time lines (0.392**); General construction index (0.318*); Royalty (0.292*); Initial working capital (0.426**); Target of equity (0.337**); Pre-defined ROE (0.354**); Working capital (0.383**); Inflation (0.264*); Exchange rate parity (0.304*); Tariff (0.393**); Interest and fees (0.268*); Economic assumptions related to global and domestic inflation or foreign exchange parity (0.273*); Loan commitment (0.286*); Maintenance cost (0.297*).	Net operating profit (0.266*); NPV (0.286*); ROE (0.305*); Principal payback (0.368**).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

## 7.5 Internal consistency reliability test

After the relationship between stakeholders' expectations and the preferred financial indicators was validated, the internal consistency or the repeatability of the agreement scale should be ensured at certain level. If the agreement scale (ranging from 1-6) for measuring the importance of each expectation and financial indicator yields relatively the same result over time, its measurement consistency is reliable. Therefore, Cronbach alpha is selected to test the internal consistency reliability of the agreement scale. The reliability coefficient is determined by the average correlation between stakeholders' expectations and the number of stakeholders' expectations.

Although the higher value of Cronbach Alpha (above 0.6 or closed to 1) is better, yet the emergent value should be cautiously interpreted. Field (2009) stated that when the number of variables on the scale increases, Cronbach Alpha will also increase. In order to test the internal consistency reliability of the agreement scale, multiple tests must be applied with one of the variables deleted. When the results are below or slightly above the original Cronbach Alpha, and Corrected Item-Total Correlation test is higher than 0.2 or 0.3, the internal consistency reliability is achieved (Everitt, 2002 and Field, 2009).

**Table 7.7** Reliability Statistics

Stage	Cronbach's Alpha	N of Items
Pre-proposal and indicators	.958	51
Contract Negotiation and indicators	.955	55*
Finance-raising and indicators	.968	52
Construction and Operation and indicators	.967	51

\*2 variables were dropped because the Corrected Item-Total Correlation test is lower than 0.2 or 0.3.

The results, as summarised in table 7.7, show that Cronbach Alpha at all stages are higher than 0.6. However, the stakeholders' expectations group and financial indicators at the contract negotiation stage failed to pass the Corrected Item-Total Correlation test. At the first test, two variables [Highest equity (CN – 7) and Credit committee requirement (CN – 15)] at corrected Item-Total Correlation are less than 0.2 or 0.3. Therefore, these variables should be removed to achieve internal consistency reliability. Again with the same procedure, the second test finally passed all the requirements (as illustrated in table 7.8) and the details are illustrated in appendix 3.

Table 7.8 Item-total statistics of stakeholders' expectations and financial indicators at the contract negotiation stage

<b>Stakeholders' Expectations</b>	<b>Scale Mean if Item Deleted</b>	<b>Scale Variance if Item Deleted</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
Cost overrun anticipation (CN – 1)	247.5000	788.723	.484	.955
Lowest equity (CN – 2)	247.6875	811.326	.227	.956
Securing cash flow (CN – 3)	247.1250	798.324	.349	.956
Fiscal incentive or tax benefits (CN – 4)	247.5417	798.849	.335	.956
Transparency (CN – 5)	246.8958	792.308	.441	.955
Attractive IRR (CN – 6)	247.1042	803.287	.379	.955
High risk premiums for a low equity level (CN- 8)	247.6875	797.794	.429	.955
Project's borrowing capacity (CN – 9)	246.6250	809.176	.286	.956
Subordinate lender determination (CN – 10)	247.4167	813.270	.235	.956
Agreement on CADS (CN – 11)	246.8333	804.184	.390	.955
Agreements on risk allocation (CN – 12)	247.0625	797.762	.349	.956
Assurance (CN – 13)	247.3750	802.324	.376	.955
Insurance (CN – 14)	248.1458	790.297	.464	.955
Input - Project costs	246.1250	796.707	.559	.955
Input - Project timelines	246.4792	793.191	.569	.954
Input - General construction index	247.0625	791.081	.524	.955
Input - Royalty to Government / Revenue Share	246.7917	790.849	.577	.954
Input - Volume / Demand (Traffic)	246.2292	798.351	.495	.955
Input - Initial working capital	246.9583	784.679	.718	.954
Input - Target of equity	246.9375	787.039	.689	.954
Input - Pre-defined ROE ratio	247.0625	777.507	.742	.954
Input - Financing cost	246.3958	795.053	.642	.954
Input - Refinancing	247.3750	785.814	.616	.954
Input - Tax Information	246.7500	795.936	.512	.955
Input - Working capital	246.7708	792.946	.600	.954
Input - Capital structure of the project vehicle	246.4375	797.570	.496	.955
Input - Revenue forecasts	246.3333	797.121	.549	.955
Input - Inflation	246.8125	790.453	.545	.955
Input - Exchange rate parity	247.5000	795.787	.487	.955
Input - Tariff reopeners	247.0417	789.275	.617	.954
Input - Interest and fees	246.5625	790.464	.646	.954
Input - Interest or swap costs associated with the debt	246.8125	792.113	.595	.954
Input - Economic assumptions related to global and domestic inflation or foreign exchange parity	246.9167	791.397	.604	.954
Input - Loan commitment	247.0208	801.851	.401	.955
Input - Schedule of disbursement	246.6250	798.282	.534	.955
Input - Loan repayment schedule	246.3958	803.563	.444	.955

**Table 7.8** Item-total statistics of stakeholders' expectations and financial indicators at the contract negotiation stage (continued)

Stakeholders' Expectations	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Input - Assumptions related to the interest rate hedge	247.0000	790.809	.652	.954
Input - Operating cost	246.2500	793.894	.677	.954
Input - Maintenance cost	246.5417	792.126	.637	.954
Output - Net operating profit	247.0417	796.381	.539	.955
Output - Internal Rate of Return (IRR)	246.3750	789.814	.663	.954
Output - Net Present Value (NPV)	246.7083	794.126	.586	.954
Output - Margin/Operation Margin	247.1667	797.248	.521	.955
Output - Repayment period	246.7083	784.041	.684	.954
Output - Debt Service Cover Ratio (DSCR)	246.2708	803.308	.428	.955
Output - Interest Covering Ratio	246.8125	794.581	.532	.955
Output - Earning Before Interest, Taxes, Depreciation and Amortization (EBITDA)	246.7083	794.637	.472	.955
Output - Project Life Cover Ratio (PLCR)	246.8958	792.861	.547	.955
Output - Revenue	246.6667	788.355	.599	.954
Output - Return on Equity (ROE) Ratio	246.7917	782.424	.615	.954
Output - Operating Cost	246.9375	781.549	.613	.954
Output - Cash Available for Debt Service (CADS)	246.3958	800.329	.501	.955
Output - Principal payback	247.0208	784.276	.603	.954
Output - Loan Life Coverage Ratio (LLCR)	246.4583	798.807	.478	.955
Output - Net cash flow	246.4792	796.000	.578	.954

## 7.6 Agreement analysis one-way ANOVA test, post hoc test and means plot

As there are more than two groups of respondents, One-Way ANOVA test is selected to determine whether the mean significance of each expectation and each financial indicator are equal across all stakeholders in utilising PPP financial models. The hypotheses for comparing the importance upon expectations and financial indicators of two of the four independent stakeholders are described below:

**Hypothesis 1:** All stakeholders agree on the importance of expectations in utilising PPP financial model.

*Ho: The mean significance of each expectation is equal between two stakeholder groups and within stakeholder groups.*

*Ha: The mean significance of each expectation is different between two stakeholder groups and within stakeholder groups.*

**Hypothesis 2:** Stakeholders' preference on indicator of PPP financial model is equal.

*Ho: The mean significance of each indicator is equal between two stakeholder groups and within stakeholder groups.*

*Ha: The mean significance of each indicator is different between two stakeholder groups and within stakeholder groups.*

If the significant variance of  $p$  value at some critical level is (less than 0.05), it defines that the null hypothesis ( $H_0$ ) should be rejected in favour of the alternative hypothesis ( $H_a$ ).

The following procedure was considered before testing the hypothesis:

The first step of variance analyses is calculating the number of responses, mean, standard deviation, standard error of the mean, minimum, maximum, and 95% confidence intervals for each dependent variable for each group. Typically, in the comparison procedures such as ANOVA or T-tests, the group sizes are assumed equal (or homogeneity of variance is assumed) to make sure that the resulting F-test is valid. However, when the homogeneity of group sizes is unknown, the homogeneity of group variance should be tested.

Therefore, the second step is to test the homogeneity of group variances by using the Levene's test<sup>44</sup>. This test shall confirm whether the variances of the group sizes are different or not. If Levene test is significant or the population variances are unequal ( $p$ -value is less than 0.05), the alternative modified procedures (Welch and Brown-Forsythe) should be also considered.

The third step is ANOVA test to find the significant variance of  $p$  value. At this step, the significance of variance is tested with caution<sup>45</sup>.

In the absence of homogeneity, the fourth step is to test the results of the  $p$  value associated with standard ANOVA  $F$  Statistic by using Robust Tests of Equality of

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<sup>44</sup> Levene's test is frequently employed before conducting ANOVA and T-tests. It tests the equality of variances in different samples.

<sup>45</sup> The validity selection of the standard ANOVA  $F$  Statistic depends on the homogeneity of group sizes.

Means (Welch and Brown-Forsythe). It is worth noting that, as with the standard  $F$  statistic, the Welch statistic is more powerful than the standard  $F$  or Brown-Forsythe statistics when sample sizes and variances are unequal.

The fifth step is to identify which group differs from another group by using Post Hoc Test. When the sample sizes and variances are unequal or equal variances are not assumed, Dunnett's T3 and Games-Howell are multiple comparison tests that mostly used. Note that when the sample sizes are small (i.e. fewer than 50 per group), Dunnett's T3 should be chosen instead of Games-Howell procedure (Maxwell and Delaney, 2004).

In order to test the aforementioned hypotheses, this procedure has been implemented in every stage of PPP financial model utilisations. Further details of ANOVA tests are shown in appendix 3. However, it is worth applying another method (Means Plot) to see the means variance of all stakeholders upon the variables (stakeholders' expectations and financial indicators). Although the variance significance is determined in the ANOVA tests, the means plot is useful to identify visually which group differs from another group.

### ***7.6.1 Agreement analysis at the pre-proposal stage***

Since the homogeneity of group sizes was unequal because one of the variables failed in the Levene test (see table 7.9), the findings from ANOVA test (see table 7.10) at the pre-proposal stage and the other stages<sup>46</sup> were further followed by Robust Tests of Equality of Means (Welch statistic test) as shown in table 7.10. These results indicate that government authorities, sponsors, lenders, and consultant agencies consider all expectation variables in using PPP financial models ( $H_0$  is accepted) at the Pre-proposal stage. Furthermore, Post Hoc test is no longer needed because there is no significant variance of p value at some critical level (less than 0.05) indicated in table 7.10 and table 7.11. However, figure 7.3 shows plot of means that is useful to identify visually which group differs from another group.

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<sup>46</sup> The findings of Lavene test at the proposal stage are enough to represent that the homogeneity of group sizes is unequal at all stages.



**Table 7.9** Test of homogeneity of variances at the pre-proposal stage

Stakeholders' Expectations	Levene Statistic	df1	df2	Sig.
PP – 1	1.012	4	67	.407
PP – 2	.649	4	67	.630
PP – 3	.478	4	66	.752
PP – 4	1.060	4	67	.383
PP – 5	1.551	4	67	.198
PP – 6	.590	4	68	.671
PP – 7	.755	4	67	.558
PP – 8	1.175	4	68	.329
PP – 9	2.673	4	66	.039

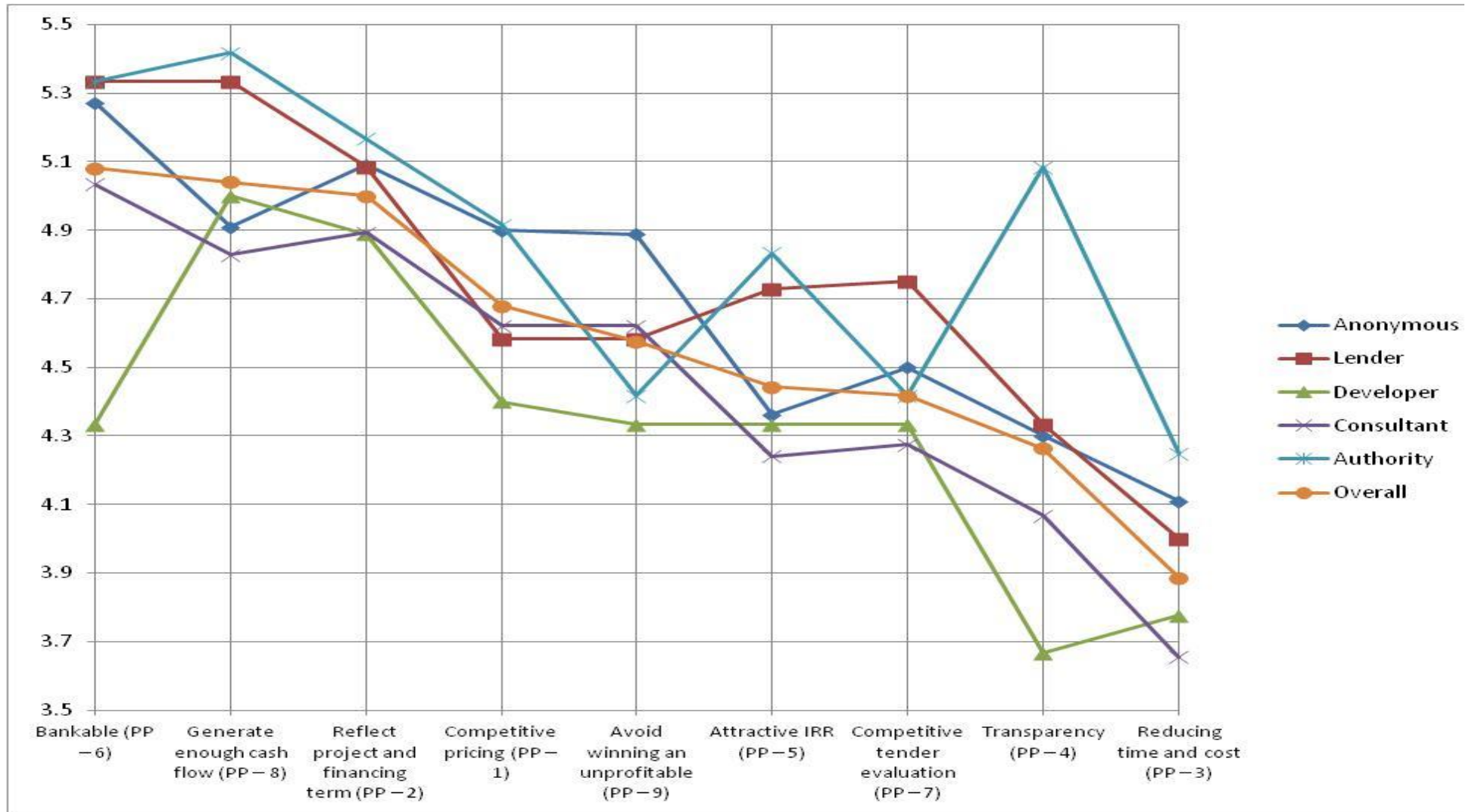
**Table 7.10** ANOVA test at the pre-proposal stage

Stakeholders' Expectations		Sum of Squares	df	Mean Square	F	Sig.
PP – 1	Between Groups	1.870	4	.467	.542	.705
	Within Groups	57.783	67	.862		
	Total	59.653	71			
PP – 2	Between Groups	.940	4	.235	.321	.863
	Within Groups	49.060	67	.732		
	Total	50.000	71			
PP – 3	Between Groups	3.852	4	.963	.712	.586
	Within Groups	89.246	66	1.352		
	Total	93.099	70			
PP – 4	Between Groups	12.441	4	3.110	1.375	.252
	Within Groups	151.545	67	2.262		
	Total	163.986	71			
PP – 5	Between Groups	4.073	4	1.018	1.373	.253
	Within Groups	49.704	67	.742		
	Total	53.778	71			
PP – 6	Between Groups	7.026	4	1.757	1.975	.108
	Within Groups	60.481	68	.889		
	Total	67.507	72			
PP – 7	Between Groups	2.040	4	.510	.430	.786
	Within Groups	79.460	67	1.186		
	Total	81.500	71			
PP – 8	Between Groups	4.246	4	1.062	1.484	.217
	Within Groups	48.630	68	.715		
	Total	52.877	72			
PP – 9	Between Groups	1.774	4	.444	.547	.702
	Within Groups	53.550	66	.811		
	Total	55.324	70			

**Table 7.11** Robust tests of equality of means at the pre-proposal stage

Stakeholders' Expectations		Statistic <sup>a</sup>	df1	df2	Sig.
PP – 1	Welch	.767	4	26.778	.556
	Brown-Forsythe	.597	4	49.959	.666
PP – 2	Welch	.333	4	26.233	.853
	Brown-Forsythe	.325	4	47.765	.860
PP – 3	Welch	.883	4	24.738	.488
	Brown-Forsythe	.726	4	42.264	.579
PP – 4	Welch	2.197	4	25.506	.098
	Brown-Forsythe	1.408	4	45.734	.246
PP – 5	Welch	1.145	4	26.337	.357
	Brown-Forsythe	1.494	4	50.938	.218
PP – 6	Welch	2.233	4	27.109	.092
	Brown-Forsythe	2.232	4	52.152	.078
PP – 7	Welch	.291	4	25.960	.881
	Brown-Forsythe	.437	4	43.751	.781
PP – 8	Welch	1.580	4	26.398	.209
	Brown-Forsythe	1.520	4	48.196	.211
PP – 9	Welch	.881	4	25.675	.489
	Brown-Forsythe	.585	4	44.587	.675

<sup>a</sup>Asymptotically F distributed.



**Figure 7.3** Means Plots of Stakeholders' Expectations at the Pre-proposal Stage

### 7.6.2 Agreement analysis at the contract negotiation stage

Based on the previous Lavene test at the pre-proposal stage, it was decided that the homogeneity of group sizes was unequal. The findings from ANOVA test (table 7.12) at the pre-proposal stage were further followed by Robust Tests of Equality of Means (Welch statistic test) as shown in table 7.13.

**Table 7.12** ANOVA Test at the Contract Negotiation Stage

Stakeholders' Expectations		Sum of Squares	df	Mean Square	F	Sig.
CN – 1	Between Groups	9.812	4	2.453	1.827	.135
	Within Groups	85.956	64	1.343		
	Total	95.768	68			
CN – 2	Between Groups	7.520	4	1.880	2.213	.078
	Within Groups	52.660	62	.849		
	Total	60.179	66			
CN – 3	Between Groups	11.265	4	2.816	2.451	.055
	Within Groups	73.546	64	1.149		
	Total	84.812	68			
CN – 4	Between Groups	8.742	4	2.185	1.671	.168
	Within Groups	85.030	65	1.308		
	Total	93.771	69			
CN – 5	Between Groups	6.864	4	1.716	1.406	.242
	Within Groups	78.093	64	1.220		
	Total	84.957	68			
CN – 6	Between Groups	3.777	4	.944	1.187	.325
	Within Groups	51.708	65	.796		
	Total	55.486	69			
CN – 7	Between Groups	12.584	4	3.146	3.044	.023
	Within Groups	67.187	65	1.034		
	Total	79.771	69			
CN – 8	Between Groups	1.676	4	.419	.411	.800
	Within Groups	64.207	63	1.019		
	Total	65.882	67			
CN – 9	Between Groups	8.287	4	2.072	3.245	.017
	Within Groups	41.499	65	.638		
	Total	49.786	69			
CN – 10	Between Groups	1.128	4	.282	.451	.771
	Within Groups	40.644	65	.625		
	Total	41.771	69			
CN – 11	Between Groups	.612	4	.153	.203	.936
	Within Groups	48.199	64	.753		
	Total	48.812	68			
CN – 12	Between Groups	9.982	4	2.495	1.684	.165
	Within Groups	94.830	64	1.482		
	Total	104.812	68			
CN – 13	Between Groups	4.065	4	1.016	1.155	.339
	Within Groups	55.406	63	.879		
	Total	59.471	67			
CN – 14	Between Groups	8.894	4	2.224	1.670	.168
	Within Groups	83.870	63	1.331		
	Total	92.765	67			
CN – 15	Between Groups	3.672	4	.918	1.434	.233
	Within Groups	40.966	64	.640		
	Total	44.638	68			

These results indicate that not all stakeholders have the same expectations in using PPP financial models (*H<sub>01</sub>* is rejected) at the contract negotiation stage. Furthermore, Post Hoc test is needed to identify group which differs from another group because there are some significant variances of p value at some critical level (less than 0.05) indicated in table 7.12 (CN – 7 and CN – 9) and table 6.13 (CN – 3, CN – 7, CN – 9, and CN – 12).

**Table 7.13** Robust Tests of Equality of Means at the Contract Negotiation Stage

		Statistic <sup>a</sup>	df1	df2	Sig.
CN – 1	Welch	1.821	4	24.765	.157
	Brown-Forsythe	1.998	4	48.057	.110
CN – 2	Welch	2.585	4	21.737	.066
	Brown-Forsythe	2.141	4	38.043	.095
CN – 3	Welch	3.230	4	24.953	.029
	Brown-Forsythe	2.489	4	34.461	.061
CN – 4	Welch	2.196	4	25.468	.098
	Brown-Forsythe	1.709	4	40.539	.167
CN – 5	Welch	2.119	4	25.804	.107
	Brown-Forsythe	1.683	4	47.347	.170
CN – 6	Welch	1.123	4	25.677	.368
	Brown-Forsythe	1.300	4	53.017	.282
CN – 7	Welch	2.852	4	24.940	.045
	Brown-Forsythe	3.048	4	43.413	.027
CN – 8	Welch	.472	4	22.203	.756
	Brown-Forsythe	.355	4	30.089	.838
CN – 9	Welch	3.775	4	25.439	.015
	Brown-Forsythe	3.502	4	45.553	.014
CN – 10	Welch	.384	4	26.043	.818
	Brown-Forsythe	.515	4	40.526	.725
CN – 11	Welch	.167	4	24.094	.953
	Brown-Forsythe	.207	4	46.557	.933
CN – 12	Welch	2.852	4	24.879	.045
	Brown-Forsythe	1.805	4	43.484	.145
CN – 13	Welch	.911	4	23.466	.474
	Brown-Forsythe	1.151	4	45.606	.345
CN – 14	Welch	2.228	4	23.478	.097
	Brown-Forsythe	1.740	4	43.668	.159
CN – 15	Welch	1.511	4	24.541	.230
	Brown-Forsythe	1.536	4	41.548	.209

a. Asymptotically F distributed.

Since the number of responses from each stakeholder was less than 50 per group, Dunnett's T3 procedure was selected for the post hoc test. However, Games-Howell was also included and a justification<sup>47</sup> was made to identify the group that differs from another group based on the previous tests. Table 7.14 and figure 7.4 show a summary of group that significantly differs from another group.

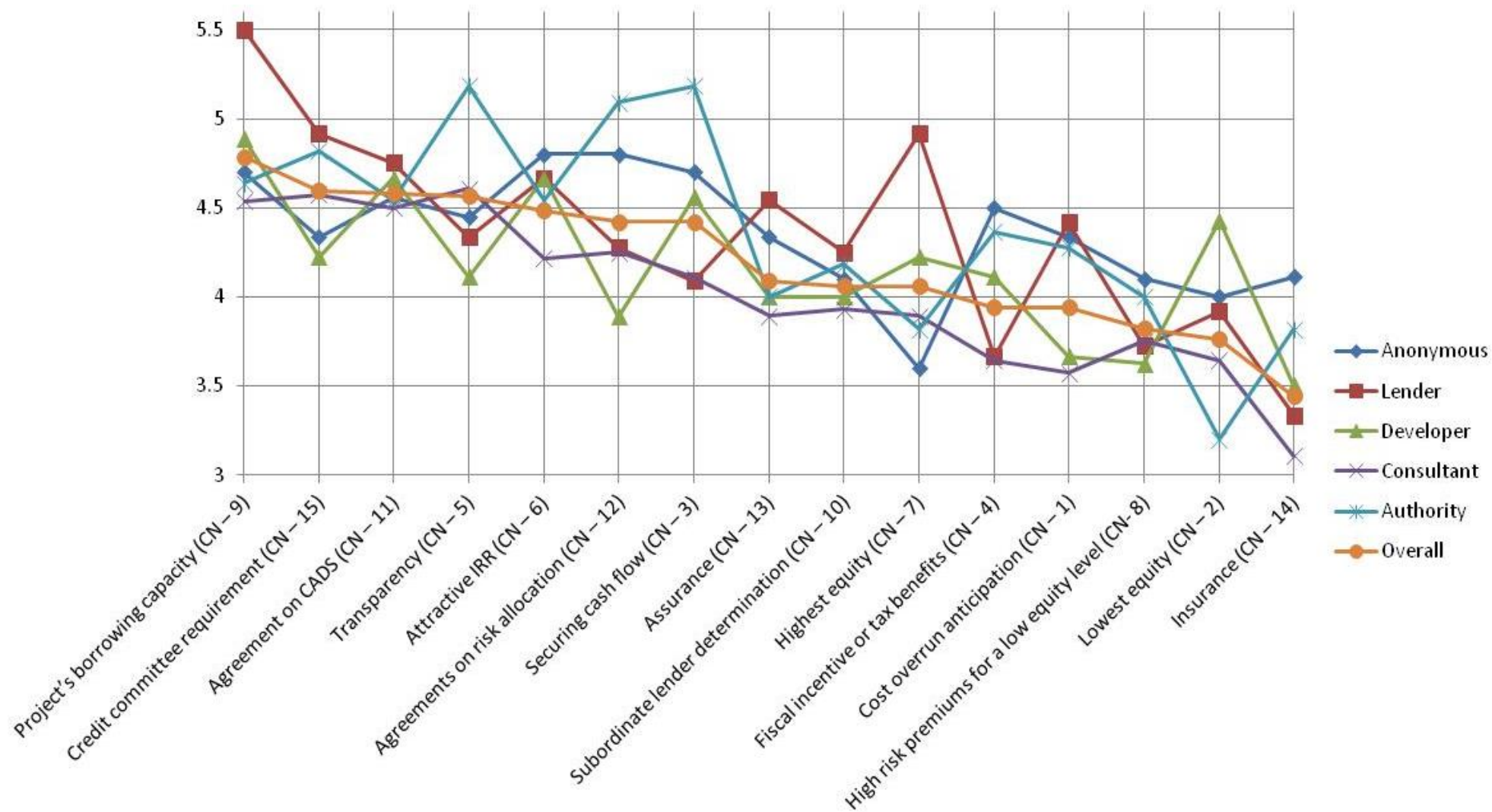
<sup>47</sup> Although Welch statistic test indicates that the variance of CN – 12 is significantly different, the Post-Hoc test did not indicate that there is no significant variance between the stakeholders upon CN – 12. Therefore, to identify which group that differs to another group on CN – 12, a justification is made by lowering the standard confidence level from 95 % to 90 %.

**Table 7.14** Post hoc tests of stakeholders' expectations at the contract negotiation stage

Dependent Variable	(I) Stakeholder	(J) Stakeholder	Mean Difference (I-J)	Std. Error	Sig.
CN – 2 (Games-Howell)	Developer	Anonymous	.42857	.49395	.904
		Lender	.51190	.39495	.698
		Consultant	.78571	.33979	.218
		Authority	1.22857*	.38815	.048
CN – 3 (Dunnett's T3)	Consultant	Anonymous	-.59286	.29349	.395
		Lender	.01623	.51675	1.000
		Developer	-.44841	.39342	.929
		Authority	-1.07468*	.30302	.015
CN – 4 (Games-Howell)	Anonymous	Lender	.83333	.51689	.511
		Developer	.38889	.38168	.843
		Consultant	.85714**	.30479	.065
		Authority	.13636	.40503	.997
CN – 5 (Games-Howell)	Developer	Anonymous	-.33333	.35573	.878
		Lender	-.22222	.47378	.989
		Consultant	-.49603	.34887	.621
		Authority	-1.07071**	.37057	.065
CN – 7 (Games-Howell)	Lender	Anonymous	1.31667	.49265	.101
		Developer	.69444	.43317	.514
		Consultant	1.02381**	.34733	.053
		Authority	1.09848*	.36598	.049
CN – 9 (Dunnett's T3)	Lender	Anonymous	.80000	.28885	.105
		Developer	.61111	.36546	.640
		Consultant	.96429*	.25614	.008
		Authority	.86364**	.28143	.054
CN – 12 (Games-Howell)	Developer	Anonymous	-.91111	.52399	.438
		Lender	-.38384	.57018	.960
		Consultant	-.36111	.42815	.913
		Authority	-1.20202**	.40998	.071
CN – 14 (Games-Howell)	Anonymous	Lender	.77778	.47378	.492
		Developer	.61111	.49646	.735
		Consultant	1.00397**	.34120	.055
		Authority	.29293	.41676	.953

\*. The mean difference is significant at the 0.05 level

\*\* . The mean difference is justified to be significant at the 0.1 level



**Figure 7.4** Means plots of stakeholders' expectations at the contract negotiation stage

### 7.6.3 Agreement analysis at the finance-raising stage

By following the same procedure of ANOVA test and Robust Tests of Equality of Means, the results (as shown in table 7.15 and table 7.16) indicate that all stakeholders have the same expectations in using PPP financial models (*H<sub>01</sub>* is accepted) at the finance-raising stage. Although the variance tests do not show any significant difference, Means Plots as shown in figure 7.5 is useful to identify visually which group differs from another group.

**Table 7.15** ANOVA test at the finance-raising stage

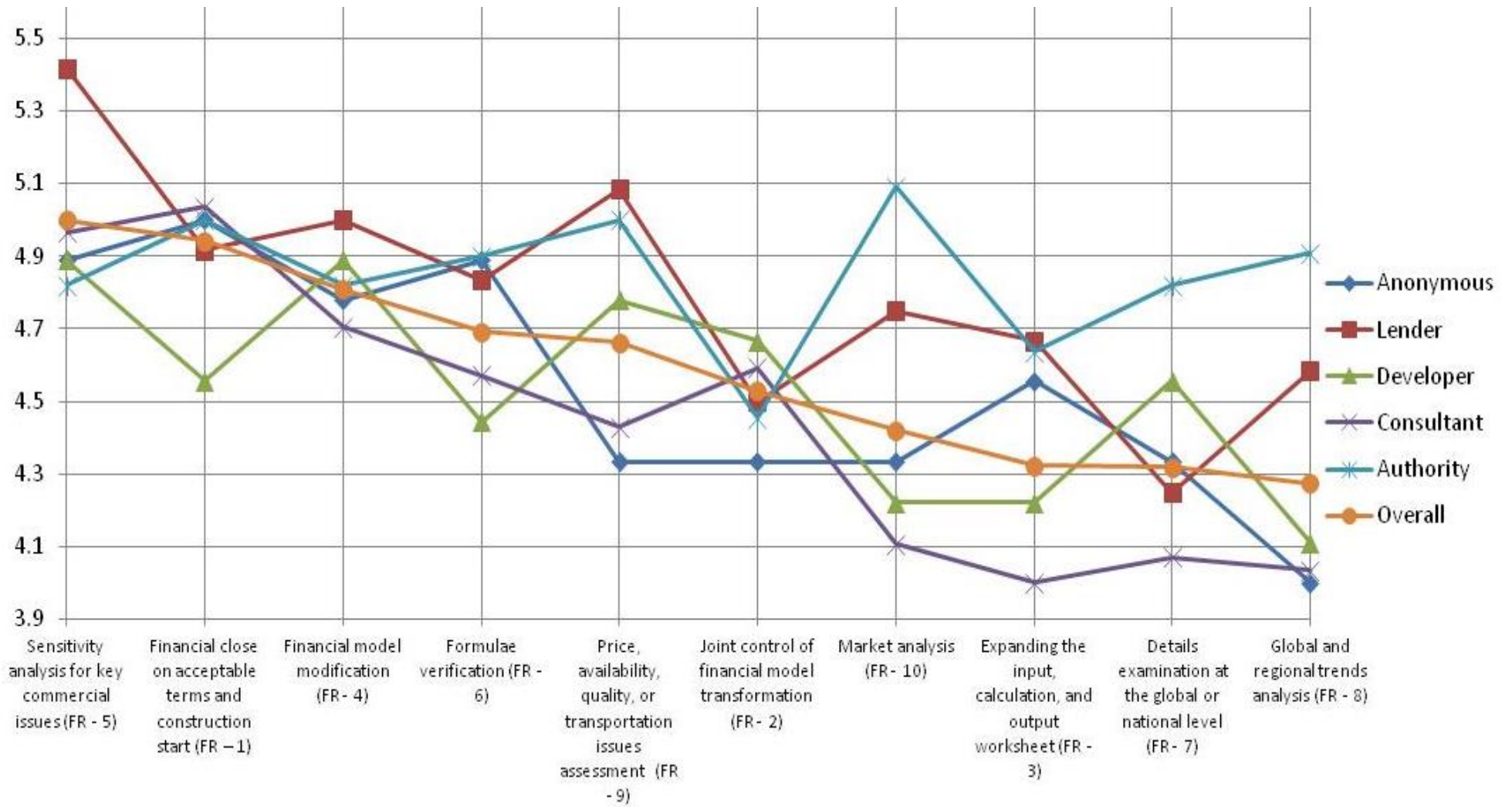
Stakeholders' Expectations		Sum of Squares	df	Mean Square	F	Sig.
FR – 1	Between Groups	1.665	4	.416	.633	.641
	Within Groups	42.103	64	.658		
	Total	43.768	68			
FR – 2	Between Groups	.695	4	.174	.218	.927
	Within Groups	50.246	63	.798		
	Total	50.941	67			
FR – 3	Between Groups	5.892	4	1.473	1.751	.150
	Within Groups	52.990	63	.841		
	Total	58.882	67			
FR – 4	Between Groups	.804	4	.201	.336	.853
	Within Groups	37.710	63	.599		
	Total	38.515	67			
FR – 5	Between Groups	2.705	4	.676	.915	.461
	Within Groups	47.295	64	.739		
	Total	50.000	68			
FR – 6	Between Groups	1.980	4	.495	.572	.684
	Within Groups	54.535	63	.866		
	Total	56.515	67			
FR – 7	Between Groups	5.020	4	1.255	1.182	.327
	Within Groups	67.966	64	1.062		
	Total	72.986	68			
FR – 8	Between Groups	8.089	4	2.022	1.476	.220
	Within Groups	87.679	64	1.370		
	Total	95.768	68			
FR – 9	Between Groups	5.891	4	1.473	1.677	.166
	Within Groups	55.329	63	.878		
	Total	61.221	67			
FR – 10	Between Groups	9.418	4	2.355	1.947	.113
	Within Groups	77.393	64	1.209		
	Total	86.812	68			



**Table 7.16** Robust tests of equality of means at the finance-raising stage

Stakeholders' expectations	Robust Tests	Statistic <sup>a</sup>	df1	df2	Sig.
FR – 1	Welch	.513	4	23.603	.727
	Brown-Forsythe	.611	4	44.896	.657
FR – 2	Welch	.264	4	24.704	.898
	Brown-Forsythe	.234	4	46.929	.918
FR – 3	Welch	1.626	4	25.702	.198
	Brown-Forsythe	2.167	4	54.391	.085
FR – 4	Welch	.274	4	22.987	.892
	Brown-Forsythe	.307	4	43.955	.872
FR – 5	Welch	1.209	4	23.974	.333
	Brown-Forsythe	.911	4	41.324	.467
FR – 6	Welch	.565	4	21.999	.691
	Brown-Forsythe	.491	4	36.784	.742
FR – 7	Welch	1.193	4	24.709	.339
	Brown-Forsythe	1.262	4	47.245	.298
FR – 8	Welch	2.267	4	24.231	.091
	Brown-Forsythe	1.529	4	42.500	.211
FR – 9	Welch	1.706	4	23.546	.182
	Brown-Forsythe	1.687	4	40.882	.172
FR – 10	Welch	2.319	4	24.656	.085
	Brown-Forsythe	2.072	4	39.345	.103

a. Asymptotically F distributed.



**Figure 7.5** Means plots of stakeholders' expectations at the finance-raising stage

#### 7.6.4 Agreement analysis at the construction and operation stage

The results of ANOVA test (see table 7.17), which are supported by Robust Tests of Equality of Means (see table 7.18), indicate that all stakeholders have the same expectations in using PPP financial models (*H<sub>01</sub>* is accepted) at the construction stage, while not all stakeholders have the same expectations (*H<sub>01</sub>* is rejected) at the operation stage. Thus, Post Hoc test is conducted to identify the group which differs from another group. Table 7.19 shows that O - 2 and O – 6 contain significant mean variance between Consultant and Authority. Moreover, figure 7.6 (Plot of Means) shows visually the mean difference of all stakeholders' expectations at the construction and operation stages.

**Table 7.17** ANOVA test at the construction and operation stages

Stakeholders' Expectations		Sum of Squares	df	Mean Square	F	Sig.
C – 1	Between Groups	2.918	4	.729	1.182	.328
	Within Groups	38.891	63	.617		
	Total	41.809	67			
C – 2	Between Groups	4.001	4	1.000	.924	.456
	Within Groups	68.234	63	1.083		
	Total	72.235	67			
O – 1	Between Groups	6.015	4	1.504	1.877	.125
	Within Groups	51.289	64	.801		
	Total	57.304	68			
O – 2	Between Groups	10.302	4	2.575	3.986	.006
	Within Groups	41.351	64	.646		
	Total	51.652	68			
O – 3	Between Groups	4.878	4	1.219	1.596	.186
	Within Groups	48.122	63	.764		
	Total	53.000	67			
O – 4	Between Groups	1.261	4	.315	.447	.774
	Within Groups	45.174	64	.706		
	Total	46.435	68			
O – 5	Between Groups	3.713	4	.928	1.160	.337
	Within Groups	50.405	63	.800		
	Total	54.118	67			
O – 6	Between Groups	13.122	4	3.281	4.553	.003
	Within Groups	45.392	63	.721		
	Total	58.515	67			
O – 7	Between Groups	3.433	4	.858	1.417	.239
	Within Groups	38.770	64	.606		
	Total	42.203	68			

**Table 7.18** Robust tests of equality of means at the construction and operation stages

Stakeholders' expectations	Robust Tests	Statistic <sup>a</sup>	df1	df2	Sig.
C – 1	Welch	1.204	4	22.679	.336
	Brown-Forsythe	1.149	4	42.593	.347
C – 2	Welch	.904	4	23.591	.478
	Brown-Forsythe	.971	4	44.509	.433
O – 1	Welch	2.415	4	24.727	.076
	Brown-Forsythe	2.099	4	49.343	.095
O – 2	Welch	3.721	4	23.210	.018
	Brown-Forsythe	3.703	4	44.818	.011
O – 3	Welch	1.308	4	23.440	.296
	Brown-Forsythe	1.604	4	43.397	.190
O – 4	Welch	.439	4	25.009	.779
	Brown-Forsythe	.475	4	44.933	.754
O – 5	Welch	1.180	4	24.165	.345
	Brown-Forsythe	1.181	4	48.757	.331
O – 6	Welch	3.471	4	23.449	.023
	Brown-Forsythe	4.611	4	41.259	.004
O – 7	Welch	1.627	4	22.487	.202
	Brown-Forsythe	1.189	4	35.283	.333

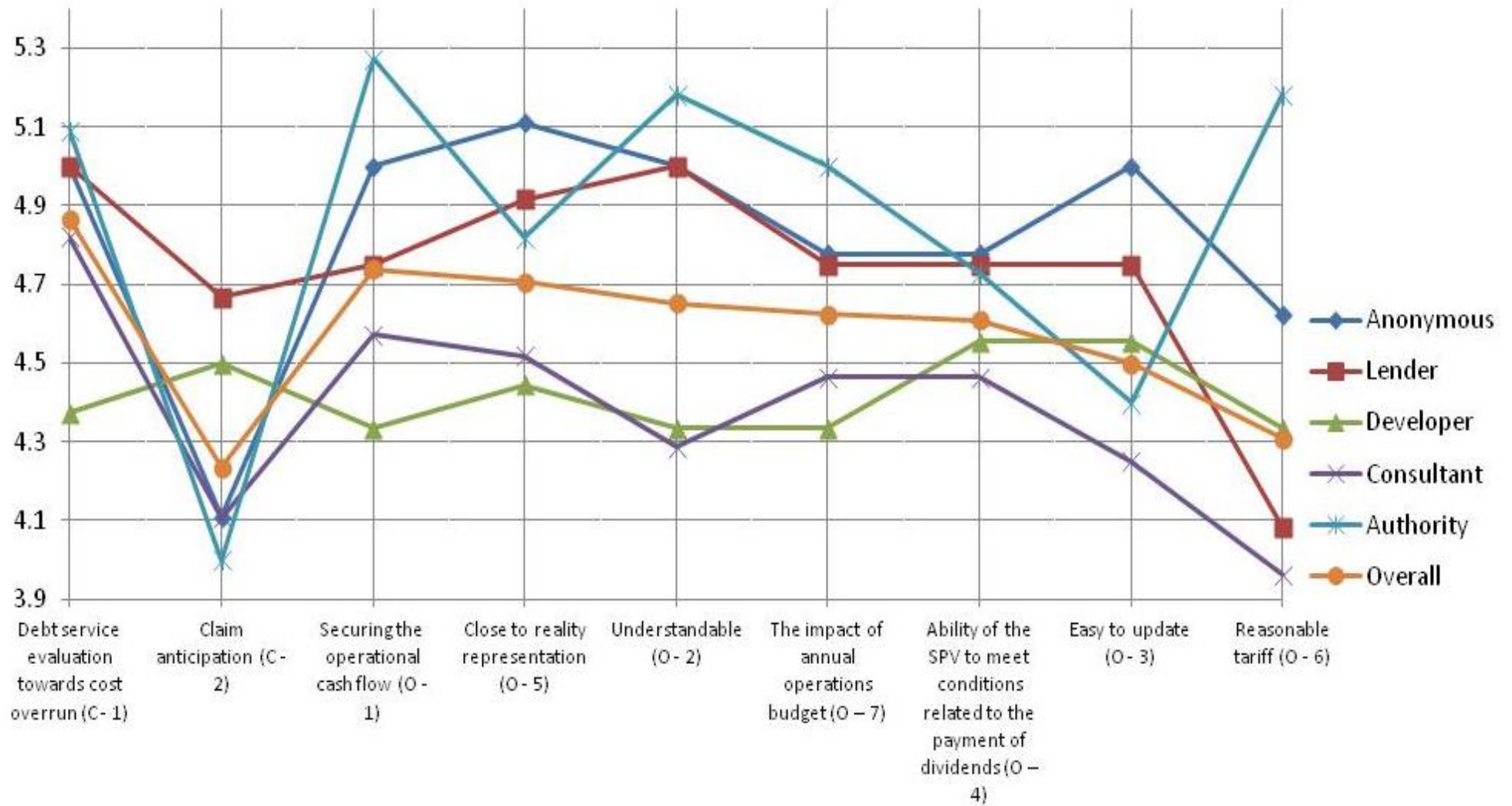
a. Asymptotically F distributed.

**Table 7.19** Post hoc tests of stakeholders' expectations at the construction and operation stages

Dependent Variable	(I) Stakeholder	(J) Stakeholder	Mean Difference (I-J)	Std. Error	Sig.
O – 2 (Games-Howell)	Consultant	anonymous	-.71429	.27147	.119
		Lender	-.71429	.30643	.184
		Developer	-.04762	.31855	1.000
		Authority	-.89610**	.29591	.055
O – 6 (Dunnett T3)	Consultant	anonymous	-.66071	.36055	.542
		Lender	-.11905	.30436	1.000
		Developer	-.36905	.22992	.683
		Authority	-1.21753*	.33569	.021

\*. The mean difference is significant at the 0.05 level.

\*\*.. The mean difference is justified to be significant at the 0.1 level



**Figure 7.6** Means plots of stakeholders' expectations at the construction and operation stages

### 7.6.5 Agreement analysis of stakeholders' preference on input assumptions

The results of ANOVA test, which are supported by Robust Tests of Equality of Means, indicate that not all stakeholders have the same preferences on input assumptions ( $H_0$  is rejected). Table 7.20 and table 7.21 show that Initial Working Capital, Target of Equity, Tax Information, Inflation, Exchange rate parity, Loan commitment, and Maintenance cost contain significant variance between stakeholders.

**Table 7.20** ANOVA test of stakeholders' preference on input assumptions

Input Assumptions	Stakeholders	Sum of Squares	df	Mean Square	F	Sig.
Project costs	Between Groups	.718	4	.179	.236	.917
Project time lines	Between Groups	5.564	4	1.391	1.747	.152
General construction index	Between Groups	7.910	4	1.978	1.755	.150
Royalty / Revenue Share	Between Groups	7.041	4	1.760	1.945	.115
Volume / Demand (Traffic)	Between Groups	5.168	4	1.292	1.761	.149
Initial working capital	Between Groups	9.038	4	2.259	2.645	.042
Target of equity	Between Groups	11.437	4	2.859	3.929	.007
Pre-defined ROE ratio	Between Groups	7.371	4	1.843	1.393	.248
Financing cost	Between Groups	2.594	4	.649	1.023	.403
Refinancing	Between Groups	5.295	4	1.324	1.161	.337
Tax Information	Between Groups	9.600	4	2.400	3.218	.019
Working capital	Between Groups	4.384	4	1.096	1.434	.234
Capital structure	Between Groups	1.517	4	.379	.503	.734
Revenue forecasts	Between Groups	4.271	4	1.068	1.520	.208
Inflation	Between Groups	10.149	4	2.537	2.534	.050
Exchange rate parity	Between Groups	13.178	4	3.294	3.209	.019
Tariff reopeners	Between Groups	2.853	4	.713	.694	.599
Interest and fees	Between Groups	4.641	4	1.160	1.375	.254
Interest or swap costs associated with the debt	Between Groups	7.011	4	1.753	2.030	.102
Economic assumptions	Between Groups	4.393	4	1.098	1.354	.261
Loan commitment	Between Groups	12.979	4	3.245	4.809	.002
Schedule of disbursement	Between Groups	.871	4	.218	.266	.898
Loan repayment schedule	Between Groups	1.179	4	.295	.437	.781
Interest rate hedge	Between Groups	2.376	4	.594	.738	.570
Operating cost	Between Groups	4.779	4	1.195	1.787	.144
Maintenance cost	Between Groups	9.080	4	2.270	3.545	.012

In order to identify how stakeholders differ from each other, Post Hoc tests are used to obtain the stakeholders' preference on input assumptions as illustrated in table 7.22. Moreover, figure 7.7 (Plot of Means) shows visually the mean difference of stakeholders' preference upon Input assumptions. Since the significance levels of all input assumptions are higher than neutral value (3.5), these assumptions are considered "important".

**Table 7.21** Robust tests of equality of means of stakeholders' preference on input assumptions

		Statistic <sup>a</sup>	df1	df2	Sig.
Input - Initial working capital	Welch	3.867	4	19.355	.018
Input - Target of equity	Welch	3.593	4	20.346	.023
Input - Tax Information	Welch	4.718	4	17.375	.009
Input - Inflation	Welch	2.688	4	20.135	.061
Input - Exchange rate parity	Welch	3.184	4	19.853	.036
Input - Loan commitment	Welch	3.742	4	15.862	.025
Input - Maintenance cost	Welch	4.661	4	20.032	.008

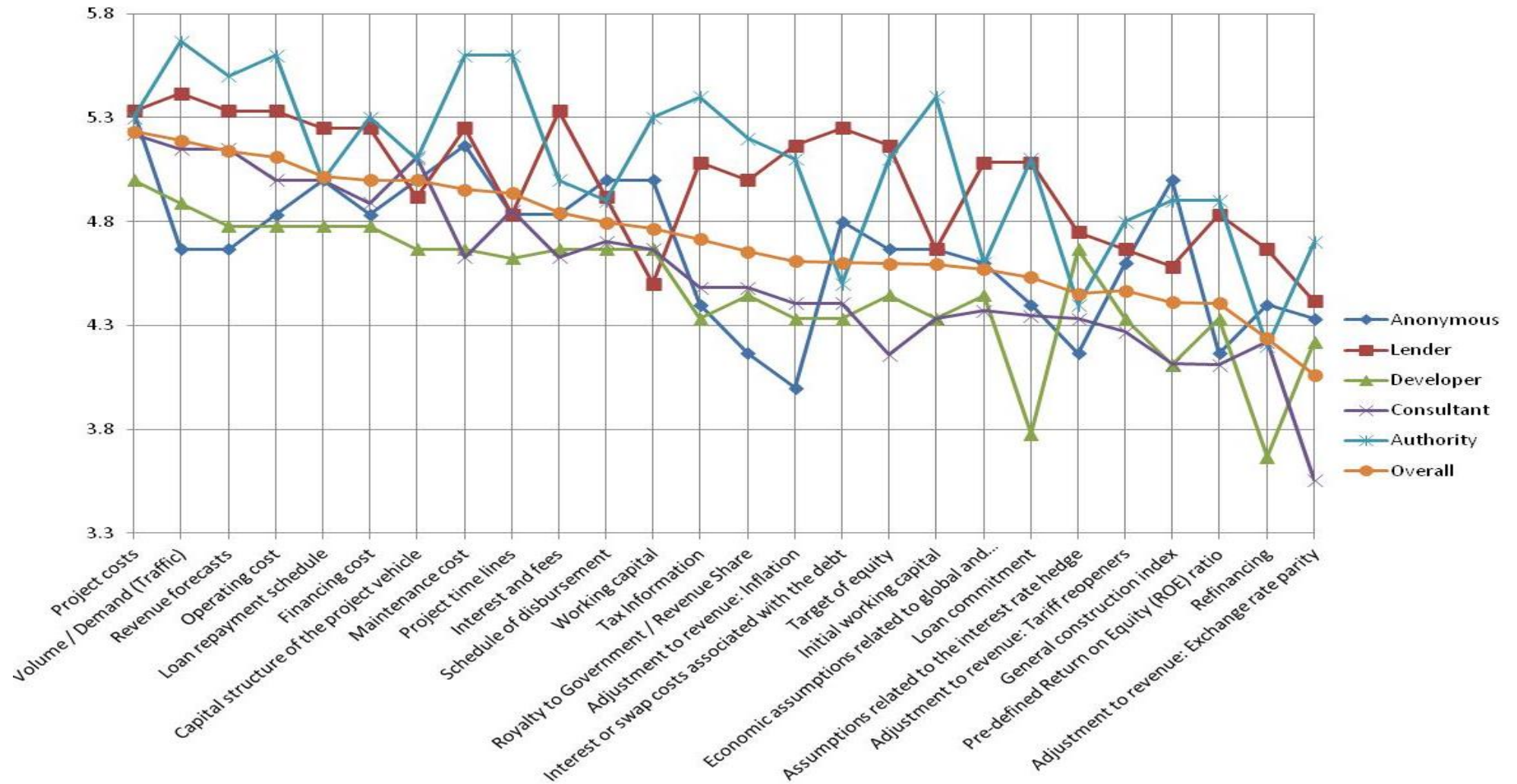
a. Asymptotically F distributed.

**Table 7.22** Post hoc tests of stakeholders' preference on input assumptions

Dependent Variable	(I) Stakeholder	(J) Stakeholder	Mean Difference (I-J)	Std. Error	Sig.
Input - Initial working capital (Dunnett T3)	Consultant	anonymous	-.33333	.36593	.975
		Lender	-.33333	.42351	.993
		Developer	.00000	.32577	1.000
		Authority	-1.06667*	.26773	.008
Input - Target of equity (Dunnett T3)	Consultant	anonymous	-.50667	.38303	.843
		Lender	-1.00667*	.30607	.029
		Developer	-.28444	.30699	.981
		Authority	-.94000*	.30007	.046
Input - Tax Information (Dunnett T3)	Authority	anonymous	1.00000	.53541	.556
		Lender	.31667	.33071	.976
		Developer	1.06667	.33166	.059
		Consultant	.91852*	.23100	.005
Input - Exchange rate parity (Dunnett T3)	Consultant	anonymous	-.77778	.46756	.652
		Lender	-.86111	.37241	.248
		Developer	-.66667	.38180	.590
		Authority	-1.14444*	.32957	.022
Input - Loan commitment (Dunnett T3)	Consultant	anonymous	-.05385	.52166	1.000
		Lender	-.73718	.28228	.159
		Developer	.56838	.41548	.822
		Authority	-.75385**	.25802	.098
Input - Maintenance cost (Dunnett T3)	Consultant	anonymous	-.53704	.34714	.720
		Lender	-.62037	.29760	.364
		Developer	-.03704	.33075	1.000
		Authority	-.97037*	.22963	.002

\*. The mean difference is significant at the 0.05 level.

\*\* The mean difference is justified to be significant at the 0.1 level.



**Figure 7.7** Means plots of stakeholders' preference on input assumptions



### 7.6.6 Agreement analysis of stakeholders' preference on financial model output

The results of ANOVA test, which are supported by Robust Tests of Equality of Means, indicate that not all stakeholders have the same preferences on financial model output ( $H_02$  is rejected). Table 7.23 and table 7.24 show that Initial Working Capital, Target of Equity, Tax Information, Inflation, Exchange rate parity, Loan commitment, and Maintenance cost contain significant variance between stakeholders. Post Hoc tests are used to obtain the stakeholders' preference on financial output indicators as illustrated in table 7.25. Moreover, figure 7.8 (Plot of Means) shows visually the mean difference of stakeholders' preference upon Input assumptions. Since the significance levels of all financial model outputs are higher than neutral value (3.5), these assumptions are considered "important".

**Table 7.23** ANOVA test of stakeholders' preference on financial model output

Financial Model Output	Stakeholders	Sum of Squares	df	Mean Square	F	Sig.
Net operating profit	Between Groups	10.969	4	2.742	3.816	.008
Internal Rate of Return (IRR)	Between Groups	8.957	4	2.239	3.612	.011
Net Present Value (NPV)	Between Groups	13.316	4	3.329	5.532	.001
Margin/Operation Margin	Between Groups	2.805	4	.701	.871	.487
Repayment period	Between Groups	4.522	4	1.131	1.034	.398
Debt Service Cover Ratio (DSCR)	Between Groups	5.591	4	1.398	2.260	.074
Interest Covering Ratio	Between Groups	6.451	4	1.613	1.814	.139
Earning Before Interest, Taxes, Depreciation and Amortization (EBITDA)	Between Groups	2.740	4	.685	.636	.639
Project Life Cover Ratio (PLCR)	Between Groups	7.405	4	1.851	2.130	.089
Revenue	Between Groups	8.314	4	2.078	2.371	.063
Return on Equity (ROE)	Between Groups	9.545	4	2.386	1.934	.117
Operating Cost	Between Groups	11.406	4	2.851	2.363	.064
Cash Available for Debt Service (CADS)	Between Groups	3.279	4	.820	1.215	.315
Principal payback	Between Groups	17.638	4	4.410	4.199	.005
Loan Life Coverage Ratio (LLCR)	Between Groups	1.984	4	.496	.591	.671
Net cash flow	Between Groups	1.465	4	.366	.515	.725

**Table 7.24** robust tests of equality of means of stakeholders' preference on financial model output

		Statistic <sup>a</sup>	df1	df2	Sig.
Net operating profit	Welch	4.527	4	15.689	.013
Internal Rate of Return (IRR)	Welch	4.219	4	15.912	.016
Net Present Value (NPV)	Welch	8.739	4	14.803	.001
Revenue	Welch	3.331	4	15.773	.037
Operating Cost	Welch	2.936	4	18.696	.048
Principal payback	Welch	3.813	4	18.440	.020

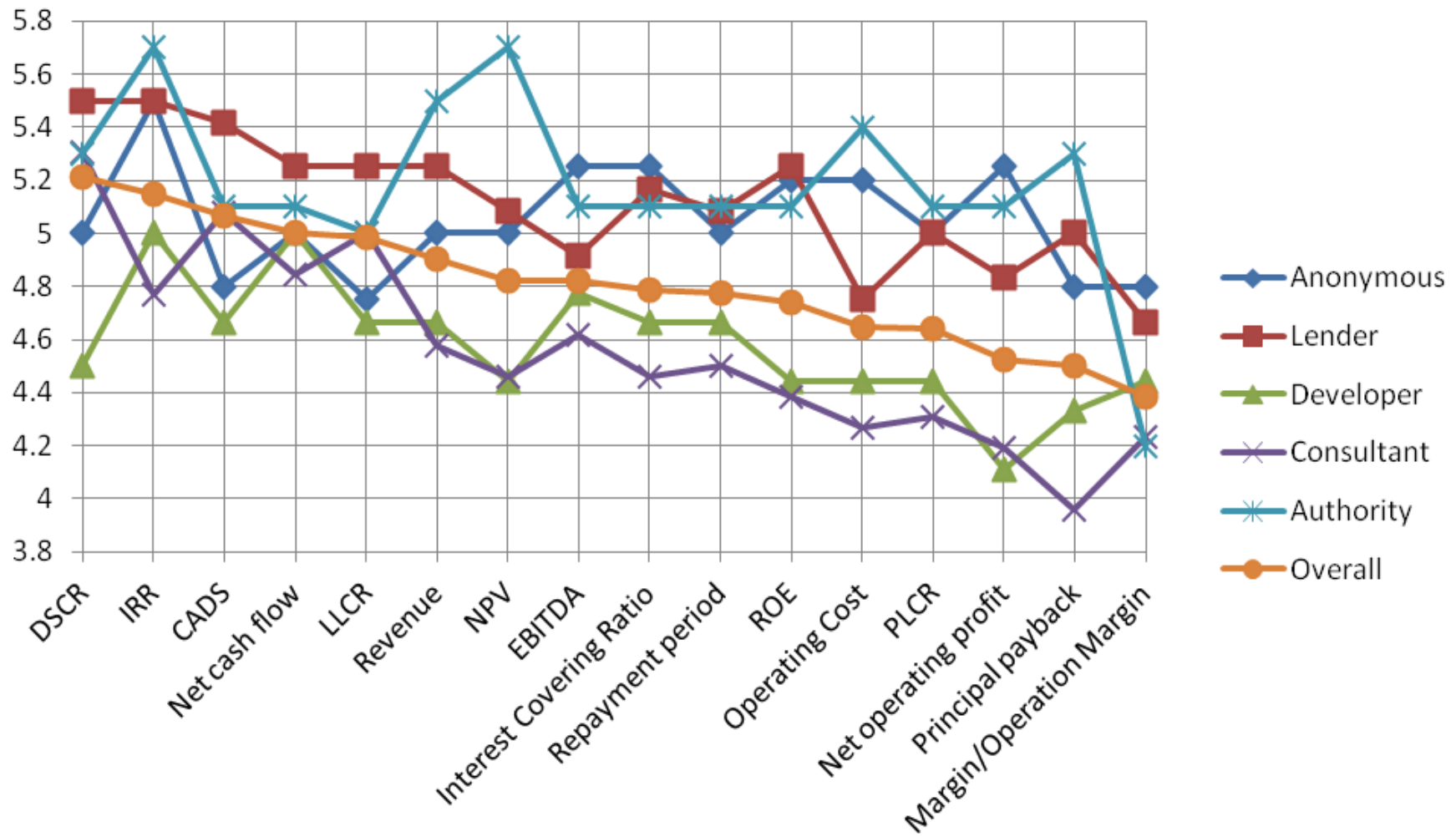
a. Asymptotically F distributed.

**Table 7.25** Post hoc tests of stakeholders' preference on financial model output

Dependent Variable	(I) Stakeholder	(J) Stakeholder	Mean Difference (I-J)	Std. Error	Sig.
Net operating profit (Games-Howell)	Consultant	anonymous	-1.05769**	.28464	.066
		Lender	-.64103	.30291	.259
		Developer	.08120	.37680	.999
		Authority	-.90769	.34265	.120
Internal Rate of Return (IRR) (Dunnett T3)	Consultant	anonymous	-.73077	.33462	.405
		Lender	-.73077	.28578	.151
		Developer	-.23077	.33462	.998
		Authority	-.93077*	.22797	.003
Net Present Value (NPV) (Dunnett T3)	Authority	anonymous	.70000	.43589	.692
		Lender	.61667	.32563	.490
		Developer	1.25556*	.33129	.023
		Consultant	1.23846*	.20617	.000
Revenue (Dunnett T3)	Consultant	anonymous	-.42308	.46522	.970
		Lender	-.67308	.33506	.399
		Developer	-.08974	.32453	1.000
		Authority	-.92308*	.27846	.022
Operating Cost (Dunnett T3)	Consultant	anonymous	-.93077	.43697	.401
		Lender	-.48077	.45206	.955
		Developer	-.17521	.37063	1.000
		Authority	-1.13077*	.34937	.035
Principal payback (Dunnett T3)	Consultant	anonymous	-.83846	.42960	.494
		Lender	-1.03846	.38809	.124
		Developer	-.37179	.35762	.960
		Authority	-1.33846*	.36682	.017

\*. The mean difference is significant at the 0.05 level.

\*\*.. The mean difference is justified to be significant at the 0.1 level.



**Figure 7.8** Means plots of stakeholders' preference on financial model output

## 7.7 Discussion of research findings

From the above analyses, it is evident that the most important stakeholders' expectations change slightly through the project stages. Meanwhile, the most important financial indicators were selected according to their rankings without considering the project stages, as shown in table 7.26 and table 7.27. However, in order to gain more interesting findings, the discussion will be limited to the disagreement between stakeholders, which is indicated by the significant mean variance from statistical analysis and visual identification of means plot.

**Table 7.26** Comparison of the top rank preferred input assumptions

Stakeholder	Input Assumptions		
	Top 5	Mean	Rank
Sponsor(s)	Project costs	5	1
	Volume / demand	4.8889	2
	Revenue forecast	4.7778	3
	Operating cost	4.7778	3
	Loan repayment schedule	4.7778	3
	Financing cost	4.7778	3
Authority	Volume / demand	5.6667	1
	Operating cost	5.6	2
	Maintenance cost	5.6	2
	Project timelines	5.6	2
	Revenue forecast	5.5	3
Lender	Volume / demand	5.4167	1
	Project costs	5.3333	2
	Revenue forecast	5.3333	2
	Operating cost	5.3333	2
	Interest and fees	5.3333	2
Consultant	Project costs	5.2222	1
	Volume / demand	5.1481	2
	Revenue forecast	5.1481	2
	Capital structure	5.1111	3
	Operating cost	5	4
	Loan repayment schedule	5	4

**Table 7.27** Comparison of the top rank preferred financial model outputs

Stakeholder	Financial Model Outputs		
	Top Rank	Mean	Rank
Sponsor(s)	IRR	5	1
	Net cash flow	5	1
	EBITDA	4.7778	2
	CADS	4.6667	3
	LLCR	4.6667	3
	Interest covering ratio	4.6667	3
	Repayment period	4.6667	3
	Revenue	4.6667	3
Authority	IRR	5.7	1
	NPV	5.7	1
	Revenue	5.5	2
	Operating cost	5.4	3
	DSCR	5.3	4
Lender	IRR	5.5	1
	DSCR	5.5	2
	CADS	5.4167	3
	Net cash flow	5.25	4
	LLCR	5.25	4
	Revenue	5.25	4
	ROE	5.25	4
Consultant	DSCR	5.3077	1
	CADS	5.0769	2
	LLCR	5	3
	Net cash flow	4.9462	4
	IRR	4.7692	5

In order to simplify the disagreement analysis, the following most financial indicators was selected: (1) Input assumptions (e.g. Project costs, Volume / Demand (traffic), Revenue forecast, Operating cost, Maintenance cost, Loan repayment schedule, Financing cost, Project timelines, Capital structure, and Interest and fees); and (2) output (e.g. IRR, Net cash flow, EBITDA, CADS, LLCR, Interest covering ratio, Repayment period, Revenue, NPV, Operating cost, ROE, and DSCR).

### **7.7.1 *Lender vs. sponsor***

At the pre-proposal stage, although all private parties agreed on the importance of expectations in utilising PPP financial model, there is a rather interesting fact for a discussion if we look at the means plot as illustrated in figure 7.4. Whilst bankability was expected for commercial project, lenders and consultants agreed that bankability (PP-6) was the most important expectation. Sponsors and the authorities preferred to use PPP financial model in order to prove that the project would generate enough cash flow (PP-8). This implies that the project should generate enough cash flow so as to give lenders a margin of safety with respect to debt service obligations, and that it is bankable. Although Bankable and Generate enough cash flow essentially have similar meaning, the sponsors have different perceptions between bankability (PP-6) and generate enough cash flow (PP-8) [see figure 7.4]. The sponsors perceived that being bankable was not enough. Thus, the sponsors significantly expected that PPP financial models reflected the project and the financing terms (PP-2 at 4.8889) and proved that the project generated enough cash flow (PP-8 at 5) more than being merely bankable (PP-9 at 4.333, which is ranked fourth within this group). This empirical evidence supports the view that an efficient negotiation is possible if PPP financial models are used at the pre-proposal stage to examine the project's ability in generating enough cash flow. As it has been reported that many planned PPP projects fail because their terms are negotiated without taking into account whether the project is bankable or not (World Bank and PPIAF, 2007).

### **7.7.2 *Lender vs. authority***

From the Post-Hoc analysis (see table 7.17) and visual identification of means plots at the contract negotiation stage, Authority group was not apt to pay much attention on the lender's requirement of high equity level to minimise the debt repayment risk (CN-7 rated at 3.8182). Contrary to Authority's, lenders score CN-7 at 4.9167 because they require a high equity level as commitment of the sponsor to ensure the financial viability of the project (Zhang, 2005b). Due to its risky nature from the lender's viewpoint, government regulation should stipulate that the level of equity ratio is not less than 20% (Yun et al., 2009). Furthermore, government authority in Turkey favours high equity because more equity means less total project cost (Bakatjan *et al.*, 2003). Nevertheless, the requirement of high equity ratio can be lowered if the credit rating of the host country is upgraded.

The other mean significant difference between Lender and Authority groups is project's borrowing capacity (CN-9). In line with the lenders' most expectations at the pre-proposal stage (PP – 6 and PP – 8), Lenders select CN – 9 as the most expectation at the contract negotiation stage as well (5.5). While authority scores this expectation only at 4.6364. The statistic and means plots suggest that government must ensure that the project has enough borrowing power (or robust cash flow) for lenders to be interested in supporting the project. The support from the government could be a no competing clause for first 7 years or 5 years after completing the project as recommended by Task Force for Indian Seaports (Government of India, 2007).

### **7.7.3 Lender vs. consultant**

At the contract negotiation stage, consultant group's point of view was dominant at the authority side. This is reflected by the mean similarity scores of consultant and authority for both expectations (Highest Equity) CN – 7 and (Project's borrowing capacity) CN – 9 (see figure 7.5). Meanwhile, the disagreement of financial input assumption between consultant and lender is target of equity. Lender significantly preferred target of equity more than consultant. These results might explain why financial close period (at the finance-raising stage) took longer than the anticipated when consultant and authority did not anticipate the lenders' requirements (e.g. high equity and high project's borrowing capacity) at the contract negotiation stage. Therefore, these findings also empower that a PPP financial model plays an important role to assist in negotiating the best equity level for the project and also the other roles in forecasting the project cash flow, and allocating the risk sharing mechanism at the contract negotiation stage.

### **7.7.4 Authority vs. sponsor**

Authority had several expectations that significantly differed from sponsor such as Transparency (PP – 4), Lowest equity (CN – 2), Securing cash flow (CN – 3), Transparency (CN – 5), Agreements on risk allocation (CN – 12), and Securing the operational cash flow (O - 1). Figure 7.4 and 7.5 show the preferred consistency of transparency expectation (PP – 4 and CN – 5) from both authority and sponsor. There is demand from the public to keep the procurement process transparent, while in the other side, sponsors need to protect their business in the competition. This expectation is regarded as the starting point in the contract negotiation process. Since transparency and

accountability are an integral part of PPP processes especially in the UK (Demirag and Khadaroo, 2011), the government authorities should maintain transparency of PPP procurement process. A transparent financial model should also show all calculation formulas. Any results from the financial model computation can be easily traced for auditing purposes. Once private parties are willing to be transparent in presenting their financial model, government must ensure that the project has enough borrowing power (or robust cash flow) for lenders to be interested in supporting the project.

The other expectation is lowest equity commitment (CN – 2). As discussed earlier, only the group of authority rates CN – 2 as the least important expectation at 3.2 (close to “disagree). It implies that the authority requires a fair equity level for the sponsor at the contract negotiation stage.

Although both authority and sponsor opted securing cash flow (CN – 3) higher than lender and consultant, the authority group significantly demanded more expectation than the sponsor in using PPP financial model to secure the project’s cash flow. This is also a sign that the authority group uses the financial model not solely to secure the project’s cash flow but also to negotiate risk sharing mechanism (CN – 12) in the contract negotiation stage.

Meanwhile, sponsors preferred to use the financial model that can be updated easily (O-3) and ‘ability of the SPV to meet conditions related to the payment of dividends’ (O-4) as their top expectations. Easy to update the financial model (O-3) means that sponsor (SPV company) does not have to think about how to update the model, but simply changing the input assumption with the real information in order to get the desired results instead. Once all information is replaced with the newest version, it is also crucial to ensure that all numbers are recalculated before reviewing the results (Tjia, 2009). Otherwise, it will lead to a wrong judgement based on misleading information. Therefore, PPP financial model should not be overly used in making decision. Instead, it should be used with caution due to error-prone humans behind the equations.



At the operation stage, authority group also dominated the expectation in securing the operational cash flow (O - 1) because government authority had to make sure that PPP project should be able to demonstrate value for money throughout in the delivery of services by the sponsor (Robinson and Scott, 2009). In connection to value for money requirement, from the post hoc test, the authority also prefers NPV more than the sponsor does.

#### **7.7.5 Authority vs. consultant**

At the finance-raising stage, authority perceived that global and regional trends analysis (FR - 8) and Market analysis (FR - 10) were very important. The authority group used PPP financial model to review the current and future tariff structure of the facility and the corresponding tariff sensitivities of its consumers, including a fairly detailed study of demand and tariff elasticity before approving broad financing terms of the project (Khan and Parra, 2003). Meanwhile, the consultant rated financial close on acceptable terms and construction start (FR-1) because there is a tendency of the lenders to revisit issues previously agreed by sponsor and government authority for securing their interest on risk management (Carlidge, 2006). Consequently, the sponsor cannot commence the construction until all the financing required by lenders are fully mobilised to commission the facility. Thus, at the finance-raising stage, consultant focused on using PPP financial model as a tool to assist in achieving financial closure as soon as possible. At the operation stage, it was important for the authority to understand how to use financial model properly (O – 2) so that a reasonable tariff (O – 6) could be achieved to maintain a healthy competition in delivering public services. Meanwhile, consultant rated reasonable tariff (O-6) as the least important expectation in using PPP financial model at the operation period. This was evidence that consultant should pay attention on what authority expected in using PPP financial model at the operation period.

Consultant and authority disagreed on some financial input indicators (e.g. Initial working capital, Tax information, Exchange rate parity, Loan commitment, and Maintenance cost) and output indicators (e.g. IRR, NPV, Revenue, Operating Cost, and Principal Payback). Authority's scores were higher than consultant on these financial indicators. The findings indicate that consultants have different preference on the most important output of PPP financial model (see figure 7.8 and 7.9). This is an interesting finding because consultants' expectations on PPP financial model at contract

negotiation stage were dominant at the authority side. Since the authority needs recommendation from consultant, this finding suggests that the consultant preference on the most financial input and output indicators should be considered by the authority.

## 7.8 Chapter summary

In general, 40 stakeholders' expectations passed all systematic analysis tests. And all preferred financial indicators (26 input assumptions and 16 output variables) also passed all tests of systematic statistical analyses, e.g. Principal component analysis (PCA), Pearson bivariate correlation (parametric) and Spearman's rank correlation (non-parametric) analyses, Cronbach alpha Internal Consistency Reliability Test, Agreement Analysis One-Way ANOVA test, Post Hoc Test and Means Plot. The summary of the systematic statistical analyses is illustrated in Figure 7.9.

The systematic statistical analyses were designed to test two hypotheses that addressed in the earlier part of this chapter. The first hypothesis is related to the agreement among stakeholders upon their expectations in using PPP financial models. By using ANOVA test and Robust Tests of Equality of Means, the results indicated that government authorities, sponsors, lenders, and consultant agencies considered all expectation variables in using PPP financial models (*H<sub>01</sub>* is accepted) at the pre-proposal and finance-raising stages. Meanwhile, not all stakeholders had the same expectations in using PPP financial models (*H<sub>01</sub>* is rejected) at the contract negotiation, construction, and operation stages. In order to identify which stakeholder differed to another stakeholder, Post Hoc Tests were conducted. The stakeholders that had different expectations at the contract negotiation stage are (1) Developer Vs Authority (CN – 2, CN – 5, and CN – 12); (2) Consultant Vs Authority (CN – 3); (3) Lender Vs Authority (CN – 7 and CN – 9); (4) Lender Vs Consultant (CN – 7 and CN – 9). And the stakeholders that had different expectations at the operation stage are: Consultant Vs Authority (O – 2) and (O – 6).

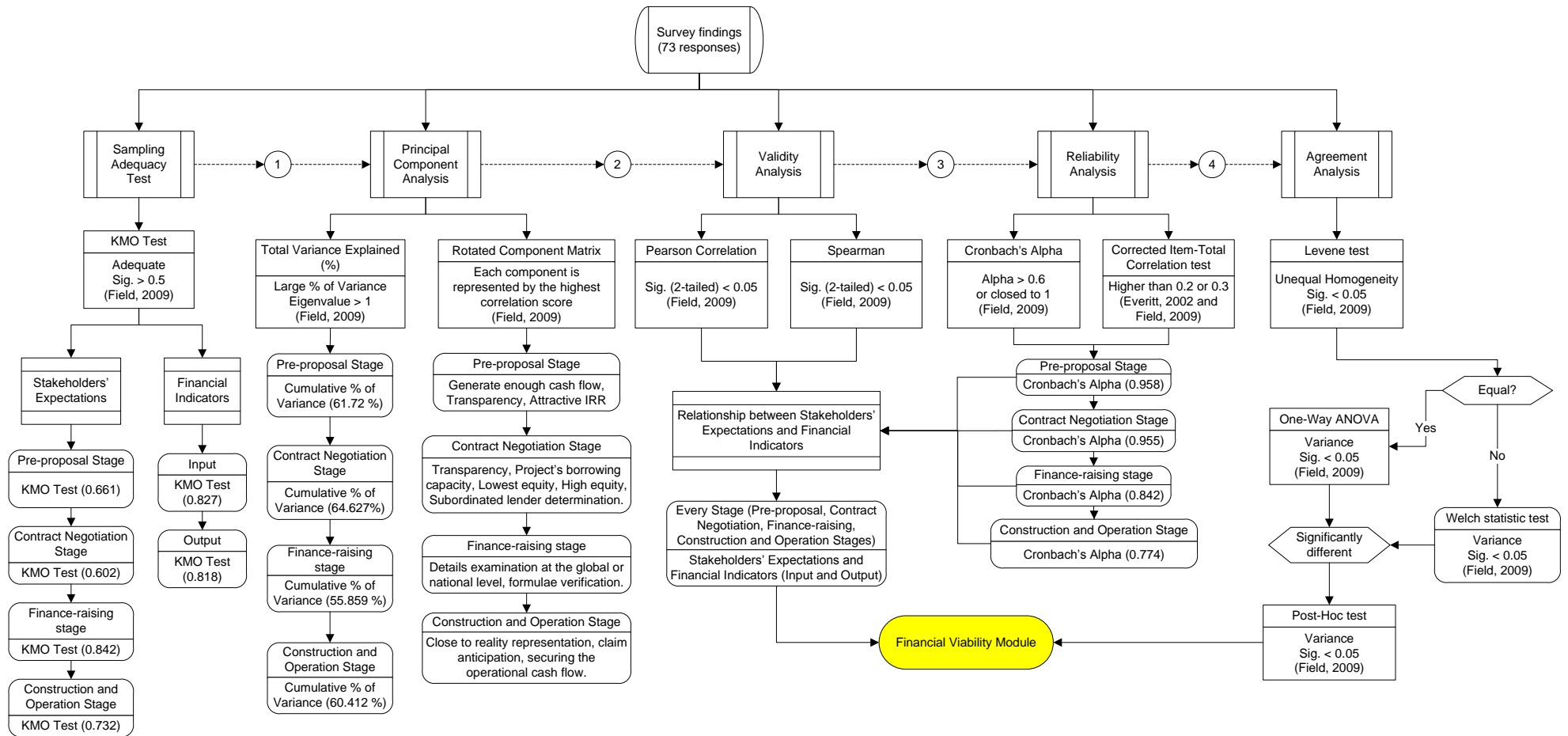
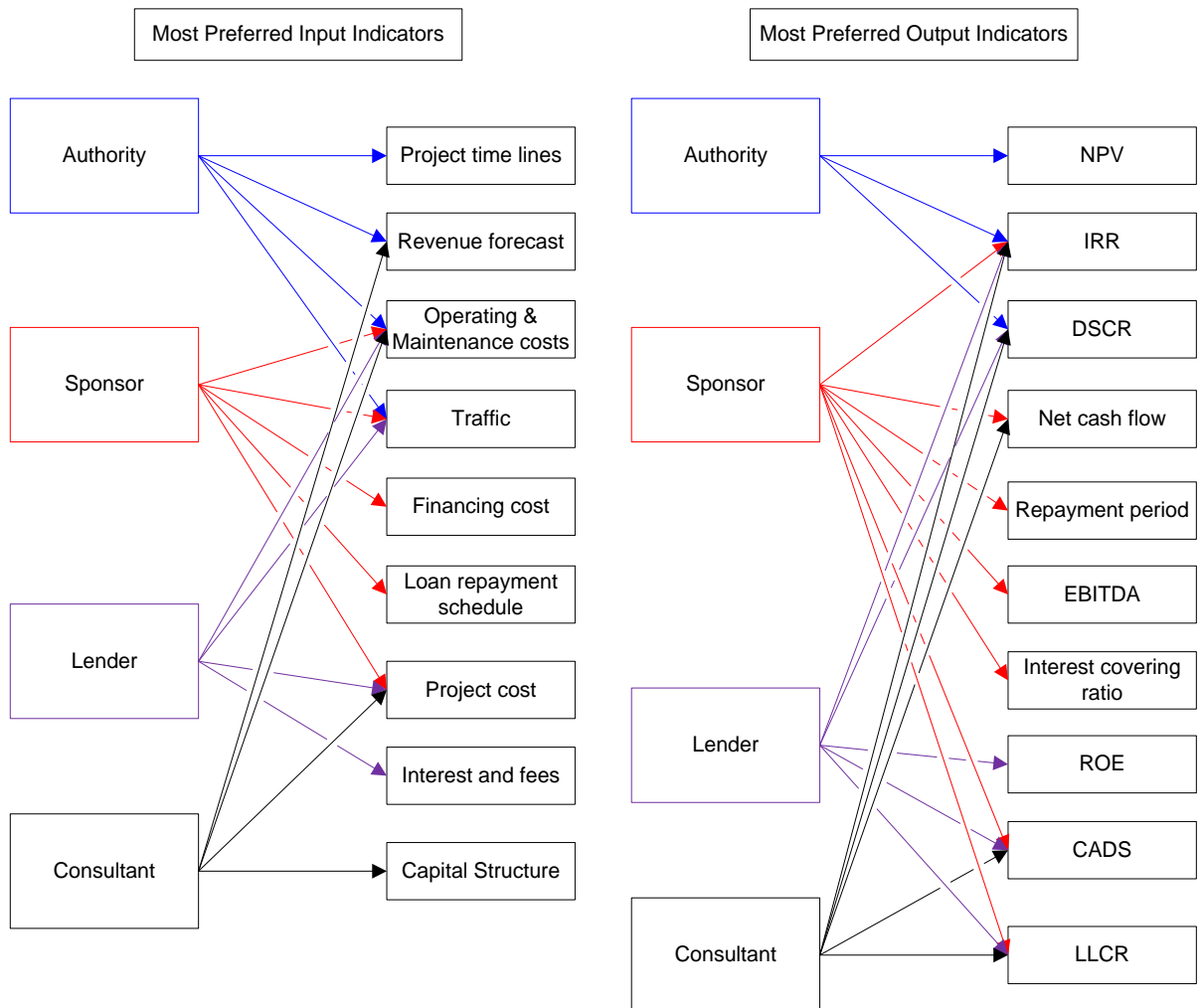


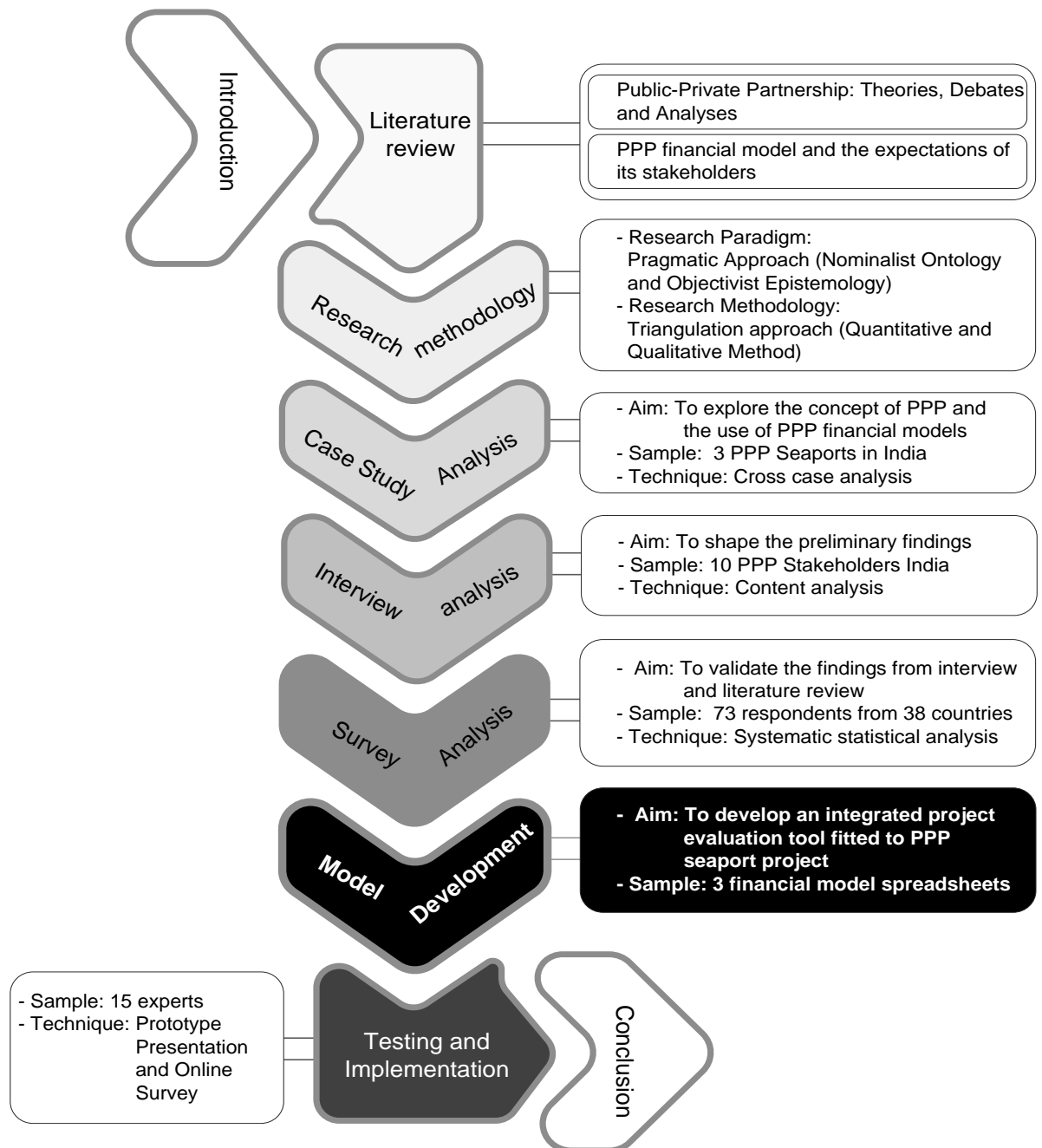
Figure 7.9 Systematic statistical analyses

The second hypothesis is proposed to test the agreement among stakeholders on financial indicators (input assumptions and output variables). The results indicate that not all stakeholders have the same preferences on input assumptions and financial model output ( $H_02$  is rejected). The stakeholders that have different preference on input assumptions are: (1) Consultant Vs Authority (e.g. Initial working capital, Tax Information, Exchange rate parity, Loan commitment, and Maintenance cost); and (2) Lender Vs Consultant (e.g. Target of equity). And the stakeholders that have different preference on financial model output are: (1) Consultant Vs Authority (e.g. Internal Rate of Return, Net Present Value, Revenue, Operating Cost, and Principal payback); and (2) Developer Vs Authority (e.g. Net Present Value). The links between stakeholders and financial indicators are presented in figure 7.10. These findings to be discussed in the next chapter.



**Figure 7.10** The links between stakeholders and financial indicators

# CHAPTER EIGHT: DISCUSSION AND FRAMEWORK CONSTRUCTION



## **Chapter 8: Discussion and Framework Construction**

*“We have to continually be jumping off cliffs and developing our wings on the way down.”*

(Kurt Vonnegut 1922 – 2007)

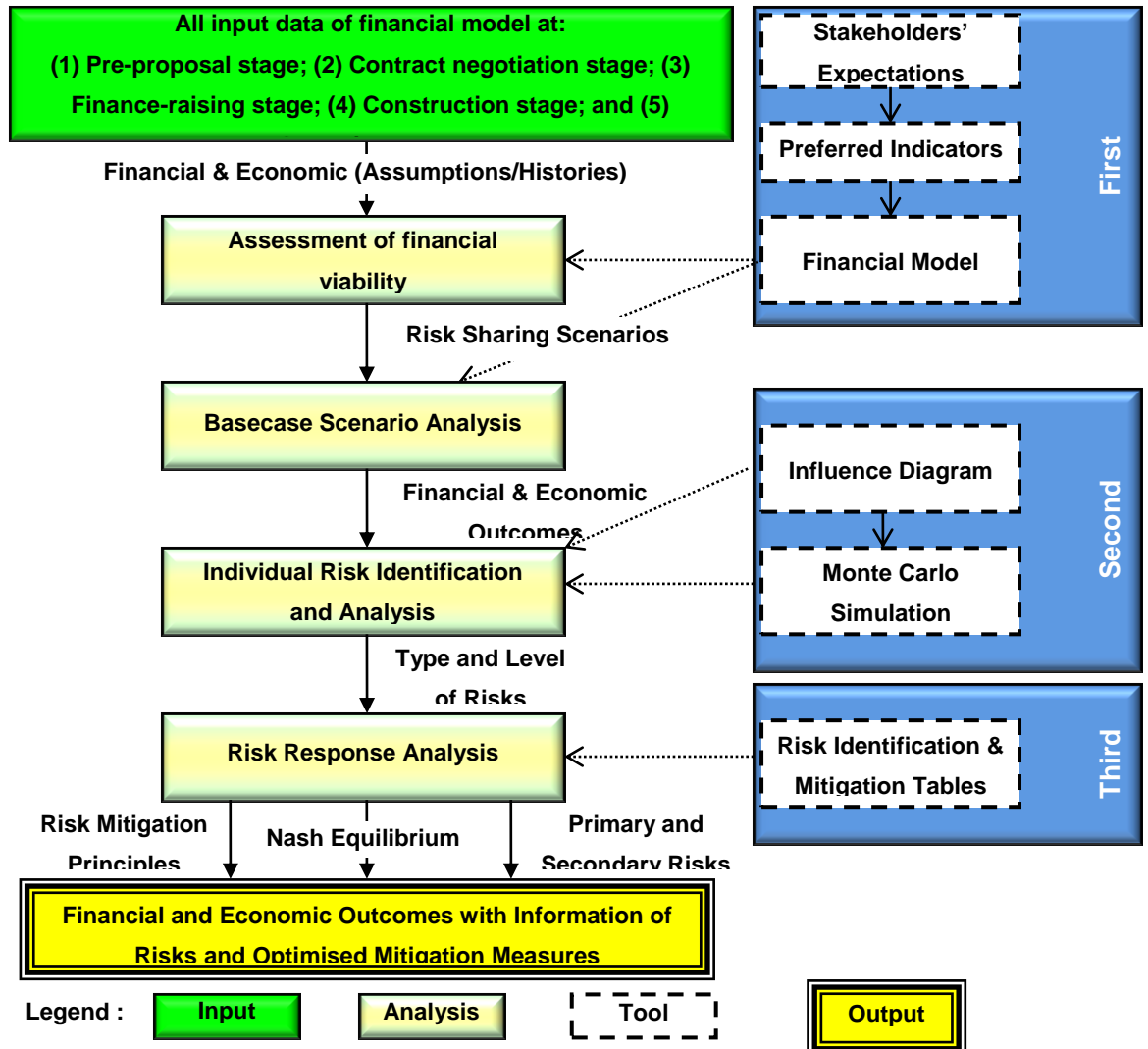
### **8.1 Introduction**

This chapter follows up the findings obtained from chapters five, six and seven. An integrated project evaluation tool (IPET) is developed based on the findings from literature review, interview, and questionnaire survey. This chapter also highlights the concept and development of the model. In order to assist government agencies in evaluating bids and making decisions efficiently, IPET considers the stakeholders' expectations, financial risk variables, financial risks, and mitigation measures with the following modules: (1) Financial viability module; (2) Financial risk analysis module; and (3) Financial risk mitigation module. Therefore, this chapter contains two parts. The first part begins with the discussion of the methods used in developing IPET. And the second part presents and explains IPET into a framework of the three modules. Each module will be combined and then demonstrated diagrammatically.

### **8.2 The approach used in developing IPET**

The implementation of PPP seaport was explored in chapter 5. Typical procedures used for evaluating PPP seaport projects in Indian case gave some insight into the proposed tool. While chapter 6 and 7 corroborated the findings of stakeholders' expectations and financial risk variables of PPP financial models to ensure that an effective evaluation method can be implemented efficiently. Stakeholders' expectations in utilising PPP financial models including their preferred financial indicators have been explored through interview (see chapter 6). McNamara (2006) stated that interview as a method for qualitative technique is particularly useful for obtaining primary data such as the story behind a participant's experiences (in utilising PPP financial models). The findings from the interview were validated quantitatively through world-wide questionnaire survey (see chapter 7). This triangulation method is deemed necessary to allow the proposed IPET to be effective and practical. Since a PPP financial model is used as the platform of financial viability module; the most important financial

indicators (e.g. input and output of financial model spreadsheet) gathered from literature review, interview and questionnaire are useful for constructing the financial viability module. The structure for an integrated project evaluation tool is illustrated in figure 8.1.



**Figure 8.1** Integrated project evaluation tool framework

The next section discusses the development of financial viability module by revisiting the general architecture of a financial model and relating it to the statistical findings from the survey.

### 8.3 The financial viability module

A financial model which is used in capital budgeting (or investment appraisal) determines which project<sup>48</sup> is worth pursuing in a capital expenditure. According to Baker and Powell (2005), *“the capital budgeting process is a system of interrelated steps for generating long-term investment proposals; reviewing, analyzing, and selecting from them; and implementing and following up on those selected”*.

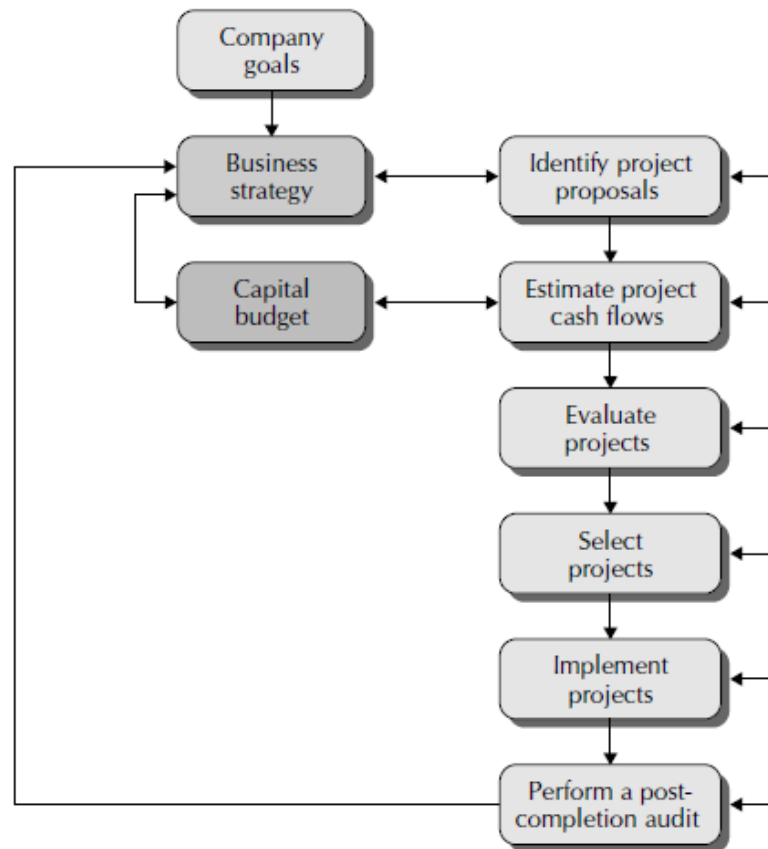
As a general principle, capital budgeting analyses such as discounted cash flow methods (e.g. NPV, IRR, MIRR, payback period and discounted payback period) require separating investment (capital budgeting) and financing decisions. Thus, a capital budgeting project should be evaluated independently of the source of funds used to finance the project. Operating cash flows (cash flows from the project’s operating activities) and investment cash flows (cash flows associated with acquiring or disposing of the project’s assets) should be included in the estimations, except financing cash flows that are associated with financing the project. Therefore, financing costs should be excluded from the cash flows used to evaluate projects (Baker and Powell, 2005).

Although no universal consensus exists, Baker and Powell (2005) proposed a simple way to view capital budgeting into six-stage process as illustrated in figure 8.1. Based on the company goals and the business strategy, project proposals are developed and evaluated. The next step is to identify and estimate the incremental, after-tax cash flows for a proposed project. The project’s incremental after-tax cash flows are evaluated to determine the financial viability of projects. Once the most financially viable project that meets the selection criteria is determined, the next step is to identify the order of implementation, initiate, and track the selected projects. Then, a post-completion audit is performed periodically to compare the actual cash flows for the project to the prior estimates in the capital budgeting proposal.

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<sup>48</sup> There are three project classifications such as: (1) expansion projects or replacement projects; (2) discretionary or mandated projects; (3) independent project or mutually exclusive projects (Baker and Powell, 2005).



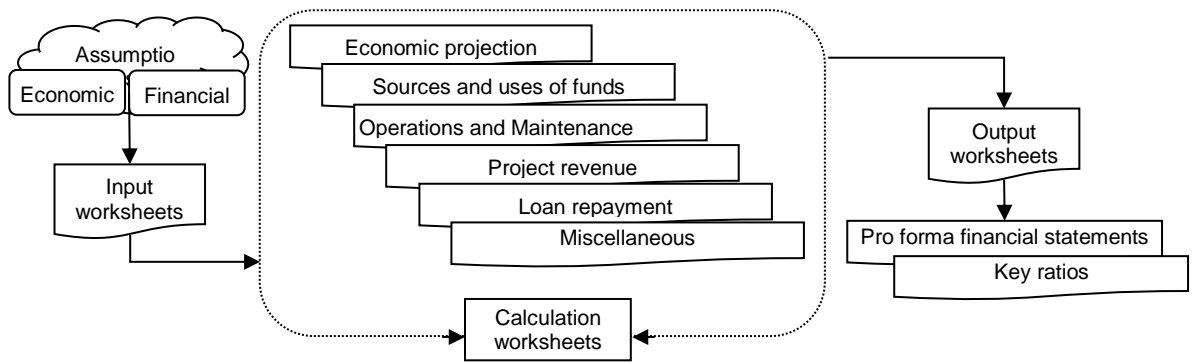


**Figure 8.2** An integrated view of the capital budgeting process

*Source: Baker and Powel (2005)*

Figure 8.2 also shows that financial model is used in the investment appraisal process, which is starting from project proposal identification up to post completion audit. Further, Chang and Chen (2001) stated that a complete financial model helps the government authority map out the best scheme for the best of public while developing policies and negotiating with the sponsor(s).

The core aim of financial model contains economic and financial assumptions to predict project performance. Typically, a financial model is arranged in a spreadsheet with different worksheets. The architecture of a typical financial modelling of a project is illustrated in figure 8.3, showing the standard parts (or worksheets) of a financial model. The standard worksheets comprise three categories such as: (1) Input Worksheet, (2) Calculation Worksheet, and (3) Output Worksheet.



**Figure 8.3** Architecture of a Financial Model

*Source: Modified from Khan and Parra (2003)*

Input worksheets. These worksheets generally comprise various assumptions (e.g. project timelines, economic assumptions, technical data, capital cost, loan commitment, tenor, grace, loan type, interest rate and fees, repayment structure, target of equity, ROE, tax information, working capital and reserves, etc.), which are derived from the project documents or from other relevant sources. These worksheets are designed to allow users to be able to change the numbers used in the model, but not the formulas. Furthermore, Swan (2008) suggested that the input worksheet should be made up of raw numbers instead of calculation. However, a link formula in the inputs sheet is not considered as calculation.

According to Swan (2008), several considerations should be followed in developing input worksheet such as:

1. Separated input sheet or assumption sheet
2. The ability to track an assumption right back to its source (e.g. a data book or project document)
3. User ability to change number without changing formula
4. Absence of calculations
5. Three types of data classification (publicly available information, commercially sensitive information and the ‘plug’ number (i.e. an imaginary or temporary number).
6. The expression of unit consistency

Calculation worksheets, as the most important part of a financial model, contain various calculations such as: economic projections, sources and uses of funds, operations and maintenance, project revenue, loan repayment, and miscellaneous calculations. However, these calculations are proven to be error-prone. Panko (2008) revealed that 88% of 113 financial model spreadsheets which have been audited since 1995 contain errors due to formula inconsistency. Further, Swan (2008) addressed that calculations on multiple sheets increase the risk of error because it can be difficult to form a mental map of the relationships between various elements on different sheets. In order to reduce the error and to ease the formula audit, all the calculations should be placed on a single sheet.

Output worksheets. An overall summary is shown from this worksheet to help the reader visualise the financial viability of the project, which includes pro forma financial statements (e.g. income statement, balance sheet and cash flow statement) and key ratios such debt service coverage ratio (DSCR), loan life cover ratio (LLCR), net present value (NPV), interest rate of return (IRR) and return on equity (ROE). In addition, three types of financial model outputs such as revenues, net profit and IRR will be enough to find the most suitable strategy for setting unit prices and adjusting them periodically.

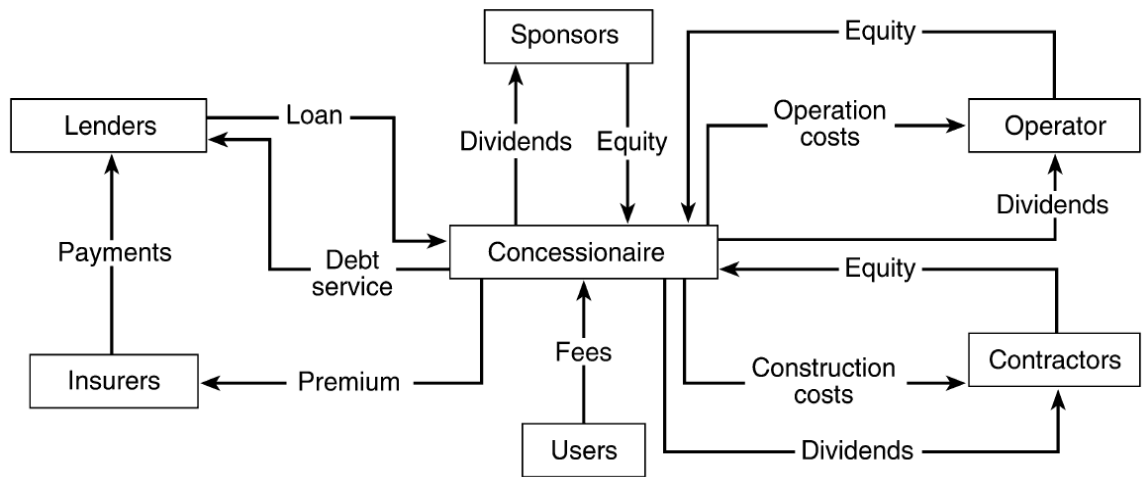
#### **8.4 Comparison of PPP financial models**

The general architecture of PPP financial model has been described in the previous section. The most common financial model used in project appraisal is a discounted cash flow (DCF) based model (Khan and Parra, 2003). According to the literature review of developing a financial model, the comparison study is limited to input and output comparison<sup>49</sup>. Therefore, in order to identify the best practice of developing PPP financial models, three financial model spreadsheets of PPP seaport projects have been selected for comparison. The input and output of financial models were compared to find the similarity and develop the best practice of financial model. Since PPP projects have the same financial structure, the variable and the parameters of financial model comparison can be done by using any type of project. The basic financial flows in a

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<sup>49</sup> Besides considering the development methods of financial models (top-down and bottom-up approaches), it is also important to examine the capability of sensitivity analysis from both input and output (i.e. calculating new outputs based on one or a range of data variations).

PPP project are illustrated in figure 8.4. Although each financial model has different format, there are six input categories and two output categories that can be classified and compared as shown in table 8.1 and table 8.2.



**Figure 8.4** BOT Financial flows

*Source: Xenidis and Angelides, (2005)*

#### 8.4.1 Background of the selected financial models

The first financial model spreadsheet is taken from the World Bank and PPIAF (2007). The financial model was used for Concession Project in China for a new Container Terminal linked (2 years construction period and 20 years operation period) to an existing terminal (22 years operation period). The public partner is the Port Authority. Meanwhile, European Joint-venture formed by a Contractor and a port operator is the sponsor of the Special Purpose Company (SPC). The Port Authority is responsible for financing and constructing the maritime infrastructures (e.g. breakwater, dredging, beaconing, etc.) and ground accesses. The responsibility of SPC are financing and construction of infrastructures, buildings, superstructures & surfacing of the new terminal; financing and installation of port equipment (gantry cranes) in the new terminal; financing and rehabilitation of the existing terminal (civil engineering and port facilities); operating of the two terminals.

**Table 8.1** Comparison of inputs of four financial models (Kulkarni and Prusty, 2007; World Bank and PPIAF, 2007; Khan and Parra, 2003)

General Architecture of financial model		PPP Container Terminal in China		La Paz Container Terminal Project		Indian PPP Seaport				
Input	General Assumptions;	(1) Project timelines;	Input	General Assumptions;	(1) Timeline Assumptions;	Input	General Assumptions;	(1) Timeline Assumptions;		
	Macro-Economic Assumptions;	(2) Economic assumptions;		Macro-Economic Assumptions;	(2) Inflation index; (3) Construction index; (4) Salaries index; (5) Interest base rates; (6) Exchange rates;		Macro-Economic Assumptions;	(3) Base Interest;	Macro-Economic Assumptions;	(2) Inflation rate; (3) Interest rate;
	Capital Expenditures Assumptions;	(3) Technical data; and (4) Capital cost.		Capital Expenditures Assumptions;	(7) Construction and Port equipment costs; (8) Development costs;		Capital Expenditures Assumptions;	(4) Project Costs;	Capital Expenditures Assumptions;	(4) Project costs;
	Operating Assumptions;	(5) Tariff; (6) Demand; (7) Operation & Maintenance; (8) Royalty to Government; (9) Other Revenue; (10) Initial Working Capital; (11) Repair & Maintenance;		Operating Assumptions;	(9) Traffic Forecasts; (10) Tariff policy; (11) Operating costs; (12) Labour costs; (13) Other fixed expenses; (14) Lease payment;		Operating Assumptions;	(5) Tariff; (6) Demand; (7) Operation & Maintenance; (8) Royalty to Government; (9) Other Revenue; (10) Initial Working Capital; (11) Repair & Maintenance;	Operating Assumptions;	(5) Operation, Maintenance, and Replacement; (6) Initial working capital;
	Financial Structuring Assumptions;	<i>Certain suppositions related to debt:</i> e.g. (12) Amount, (13) Tenor, (14) Grace, (15) Interest rate, (16) Loan type, (17) Repayment structure and fees; <i>as well as equity</i> , e.g. (18) Amount, (19) Target of equity and (20) ROE.		Financial Structuring Assumptions;	(15) Equity; (16) Financial Debt under Project Finance basis; (17) Export credit option (for the purchase of the port equipments); (18) Trustee account option (for the debt service); (19) Option for a dynamic management of the cash flow account; (20) revolving credit option; (21) cash-in / cash-out (contractor);		Financial Structuring Assumptions;	(12) Capital Structure; (13) Debt; (14) Equity;	Financial Structuring Assumptions;	(7) Capital Structure; (8) Debt; (9) Equity; (10) Repayment structure;
	Fiscal & Accounting Assumptions.	(21) Tax information; working capital; and (22) Reserves.		Fiscal & Accounting Assumptions.	(22) Fiscal assumptions (Corporate tax rate); (23) Accounting assumptions (Depreciation mode and period).		Fiscal & Accounting Assumptions.	(15) Income Tax Assumptions.	Fiscal & Accounting Assumptions.	(11) Income Tax Assumptions.

**Table 8.2** Comparison of the outputs from four financial models (Kulkarni and Prusty, 2007; World Bank and PPIAF, 2007; Khan and Parra, 2003)

General Architecture of financial model		PPP Container Terminal in China		La Paz Container Terminal Project		Indian PPP Seaport				
Output	Pro forma financial statements	(1) Income statement;	Profit & Loss Statement	(1) Profit & Loss Statement; (2) Corporation Tax Calculation;	Income Statement	(1) Demand; (2) Tariff; (3) Revenue; (4) Expenses; (5) EBITDA; (6) EBIT; (7) EBT; (8) Net income; (9) Free Cash Flow to Equity;	Projected Profit & Loss Statement	(1) Revenue; (2) Revenue share; (3) Net revenue, expenditure; (4) EBITDA; (5) EBT; (6) Net Income;		
		(2) Cash flow statement.	Cash Flow Statement	(3) Dividends Distribution Policy; (4) Cash Flow Statement; (5) Sources & Uses Statement; (6) Trustee Account for Debt Service; (7) Dynamic Management of Trustee Account;	Cash Flow Statement	(10) Net Income; <i>Adjustments</i> : (11) Depreciation, (12) Principal Payments, (13) Increase in working capital; (14) Netcashflow available to equity holders; (15) Cash balance;	Projected Cash Flow Statement	(7) Cash flow from operating activities; (8) Cash flow from investing activities; (9) Cash flow from Financing activities; (10) Closing balance of cash;		
		(3) Balance sheet;	Balance Sheet	(8) Assets; (9) Liabilities; (10) Equity; (11) Balance Check;	Balance Sheet	(16) Assets; (17) Liabilities; (18) Equity; (19) Balance Check;	Projected Balance Sheet.	(11) Liabilities; and (12) Assets;		
	Key ratios	(4) DSCR; (5) LLCR; (6) NPV; (7) IRR; and (8) ROE.	Requirement for Financial Balance	(12) Annual Debt Service Cover Ratio; (13) Debt Cost & Loan Life Cover Ratio; (14) Financial Structure Ratios;	Output		(20) IRR; (21) ROE; (22) DSCR; (23) Cover Ratio; (24) Historical DSCR; (25) Projected DSCR.	IRR & DSCR Calculation	(13) EBITDA; (14) Interest Expense; (15) Loan Repayment, Equity; (16) Debt; (17) Total Capital; (18) Tax Expense; (19) Project Cash flow (after tax); (20) Equity IRR (after tax); (21) Project IRR (post-tax); (22) Cash flow to equity (after tax); (23) DSCR;	
			Requirement for Financial Return	(15) Payback; (16) Internal rate of Return of the Project; (17) Return on Equity; (18) Shareholders Return; (19) Cash-in / Cash-Out Contractor;					Other Important Ratios	(24) Current ratio; (25) Asset turnover ratio; (26) Operating margin; (27) Net profit margin; (28) Degree of operating leverage; (29) Interest coverage ratio.
			Project Synthesis	(20) Traffic forecast (annual); (21) Cash Flow Statement (annual); (22) Annual Debt Service Cover Ratios; (21) "Endogenous" Financial Risk Analysis (Net Operating Cash Flow vs. Debt Service).						

The second financial model is derived from Khan and Parra (2003). An illustrative project of La Paz Container Terminal, with 2 years construction and 30 years operation periods, is used in the financial model. The SPC is a joint venture of international stevedoring company and a local firm with no borrowing history. The responsibilities of both the Port Authority and the SPC are similar to the first sample of concession project in China.

The third project is a PPP seaport project in India with an assumption of 30 years concession period, which includes 2 years construction period and the remaining 28 years of operation. The government authority has taken initiatives for private sector participation of Indian seaports since October 1996 (Kulkarni and Prusty, 2007). The sponsors comprise joint ventures by international marine terminal operators and local infrastructure developer holding companies. The responsibilities of both the Sponsor(s) and the government authority are relatively similar to the two abovementioned projects.

#### ***8.4.2 Input assumptions***

There are six categories commonly used in the input of PPP financial models, such as: (1) General Assumptions; (2) Macro-Economic Assumptions; (3) Capital Expenditures Assumptions; (4) Operating Assumptions; (5) Financial Structuring Assumptions; and (6) Fiscal Accounting Assumptions. Each category has several detailed assumptions that may vary from one financial model to another. Hence, these numerous assumptions are complicated for the stakeholders, especially for the government authority, to evaluate PPP projects. In order to narrow-down the scope of analysis, only the most preferred financial model assumptions, which are based on each stakeholder, are compared to the three financial models. These financial indicators are available in all three financial models of the container terminal in China, La Paz container, and the Indian PPP seaport.

Ten most preferred input assumptions stand out from various stakeholders' preference on input assumptions, which are: (1) Project costs; (2) Volume / Demand (traffic); (3) Revenue forecast; (4) Operating cost; (5) Maintenance cost; (6) Loan repayment schedule; (7) Financing cost; (8) Project timelines; (9) Capital structure; (10) Interest and fees. Therefore, these input assumptions were selected to be the input assumptions of the financial viability module.

### 8.4.3 The financial model output

According to Khan and Parra (2003), there are two categories of the financial model outputs: (1) Pro-forma financial statements; and (2) Key ratios. Like the selection process for the input assumptions in the financial viability module, only the most preferred financial model outputs, based on each stakeholder, are compared to the three financial models. These financial indicators are also available in all the three financial models; i.e.: the container terminal in China, La Paz container, and Indian PPP seaport.

Twelve most preferred outputs stand out from various stakeholders' preference on financial model outputs, which are: (1) IRR; (2) Net cash flow; (3) EBITDA; (4) CADs; (5) LLCR; (6) Interest covering ratio; (7) Repayment period; (8) Revenue; (9) NPV; (10) Operating cost; (11) ROE; and (12) DSCR. Hence, 10 input assumptions and 12 output indicators were selected in the financial viability module as shown in table 8.3.

**Table 8.3** Financial risk variables of financial viability module

Financial risk variables	Yun, et al. (2009)	Zhang and AbouRizk (2006)	Zhang (2005b)	Survey findings
Project costs	Total project cost	Project development cost	Construction cost, construction cost escalation rate	√
Volume / Demand (traffic)	Traffic demands	Market demand	Market demand	√
Revenue forecast	Annual revenue	Sale price	Price	√
Operating and Maintenance cost	Operation and maintenance cost	Project O&M costs	O&M Cost	√
Loan repayment schedule	–	–	Loan repayment period	√
Financing cost	–	–	–	√
Project timelines	Concession period and construction duration	Construction period	Construction duration	√
Capital structure	–	–	Required minimum ratio of equity at project risks	√
Interest and fees	Escalation rate, interest rate of the loan, discount rate	Discount rate (combining interest rate and inflation rate).	Base debt interest rate, currency exchange rate, and inflation rate	√
IRR	√	–	√	√
Net cash flow	–	√	–	√
EBITDA	–	–	–	√
CADS	–	–	–	√
LLCR	–	–	√	√
Interest covering ratio	–	–	–	√



Repayment period	–	–	Loan repayment period	√
Revenue	√	√	√	√
NPV	√	Project development cost NPV	√	√
Operating cost	√	√	√	√
ROE (Equity IRR)	–	–	√	√
DSCR	√	–	√	√

#### ***8.4.4 Correlation framework of the financial viability module***

By knowing the most important expectations and the most preferred financial indicators, it is possible to highlight the correlation between them. Since the financial viability module is developed into five stages of PPP project, the correlation framework will be addressed at every stage. This will enable stakeholders to collaborate with the financial modeller in developing a comprehensive financial model.

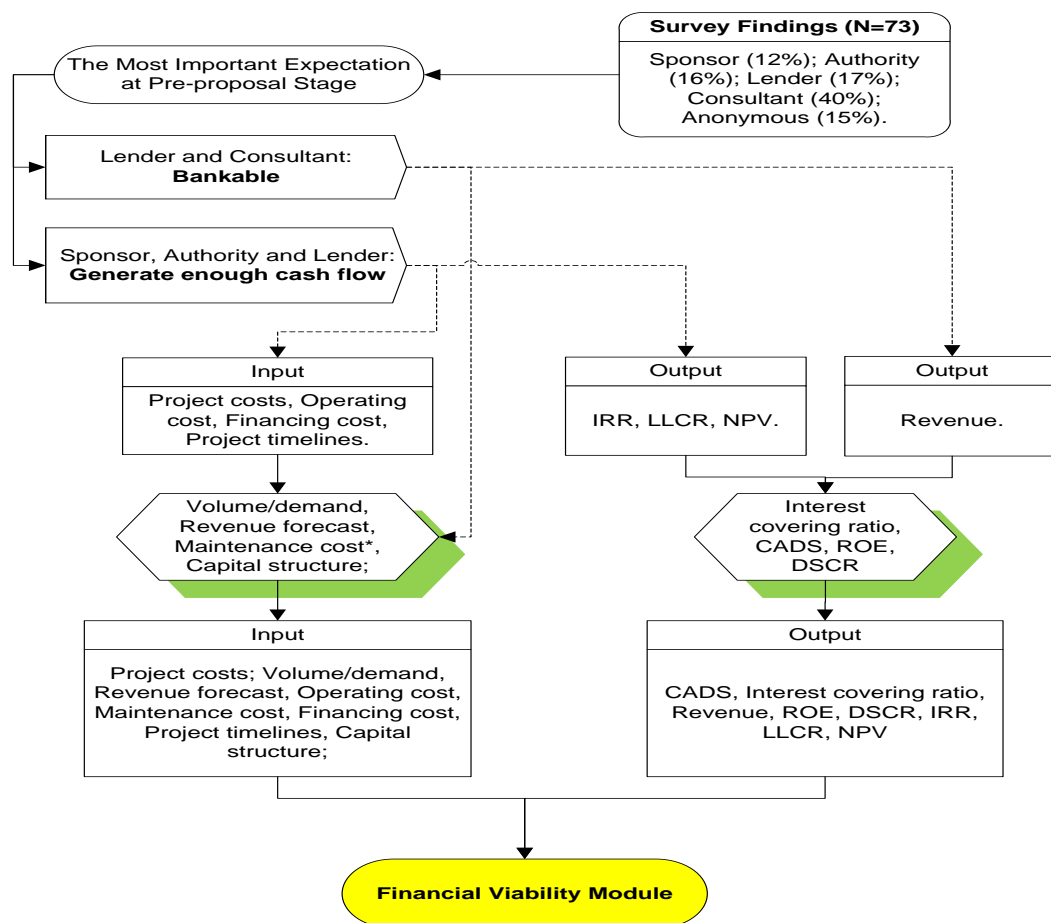
#### ***8.4.5 The financial viability module at the pre-proposal stage***

According to survey findings of the stakeholders' agreement at the previous chapter, the most important expectations in utilising PPP financial model at the pre-proposal stage can be divided into two groups. The first group consists of Lenders and Consultants who mostly prefer to employ PPP financial models in order to assess the “Bankability” of projects. Meanwhile, the second group comprises Sponsors, Authorities, and also Lenders. At the pre-proposal stage, they perceived that PPP financial models should be used mostly for knowing the ability of the project to “generate enough cash flow”.

Therefore, financial models should be able to demonstrate that the project generates enough cash flow and that it is bankable. It means that being bankable implies that the project is generating enough cash flow so as to give lenders a margin of safety with respect to debt service obligations. It has been reported that many planned PPP projects fail because their terms are negotiated without taking into account whether the project is bankable or not (World Bank and PPIAF, 2007). Although Bankable and Generate enough cash flow essentially have the same meaning, the sponsors had different perceptions between “bankability” and “generate enough cash flow” (see table 6.3). The sponsors perceived that being “bankable”, which was rated at 4.333 (close to agree), was not enough. Thus, the sponsors significantly expected that PPP financial models

proved that the project “generates enough cash flow”, which was rated at 5 (very agree), was more than being merely “bankable”.

Once the most important expectations in utilising PPP financial models are identified from the stakeholders, it is essential to determine the correlation between stakeholders’ expectations and financial indicators of PPP financial models. Top five financial indicators (input and output) which are significantly correlated with each stakeholder’s expectation are presented in this analysis (see table 7.25 and table 7.26). Figure 8.5 shows that “bankable” is significantly correlated with several input assumptions (e.g. volume/demand, revenue forecast, maintenance cost, and capital structure) and some financial model output (e.g. CADS, interest covering ratio, revenue, ROE, and DSCR). Figure 8.4 also illustrates that “generate enough cash flow” has strong correlation with several input assumptions (e.g. project costs, operating cost, financing cost, project timelines, volume/demand, revenue forecast, maintenance cost, and capital structure) and some outputs (e.g. IRR, LLCR, NPV, interest covering ratio, CADS, ROE, and DSCR).



Note: \*Contain significant variance between Consultant and Authority

**Figure 8.5** Correlation framework for financial viability module at the pre-proposal stage

These financial indicators are useful for the stakeholders to evaluate projects at the pre-proposal stage. Furthermore, among the aforementioned financial indicators, some indicators have significant correlations with two most important expectations (bankable and generate enough cash flow). They are categorised under input assumptions (e.g. volume/demand, revenue forecast, maintenance cost<sup>50</sup>, and capital structure) and financial model output (e.g. interest covering ratio, CADS, ROE, and DSCR). Therefore, these indicators are the core financial indicators that should be further analysed by all stakeholders at the pre-proposal stage.

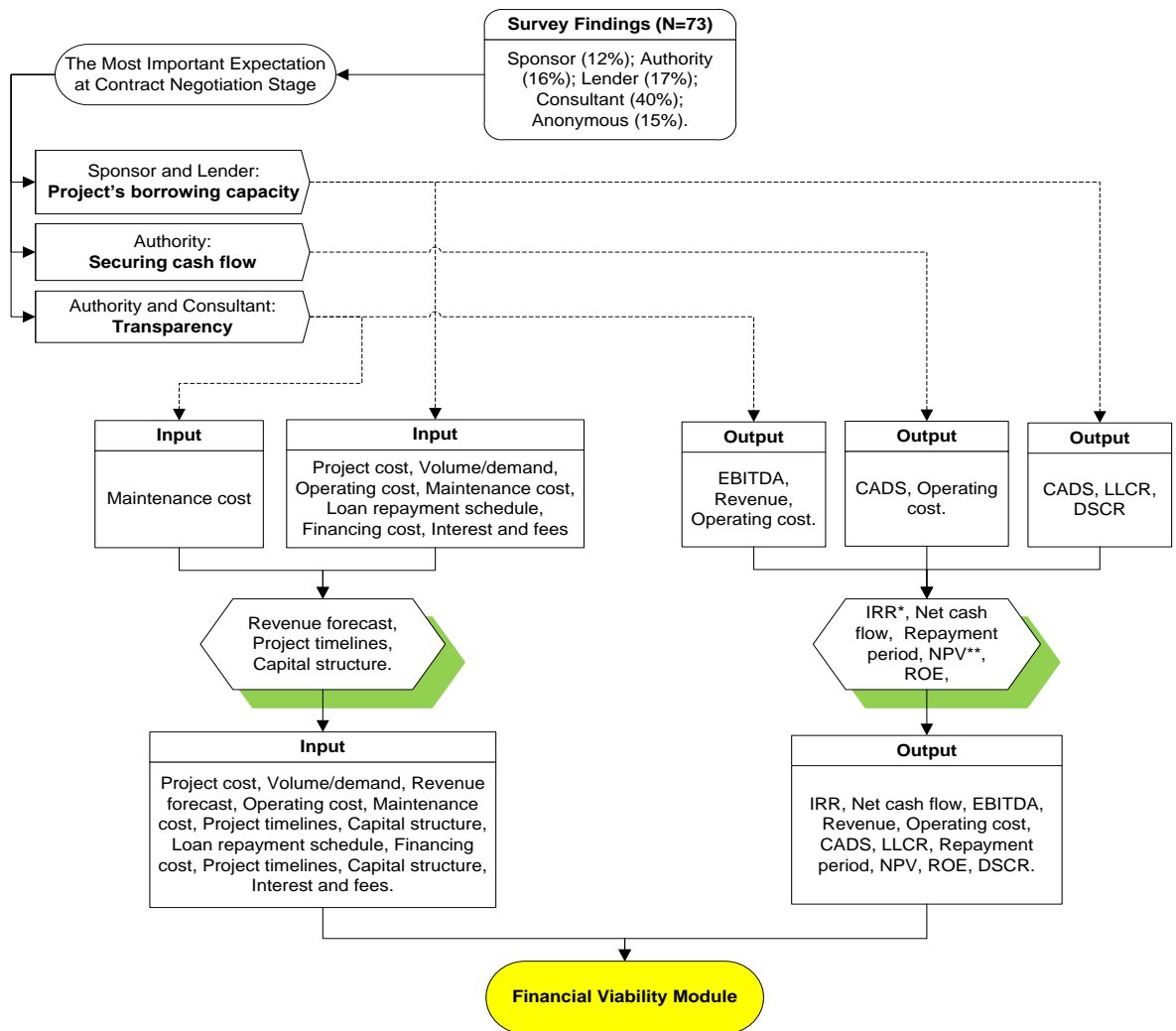
#### **8.4.6 Financial viability module at the contract negotiation stage**

Based on the most important expectations at the contract negotiation stage (see figure 8.6), sponsors and lenders expected that PPP financial model can be used to evaluate the “project’s borrowing capacity”. On the other hand, authority and consultant preferred “transparency” to be the most important expectation in utilising financial models. Authorities also use PPP financial model at the contract negotiation stage to “secure the project’s cash flow”.

The “project’s borrowing capacity” has significant correlation with input assumptions (e.g. project cost, volume/demand, operating cost, maintenance cost, loan repayment schedule, financing cost, interest and fees, revenue forecast, project timelines, and capital structure) and financial model output (e.g. CADS, LLCR, DSCR, IRR, Net cash flow, repayment period, NPV, and ROE). Meanwhile, “transparency” has a strong correlation with some input assumptions (e.g. maintenance cost, revenue forecast, project timelines, and capital structure) and outputs (e.g. EBITDA, revenue, operating cost, IRR, net cash flow, repayment period, NPV, and ROE). The other most important expectation (securing cash flow) also has a significant correlation with some financial model outputs only (e.g. CADS, operating cost, IRR, net cash flow, repayment period, NPV, and ROE).

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<sup>50</sup> Although maintenance cost has strong correlation with both expectations (bankable and generate enough cash flow), the findings of agreement analysis show that authority concerns significantly on maintenance cost more than consultant (see table 7.22 and figure 7.8).



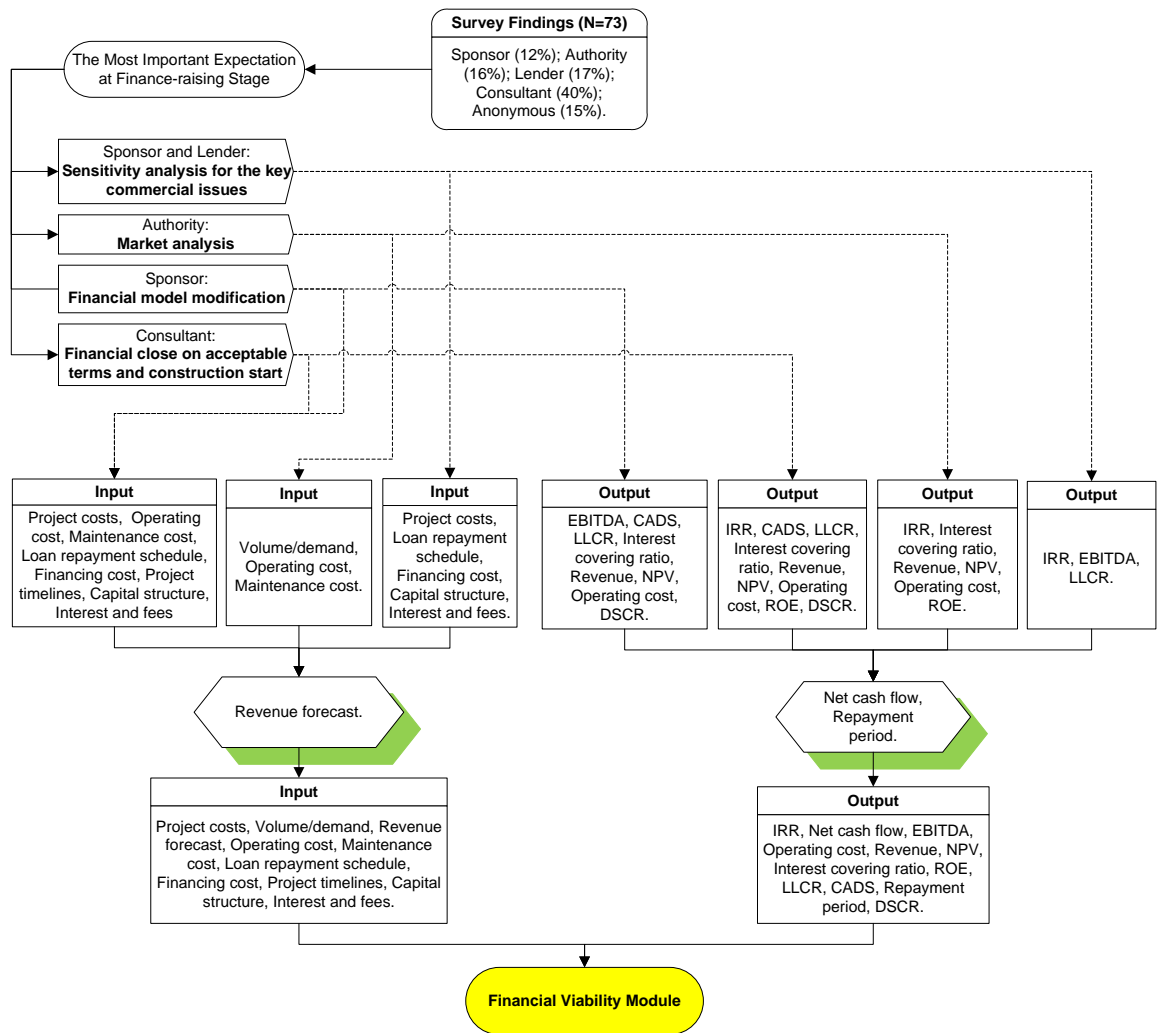
**Notes:** \*Contain significant variance between Consultant and Authority  
 \*\*Contain significant variance between Authority and Developer, Authority and Consultant.

**Figure 8.6** Correlation framework for financial viability module at the contract negotiation stage

There are some input assumptions (e.g. revenue forecast, project timelines, and capital structure) and financial model outputs (e.g. IRR, net cash flow, repayment period, NPV and ROE), which have significant correlation with three most important expectations (project's borrowing capacity, securing cash flow, and transparency). Although IRR and NPV are significantly correlated with the three most important expectations at the contract negotiation stage, authorities perceived that IRR and NPV were significantly more correlated than sponsors and consultants (see table 7.25 and figure 7.8).

### 8.4.7 Financial viability module at the finance-raising stage

At the finance-raising stage as illustrated in figure 8.7, each main stakeholder had their own preference in using PPP financial model at this stage. The lender agreed with the sponsor in ranking “sensitivity analysis for key commercial issues” as the most important expectation.



**Figure 8.7** Correlation framework for financial viability module at the finance-raising stage

Following the receipt of initial PPP financial model proposed by the sponsor, the lenders conducted due diligence for evaluating key technical, legal, insurance, environmental, market, modelling and other similar issues. During due diligence phase, sensitivity analysis is used for evaluating key commercial issues based on the project documents through the PPP financial model (Woodward, 1995). Once due diligence is launched, the sponsor’s PPP financial model can be converted into a lenders base case model (Khan and Parra, 2003). This was the underlying reason why the sponsor also

rated “financial model modification” as the most important expectation as well. Meanwhile, the authority at the finance-raising stage preferred “market analysis” as the most important expectation in utilising PPP financial model. This result is showing that the authority uses PPP financial model to review the current and future tariff structure of the facility and the corresponding tariff sensitivities of its consumers, including a fairly detailed study of demand and tariff elasticity before approving broad financing terms of the project (Khan and Parra, 2003). The consultant rates “financial close on acceptable terms and construction start” as the most important expectation because there is a tendency of the lenders to revisit issues previously agreed by the sponsor and the government authority for securing their interest on risk management (Carlidge, 2006). Consequently, the sponsor cannot commence the construction until all the financing required by lenders are fully mobilised to commission the facility. Thus, at this stage, the consultant focuses on using PPP financial model as a tool to assist in achieving an agreement between sponsors and lenders.

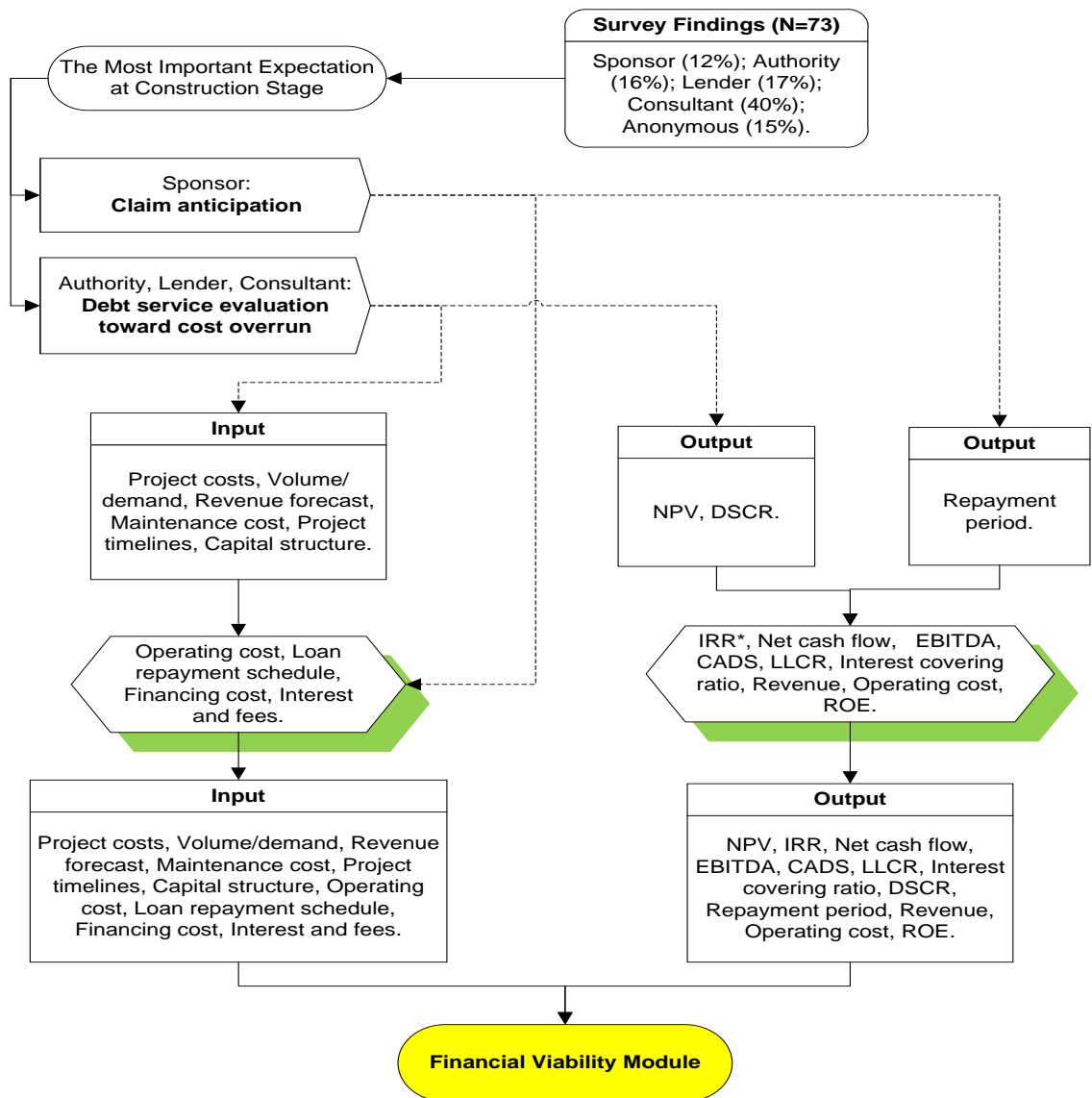
The “sensitivity analysis for the key commercial issues” had a significant correlation with input assumptions (e.g. project costs, loan repayment schedule, financing cost, capital structure, interest and fees, and revenue forecast) and financial model outputs (e.g. IRR, EBITDA, LLCR, net cash flow, and repayment period). The “financial model modification” and “financial close on acceptable terms and construction start” had a similar significant correlation with input assumptions (e.g. project costs, operating cost, maintenance cost, loan repayment schedule, financing cost, project timelines, capital structure, interest and fees, and revenue forecast). While some financial model outputs (e.g. EBITDA, CADS, LLCR, interest covering ratio, revenue, NPV, operating cost, DSCR, net cash flow, and repayment period) were significantly correlated with “financial model modification”, some other financial model output indicators (e.g. IRR, CADS, LLCR, interest covering ratio, revenue, NPV, operating cost, ROE, DSCR, net cash flow, and repayment period) were considerably correlated with “financial close on acceptable terms and construction start”. Furthermore, “market analysis” also had a significant correlation with several input assumptions (e.g. volume/demand, operating cost, maintenance cost, and revenue forecast) and financial output indicators (e.g. IRR, interest covering ratio, revenue, NPV, operating cost, ROE, net cash flow, and repayment period).

#### ***8.4.8 Financial viability module at the construction stage***

At the construction stage, overall, all stakeholders agreed that “debt service evaluation towards cost overrun” was the most important expectation except the sponsor (see figure 8.8). The main purpose of debt service evaluation towards cost overrun through PPP financial model is to ensure that no defaults occur for failure to meet debt service cover and that the project vehicle is able to pay dividends, if other conditions for doing so are met. While sponsors preferred “claim anticipation” as the most important expectation, they needed to select an appropriate financing strategy to mitigate any construction risks or claims. Sponsors use PPP financial models to maintain debt service coverage ratio (DSCR) above a certain level (in practice is set a level that is greater than 1.0), so that declaration of loan agreement breach by Lenders, which is based on a material adverse change (MAC) or some other similar covenant, can be avoided (Khan and Parra, 2003).

The Sponsors’ most important expectation (claim anticipation) had significant correlations with several input assumptions (e.g. operating cost, loan repayment schedule, financing cost, interest and fees) and financial model outputs (e.g. CADS, LLCR, IRR, Net cash flow, EBITDA, interest covering ratio, repayment period, revenue, operating cost, and ROE). Meanwhile, “Debt service evaluation toward cost overrun” had strong correlation with some input assumptions (e.g. project cost, volume/demand, operating cost, maintenance cost, loan repayment schedule, financing cost, interest and fees, revenue forecast, project timelines, and capital structure) and outputs (e.g. EBITDA, revenue, operating cost, IRR, net cash flow, interest covering ratio, CADS, LLCR, DSCR, NPV, and ROE).

There were some input assumptions (e.g. operating cost, loan repayment schedule, financing cost, interest and fees) and financial model outputs (e.g. EBITDA, revenue, operating cost, IRR, net cash flow, interest covering ratio, CADS, LLCR, and ROE), which had significant correlations with two most important expectations (claim anticipation and debt service evaluation toward cost overrun).



Notes: \*Contain significant variance between Consultant and Authority.

**Figure 8.8** Correlation framework for financial viability module at the construction stage

#### 8.4.9 Financial viability module at the operation stage

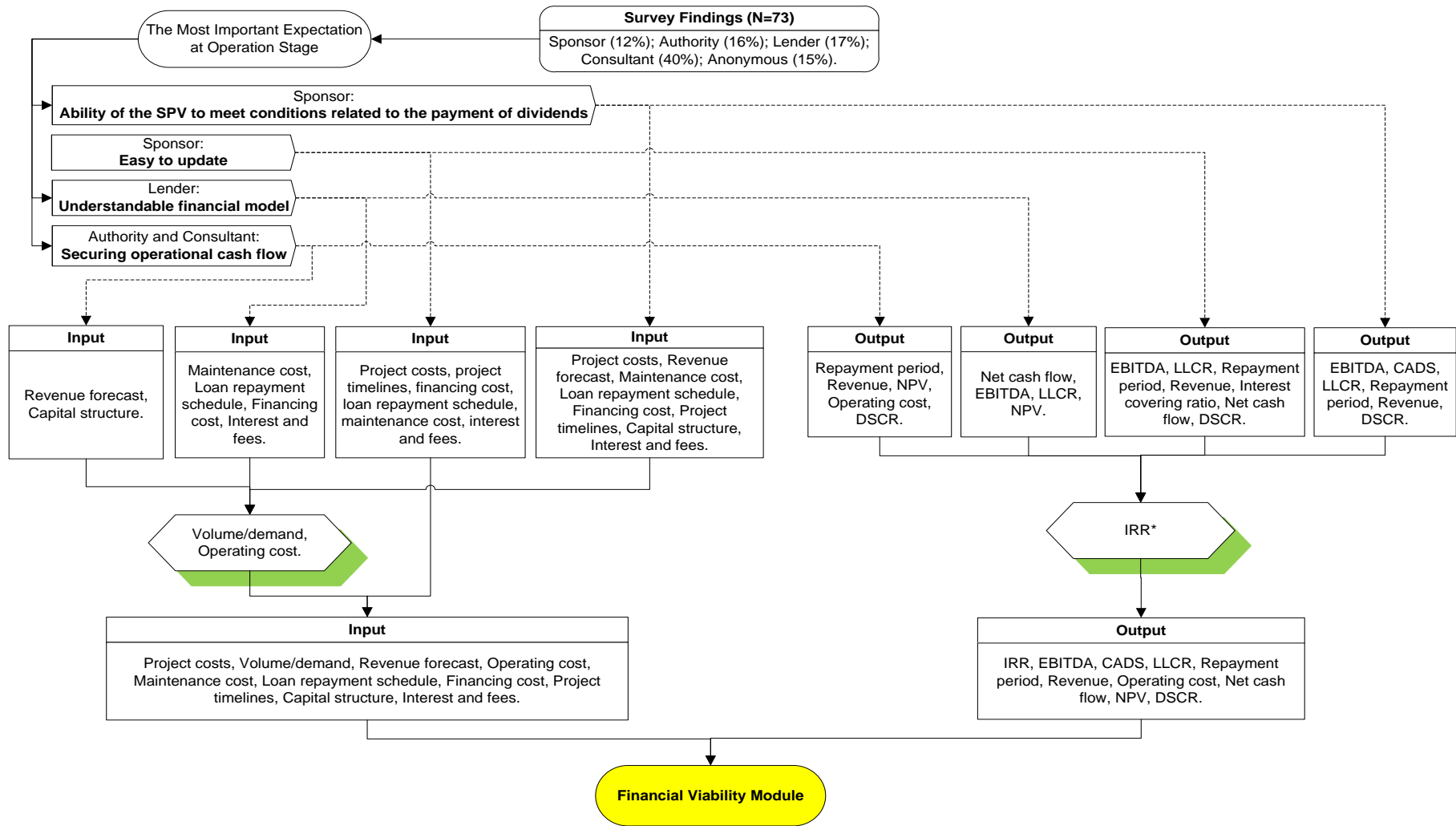
At the operation stage, Consultants and Authorities agreed that “securing operational cash flow” was the most important expectation (see figure 8.9). They considered that performance monitoring was very important in PPP projects as it ensured (a) value for money; and (b) credit and operational risks are anticipated earlier, so that the risks would be kept manageable. In this regard, the purposes of a PPP financial model during the operation stage are to assist in ensuring that no defaults have taken place for failure to meet performance standards, debt service cover and dividend’s obligations. This expectation had significant correlation with input assumptions (e.g. revenue forecast,



capital structure, volume/demand, and operating cost) and outputs (repayment period, revenue, NPV, operating cost, DSCR, and IRR).

Lenders rated “understandable financial model” as the most important expectation at the operation stage because it is imperative to allow stakeholders to understand the mechanism of financial model utilisation at the operation stage. Tjia (2009) suggested that a financial model should be built from the user’s point of view, which is accurate, robust, fast, easy to debug, and easy to use. Thus it implicitly defines that the stakeholders do not have to think about how to run it, but simply use it in order to get the desired results. This expectation correlates significantly with some input assumptions (e.g. maintenance cost, loan repayment schedule, financing cost, interest and fees, volume/demand, and operating cost).

Sponsors had two identical scores for the most important indicators, both “easy to update” and “ability of the SPV to meet conditions related to the payment of dividends” are rated at 4.5556. “Easy to update” means that sponsor (SPV company) does not have to think about how to update the model, but simply replacing the input assumption with the real information in order to obtain the desired results instead. At the operation stage, all assumptions have to be updated based on real information of project input. Once all information are replaced with the newest version, it is also crucial to ensure that all numbers are recalculated before reviewing the results (Tjia, 2009). Otherwise, it will lead a wrong judgement based on misleading information. Therefore, PPP financial model should not be overly used in making decision. Instead, it should be used with cautious because anything can be wrong. “Easy to update” has significant correlation with input assumptions (e.g. project costs, project timelines, financing cost, loan repayment schedule, maintenance cost, interest and fees) and financial model outputs (e.g. EBITDA, LLCR, repayment period, revenue, interest covering ratio, net cash flow, DSCR, and IRR).



Notes: \*Contain significant variance between Consultant and Authority.

**Figure 8.9** Correlation framework for financial viability module at the operation stage

Sponsors expected that PPP financial model could be used to monitor the ability of the SPV to meet conditions related to the payment of dividends and repayment of debt. Hence, this result also corresponds with Schaufelberger and Wipadapisut's (2003) statement that Lenders and Investors (including Sponsors) consider the revenues generated from projects as the source of dividends on equity and repayment of debt. However, there is a question concerning how to assure both investors and lenders that their dividends and money will be remitted. Proper mitigation measures should be considered and negotiated before reaching financial closure. This expectation correlates significantly with several input assumptions; such as: project costs, revenue forecast, maintenance cost, loan repayment schedule, financing cost, project timelines, capital structure, interest and fees, volume/demand, and operating cost; and some financial model outputs; such as: EBITDA, CADS, LLCR, repayment period, revenue, DSCR, and IRR.

## **8.5 Financial risk analysis module**

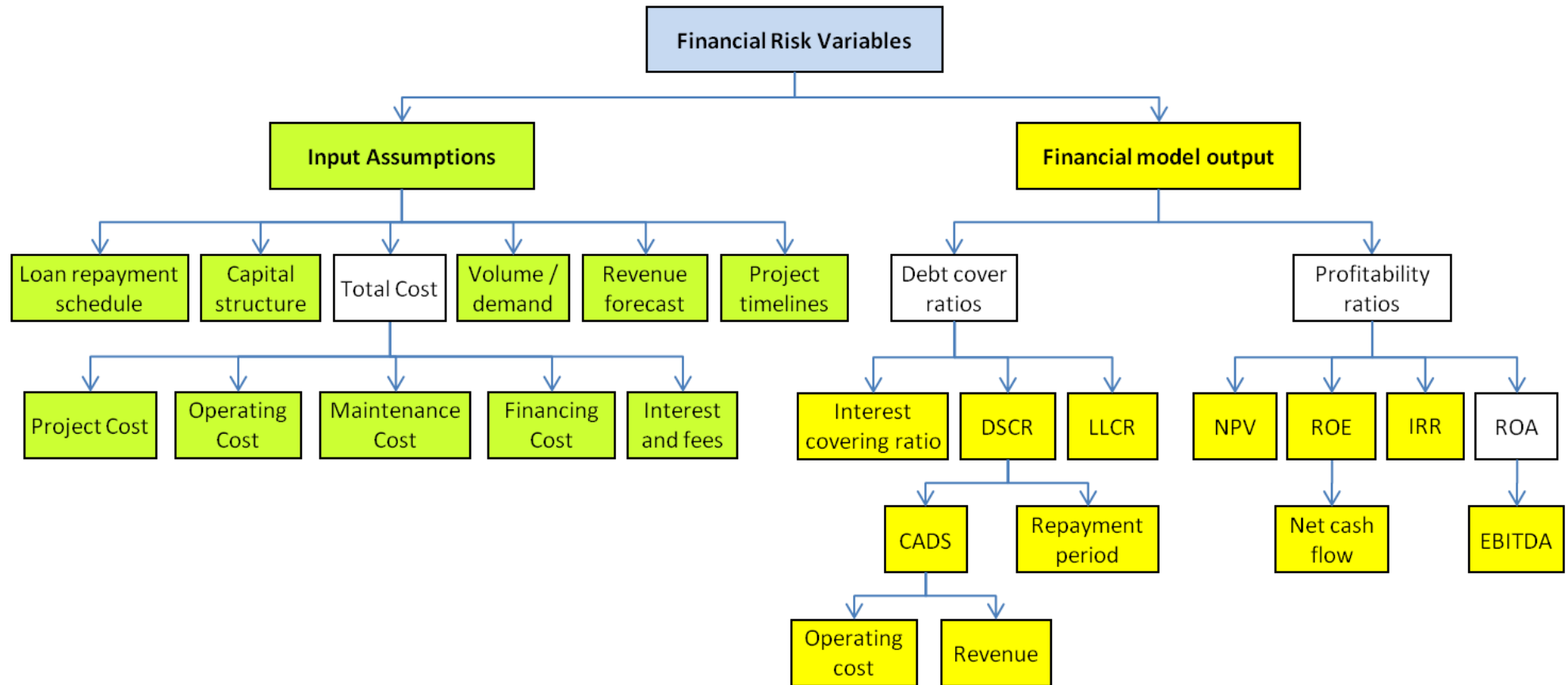
Although advanced standardised PPP contracts have been introduced by the government in the UK in order to reduce bid costs and negotiations (Yule, 2001), the conditions in the contract can be renegotiated from time to time, through renegotiations can be costly and lengthy (Ng *et al.*, 2007). Therefore, when PPP financial models are used as tools for evaluating PPP projects (e.g. cash flow estimation) and negotiating PPP contract and financial terms (e.g. concession period and tariff rate), it is imperative to identify the expected risks from the most important financial indicators<sup>51</sup> or financial risk variables. This section describes the development of the financial risk analysis module, identifies the potential risks attributed to financial risk variables, and discusses the outcome of the module.

### ***8.5.1 Developing financial risk analysis module***

The first step in developing the second module is identifying the financial risk variables (see Figure 8.10). These variables were derived from the component of the first module (financial viability module). The components of the first module are divided into two

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<sup>51</sup> *In this research, the most important financial indicators are defined as the variables used in the financial viability module. Since these indicators are used to explore the expected risks, these indicators are called as financial risk variables. The definition of financial risk variables was introduced by Yun et al., (2009).*



**Figure 8.10** Hierarchy diagram of financial risk variables

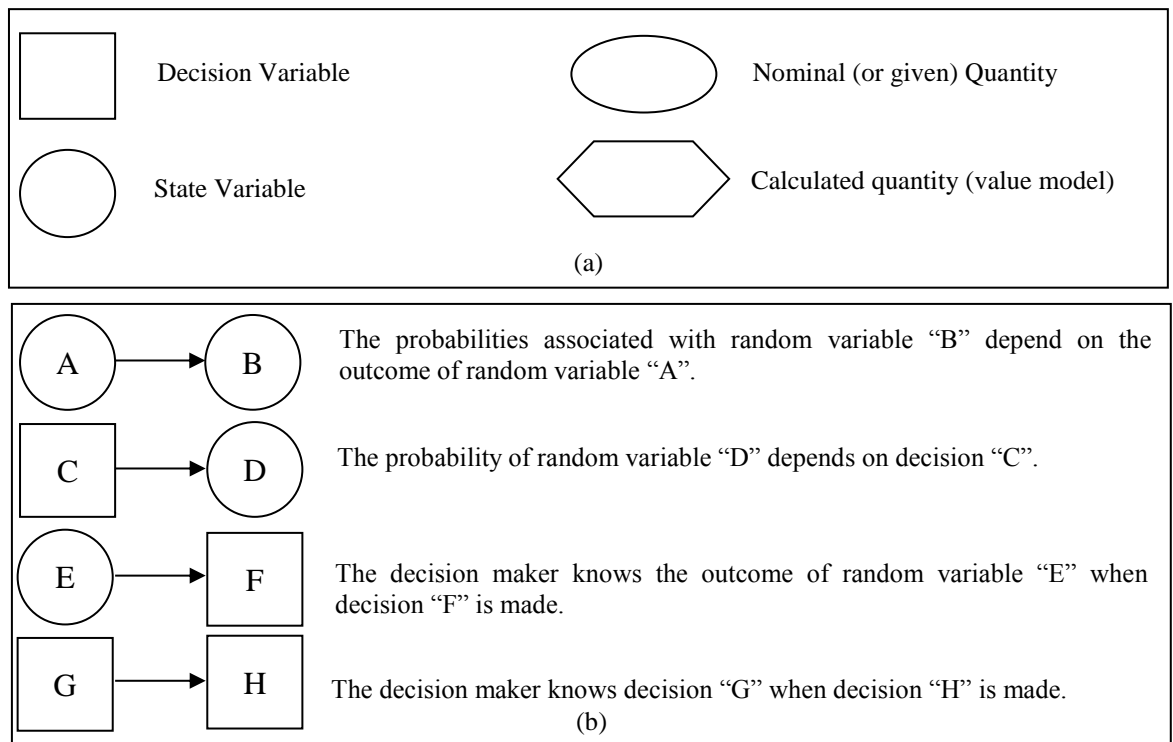
parts, such as: (1) Input assumptions (i.e. Project costs, Volume / Demand (traffic), Revenue forecast, Operating cost, Maintenance cost, Loan repayment schedule, Financing cost, Project timelines, Capital structure, and Interest and fees) and (2) output (i.e. IRR, Net cash flow, EBITDA, CADS, LLCR, Interest covering ratio, Repayment period, Revenue, NPV, Operating cost, ROE, and DSCR).

The second step is exploring the risks in PPP projects, including their causes and financial consequences, from an extensive literature review. In this research, the risk identification is limited to the risks related to the financial risk variables. Liu and Yue (2009) explored several methods and tools which have collective functions of risk description, analysis and calculation in the engineering field such as: active network or program evaluation and review technique (PERT), fault tree analysis (FTA), influence diagram, etc. Further, among the risk analysis tools, they argued that influence diagram is the perfect analysis tool for dynamic risk management because it represents the combination and transfer of risk elements from the two aspects of time and logic, and is good at analyzing the sensitivity and control value of risk elements. Ashley and Bonner (1987) also stated that the influence diagram method provides a very useful picture of a project and its inherent risks. Influence diagram is a convenient communication tool between experts, managers and owners as well, to make the decision of risk management more timely and accurate. Hence, the links between the financial risk variables and the related risks are identified by the Influence diagram method.

Several influence diagrams that were developed in this research can be considered as representing financial risk analysis for PPP projects. One of these influence diagrams can be seen in figure 8.12. Although the developed influence diagrams are relatively wide-ranging in structure, they should encompass critical factors and their influences. When these influence diagrams are used continuously from the pre-proposal stage to operation stage, it would invariably lead to enhancements and refinements of the decision making process.

### 8.5.2 Systematic analysis

Systematic analysis of construction financial risk variables requires a uniform language for communication<sup>52</sup>. Figure 8.11 shows the notations used for state variables, decision variables, fixed (or nominal) values calculations (or value models), and influence relationships. State variables as used in this context represent risks or uncertainties. Each element represents possible nodes in an influence diagram. Combining nodes with interrelationships yields a joint cause-effect and time-sequence mapping of risks, decisions, and outcomes.



**Figure 8.11** Influence diagram notation and conventions:  
(a) notation; (b) relationships.

*Source: Ashley and Bonner (1987)*

The sources of financial risk were supplemented through literature review and conversations with experts. The next section addresses the connection between financial risks and financial risk variables.

### 8.5.3 Risks related to input assumptions and output indicators

Since the identification of financial risk and consequence variables is derived from the financial risk variables, this section attends to the connection between financial risk variables and financial risks, including the decision rules to avoid the risks. It is worth

<sup>52</sup> The language of influence diagram notation and conventions is adopted from Ashley and Bonner (1987).

recalling that financial risk variables are divided into two categories (input assumptions and financial model output). Any calculation of new outputs is based on one or a range of input data variations. Furthermore, the information to be provided in the input worksheet is raw numbers (of assumptions) instead of calculations. The output worksheet of the financial model is an overall summary of pro forma financial statements and key ratios that help the reader to understand the financial viability of the project. Therefore, financial risk variables are divided into two categories.

The importance of financial risk variables were identified from the literature review and then consolidated into five most important indicators of each input and output of PPP financial model (based on each stakeholder's point of view). These indicators were further analysed by conducting another literature review to identify the related risks as shown in table 8.4 and table 8.5.

**Table 8.4** Input assumptions and financial risks

<b>Input Assumptions</b>	<b>Decision Rules</b>	<b>Financial risk</b>
Project costs	PFI should not be used for individually procured projects under £20m (HM Treasury, 2004).	High bidding costs, prolonged negotiation period, cost overruns, and financing risks (Xenidis and Angelides, 2005).
Volume / Demand (traffic)	Traffic forecast should serve several purposes (leics.gov.uk, 2011): A background for estimating future traffic levels in the design and appraisal of infrastructure improvement schemes, and of traffic policies and initiatives aimed at changing the use of the network. A basis for predicting many of the environmental impacts of the traffic both at the national and local levels; An indicator for informing regarding how much the traffic can be expected to grow under present policies An indicator of the effect of measures that they might propose to influence the growth.	Competitive risk (World Bank and Public-Private Infrastructure Advisory Facility, 2007), project approval risk (HM Treasury, 2004), and revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i> , 2009, Bonnafous, 2010; and Vajdic <i>et al.</i> , 2012).
Revenue forecast	"If there is no off-take agreement, and the revenue forecast is subject to price, demand, business cycle, inflation, currency parity and other operating risks" (Khan and Parra, 2003).	Bidding risk (Kulkarni and Prusty, 2007), traffic risk (Soehodho <i>et al.</i> , 2003; Bakatjan, <i>et al.</i> , 2003; and Ng, <i>et al.</i> , 2010), competitive risk (World Bank and Public-Private Infrastructure Advisory Facility, 2007), project approval risk (HM Treasury, 2004), revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i> , 2009, Bonnafous, 2010; and Vajdic <i>et al.</i> , 2012), and funding risk (Bradley and Whelan, 1997; and Singh and

Operating cost	A general estimate of operating costs should include estimates of the services required to operate the completed facility and will alter in line with the nature of the project, such as: (1) human resource costs, staffing, pension liabilities, redundancy costs etc; (2) consumables; (3) repairs, maintenance and cleaning; (4) administrative overheads; (5) insurance costs; (6) in-house management costs (Cartlidge, 2006).	Market risk (Soehodho <i>et al.</i> , 2003; Ahadzi and Bowles, 2004; and Bonnafous, 2012), and cost overruns (Xenidis and Angelides, 2005).
Loan repayment schedule	Loan repayment profile must be tailored to the project for which it was set up (i.e. Greenfield or Brownfield project in developed or developing country, etc.) (World Bank and PPIAF, 2007).	Construction risk (Zhang, 2005b; and (Özdoğanm and Birgönül, 2000), revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i> , 2009, Bonnafous, 2010; and Vajdic <i>et al.</i> , 2012), and funding risk (Bradley and Whelan, 1997; (Singh and Kalidindi, 2009; and Zhang, 2004).
Financing cost	Higher transaction and financing costs should be off-set through efficiency gains (e.g. low financial service charges, fixed and low interest rate financing, long-term loan financing and low costs from fluctuations of currency and exchange rates) (Quium, 2011, Yuan <i>et al.</i> , 2009).	Financial risk (World Bank, 1999; Zhang and Kumawaswamy, 2001; and Baker and Powell, 2005), agency cost risk (Jobst, 2009), legislative & government risk (HM Treasury, 2004), and construction risks (Özdoğanm and Birgönül, 2000).
Project time lines	The length of the concession period should be determined based on project conditions, whole life cycle cost, likely term of senior debt, and financial analyses (Aziz, 2007).	Time overrun (Soehodho <i>et al.</i> , 2003; (Wibowo and Mohamed, 2010; and Xenidis and Angelides, 2005), market risk (Zhang, 2005b; Schaufelberger and Wipadapisut, 2003; and Khan and Parra, 2003), prolonged negotiation period, and cost overrun (Xenidis and Angelides, 2005).
Capital structure	The Korean government regulates that the level of equity ratio should not be less than 20% (Yun <i>et al.</i> , 2009).	Revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i> , 2009, Bonnafous, 2010; and Vajdic <i>et al.</i> , 2012) and funding risk (Bradley and Whelan, 1997; (Singh and Kalidindi, 2009; and Zhang, 2004).
Interest and fees	The interest rate and fees should be tested to ensure that they are reasonably close to market for the type of project being considered (Khan and Parra, 2003).	Market risk (Soehodho <i>et al.</i> , 2003; Ahadzi and Bowles, 2004; and Bonnafous, 2012), traffic risk (Cheng, 2010b), and credit risk (Xenidis and Angelides, 2005).

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**Table 8.5** Output indicators and financial risks

Financial Outputs	Decision Rules	Financial risk
IRR	IRR must be greater than the required rate or discount rate (Bakatjan <i>et al.</i> , 2003). The Government authority should implement a project if the expected IRR covers the market interest rate plus a risk premium which takes account of the uncertainties (Bonnafous, 2012).	Violation of flat payment profile assumption (Cuthbert and Cuthbert, 2012), cost overrun (Xenidis and Angelides, 2005), revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i> , 2009, Bonnafous, 2010; and Vajdic <i>et al.</i> , 2012), high risk premium (Bonnafous, 2012), traffic risk (Cheng, 2010b), and market risk (Soehodho <i>et al.</i> , 2003; Ahadzi and Bowles, 2004; and Bonnafous, 2012).
Net cash flow	Positive and higher net cash flows are preferred (Schmidt, 2012).	Market risk (Soehodho <i>et al.</i> , 2003; Ahadzi and Bowles, 2004; and Bonnafous, 2012), cost overrun (Xenidis and Angelides, 2005), tariff risk, (Soehodho <i>et al.</i> , 2003; Bakatjan, <i>et al.</i> , 2003; and Ng, <i>et al.</i> , 2010), and decision risk (Engle, 2010; Faulkenberry, 2006; and Boussabaine, 2006).
EBITDA	Higher is better	Decision risk (Engle, 2010; Faulkenberry, 2006; and Boussabaine, 2006).
CADS	Higher is better	Funding risk (Bradley and Whelan, 1997; (Singh and Kalidindi, 2009; and Zhang, 2004), revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i> , 2009, Bonnafous, 2010; and Vajdic <i>et al.</i> , 2012), cost overrun (Xenidis and Angelides, 2005), and calculation risk (Warnelid, 2012).
LLCR	The minimum LLCR generally should be greater than 1.2 (Querioz, 2011)	Market and cross-currency risk (Zhang, 2005b; Schaufelberger and Wipadapisut, 2003; and Khan and Parra, 2003), revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i> , 2009, Bonnafous, 2010; and Vajdic <i>et al.</i> , 2012), cost overrun (Xenidis and Angelides, 2005), and funding risk (Bradley and Whelan, 1997; (Singh and Kalidindi, 2009; and Zhang, 2004).
Interest coverage ratio	“When a project's interest coverage ratio is 1.5 or lower, its ability to meet interest expenses may be questionable. An interest coverage ratio below 1 indicates the project is not generating sufficient revenues to satisfy interest expenses” (Loth, 2012).	Funding risk (Bradley and Whelan, 1997; (Singh and Kalidindi, 2009; and Zhang, 2004), revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i> , 2009, Bonnafous, 2010; and Vajdic <i>et al.</i> , 2012), and cost overrun

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Repayment period	<p>A project is acceptable if its payback is less than the maximum cost recovery time established by the analyst.</p> <p>The investment should proceed if the payback period exceeds a specified period.</p> <p>When using payback period as a ranking method between projects, the project with the shortest payback period should be selected (Boussabaine, 2006).</p>	<p>(Xenidis and Angelides, 2005).</p> <p>Liquidity risk (Malini, 2011), tariff risk (Soehodho <i>et al.</i>, 2003; Bakatjan, <i>et al.</i>, 2003; and Ng, <i>et al.</i>, 2010), and decision risk (Engle, 2010; Faulkenberry, 2006; and Boussabaine, 2006).</p>
Revenue	Higher is better	<p>Bidding risk (Kulkarni and Prusty, 2007), traffic risk (Cheng, 2010b), competitive risk (Soehodho <i>et al.</i>, 2003), project approval risk (HM Treasury, 2004), revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i>, 2009, Bonnafous, 2010; and Vajdic <i>et al.</i>, 2012), and funding risk (Bradley and Whelan, 1997; (Singh and Kalidindi, 2009; and Zhang, 2004).</p>
NPV	Higher is better	<p>Discount rate risk (Vassallo, 2010; Grout, 2003; and Shaoul, 2005), decision risk (Engle, 2010; Faulkenberry, 2006; and Boussabaine, 2006), unprofitable project risk (Bonnafous, 2010), and high social margin cost (Evenhuis and Vickerman, 2010).</p>
Operating cost	Lower better	<p>Market risk (Soehodho <i>et al.</i>, 2003; Ahadzi and Bowles, 2004; and Bonnafous, 2012) and cost overruns (Xenidis and Angelides, 2005).</p>
ROE (Equity IRR)	<p>The project sponsor should use less borrowing than the level that maximizes the debt market value, when the project sponsor chooses to maximize the ROE (Wibowo, 2005).</p>	<p>Tariff risk (Soehodho <i>et al.</i>, 2003; Bakatjan, <i>et al.</i>, 2003; and Ng, <i>et al.</i>, 2010), and cost overrun (Xenidis and Angelides, 2005).</p>
DSCR	<p>Government of India prefers that the minimum ADSCR should be above 1.30 in all years of the loan period (DOA, 2012).</p>	<p>Revenue risk (Aziz, 2007; Jun, 2010, Kuffler and Leung, 1998; Yun, <i>et al.</i>, 2009, Bonnafous, 2010; and Vajdic <i>et al.</i>, 2012), cost overrun (Xenidis and Angelides, 2005), calculation risk (Warnelid, 2012), and decision risk (Engle, 2010; Faulkenberry, 2006; and Boussabaine, 2006).</p>

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#### 8.5.4 Monte Carlo Analysis

After identifying the link between the financial risk variables and the related risks for the second module, the module will also analyse the project risk level through Monte Carlo simulation. The Monte Carlo method of computation was invented by Stanislaw Ulam (Proctor, 2012). This simulation is known as a useful technique for financial modelling that utilises random inputs to represent uncertainty. Forecasting future project performance is always a problem because there will clearly be a number of inputs into the model that are unknown. Monte Carlo simulation provides better estimate with the probability distribution of the inputs. Since random inputs are generated by using the probability distribution, one of the five probability distributions (normal, logarithm normal, uniform, triangle, and beta) should be chosen for each input to better reflect real life project conditions (Yun *et al.*, 2009). Varying the input parameters in the financial model (e.g. traffic, tariff, debt-equity ratio, O&M costs, and project costs) is also part of sensitivity analysis (Kulkarni and Prusty, 2007). Another Monte Carlo simulation of input variables (e.g. construction period, project development cost, market demand, sale price, O&M price, discount rate, exchange rate, interest rate, and inflation rate) can be used to determine the distribution of NPV (Zhang and AbouRizk, 2006). Table 8.6 shows the selected probability distribution of each input.

**Table 8.6** Input Assumptions and Probability Distribution

<b>Input Assumptions</b>	<b>Probability Distribution</b>
Container Terminal Capacity	Beta (Yun et al., 2009)
Composite Tariff	Uniform (Yun et al., 2009)
Land acquisition cost	Beta (Wibowo and Kochendorfer, 2005)
Construction Cost	Normal (Yun et al., 2009)
Financing cost	Normal (Yun et al., 2009)
Interest rate	Normal (Yun et al., 2009)
Construction period	Beta (Netmba, 2010)
Inflation Rate	Normal (Yun et al., 2009)

The second financial risk analysis allows the base case scenario to be randomly simulated. According to Chee and Yeo (1995), performing Monte-Carlo simulation up to 500 iterations is sufficient to make the sampling bias insignificant. Therefore, it is intended to limit the simulation up to 500 iterations. Every iteration result is recorded up to 500 times. The probability distribution of the iteration results, then, could be estimated. Each output (e.g. ROA, ROE, NPV, IRR, DSCR min, LLCR min, Interest Covering Ratio, and Payback Period) will have different standard deviation, mean, upper and lower value with 95% confidence level. This simulation provides information on which output is affected by a random simulation of financial risk variable input. Then, the last module (financial risk mitigation module) will arrange the alternative mitigation measures toward the identified type and level of risks based on the financial risk variables.

## 8.6 Financial Risk Mitigation Module

At the end of preliminary evaluation with an IPET, the financial and economic outcomes will be accompanied by the information of source(s) and consequence(s) of risks, and optimised mitigation measures. Since the outcome of an integrated project evaluation tool (IPET) provides the output of a PPP financial model linked with the risk management information, the government authority or the other stakeholder will be able to determine the best option for the project. The sponsor(s) will also have greater confidence to facilitate the submission of a convincing proposal or unsolicited proposal. Table 8.7 shows alternative mitigation measure(s) for each financial risk.

**Table 8.7** Financial risks and mitigation measures

No.	Financial risk	Mitigation Measures
1	Violation of flat payment profile assumption	IRR should be accompanied with a statistic based on an average outstanding debt over the period of the relevant transaction (Cuthbert and Cuthbert, 2012)

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2	Cost overrun	<p>Construction cost reduction will minimise the impact of the overall costs (Xenidis and Angelides, 2005);</p> <p>Contract negotiation (Ahadzi and Bowles, 2004);</p> <p>An incentive to incur additional construction cost if it reduces future operating and maintenance cost (Burger and Hawkesworth, 2011);</p> <p>Government intervention to negotiate with the lenders (Cheng, 2010a);</p> <p>Efficient operation, better preventive maintenance, and optimal utilisation of manpower resources (Kulkarni and Prusty, 2007);</p> <p>Subsidies from the public authority (Bonnafous, 2012);</p> <p>Project vehicle should procure timely permits and consents that obviate unnecessary delays (Khan and Parra, 2003);</p> <p>Reimbursement to the contractor on the basis of costs incurred can be applied (HM Treasury, 2004);</p> <p>The project sponsor should use less borrowing than the level that maximise the debt market value (Wibowo, 2005).</p> <p>Penalty (Özdoğanm and Birgönül, 2000).</p>
3	Revenue risk	<p>A tariff level reduction, as initiative to leverage the project revenue (Aziz, 2007);</p> <p>Revenue cap agreement (Jun, 2010);</p> <p>Tariff regulation by government authority (World Bank and Public-Private Infrastructure Advisory Facility, 2007);</p> <p>Government intervention to negotiate with the lenders (Cheng, 2010b).</p> <p>Differed repayment or a grace period (World Bank and Public-Private Infrastructure Advisory Facility, 2007)</p> <p>Debt service reserve is set to 6 months debt's service of the rated obligation (Kuffler and Leung, 1998);</p> <p>Establish an appropriate capital structure (Yun <i>et al.</i>, 2009);</p> <p>Government subsidy and not to levy any toll (Bonnafous, 2010);</p> <p>Tariff to be set for the private operator by government (Bonnafous, 2010);</p> <p>Minimum tariff should be calculated based on the annual average daily traffic and construction cost scenarios (Vajdic <i>et al.</i>, 2012).</p>
4	High risk premium	<p>Subsidies from the public authority (Bonnafous, 2012).</p>
5	Traffic risk	<p>Government intervention to negotiate with the lenders (Cheng, 2010b).</p>
6	Market risk	<p>Guarantee of periodical adjustment tariff (Soehodho <i>et al.</i>, 2003);</p> <p>Contract negotiation (Ahadzi and Bowles, 2004);</p> <p>Subsidies from the public authority (Bonnafous, 2012);</p> <p>Project's revenue (either from unitary payment or toll/tariff) should be linked to inflation fluctuation in order to minimised negative cash flow period (Al-Sharif, 2007)</p>
7	Tariff risk	<p>Guarantee of periodical adjustment tariff (Soehodho <i>et al.</i>, 2003);</p> <p>Upgrading credit rating of the host country (Bakatjan, <i>et al.</i>, 2003);</p> <p>Users' projection for the planned facility should be collected based on the statistical data from similar projects (Ng, <i>et al.</i>, 2010)</p>
8	Decision risk	<p>EBITDA should not be the only indicator used to assess the value of a company (Engle, 2010);</p> <p>Net cash flow should be seen from operating activities (Faulkenberry, 2006);</p> <p>A project is acceptable if its payback is less than the maximum cost recovery time established by the analyst (Boussabaine, 2006);</p> <p>NPV should not be used as a primary VFM methodology (Shaoul, 2005);</p> <p>The level of debt to equity ratio should be considered in such a way to meet lender's interest (Boussabaine, 2006)</p>

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9	Funding risk	Minimum Revenue Guarantee agreement (Bradley and Whelan, 1997) Subordinated debts are treated as equity investment (Singh and Kalidindi, 2009); Providing up-front equity during the development and construction phases (Schaufelberger and Wipadapisut, 2003); Higher levels of equity from 40 to 50% (Zhang, 2004); Upgrade country's credit rating (Bakatjan <i>et al.</i> , 2003); Average DSCR should be at least equal to 1.5 (Bakatjan <i>et al.</i> , 2003); Each shareholder should be committed to jointly and seriously guarantee the others contribution (Khan and Parra, 2003); Fixed interest rate or interest rate swap arrangement (Khan and Parra, 2003); Debt hybrid arrangement (Khan and Parra, 2003)
10	Calculation risk	Since Project Finance focuses on actual cash flow, CADS should be used in DSCR calculation (Warnelid, 2012); DSCR calculation should be checked carefully (Warnelid, 2012).
11	Market and cross-currency risk	An offshore account establishment (Zhang, 2005b); Government guarantees on preferential access of the project to foreign exchange, conversion. And transfer (Zhang, 2005b); Guarantee of interest rate fluctuation (World Bank and Ministry of Construction Japan, 1999); Fixed rate swap (Schaufelberger and Wipadapisut, 2003); Subordinate debt is required by lenders (Khan and Parra, 2003)
12	Liquidity risk	Debt service terms should be determined comprehensively, particularly with reference to the grace and loan repayment periods (Malini, 2011).
13	Bidding risk	Proven expertise requirement (Kulkarni and Prusty, 2007).
14	Competitive risk	Tariff regulation by government authority (World Bank and Public-Private Infrastructure Advisory Facility, 2007); Planning integrated transportation network system to improve traffic volume (Soehodho <i>et al.</i> , 2003).
15	Project approval risk	Reimbursement to the contractor on the basis of costs incurred (HM Treasury, 2004); Subsidies from the public authority (Bonnafous, 2012).
16	Discount rate risk	The discount rate should never be higher than the WACC estimated by the concessionaire (Vassallo, 2010); The selection of discount rate should be based on investment decisions between public and private finance instead of political decision (Grout, 2003; and Shaoul, 2005)
17	Unprofitable project risk	Government subsidy and not to levy any toll (Bonnafous, 2010)
18	High social margin cost	Price regulation should not be based on SMCP but on some second best alternative to SMCP (Evenhuis and Vickerman, 2010).
19	High bidding costs	Prioritising domestic companies / stakeholders (Xenidis and Angelides, 2005).
20	Prolonged negotiation period	Providing solid evidence that a successful deal can be reached in a short period of time (Xenidis and Angelides, 2005).
21	Legislative & government risk	Reimbursement to the contractor on the basis of costs incurred; Change in Unitary Charge (HM Treasury, 2004)

22	Construction risks	High equity ratio; Turnkey contracts by experienced and financially strong contractors; Contractor performance bonds/ third party guarantees; Cost estimation by an independent party (Zhang, 2005b). Penalty if it is caused by contractor breach (Özdoğanm and Birgönül, 2000) Refinancing or debt rescheduling (HM Treasury, 2004)
23	Financing risks	The investment portfolio of each sponsor shall include long- and short-term investment (Xenidis and Angelides, 2005); Encouraging domestic funds in the financing scheme (Xenidis and Angelides, 2005); Government subsidies for the SPV's interest payment that should be set in such a way as to keep overall financing costs at the predetermined levels (World Bank and Ministry of Construction Japan, 1999); Capital incentive should be provided in the network (Zhang and Kumaraswamy, 2001); The SPV should rely on internal equity (retained earnings) to provide the equity portion of their capital structure target (Baker and Powel, 2005)
24	Agency cost risk	Islamic securitisation (Jobst, 2009)
25	Time overrun.	Investor has to pre-finance as long as certainty of time and price settled (Soehodho <i>et al.</i> , 2003); A "capped" land acquisition cost by the government (Wibowo and Mohamed, 2010); Providing solid evidence that a successful deal can be reached in a short period of time (Xenidis and Angelides, 2005).
26	Credit risk	A protected loan system against all risks (Xenidis and Angelides, 2005)

The influence diagram of each financial risk variable that includes its alternative mitigation measures will be further discussed in the next section.

### **8.6.1.1 Project costs**

Project costs are predominantly used to determine the price proposal at pre-proposal stage. Kulkarni and Prusty (2007) argued that the price proposal is taking an important role of the entire bidding process for final selection of the project sponsor. Schaufelberger and Wipadapisut (2003) also posited that three of the sponsor's major challenges such as: estimation of project costs, projection of revenues during the concession period, and selection of an appropriate financing strategy. In the context of PFI projects in the UK, HM Treasury (2004) stipulated that PFI should not be used for individually procured projects under £20m. Coulson (2008) re-emphasised that PFI should pass two aspects, 'qualitative evaluation' and 'quantitative analysis'. Both aspects consider costs as a subject of analyses. The main difference is at the qualitative evaluation, the costs are associated with project costs, and at the quantitative analysis,

they mainly analyse the costs of risk transferred to the private sector (capital costs and operating costs). Furthermore, according to World Bank and PPIAF (2007), the inventory of project costs especially in the port sector must also take into account “nonmarket” economic costs; these are included but are not limited to:

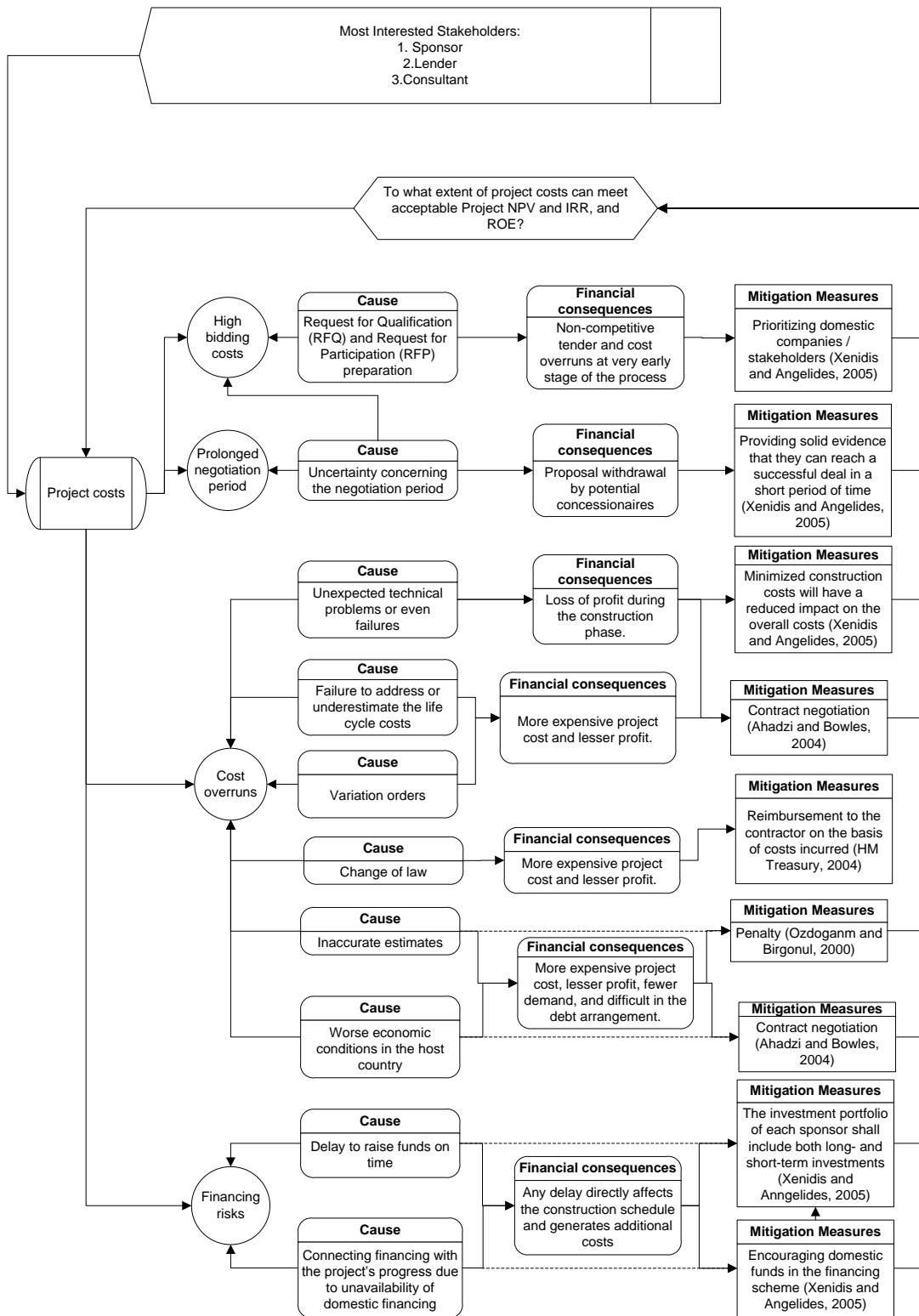
- The costs related to transferring traffic from one transport route to another (for example, if several ports are competing within the same country).
- Possible effects of the project on town planning (particularly traffic congestion).
- The impact of the project on the environment and safety (for example, marine pollution, nuisance to locals, and pollution resulting from handling bulk cargoes).

The assessment of these economic costs is a particularly difficult exercise, but is essential to determine the economic rate of return of a project.

Figure 8.12 illustrates the relationship of how financial risks are related to project cost. There are four type of risks identified in this research, such as: high bidding costs, prolonged negotiation period, cost overruns, and financing risks.

High bidding cost in PPP project is generally caused by long project preparation (e.g. preparation of RFQ and RFP documents). The financial consequence of this risk is non-competitive of PPP bid and high probability of cost overruns at early project stage. In order to mitigate this risk, the proposed strategy is prioritising domestic companies / stakeholders (Xenidis and Angelides, 2005). Should no domestic companies / stakeholders are fully qualified for the project, alternatively, a joint venture company between international and domestic companies will reduce high bidding cost probability.





**Figure 8.12** Influence diagram of project costs, risks, and mitigation measures

Prolonged negotiation period is mainly due to uncertainty concerning the negotiation period. The consequence of this risk is proposal withdrawal by potential bidder. This risk also influences the bidding cost. Government authority should provide solid evidence that the negotiation process can be achieved in a certain time manner (Xenidis and Angelides, 2005). Without solid evidence from government authority in view of

negotiation period (i.e. negotiated procedure is selected instead of open procedure), it is likely that the probability of prolonged negotiation period is higher. As Solino and De Santos (2010) studied that the negotiated procedure in PPPs is proven to be more expensive and lengthy.

Cost overrun risk might be triggered by several factors such as technical problems, life cycle cost underestimation, variation orders, change of law and regulations and other government macroscopic economic policies, and uncertain economic conditions. The fact that delay in traditionally procured project costs has increased on average by 47% from the original design phase to completion (HM Treasury, 2003). In general, cost overrun causes lesser profit or even loss of profit during the construction and operation stages. The proposed risk mitigation strategy is based on each triggered factor. As illustrated on figure 8.12. According to Xenidis and Angelides (2005), cost overrun can be mitigated by minimising construction cost, which will have a reduced impact on the overall costs. When cost of overrun is caused by change of law, reimbursement to the contractor on the basis of costs incurred can be applied (HM Treasury, 2004). Penalty is also considered as an alternative mitigation measure for anticipating cost overrun due to inaccurate estimates (Özdoğanm and Birgönül, 2000).

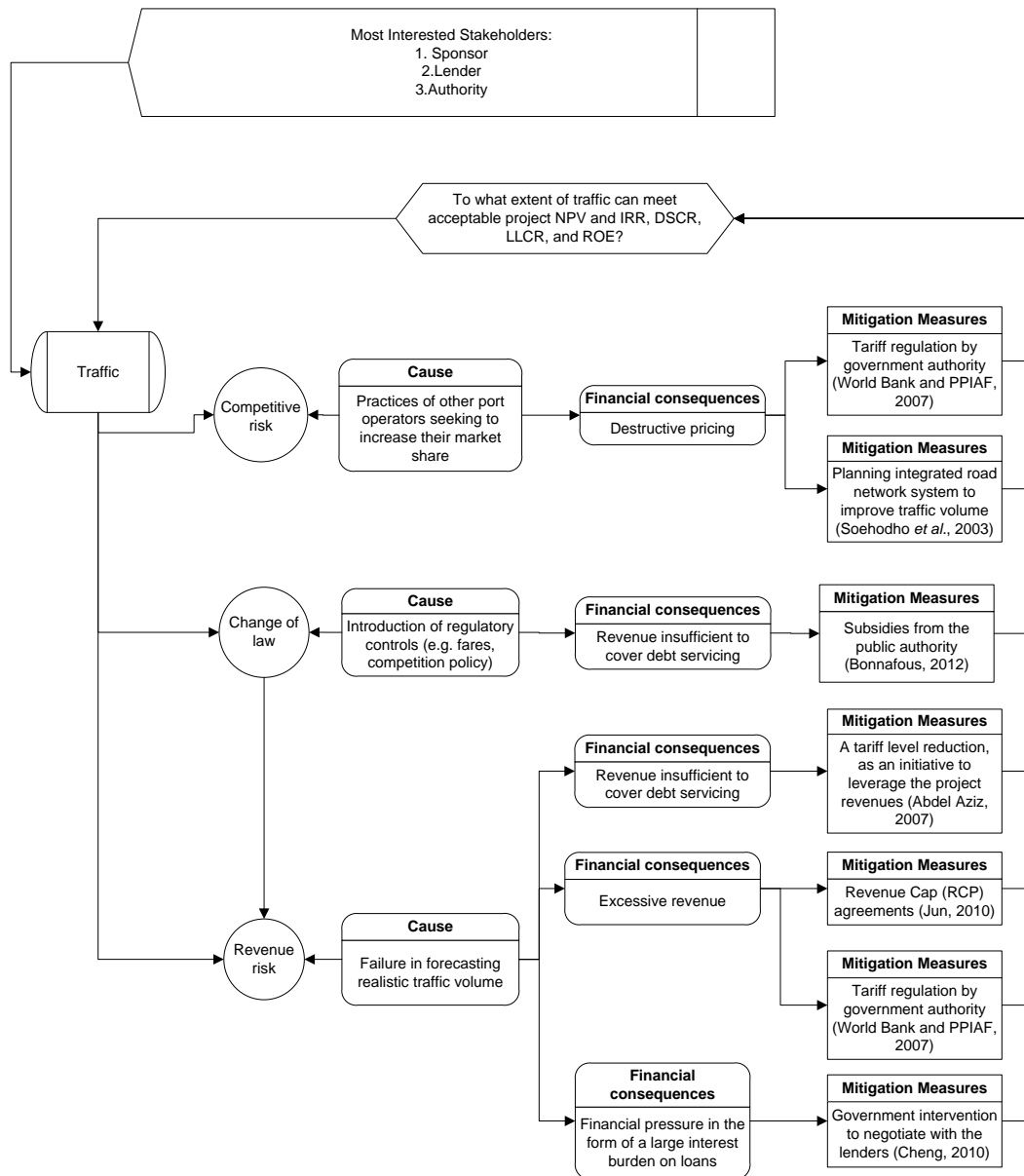
Financing risk due to inability the project sponsor to raise fund on time might affect the construction schedule. To anticipate an additional project cost incurred due to construction delay, the investment portfolio of each sponsor should include both long- and short-term investments (Xenidis and Anngelides, 2005). There is another issue related to financing risk that should be anticipated when the funding is connected to progress of the project because of unavailability of domestic financing. Xenidis and Angelides (2005) suggested that domestic funds should be encouraged in the financing scheme.

### 8.6.1.2 Volume / demand (traffic)

When the traffic demand is increasing significantly, there is a need for developing the existing infrastructure facilities that could not capture the considerable traffic demand. This (Brownfield) project has a more self-financing ability because stable revenue stream and demand of particular services are historically proven. But, when a new (Greenfield) project is initiated to capture the market demand, over optimistic traffic projections commonly happened, e.g. inaccurate traffic forecast model (Lam and Tam, 1998). Therefore, it is essential to pay attention on how traffic forecast can serve several purposes: (1) as a background for estimating future traffic levels in the design and appraisal of infrastructure improvement schemes, and of traffic policies and initiatives aimed at changing the use of the network; (2) to analyse problems on a reasonably disaggregated basis; (3) as a basis for predicting many of the environmental impacts of the traffic both at the national and local levels; (4) to inform how much the traffic can be expected to grow under present policies and give an indication of the effect of measures that they might propose to influence this growth (Department for Transport, 1997).

The risks related to traffic assumption were identified as follows: competitive risk, project approval risk, and revenue risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.13.

When port operator(s) are seeking to increase their market share, it is possible that they will use destructive pricing strategy. Ship owners or shippers as customers who are also sensitive to the quality of service supplied and the rates charged are directly affected by the extent of competition confronting the operator. Since these risks are affected by the operator's pricing decisions and by any price regulation imposed by government, competitive risks can be anticipated by: (1) enforcing a fair tariff regulation and competition policy (World Bank and PPIAF, 2003); and (2) planning integrated road network system to improve traffic volume (Soehodho, *et. el.*, 2003).



**Figure 8.13** Influence diagram of traffic, risk, and mitigation measures

An introduction of regulatory controls, e.g. fares and competition policy, is not always deemed as a fair policy. The consequence of any change of law or policy might be insufficient revenue of the project to cover debt servicing. “Regulation also has a direct impact on the extent of the revenue risk for the operator and on its ability to manage this risk” (World Bank and PPIAF, 2007). To prevent the revenue risk due to change of law, Bonnafous (2012) suggested that the project gets subsidies from the public authority.

Under revenue risks, there are three consequences due to failure in forecasting traffic volume, such as: Insufficient revenue to cover debt servicing, excessive revenue, and financial pressure in the form of a large interest burden on loans.

*"The more accurate and reliable the traffic and financial forecasts are perceived to be by prospective investors, the higher the probability that a port authority or port operator will be able to attract risk capital and obtain loans"* (World Bank and PPIAF, 2007). However, high degree of uncertainty associated with medium- or long-term projections of port activity contributes potential shortfalls in projected traffic. Abdel Aziz (2007) suggested that a tariff level reduction can be applied to leverage the project revenues.

It is also possible that the project sponsor generate excessive revenue due to failure in forecasting traffic volume. JNPT is an example for this case (see chapter 5).

Government intervention is also sought to negotiate with the lenders upon financial pressure in the form of interest rate burden (Cheng, 2010a). Two solutions can be applied in order to minimise this risk. The first is revenue cap agreement (RCP) between government authority and project sponsor to allow the project sponsor gain an acceptable revenue (Jun, 2010). The second is tariff regulation by government agency to control a fair tariff level (World Bank and PPIAF, 2003).

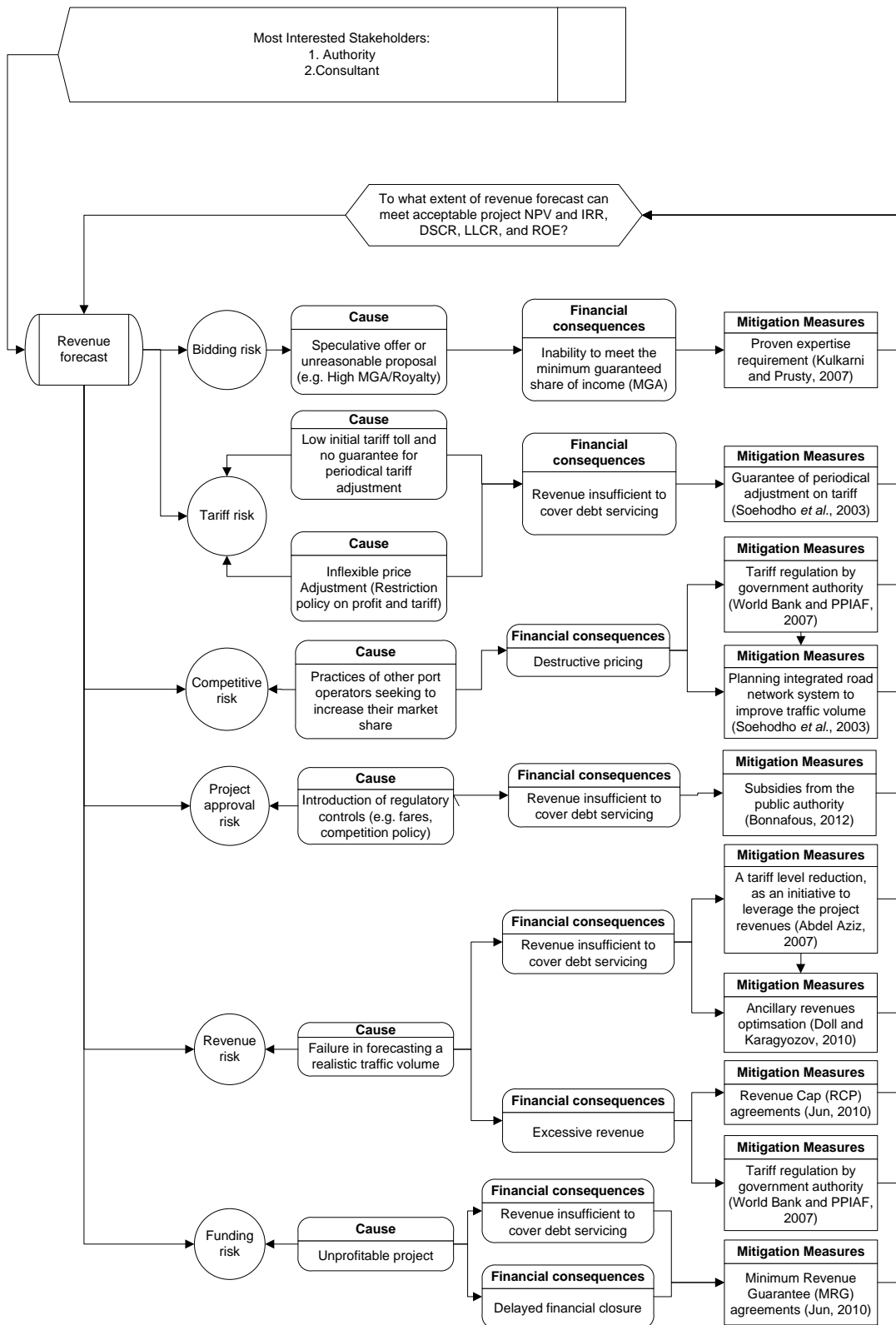
### **8.6.1.3 Revenue forecast**

Pantelias and Zhang (2010) stated that the investment risk is directly influenced by the relationship between the infrastructure-generated revenue and costs. The project revenue is depending on the nature of revenue stream of each type of project. Most of infrastructure projects have low demand price elasticity except toll road (Bult-Spiering and Dewulf, 2006). When the project revenue is driven by the traffic, improving the project revenue is not an easy task when the actual revenue is far behind the projection. For an example, Land Cove Tunnel and Eastlink projects in 2008, failed to meet their forecasted revenue (Regan et al, 2011). Generally, to become finance-able, riskier projects require the most robust revenue forecasts (Khan and Parra, 2003). According to Ashley, et al (1998), prospective investors pay special attention to traffic and toll revenue forecasts.

A tariff level reduction, as an initiative to leverage the project revenues, is necessary but not always sufficient to generate enough revenues. And one of the alternative remedies for this failure is extending the concession period (Abdel Aziz, 2007). However, the

revenue sources from other than volume or demand traffic (ancillary revenues) are also playing an important role to sustain the project. Doll and Karagyozov (2010) defined the examples of ancillary revenues such as retail, car parking or intermodal facilities.

The risks related to revenue forecast assumption were identified as follows: bidding risk, tariff risk, competitive risk, project approval risk, revenue risk, and funding risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.14.



**Figure 8.14** Influence diagram of revenue forecast, risk, and mitigation measures

#### **8.6.1.4 Operating cost**

In the context of PFI/PPP projects, the estimation of maintenance and operating (O&M) costs are very important because these costs include the costs of risk transferred to the private sector. According to Cartlidge (2006), a general estimate of operating costs<sup>53</sup> should include estimates of the services required to operate the completed facility and will alter in line with the nature of the project, such as: (1) human resource costs, staffing, pension liabilities, redundancy costs etc; (2) consumables; (3) repairs, maintenance and cleaning; (4) administrative overheads; (5) insurance costs; (6) in-house management costs.

Since an average concession period of PPP projects is ranging from 20 years up to 40 years, beside maintenance costs have to be considered, life cycle costs also become prominent to be anticipated in the project assumptions. Failure to address or underestimate the life cycle costs will damage an entire project.

#### **8.6.1.5 Maintenance cost**

Although financial robustness of bids is crucial, strong contracts to suitable counterparties have to be prepared for a long term PPP project. One of the most common risks in a long term contract is operating and maintenance cost overrun. In this case, O&M contractor is supposed to be aware and responsible to this risk. Nonetheless, there is a chance that the O&M contractor abandoning the contract. To anticipate this residual risk, Grimsey and Lewis (2004) suggested that sensitivity tests for the operating expenditure (OPEX) and capital expenditure (CAPEX) are intended to reflect this residual risk. So that the sponsor company could decide that it was in its best interests to share the pain with the O&M contractor by agreeing to a price increase to absorb some of the increased cost.

Maintenance and major repair costs are also one of the major parameters<sup>54</sup> used in the economic viability of PPP projects (Zou *et al.*, 2008). Maintenance cost also contributes

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<sup>53</sup> *The effect of inflation is excluded from PSC calculations except where the one element of the project is expected to rise more quickly than other factors (Cartlidge, 2006).*

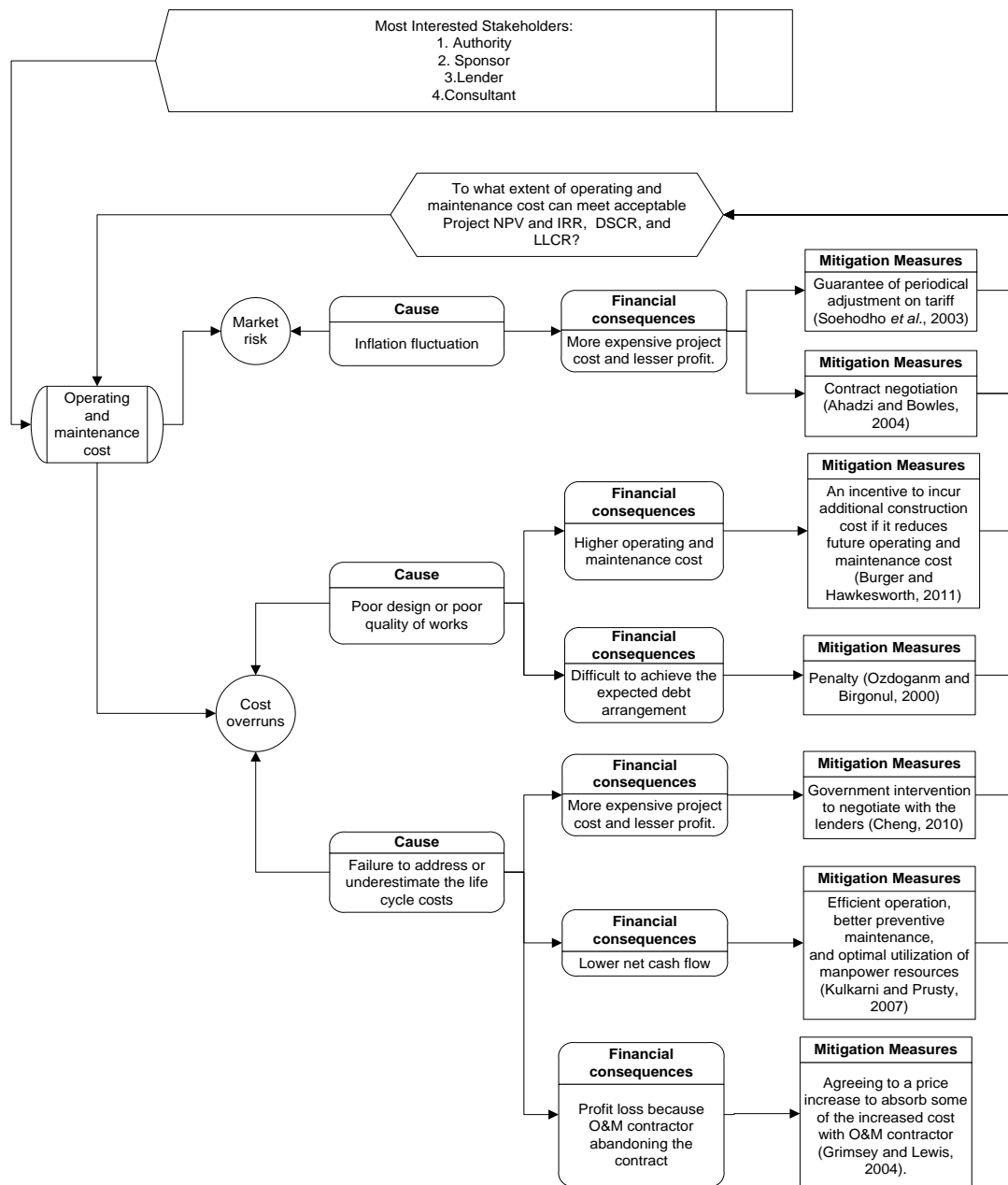
<sup>54</sup> *There are seven parameters used in the economic viability of PPP projects such as: (1) Construction cost; (2) Maintenance and major repair cost; (3) Managerial cost of toll-system; (4) Sales tax; (5) Income tax; (6) Depreciation; (7) Accumulative funds and public welfare (Zou *et al.*, 2008).*



important roles in determining the ability of PPP in delivering greater value for money (VFM). From accounting perspective, Shaoul (2005) criticised that the VFM methodology used for PFI projects in the UK falls short of demonstrating the VFM goals. The VFM analysis compares the net present cost (NPC) of the project between public sector comparator (PSC) and PFI. Maintenance cost as one of the project cost elements for the NPC comparison has different accounting treatment between PSC and PFI. In PFI option, the availability fee does not include the costs of energy, water, computers, software, etc., this is because the government authority retain some of their existing assets. Meanwhile, these costs are included in the maintenance cost of PSC.

As a PPP project ages, the project maintenance cost will gradually increase; thus the net cash flows and the annual NPV can be declined, and IRR can be lower (Shen et al, 2002). Therefore, a better preventive maintenance strategy will reduce the maintenance cost, thus the net cash flows and the annual NPV can be maintained at the expected level, and IRR becomes higher (Kulkarni and Prusty, 2007).

The risks related to operation and maintenance costs assumption were identified as follows: market risk and cost overrun. The influence diagram of these risks and mitigation measures is illustrated in figure 8.15.



**Figure 8.15** Influence diagram of operating and maintenance cost, risk, and mitigation measures

### 8.6.1.6 Loan repayment schedule

World Bank and PPIAF (2007) suggested that the repayment of a loan must be tailored to the project for which it was set up<sup>55</sup>. The ability of Greenfield port projects to

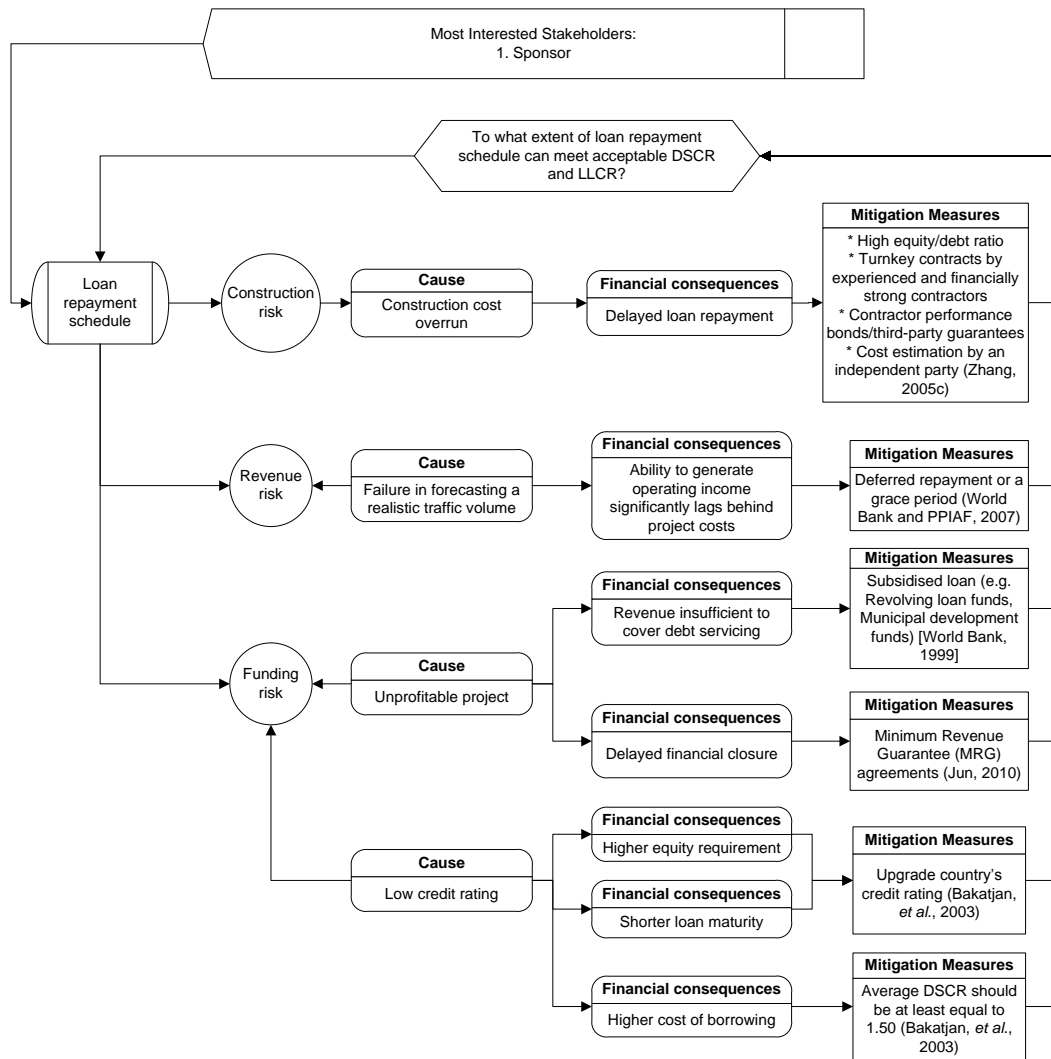
<sup>55</sup> Theoretically there are three types of loan repayment profiles: (1) Equal instalments of principal; (2) Equal instalments of interest and principal; (3) Instalments depending on the availability of cash flow (World Bank and PPIAF, 2007).

generate revenue at the initial operating period usually lags behind the project costs. Therefore, deferred repayment or a grace period, which allows the sponsor company to pay only interest to lender over a certain period, is needed especially for the loan repayment profile is dependent on available cash flow (e.g. Greenfield BOT port projects). The lenders (modelling bank) also want to make sure that the proposed repayment schedule is amortizing in structure, preferably level principal rather than annuity, with final maturity, grace period(s), and average loan life falling within acceptable internal guidelines (Khan and Parra, 2003). However, ADB (2000) stated that the PPP projects in developing countries with high and volatile inflation rates cannot be solved simply by using inflation-adjusted interest rates and/or compressing the loan repayment schedule.

The risks related to loan repayment schedule were identified as follows: construction risk, revenue risk, and funding risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.16.

#### ***8.6.1.1 Financing cost***

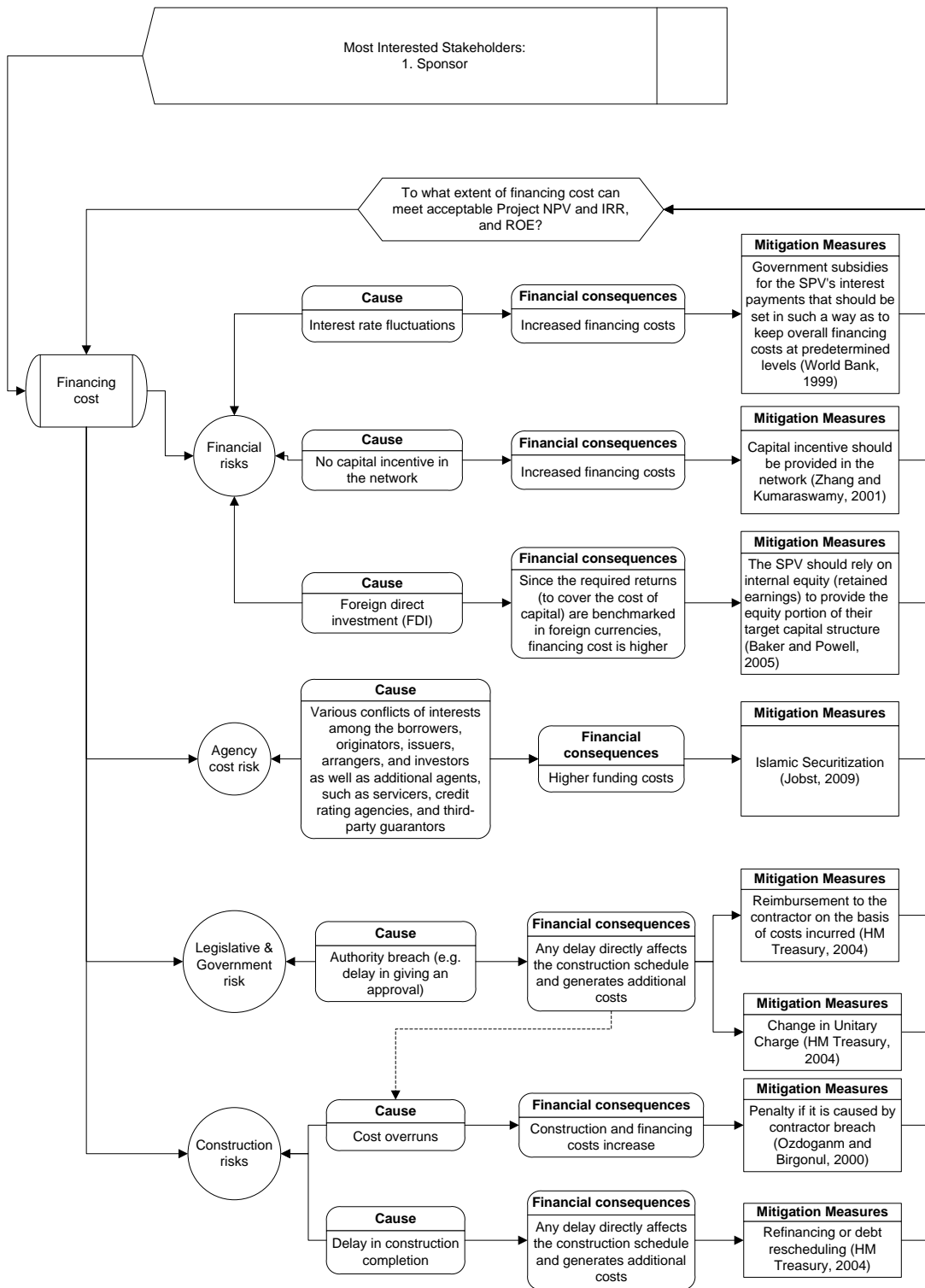
Financing cost is the cost of raising funds to finance the project; principally the cost of interest payments (World Bank and the Ministry of Construction of Japan, 1997; Kelly, 2009). Further, financing cost encompasses: (a) Interest, fees, commissions and costs payable by the borrower under the finance documents. (b) Amounts payable by the borrower in respect of tax gross-up, market disruption and increased costs. (c) Stamp duties and indemnities. (d) Net amounts payable by the borrower under any hedging agreement. (e) Any value-added or other taxes payable by the borrower in respect of the above (Khan and Parra, 2003). Financing cost also covers cost of debt issuance including underwriting, agency, trustee fees (Wibowo, 2005).



**Figure 8.16** Influence diagram of loan repayment schedule, risk, and mitigation measures

A PPP project may be more costly unless additional costs (due to higher transaction and financing costs) can be off-set through efficiency gains (Quium, 2011). For instance, an efficient financing cost refers to low financial service charges, fixed and low interest rate financing, long-term loan financing and low costs from fluctuations of currency and exchange rates (Zhang, 2005b cited in Yuan *et al.*, 2009).

The risks related to financing cost were identified as follows: financial risk, agency cost risk, legislative & government risk, and construction risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.17.



**Figure 8.17** Influence diagram of financing cost, risk, and mitigation measures

### **8.6.1.2 Project timelines**

Project timelines consist of construction time and operation time, which are often included in one term as concession period. The length of concession period should be determined based on project conditions, whole life cycle cost, likely term of senior debt, and financial analyses. For an example, the concession is determined to end once the private debt repayment is fully recovered (Aziz, 2007). There are also many factors that influence the decision in determining the length of the concession period such as a change in inflation rate, traffic flow, and operating cost (Ng *et al.*, 2007). Therefore, based on the expected return, decision makers should seek a balance between expected costs and revenues of the projects to achieve an optimal concession period.

The risks related to project timelines were identified as follows: time overrun, market risk, prolonged negotiation period, and cost overrun. The influence diagram of these risks and mitigation measures is illustrated in figure 8.18.

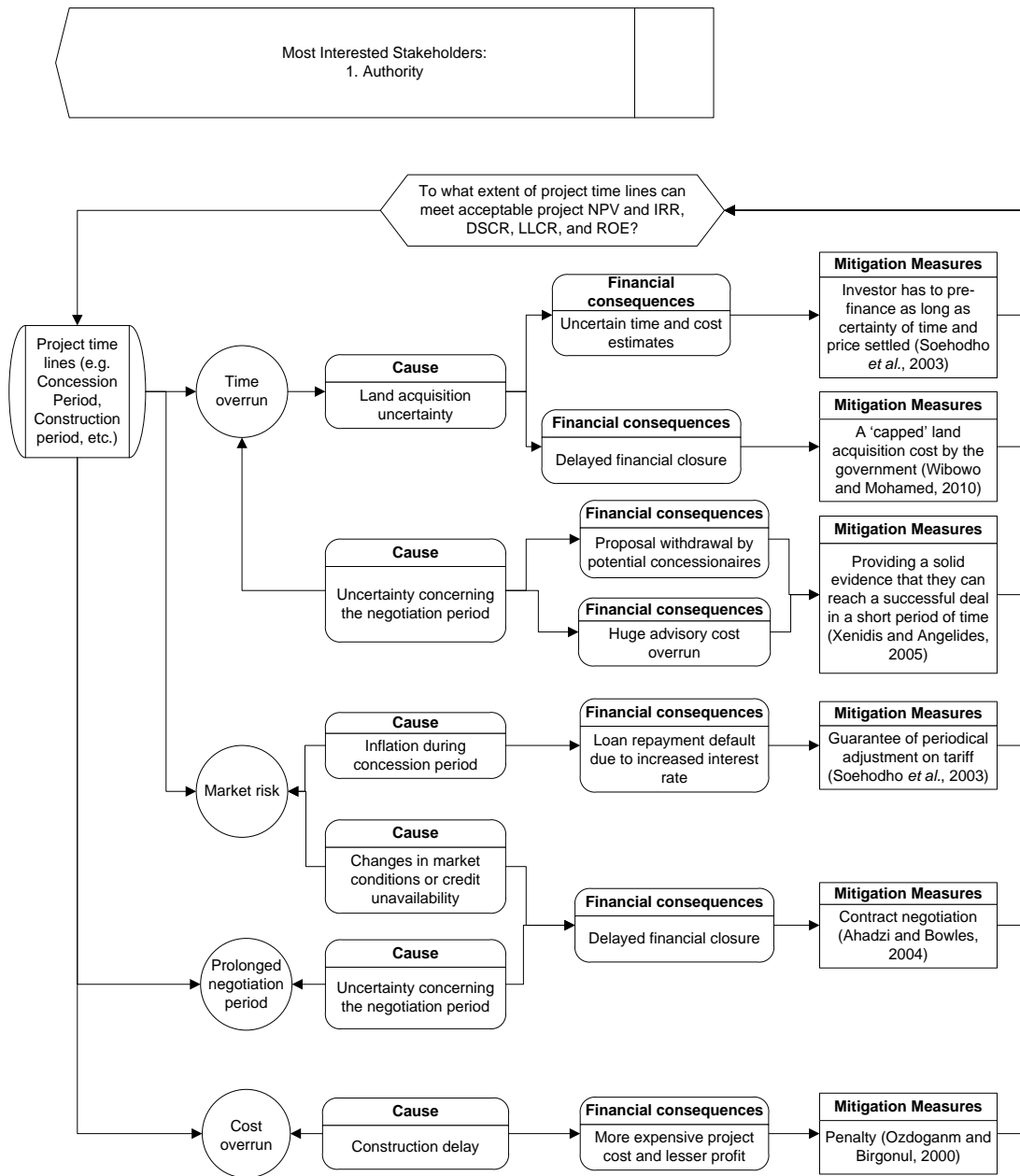
### **8.6.1.1 Capital structure**

PPP projects generally are funded with both equity and debt. Equity financing typically covers only 10–30% of total project costs, while debt financing is obtained for the remaining 70–90% (Levy, 1996 cited in Schaufelberger and Wipadapisut, 2003). The common strategy in PPP is to utilise as much debt as the project cash flows can justify providing an attractive rate of return to equity investors. The proportion of debt to equity in a project can be signified by using Debt to Equity Ratio. Higher the ratio means that there is more debt being used to finance the project. According to DEA (2012), the most commonly used ratio to ascertain the financing structure in India is:

$$\text{Debt to Equity Ratio} = \text{Total Long Term Liabilities} / (\text{Equity} + \text{Quasi-equity})$$

*Notes:*

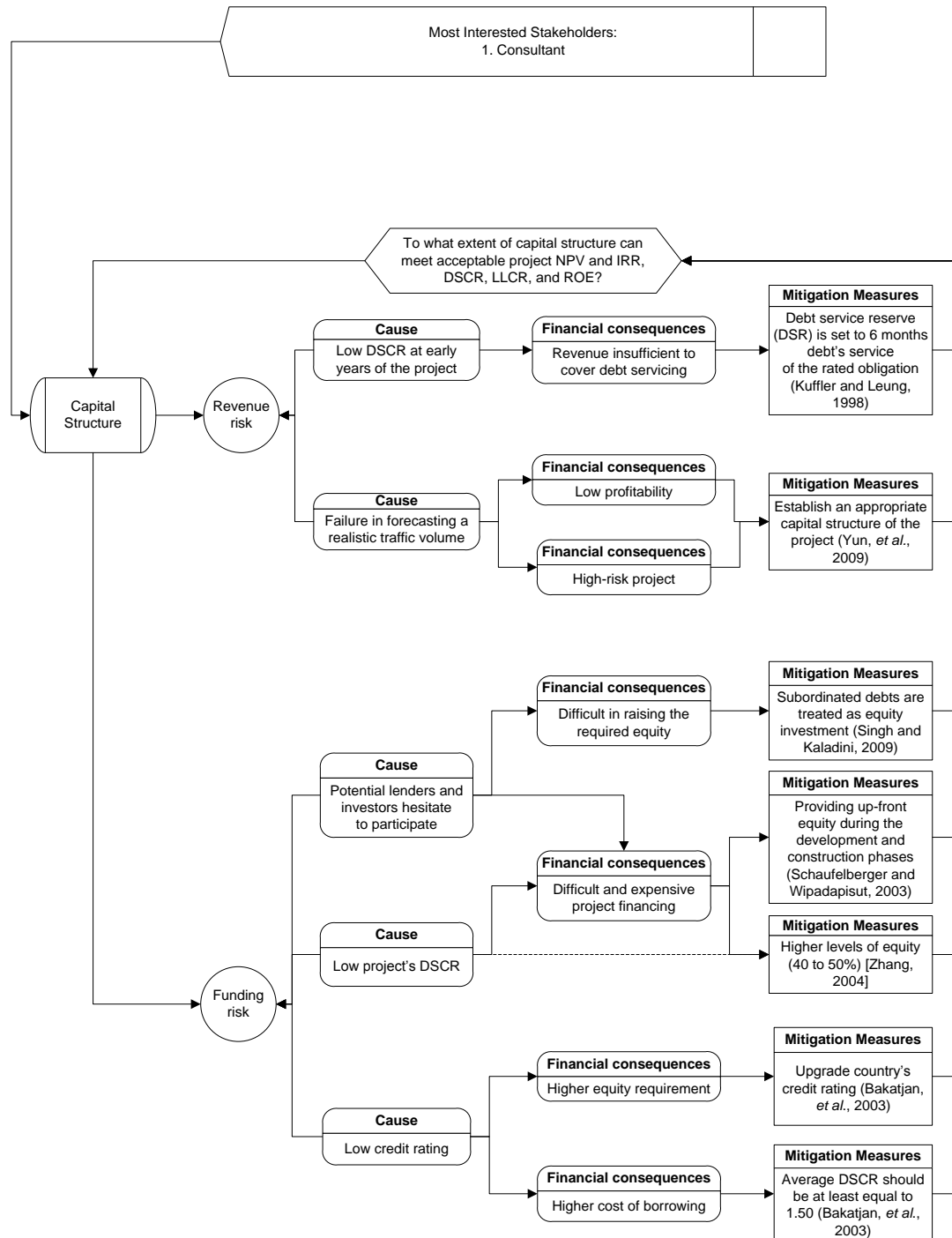
*Long Term Liabilities include all liabilities in the nature of loans and debts that the SPV undertakes. Please note that the Long Term Liabilities do not include share capital, reserves and surplus, and current liabilities.*



**Figure 8.18** Influence diagram of project time lines, risk, and mitigation measures

However, Korean government regulates that the level of equity ratio should not be less than 20% (Yun et al., 2009). Furthermore, government authority in Turkey favours high equity because more equity means less total project cost (Bakatjan *et al.*, 2003). Although the company success depends on investment decisions, not how it funds them (i.e. with equity only, or with equity and debt), it is important that the debt equity ratio be balanced for win–win results between public and private sectors.

The risks related to capital structure were identified as follows: revenue risk and funding risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.19.



**Figure 8.19** Influence diagram of capital structure, risk, and mitigation measures



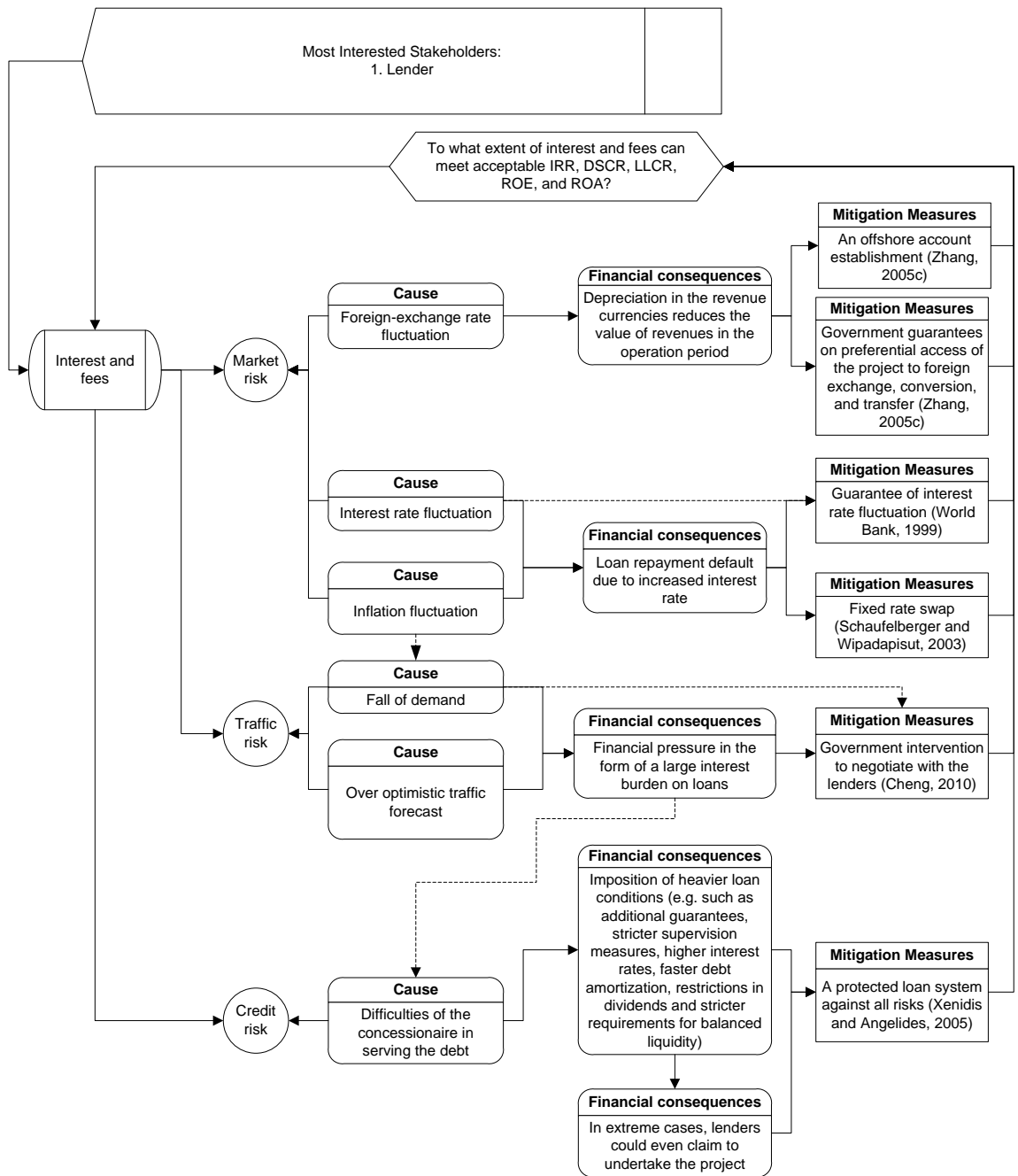
### **8.6.1.2 Interest and fees.**

Horcher (2005) stated that most companies and governments perceive the importance of interest rates, which are the key ingredient in the cost of capital, because they require debt financing for expansion and capital projects. Any changes on interest rate will have significant impact on many organizations, both borrowers and investors, and other financial markets. Interest rates consist of the real rate plus a component for expected inflation. The interest rate and fees should be tested to ensure that they are reasonably close to market for the type of project being considered. Khan and Parra (2003) asserted that interest rate and fees in the financial model should follow the convention in the Project Finance market such as: (1) compound semi-annually and be payable for the first time six months after the commissioning of the project, or at some interval after that; (2) the interest is payable in terms of a rate per annum should be calculated as if each year had 360 days, rather than 365 days.

The risks related to interest and fees were identified as follows: market risk, traffic risk and credit risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.20.

### **8.6.1.1 IRR**

Fischer, et. al (2010) identified that IRR is one of the key indicators for measuring the equity provider's expectation. Since the equity provider expects an adequate return of their investment, IRR can be used to measure the potential impact of their investment over the project lifetime. Some parameters affecting project IRR and equity IRR are capital structure of the firm, tariff rates, traffic levels, operation and maintenance costs, and project costs (Kulkarni and Prusty, 2007). Bakatjan, et al (2003) cited from Lohmann (1988) also stated that IRR and NPV are the most common and essential economic decision measure used in evaluating a project. Chang and Chen (2001) defined that IRR is the discount rate that makes the NPV value of a project to be zero.



**Figure 8.20** Influence diagram of interest and fees, risk, and mitigation measures

According to Ye and Tiong (2000) and Bakatjan, et al (2003), the decision rule is IRR must be greater than the required rate or discount rate. Therefore, IRR can be used to evaluate the desirability of the project. The higher a project's IRR, the more attracting the project is. Theoretically, a project with IRR that exceed the cost of capital should be considered. The Project IRR is the rate which satisfies the following formula:

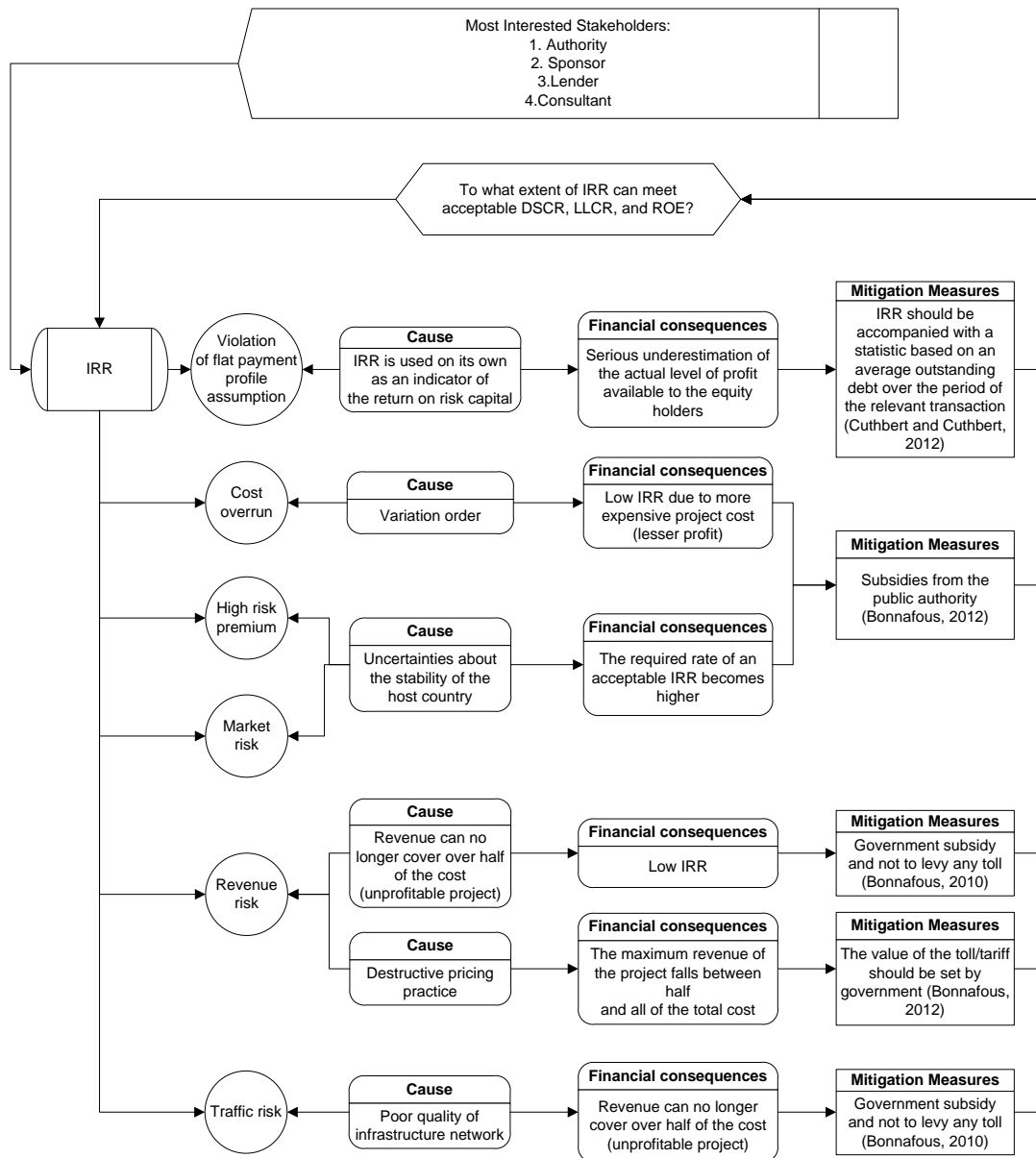
$$\sum_{i=\text{first year of construction}}^{\text{end of concession}} \frac{(OCFBF)_i}{(1 + IRR)^i} = 0 \quad \dots\dots\dots(8.1)$$

Where:  $i$ : number of tranches,  $1 \leq i \leq 3$

OCFBF = Operating Cash - Flows Before Financing  
 = Operating revenue + Subsidy - Construction costs - Fixed operating costs - Variable operating costs - Corporate tax paid - Other tax.

However, decision makers have to be cautious when using IRR as an investment decision tool. IRR should be used only for evaluating a single project rather than comparing mutually exclusive projects. Higher IRR does not guarantee that the project is more attractive than the other project is (Kelleher and MacCormack, 2004). Further, IRR should not be used alone in relation to PPP projects. Cuthbert and Cuthbert (2012) argued that IRR utilisation understates the true opportunity cost of PPP finance to public sector and the potential profit earned by private sector. Alternatively, an average outstanding debt over the period of the relevant transaction has to be reviewed by the public sector negotiators as an indicator of potential excess profits in PPP schemes.

The risks related to IRR were identified as follows: violation of flat payment profile assumption, cost overrun, high risk premium, market risk, revenue risk, and traffic risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.21.



**Figure 8.21** Influence diagram of IRR, risk, and mitigation measures

### 8.6.1.2 Net cash flow

Net cash flow is the difference between cash inflows and outflows of SPV Company (revenue minus expenditures) in certain period. It is also known as the "change in cash and cash equivalents" in a cash flow statement. It is worth noting that net cash flow is not the same with net income, free cash flow, or EBITDA. Under discounted cash flows (DCF) analysis, an estimation of net cash flows during the project's life is required to calculate the NPV, IRR, ROI, and payback period (Arboleda and Abraham , 2006; and Schmidt, 2012). Therefore, the estimation of net cash flow is very important as basic information for evaluating the project with various techniques and alternative solutions.

At project feasibility study, a positive total net cash flow of PPP project is preferred. However, higher project's total net cash flow does not guarantee that the PPP project is more attractive than PSC. Other considerations such as financial output indicators (e.g. NPV, IRR, payback period, etc.), risk, and social benefits should be taken into account in determining the best value for money (Schmidt, 2012). Meanwhile, at the operation stage, net cash flow allows an analyst to evaluate the financial performance and to see the entire picture of the options available<sup>56</sup> based on how much cash a PPP project is generating from operations. In addition, the priorities depend on annual net cash flow which changes over time.

Kulkarni and Prusty (2007) stated that net cash flow is influenced by several factors (where revenues and expenses are the main drivers). For examples, higher net cash flows are influenced by increasing the traffic or tariff levels. And when operating and maintenance costs and project costs are increasing, the net cash flows are declining. In addition to the above factors, Al-Sharif (2007) argued that net cash flow is also sensitive to discount rate and inflation rate. The variance of annual net cash flow can be seen from three activities: (1) operating activities or business activities; (2) investment activities; and (3) financing activities. The net cash flow is best viewed from operating activities because it gives better information of how the project will generate cash from operation (Faulkenberry, 2006).

The risks related to net cash flow were identified as follows: discount rate risk, cost overrun, decision risk, market risk, and tariff risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.22.

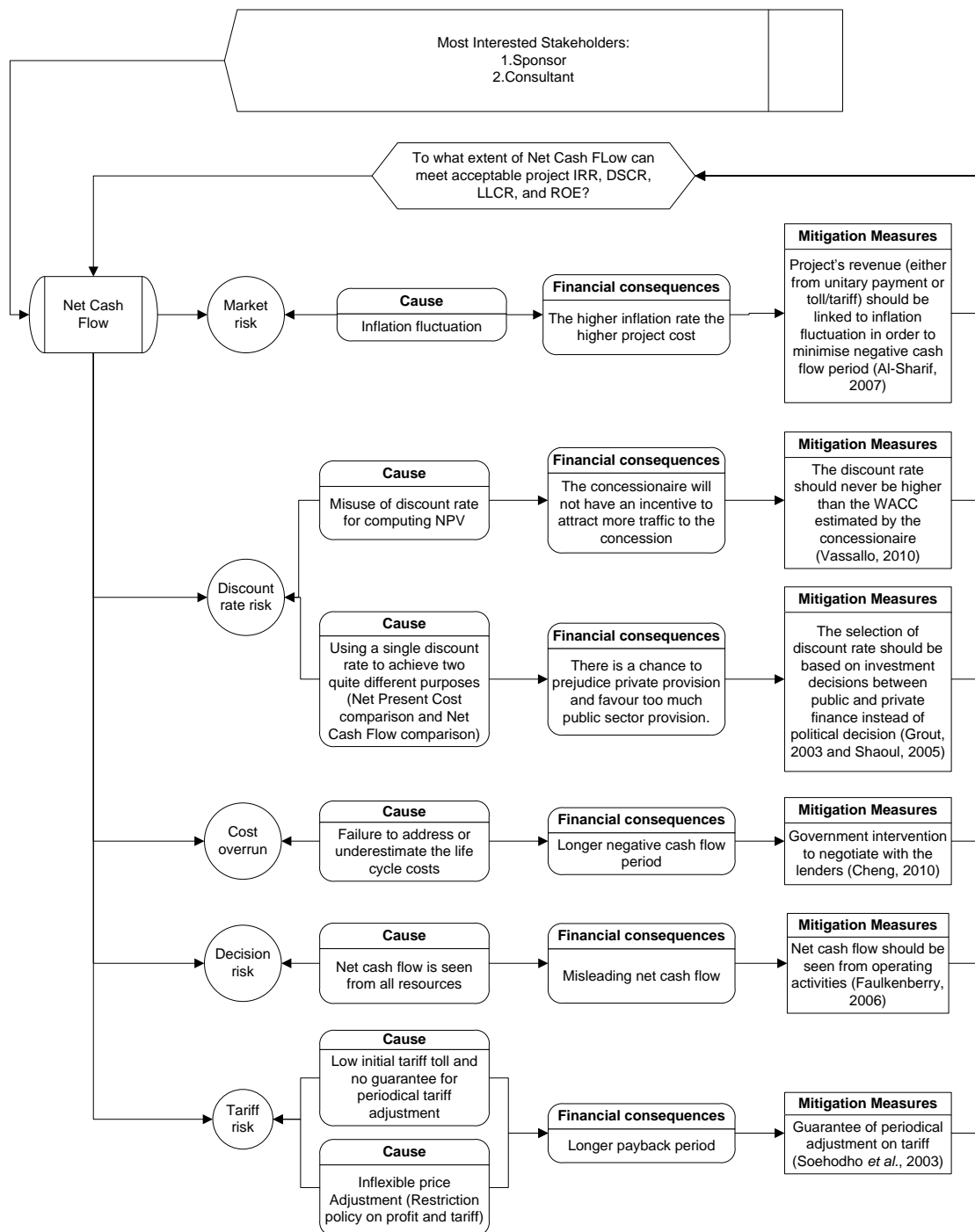
#### **8.6.1.1 EBITDA**

EBITDA is earning before interest, taxes, depreciation, and amortisation of intangibles, which is useful in examining and comparing profitability between companies and industries, because this figure does not include the effects of financing and accounting decisions, such as interest (from different capital structures), taxes (from different tax treatments), depreciation (from different fixed asset bases), and amortization (from different holdings of intangibles) [Engle, 2010; Tjia, 2009]. EBITDA is “cash

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<sup>56</sup> Three choices available, which are seen from net cash flow: invest for future growth (buildings, equipment, inventory, etc.), pay off debt, or return money to shareholders (Faulkenberry, 2006).

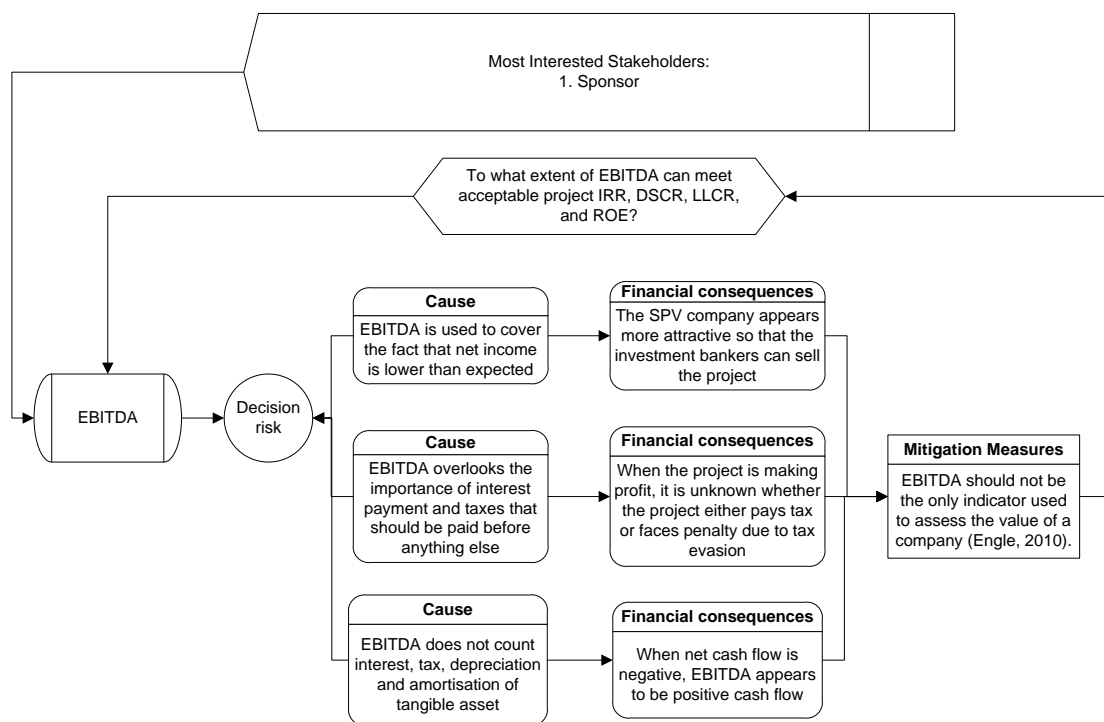
earnings”, the amount of cash generated by the operations. Since depreciation and amortization are non cash expenses, there is no actual cash expensed by the company. Thus EBITDA can give a good indication of a company’s absolute ability to pay interest (Tjia, 2004).



**Figure 8.22** Influence diagram of net cash flow, risk, and mitigation measures

However, from the investor’s perspective, Engle (2010) suggested that EBITDA should not be the only indicator used to assess the value of a company. Other measures such as market growth, competition, the quality of management and the workforce also play an important role to assess the value of a company. Furthermore, investors should recognize how a company achieved a particular EBITDA level especially if dramatic improvements took place in a short span of time. King (2001) also argued that EBITDA is used merely because companies hide something in their finances (e.g. net income lower than expected).

The risk related to EBITDA was identified as follows: decision risk. The influence diagram of this risk and mitigation measure is illustrated in figure 8.23.



**Figure 8.23** Influence diagram of EBITDA, risk, and mitigation measures

### 8.6.1.2 CADs

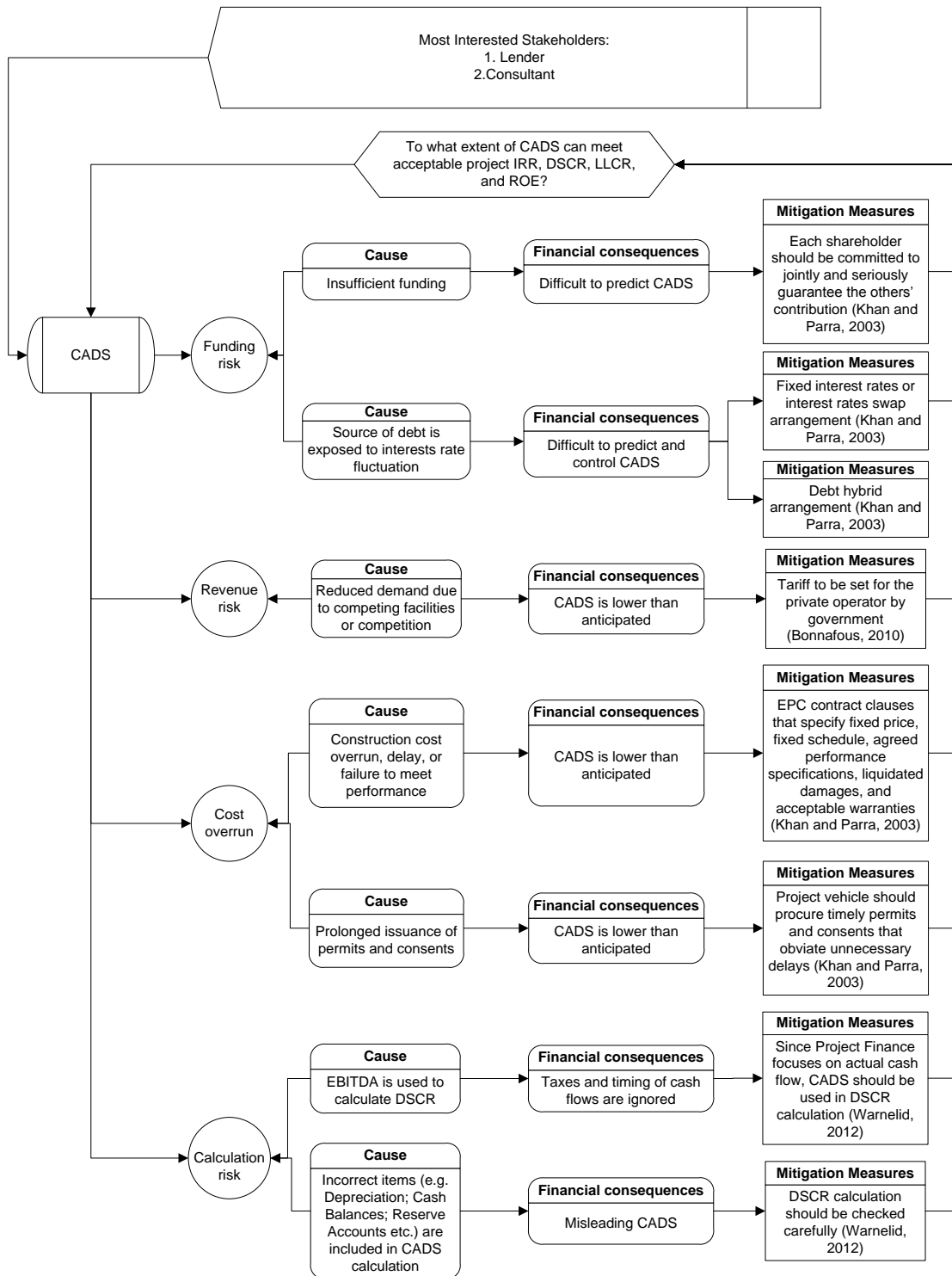
The project’s finance-ability can be determined by the ability of the project to generate enough cash flow so that lenders have a safety margin in terms of its debt service obligations. However, it is a difficult call for project sponsor to determine the finance-ability of the project when project agreements have not been negotiated at the pre-bid stage or project development (Khan and Parra, 2003). Nevertheless, project sponsor can

use two measurement ratios (DSCR and LLCR) that are commonly employed by lenders to evaluate the project's ability to meet its debt service (Lamb and Merna, 2004). Since cash available for debt service (CADS) is used to calculate both ratios, it is prominent to predict and control CADS. Project sponsor should consider all fallback possibility in predicting project cash flow and CADS. Further, lenders consider CADS metric to determine debt sizes and repayment criteria (Warnelid, 2012). Lenders also have to make sure whether the project requires a subordinated loan.

An agreement on forecast for cash available for debt service (CADS) over project loan life is expected by the lenders to be reached during contract negotiation stage. Therefore, the sponsor and the authority have to find a way of complying with the lender's requirement. There are two options available in order to improve the predictability of CADS estimation. First option is an arrangement of interest rate swap through a broker or commercial bank, which "fixes" the interest rate for the life of the loan. The second is persuading the lenders to arrange a debt hybrid instead of extending straight loan.

The risks related to CADS were identified as follows: funding risk, cost overrun, calculation risk and revenue risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.24.





**Figure 8.24** Influence diagram of CADs, risk, and mitigation measures

### 8.6.1.3 *LLCR*

Loan life coverage ratio (LLCR) is defined as the NPV of project cash available for debt service (CADS) over loan life to the remaining term of the debt. In this case, the numerator comprises the project CADS over the outstanding loan discounted by the average cost of debt in the project debt plan divided by the amount of senior debt (Khan and Parra, 2003).

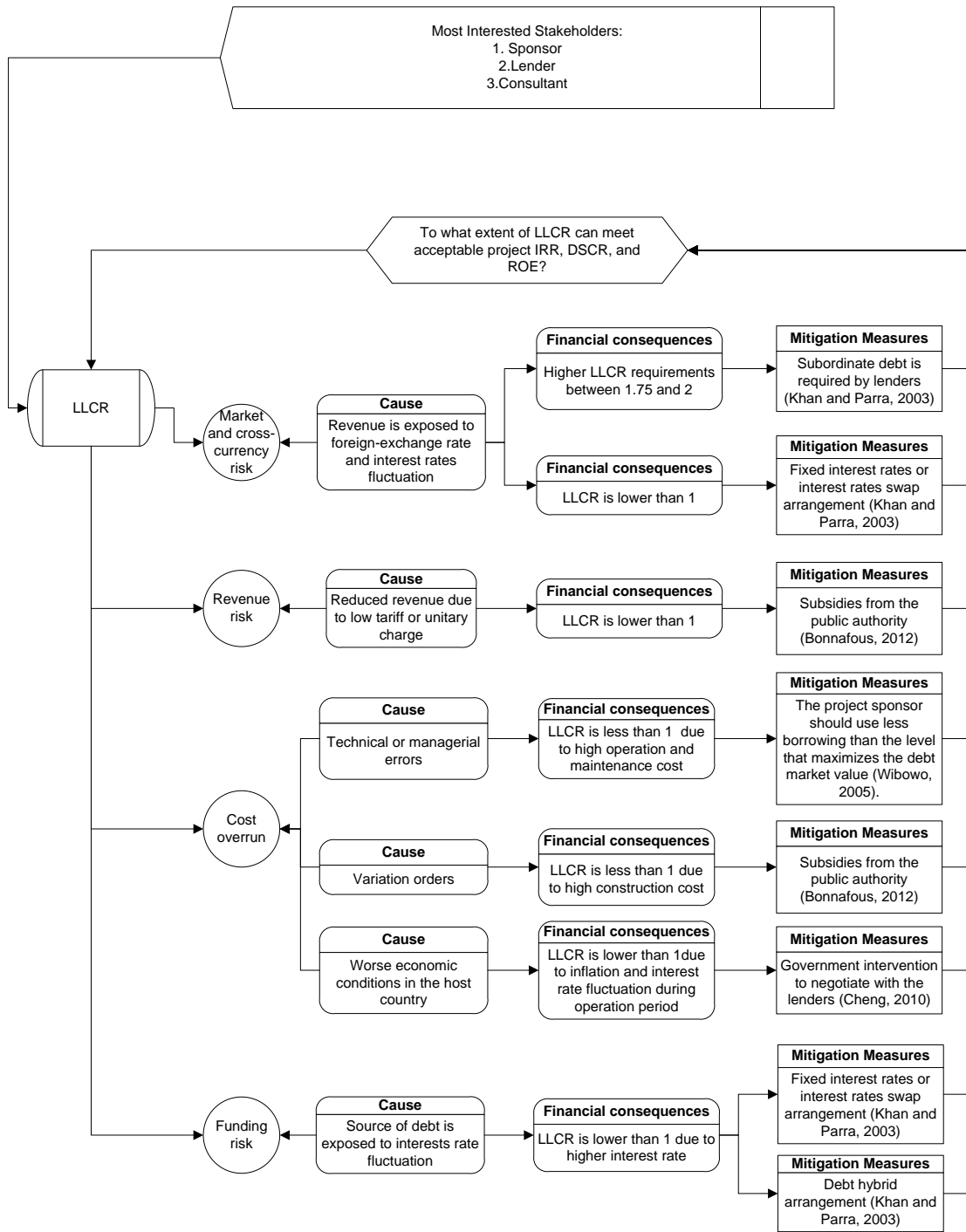
$$\text{LLCR} = \text{NPV of CADS over the Debt Period} / \text{Total Debt} \dots \dots \dots (8.2)$$

*Notes:*

- *The discount rate used in calculating the NPV is that of the average interest rates of the financial debts.*
- *The period over which the NPV is calculated, is the length of the financing cycle, in other words the duration of the total loan period.*

The purpose of calculating LLCR is to estimate the ability of the project to repay an outstanding debt balance. In other words, LLCR is used to ensure that no defaults have taken for failure to meet debt service cover and that the project vehicle is entitled to pay dividends to the sponsor, if other conditions for doing so are met. And if a very huge cost overrun is anticipated earlier, the declaration of the loan agreement breaching may be able to be claimed by lenders, based on a material adverse change or some other similar covenant. The lenders also want to know whether the project needs a subordinated lender or not. Their minimum range of required LLCR for a container port is between 1.50 and 1.90 in order to determine subordinated loan. Queiroz (2011) also stated that the minimum LLCR generally should be greater than 1.2. Government of India considers a good project's capital structure, if it shall enable a LLCR above 1.70. Nevertheless, there is no single rule for an optimum ratio (DEA, 2012).

The risks related to LLCR were identified as follows: market and cross currency risk, cost overrun, revenue risk, and funding risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.25.



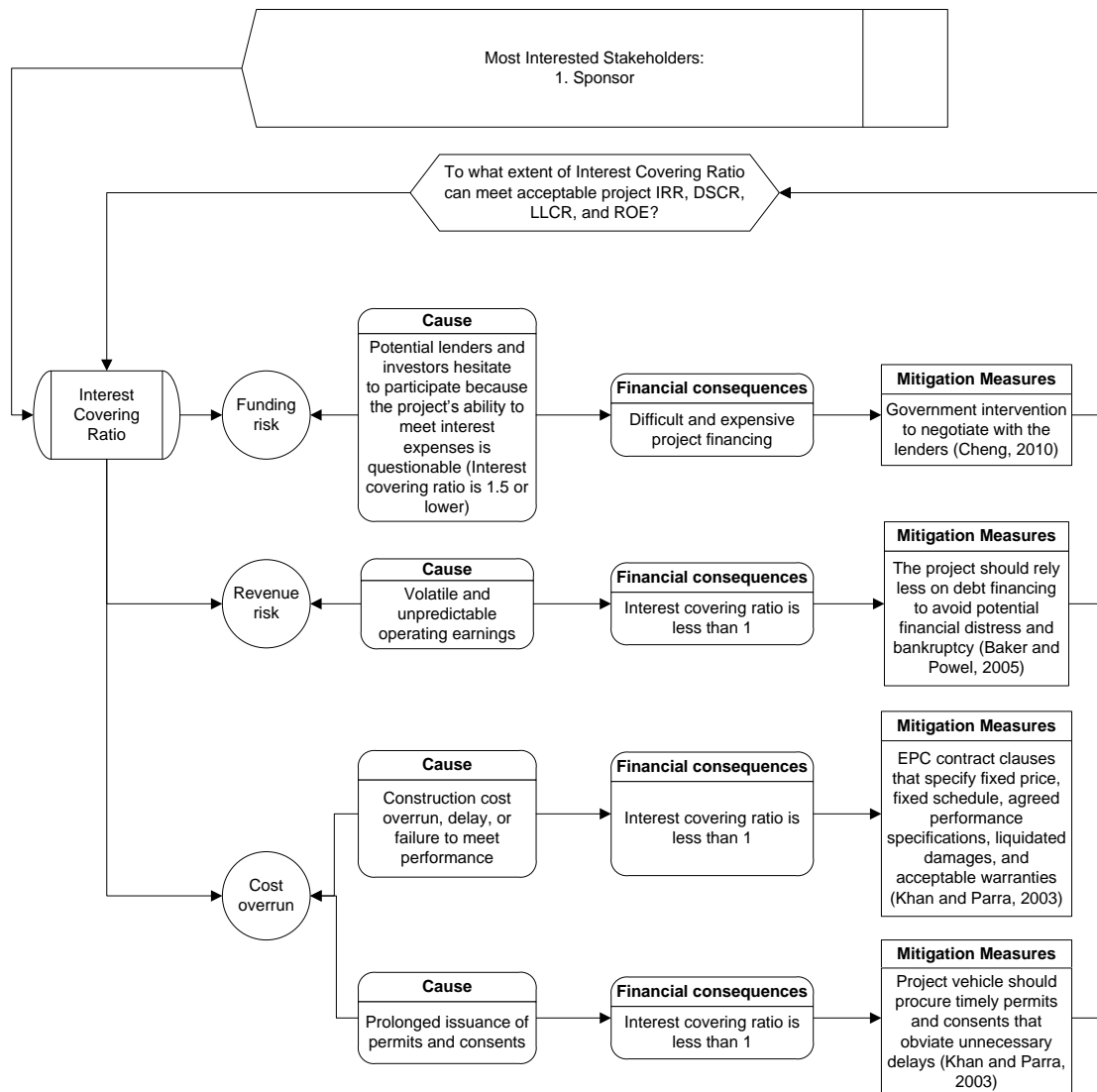
**Figure 8.25** Influence diagram of LLCR, risk, and mitigation measures

#### 8.6.1.4 *Interest coverage ratio*

The interest coverage ratio, also called times interest earned, is used to determine how easily a company can pay interest expenses on outstanding debt. This ratio is calculated by dividing a project's earnings before interest and taxes (EBIT) by its interest expense.

Baker and Powel (2005) argued that an acceptable interest coverage ratio is largely depends on the expected level of the project's future operating income (EBIT), as well as the volatility of EBIT. Projects with stable revenue (e.g. DBFO/PFI projects) can typically borrow more because of the lower probability of operating earnings falling below the level of interest expenses (i.e. revenue is generated from the annual unitary charges paid by government). Meanwhile, projects with more volatile and unpredictable operating earnings (e.g. BOT projects) should rely less on debt financing to avoid potential financial distress and bankruptcy. *“The lower the ratio, the more the project is burdened by debt expense. When a project's interest coverage ratio is 1.5 or lower, its ability to meet interest expenses may be questionable. An interest coverage ratio below 1 indicates the project is not generating sufficient revenues to satisfy interest expenses”* (Loth, 2012).

The risks related to Interest Coverage Ratio were identified as follows: funding risk, cost overrun, and revenue risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.26.



**Figure 8.26** Influence diagram of Interest Covering Ratio, risk, and mitigation measures

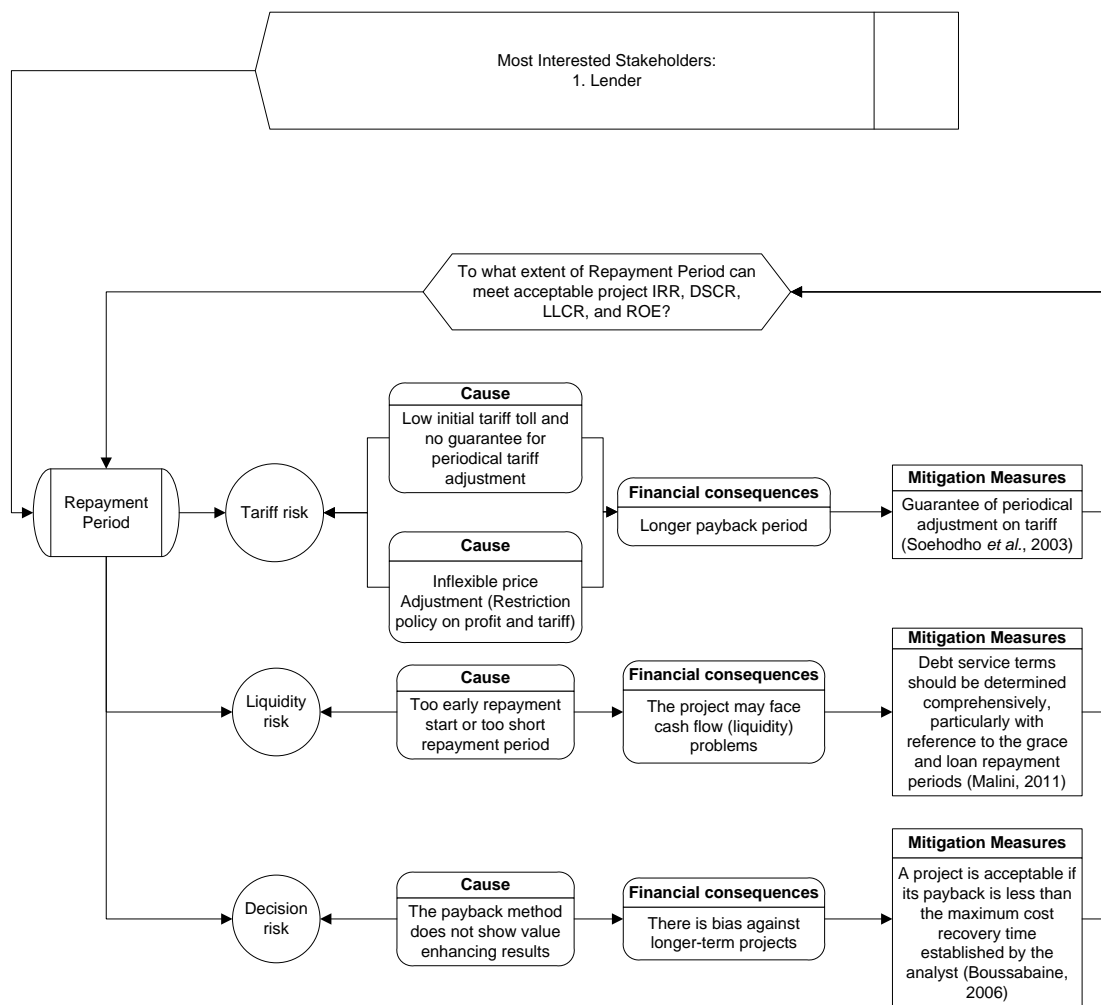
### 8.6.1.5 Repayment period

Chang and Chen (2001) referred the debt repayment period to the time, after the grace period, needed for the loan borrower to pay off all the interest and principal. The loan repayment period usually does not exceed 10 years following completion of basic facilities, but longer repayment periods are possible if the project is very long-lived (e.g., an infrastructure project). If the cash flow from the project is inadequate to wholly amortize the principal debt within this period, the sponsors must bear the risks of refinancing the loan (Finnerty, 2007).

Although Construction, operation, and repayment periods are initially set under the agreed contract (Yun *et al.*, 2009), the debt repayment period is still possible to be re-

negotiated under refinancing clause (Cartlidge, 2006). Furthermore, Malini (2011) asserted that the debt service terms should also be determined comprehensively, particularly with reference to the grace period (or moratorium period) and the loan repayment period. When the repayment is started too early or if the repayment period is too short, the project may face cash flow (liquidity) problems. Thus, the particular terms of debt service in the future will depend on the economic and monetary climate. Alternatively, repayment period might be still the same if government guarantees a periodical adjustment of tariff (Soehodho *et al.*, 2003).

The risks related to repayment period were identified as follows: tariff risk, liquidity risk, and decision risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.27.



**Figure 8.27** Influence diagram of repayment period, risk, and mitigation measures

### 8.6.1.6 Revenue

Since PPP projects are financed on a project finance basis, lenders only rely on the project's revenue generation capacity for the repayment of debt service (Özdoğanm and Birgönül, 2000). Although source of revenue in PPP can be either from government or users, sponsor company is the one who responsible for debt repayment. From the operating revenues, sponsor has to allocate the money not only to the outstanding debt but also to all project costs, including tax, royalty or even revenue-sharing to government. On the other hand, at some BOT projects, government authority prefers to select a bidder with the highest percentage of revenue share (Kulkarni and Prusty, 2007; Handley, 1997). Accordingly, the revenue as financial model output is deemed to be an important indicator by three main stakeholders such as sponsor, lender, and authority.

### 8.6.1.7 NPV

*“NPV is the present value of a project's future cash flows minus its cost. It is the technique of finding the PV of all cash flows (both inflows and outflows) associated with an investment. Operating firms, acquisitions or divestitures, are appraised generally using NPV technique”* (Khan and Parra, 2003). NPV is the most common measure for evaluating a project. NPV is the total project's value, with considering time value of money, which calculated by summing all project's cash flows. The operating cash-flows before project financing are discounted at the average rate on the three tranches of debt using the following formula:

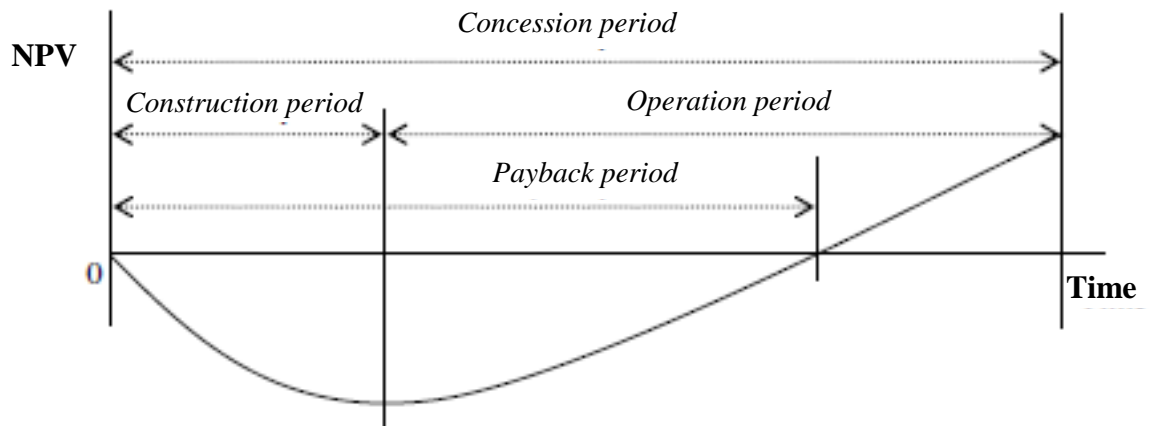
$$Project\ NPV = \sum_{i=first\ year\ of\ construction}^{end\ of\ concession} \frac{(OCFBB)_i}{(1+t)^{i-year\ of\ study}} \dots\dots\dots(8.3)$$

Where:

- *t is the weighted average of the three rates on the tranches of debt;*
- *The NPV is calculated for the first year of the construction period.*

Wibowo (2005) argued that the project's NPV can be improved if the project sponsor uses less borrowing than the level that maximizes the expected ROE. Since cost of equity is quite sensitive to the leverage, any increase in cost of equity should be sufficiently balanced by an increase in the expected ROE.

Ye and Tiong (2003a) introduced NPV-at Risk to analyse the influence of different concession period structures so that both government and the concessionaires can understand their risk exposure and rewards as illustrated in figure 8.28.



**Figure 8.28** Relationship between the concession period and NPV

*Source: Ye and Tiong (2003a)*

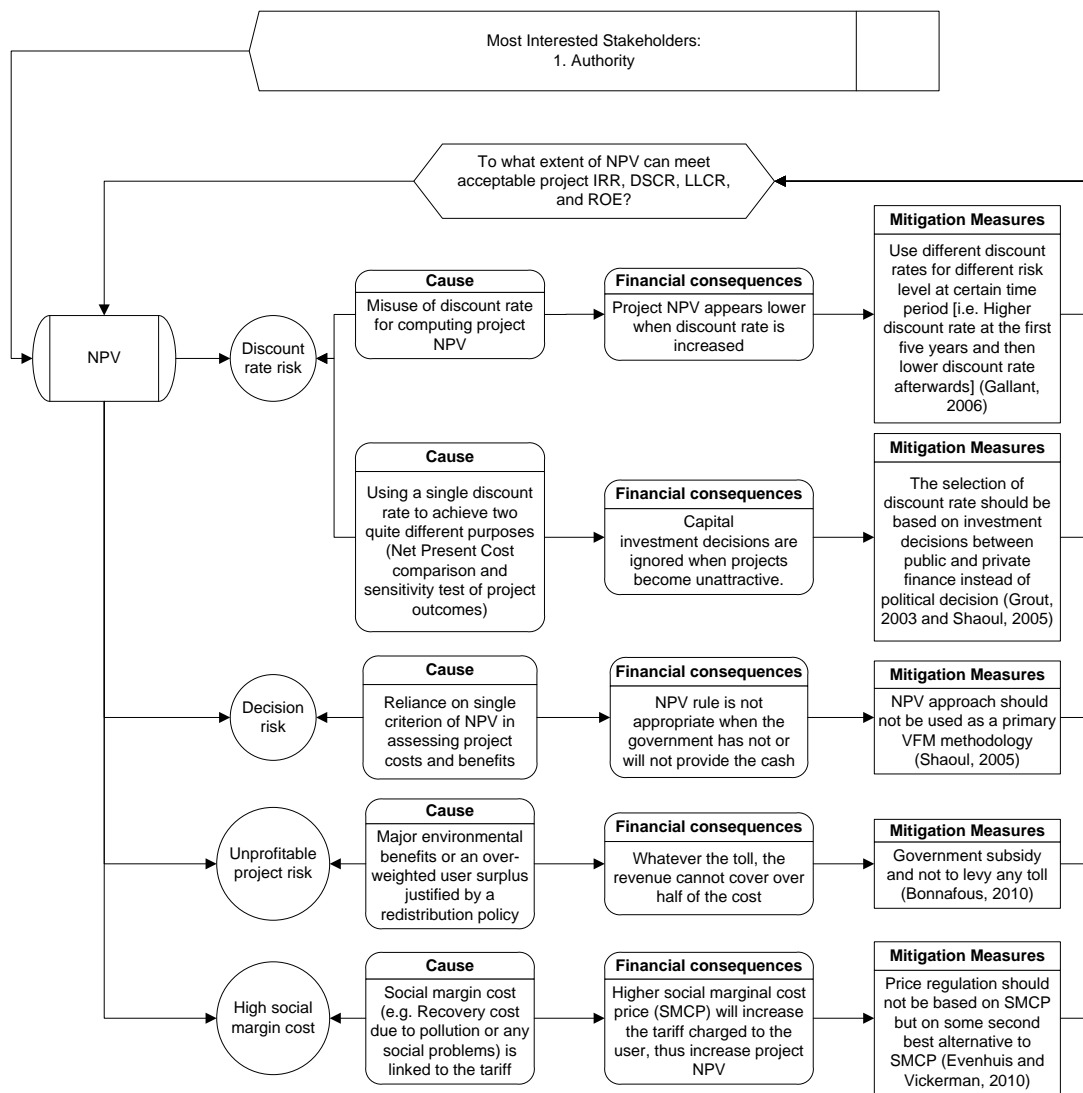
The risks related to NPV were identified as follows: discount rate risk, decision risk, unprofitable project risk and high social margin cost. The influence diagram of these risks and mitigation measures is illustrated in figure 8.29.

#### **8.6.1.8 Operating cost**

Khan and Parra (2003) defined that operating cost is all costs and expenses sustained or to be sustained by sponsor in connection with the operation, maintenance, repair and reinstatement of the project in the ordinary course of its business including but not limited to:

- a. Operating costs and expenses set out in the operating budget.
- b. Liabilities of the borrower under the project agreements.
- c. Insurance premia.
- d. Maintenance expenditure (which shall include the funding of the major maintenance reserve account).
- e. Fees, commissions, charges, administrative, legal, management, accounting, other consulting and all other overhead and employee costs.
- f. All other costs and expenses which the inter-creditor agent (acting reasonably) agrees may be classified as operating costs.





**Figure 8.29** Influence diagram of NPV, risk, and mitigation measures

### 8.6.1.9 ROE (Equity IRR)

Annual return on equity is calculated as annual net profits after taxes divided by shareholders' equity (Khan and Parra, 2003). Fischer, et. al (2010) stated that the equity provider expectation is maximising their return and long-term current income. Thus, ROE can be used to measure how much total equity needed, according to the pre-defined ROE ratio, over a free defined period. Wibowo (2005) stated that the project sponsor should use less borrowing than the level that maximizes the debt market value, when the project sponsor chooses to maximize the ROE. However, for project financing purposes, Lynch (2005) argued that equity returns are calculated as an internal rate of return to equity (IRRE) rather than annual return on equity (ROE).

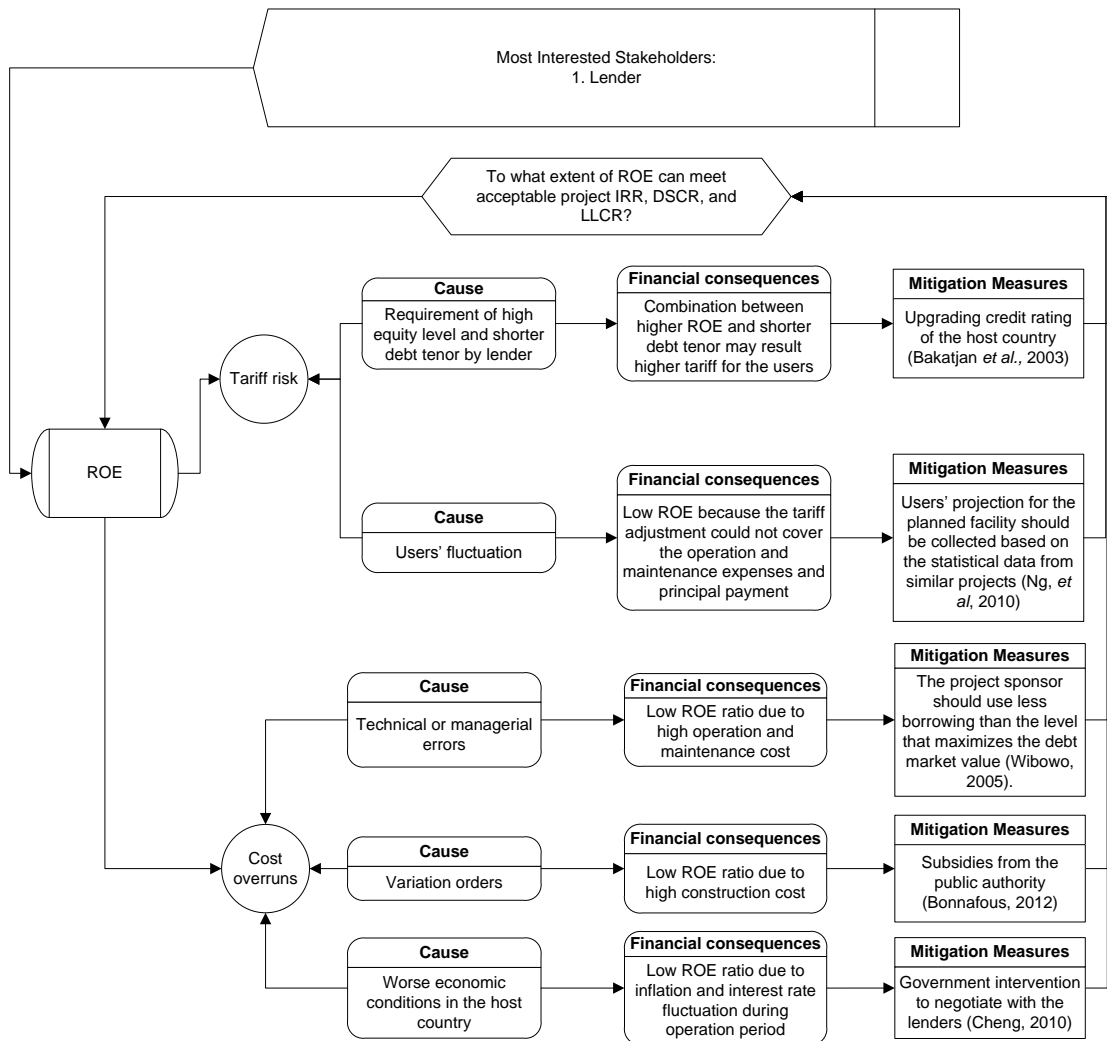
The following formula is used to calculate the IRRE:

$$\sum_{i=1}^{\text{end of the concession}} \frac{\text{Equity injected} - \text{dividends}}{(1 + ROE)^i} = 0 \quad \dots\dots\dots(8.4)$$

Where:

- *Equity injected(i)* is the equity provided by the sponsors in year (i);
- *Dividends(i)* are the dividends distributed to shareholders in year (i);
- *ROE* is calculated in real terms through deflated flow (equity - dividends).

The risks related to ROE were identified as follows: tariff risk and cost overrun. The influence diagram of these risks and mitigation measures is illustrated in Figure 8.30.



**Figure 8.30** Influence diagram of ROE, risk, and mitigation measures

### 8.6.1.10 DSCR

“At any time, the ratio of available cash flow to the aggregate of senior debt service and subordinated debt service due to (or projected to fall due) in that period” (Khan and Parra, 2003). This ratio signifies the ability of project’s cash flow to meet the annual debt service requirements. This requirement is based on the terms of the loan that a lender is providing to the project. Fischer, et. al (2010) mentioned that debt funder use DSCR to ensure their debt will not be interrupted over a given loan term. Therefore, the promotion of development objectives by development banks can be achieved.

$$\text{ADSCR} = \text{CADS} / (\text{Principal} + \text{Interest Payment}) \dots \dots \dots (8.5)$$

This ratio is calculated each year and therefore provides a continuous view of the project’s ability to service its debt. Higher Debt Service Coverage Ratio reduces risks for lenders. Bakatjan, et al (2003) cited from Koh et al (1999) mentioned that the range of 1.10 to 1.25 for DSCR is bankable, the range between 1.30 and 1.50 is satisfactory, and above 1.50 is preferable. Government of India prefers the minimum ADSCR should be above 1.30 in all years of the loan period (DOA, 2012). An indication of the strength of different DSCR levels is shown in Table 8.8.

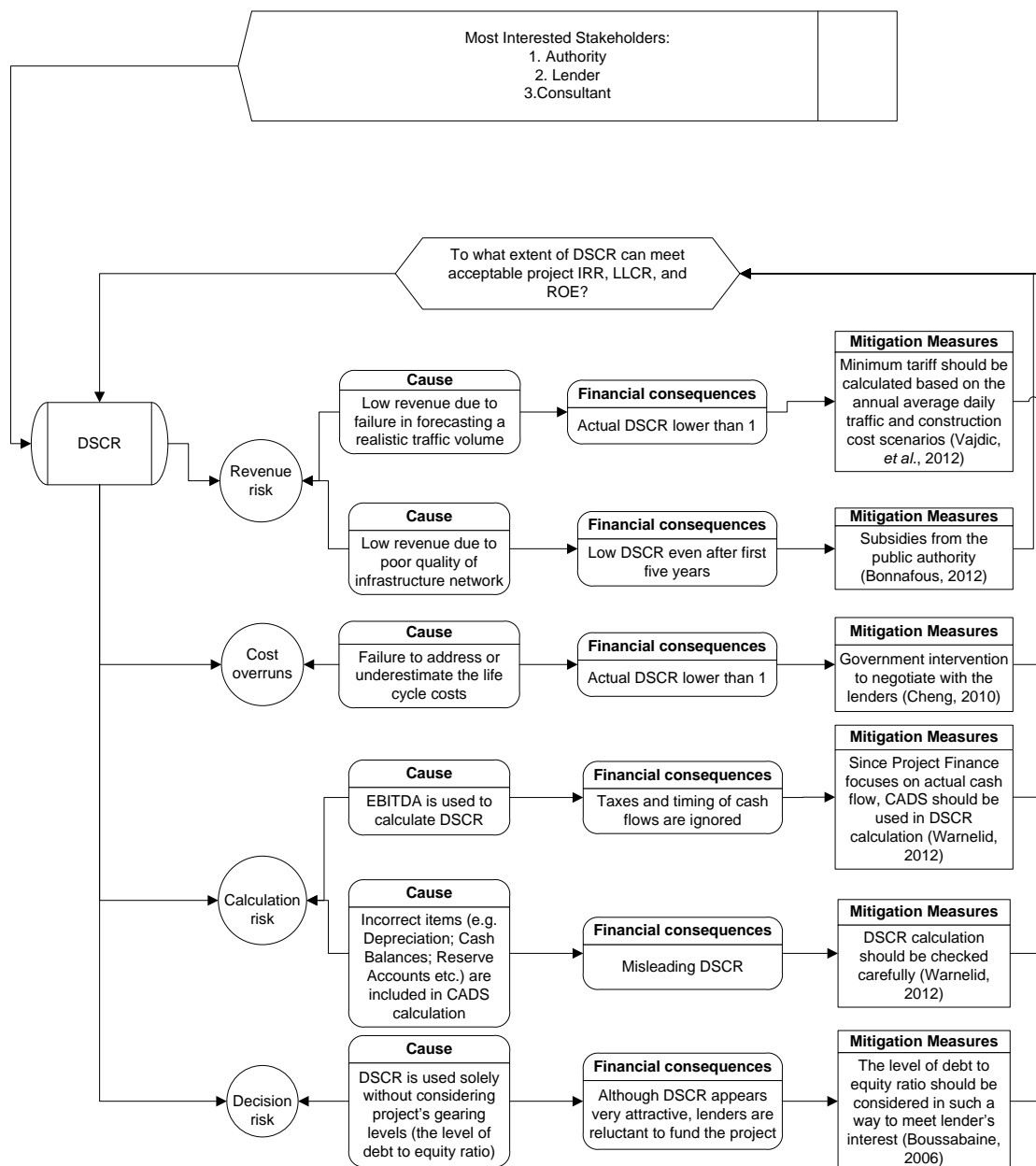
**Table 8.8** DSCR strength criteria (DOA, 2012).

Strength	DSCR assessment
Very Strong	Very strong ability to pay interest and principal with Minimum DSCRs above 2x and remaining above 1.5x during periods of project stress (i.e. in sensitivity analysis).
Strong	Strong ability to pay interest and principal with Minimum DSCRs above 1.5x throughout life of project and remaining above 1.3x during periods of project stress (i.e. in sensitivity analysis).
Modest	Modest ability to pay interest and principal with minimum DSCRs above 1.3x throughout life of project and remaining above 1.1x during periods of project stress (i.e. in sensitivity analysis).
Poor	Highly likely to miss scheduled debt service payments during some periods of project life with minimum DSCRs as low as 1.0x throughout life of project and falling below this if projects faces any financial stress (i.e. in sensitivity analysis).

The inter-creditor agent uses the financial model (lenders base case model) to monitor cost overruns and other events that may have a material and unfavourable effect on the DSCR or the LLCR during construction period (Khan and Parra, 2003). Bakatjan, et al

(2003) also concluded that the DSCR requirement is influenced by how much equity provided in the project. The more equity provided, the lesser debt obligation is. Thus, a high equity in the project is resulted from a high DSCR that required by lenders. Or in other word, DSCR should be higher than the minimum level of annual DSCR.

The risks related to DSCR were identified as follows: revenue risk, cost overrun, calculation risk, and decision risk. The influence diagram of these risks and mitigation measures is illustrated in figure 8.31.



**Figure 8.31** Influence diagram of DSCR, risk, and mitigation measures

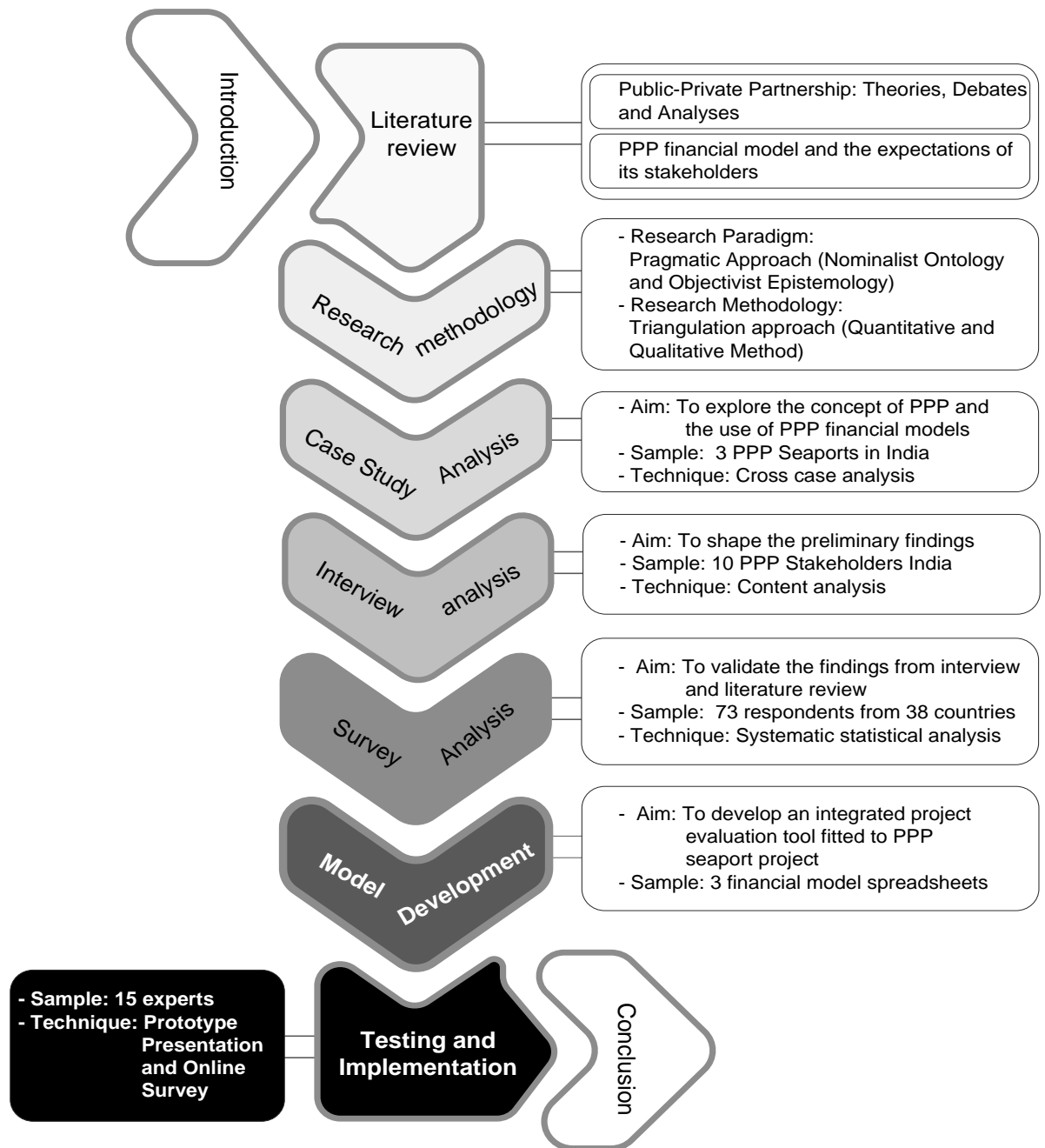
## 8.7 Chapter summary

This section summarises the concept and development of the IPET. Financial model was used as the platform of financial viability module. The input and output of three financial models were compared to find the similarity and develop the best practice of financial model. Since financial viability module was developed into five stages of PPP project, the correlations between the most important expectations and the most preferred financial indicators were highlighted into five project stages.

The most preferred financial indicators of financial viability module are adopted as financial risk variables for financial risk analysis module. This module is designed to help the user to identify the possible risks from the financial risk variables. The link between the financial risk variables and the related risks was identified by Influence diagram method. This module also analyse the project risk level through Monte Carlo simulation with maximum of 500 iterations.

At the end of preliminary evaluation with an IPET, under financial risk mitigation module, the financial and economic outcomes are accompanied by the information of source(s) and consequence(s) of risks, and optimised mitigation measures. The influence diagram of each financial risk variable that includes its alternative mitigation measures was also discussed. In order to ensure that the proposed tool meets stakeholders' expectations, the next chapter will discuss the verification and validation of IPET.

## CHAPTER NINE: VERIFICATION AND VALIDATION



## Chapter 9: Verification and Validation

*“And do not accept any information, unless you verify it for yourself. I (God) have given you the hearing, the eyesight, and the heart, and you are responsible for using them.”*

(Quran 17: 36)

### 9.1 Introduction

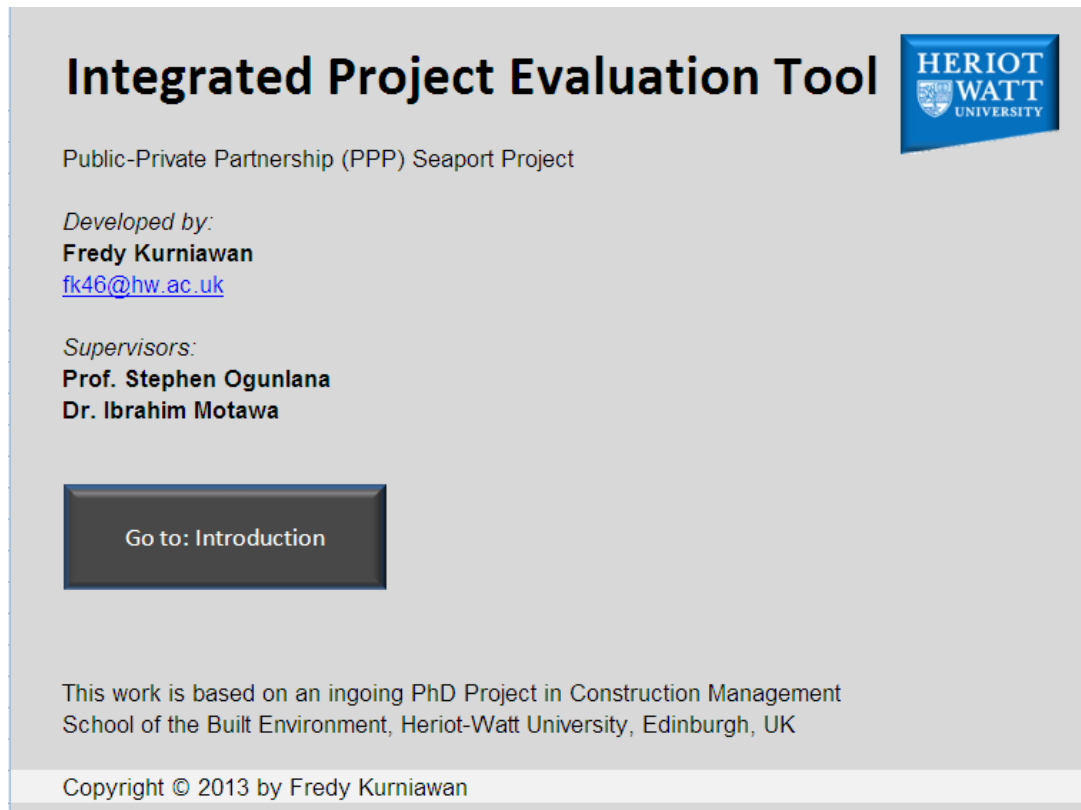
The findings generated from triangulation method (e.g. multiple case literature review, interview, and questionnaire survey) are not necessarily applicable to other cases. This chapter will verify and validate the proposed IPET into a framework that can be generalised for the construction industry. As mentioned earlier in the chapter four, once IPET was developed, it was verified and validated by two means. This chapter begins with discussion of the methods used to verify and validate the research findings. The first strategy was testing IPET with a sample financial model to verify the model consistency. Secondly, experts who have experience in the field of PPP projects reviewed the effectiveness and the applicability of the framework. Opinion from expert practitioners and academics has been gathered to evaluate applicability and effectiveness of the framework in the construction industry. This validation process is presented at the end of this chapter.

### 9.2 Verification

An integrated project evaluation tool is dedicated to accommodate the knowledge gap between public and private parties in evaluating financial viability of PPP project. However, this research is limited to the utilisation of PPP financial model as a tool for evaluating the project and negotiating risk sharing mechanism. Therefore, the first verification process is to check the formula and output consistency of IPET against any error or discrepancies with a sample financial model from Khan and Parra (2003). In this research, only the financial viability module was tested individually. The other two modules are complimentary to the first module; testing and validation of the proposed tool was done in an integrated manner.

Al-Sharif (2007) suggested that financial model in a computer-based spreadsheet has to be chased for each entry and output. Moreover, precedents and dependent relationships of each equation should be traced carefully and judged according to the required results

and the right entries. These activities are intended to find and fix errors in a model, it is often called debugging (Sengupta, 2004). Figure 9.1 shows the opening screen of IPET.



**Figure 9.1** Screenshot of integrated project evaluation tool cover

### **9.2.1 The Financial Viability Module**

The financial viability module was debugged by entering different sets of data to check the consistency of the module in the Excel spreadsheets. During the development process, several errors and discrepancies were found in the outputs between the financial viability module and a sample financial model by Khan and Parra (2003). It took a few months, but eventually, they were all fixed. A sample for consistency check of the module is illustrated in table 9.1.

The introduction part of IPET is designed to provide information to the user about the structure of IPET and how to use the tool, as illustrated in figure 9.2. In order to find out how IPET can be used to evaluate a PPP seaport project, hypothetical data from a financial model by Khan and Parra (2003) was used to demonstrate the tool's utility.



The first part of financial viability module provides information<sup>57</sup> to the user about the most important expectation of using PPP financial model at certain stage.

**Table 9.1** Sample of output consistency between financial viability module and La Paz container financial model (Khan and Parra, 2003).

Input Assumption (Value)	Output Parameter (Value)	Equation	
		Financial Viability Module	Financial Model La Paz Container (Khan and Parra, 2003)
Terminal Capacity (350 Million TEU)	IRR (25%)	=Output!B11 → =IRR(F9:AK9)	=Output!B9 → =IRR(F8:AK8)
Composite Tariff (US\$219.94/TEU)	ROE (60%)	=Output!B20 → =IRR(F18:AJ18)	=Output!B15 → =IRR(F14:AJ14)
Construction cost (US\$231.12 Million)	DSCR min (1.75)	=Output!D32 → =MIN(H32:V32)	=Output!D25 → =MIN(H25:V25)

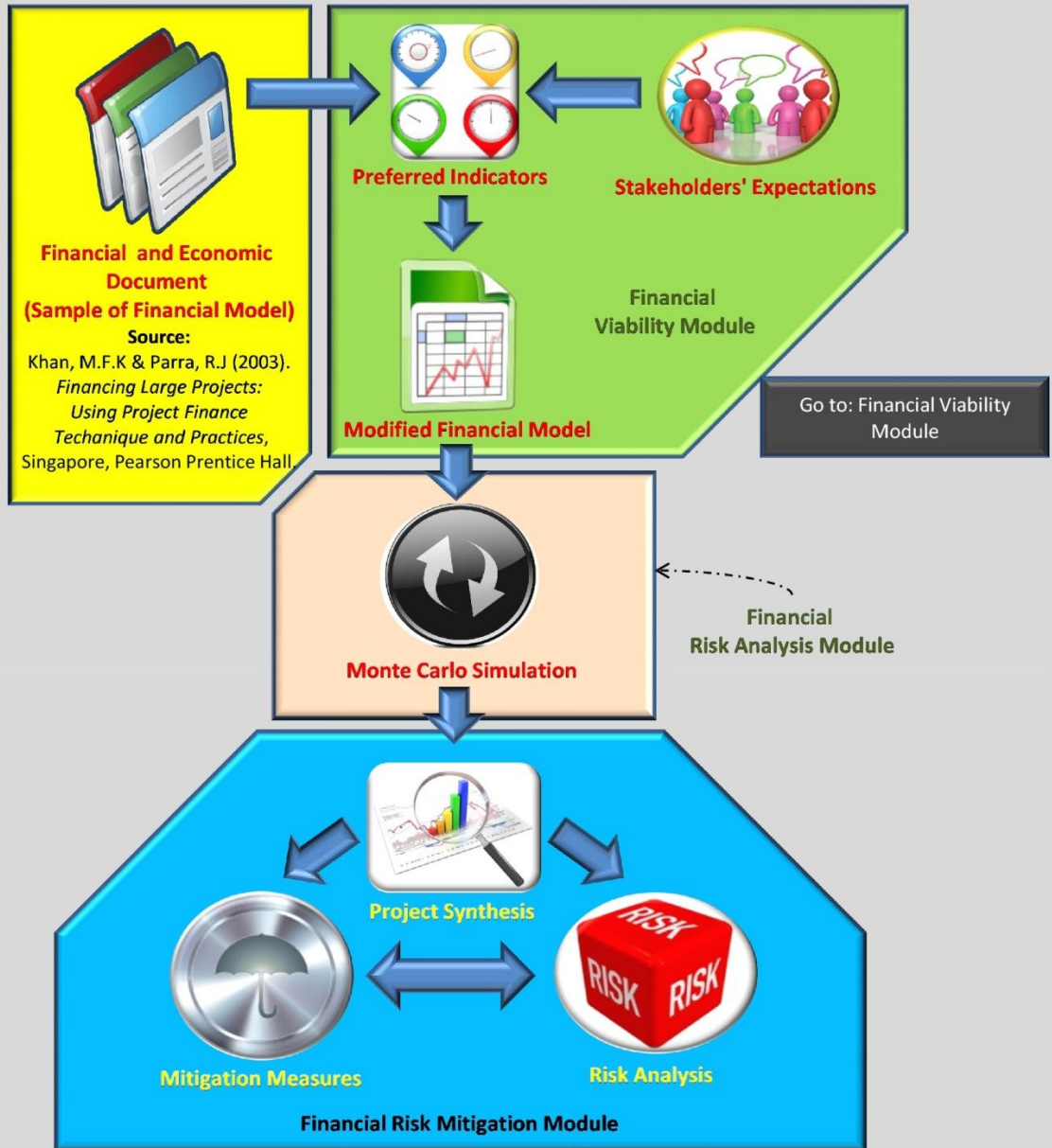
It is assumed that this tool is used by “government authority” at the “pre-proposal stage”. Then, the authority is informed that PPP financial model is used at this stage to “evaluate the estimated cost of two procurement alternatives: PPP or public sector comparator (PSC)”. During the evaluation process at the pre-proposal stage, the authority is also reminded that the most important expectation in using PPP financial model is “ensuring that the project must generate enough cash flow to give lenders a margin of safety with respect to its debt service obligations”. Furthermore, the authority agency is advised to consider the other stakeholder’s expectation to have an efficient risk sharing negotiation for an example: “There is a demand from the public to keep the procurement process transparent, while on the other side, the sponsors need to protect their business in the competition”.

After considering several issues related to stakeholders’ expectations in utilising PPP financial model, the authority is given several preferred financial indicators (Input Assumptions: Volume / Traffic, Revenue Forecast, Operating and Maintenance cost, and Project timelines; Output: IRR, Revenue, Project NPV, and Operating cost) to evaluate the project at the pre-proposal stage as shown in figure 9.3. The authority is advised to concentrate on these preferred financial indicators including the possible risks and its mitigation measures.

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<sup>57</sup> This information is validated from interviews and worldwide questionnaire survey with PPP experts.

An integrated project evaluation tool (IPET) is designed to help the user in evaluating bids and making decisions efficiently. This tool consists of three modules: (1) The Financial Viability Module, (2) The Financial Risk Analysis Module, and (3) The Financial Risk Mitigation Module; developed by considering stakeholders' expectations in utilising PPP financial model. The structure for IPET is illustrated in the following figure.



Please follow the instruction below to start using this tool as a demo :

- 1 Go to the first part of financial viability module (Stakeholders' Expectations), fill all the requested instructions according to your organisation and project stage;
- 2 Go to the second part of financial viability module (Financial Viability Analysis), modify the selected cells in order to achieve the preferred output;
- 3 Go to the first part of financial risk analysis module (Risk Identification), select type of project and financial risk variables to identify possible risks;
- 4 Go to the second part of financial risk analysis module (Monte Carlo Simulation), modify the selected cells in order to achieve the preferred output;
- 5 Run a monte carlo simulation to analyse the project based on random combination of financial input assumptions;
- 6 Go to project synthesis, run another simulation to see which financial risk variables need to be negotiated;
- 7 Go to financial risk mitigation module, select the financial risk variables in order to see alternative mitigation measures;
- 8 Repeat the step No. 2 to find out the best scenario for the project.

Figure 9.2 Screenshot of introduction of integrated project evaluation tool

The idea behind this presentation is to guide a government authority to use PPP financial model effectively since some interviewees have admitted that PPP financial model is being treated as a formal administrative requirement rather than the main focus for making decision.

The second part of the financial viability module contains selected financial indicators to be used for evaluating project financial viability. Input data in the financial viability module can be generated from any financial model of a seaport project. In order to test this tool, the input data and its assumptions were generated from La Paz Container Financial Model (Khan and Parra, 2003). Several output indicators are presented in a graph (see figure 9.4) to help the authority understand key constraints to bankability during the concession period and to make better project structuring decisions.

### ***9.2.2 Financial risk analysis module***

Financial risk analysis module comprises two parts, risk identification and Monte Carlo simulation. The verification process of this module is divided into two strategies. The first strategy was verified by undertaking a thorough literature review about risks in PPP projects and Monte Carlo Simulation. Debugging strategy was used to verify the second part of the financial risk analysis module (Monte Carlo Simulation).



# Financial Viability Module - Stakeholders' Expectations

Next: Financial Viability Analysis

Financial Risk Analysis Module

Financial Risk Mitigation Module

Please leave your feedback



**Back** The Financial Viability Module has been developed by considering stakeholders' expectations in using PPP financial models. Please follow the step-by-step instructions below in order to use this module effectively: **Next**

1 Please select the following stakeholder you represent: Authority  Only cells with this format can be modified using combo box

2 Please select the project stage you wish to evaluate: Pre-proposal stage

3 At this stage, financial model is used by Authority to: Evaluate the estimated cost of two procurement alternatives either PPP or public sector comparator (PSC).

4 The most important expectation in using financial model is: Ensuring that the project must generate enough cash flow to give lenders a margin of safety with respect to debt service obligations.

5 Sometimes, there is disagreement in utilising financial model at this stage. To have an efficient risk sharing negotiation, please consider the following expectation: There is demand from the public to keep the procurement process transparent, while on the other hand, sponsors need to protect their business in the competition.

6 The preferred financial indicators of PPP financial model are:

Input		
Volume / Demand (Traffic)	Maintenance cost	-
Revenue forecasts	Project timelines	-
Operating cost	-	-
Output		
IRR	Operating Cost	-
Revenue	-	-
NPV	-	-

Next: Financial Viability Analysis

Figure 9.3 Screenshot of financial viability module and stakeholders' expectations



# Financial Viability Analysis at the Pre-Proposal Stage

Back: Stakeholders' Expectations

Financial Risk Analysis Module

Financial Risk Mitigation Module

Please leave your feedback here



Financial viability analysis is to be started by modifying some input cells.  
 Due to time constraints, this tool has been simplified to speed up the data entry process.  
 All input data assumptions have been defined. Hence, the following data is only an example of using this tool at the pre-proposal stage.

No.	Input	Value	Unit	No.	Input	Value	Unit	No.	Output	Value	Status
1	Container terminal capacity	350	TEU (thousand)	10	Debt	150	US\$ million	1	ROA (Average)	11%	(ROA>0) OK
2	Composite tariff	219.94	(US\$/TEU)	11	Equity	41	% of Total Project Cost	2	ROE (Equity IRR)	60%	(ROE>MARR) OK
3	Land acquisition cost	35	US\$ million	12	Tenor	10	Years	3	Project NPV	162.582	(NPV>0) OK
4	Construction Cost	231.12	US\$ million	13	Grace period	3	Years	4	Project IRR	25%	(IRR>MARR) OK
5	Financing cost	22.13	US\$ million	14	Revenue share	0	% of Gross Revenue	5	DSCR (Min)	1.75	(DSCR>1) OK
6	Interest rate	9	% (p.a)	15	Tax holiday	15	Years	6	LLCR (Min)	2.71	(LLCR>1) OK
7	Construction period	24	Months	16	Discount rate	15	%	7	Interest covering ratio	15.77	(ICR>1.5) OK
8	Operation period	30	Years	17	Income tax rate	30	%	8	Payback period	4.00	(PP<Tenor) OK
9	Inflation rate	2	%								

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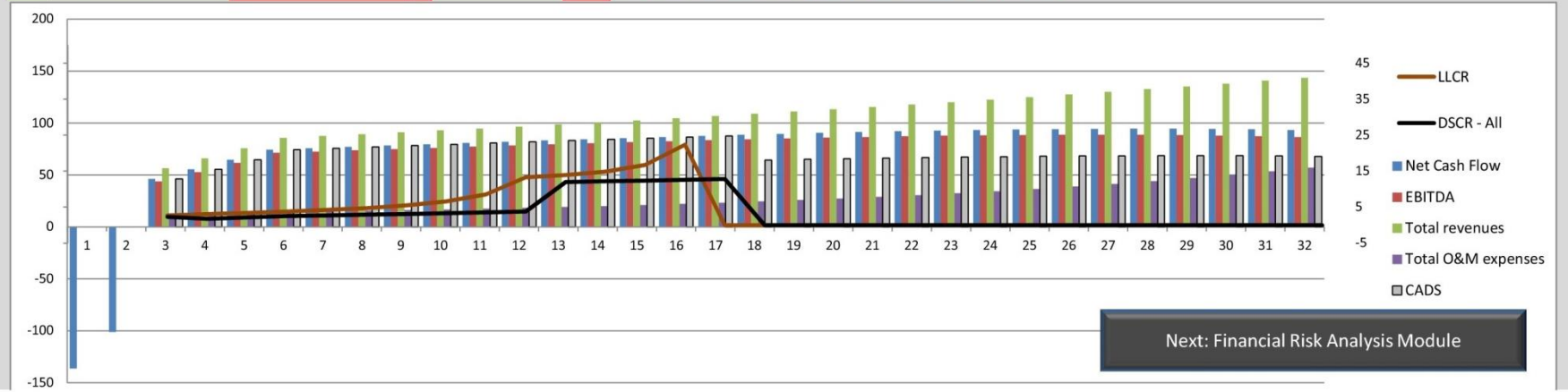


Figure 9.4 Screenshot of second part of financial viability module: financial viability analysis

The next verification step is explaining how to use the second module from the assumptions adopted in the previous module. Although the financial viability module shows that the project is financially viable, the government authority has to consider possible risks related to the input assumptions used in the financial evaluation. Therefore, the financial risk analysis module is designed to help the authority identify the possible risk based on the base case provided in the previous module. The first part of financial risk analysis module is risk identification sheet (see figure 9.5). In this sheet, the authority is given an option to visualise the possible risks based on the financial indicators used in the first module. In this example, container terminal capacity has five possible risks (e.g. revenue risk due to nature of Greenfield project, revenue risk due to over estimated forecast, revenue risk due to excessive revenue, competition risk, and project approval risk) that the authority must consider in the evaluation and negotiation processes.

**Financial Risk Analysis at the Pre-Proposal Stage**

Financial Risk Analysis Module consists of two parts: (1) Risk Identification and (2) Monte Carlo Simulation. In this section, the possible risks are presented according to each financial risk variable from the first module.

A Please select the project type:

B Please select the financial risk variable to see the possible risk(s):

Only cells with this format can be modified using combo box

No	Risk	Remark
1	Revenue risk	The ability of Greenfield port projects to generate revenue (PPIAF, 2007)
2	Revenue risk	When a new infrastructure project is initiated to capture the actual revenue is far behind the projection
3	Revenue risk	A failure in forecasting realistic traffic volume will also erode NSICT's tariff by 12%
4	Competition risk	An excess of project capacity will cause the sponsor companies to lead to destructive pricing (World Bank and PPIAF, 2007)
5	Project approval risk	Introduction of regulatory controls (e.g. fares, competition)
6	#N/A	#N/A
7	#N/A	#N/A

Next: Monte Carlo Simulation

**Figure 9.5** Screenshot of financial risk analysis module: risk identification

The next financial risk analysis step is conducting Monte Carlo Simulation to the base case financial model used in the first module. Some financial input assumptions

considered uncontrollable are randomly simulated. The assumption of each probability distribution is derived from various literatures. For an instance, the probability distribution of container terminal capacity is assumed to be beta distribution (Yun *et al.*, 2009). Based on this assumption, the user can modify the minimum and maximum standard deviation to simulate the variable. However, the other financial risk variables that are not randomly simulated can be modified in the first module. The input sheet to be simulated by using Monte Carlo Simulation is illustrated in figure 9.6.

**Financial Risk Analysis (Monte Carlo Simulation)**

Financial Viability Module | **Next: Project Synthesis** | Financial Risk Mitigation Module | Please leave your feedback

Financial Risk Analysis Module consists of two parts: (1) Risk Identification and (2) Monte Carlo Simulation. In this section, each financial risk variable is simulated by using Monte Carlo Simulation.

No.	Input Assumptions	Mean (Base Case from the previous Module)	Probability Distribution	Standard Deviation		Random Probability	Simulation	
				Min	Max			
1	Container Terminal Capacity	350	TEU (thousand)	Beta (Yun et al., 2009)	240	350	0.11	310.97
2	Composite Tariff	219.94	US\$/TEU	Uniform (Yun et al., 2009)	2%	4.3988	0.32	218.68
3	Land acquisition cost	35	US\$ million	Beta (Wibowo and Kochendorfer, 2005)	35.6	70	0.11	57.74
4	Construction Cost	231.12	US\$ million	Normal (Yun et al., 2009)	20%	46.224	0.21	194.41
5	Financing cost	22.13	US\$ million	Normal (Yun et al., 2009)	20%	4.426	0.75	25.15
6	Interest rate	9	% (p.a)	Normal (Yun et al., 2009)	20%	1.8	0.84	10.80
7	Construction period	24	Months	Beta (Netmba, 2010)	20	26	0.67	26
8	Inflation Rate	2	% (p.a)	Normal (Yun et al., 2009)	20%	0.4	0.363205355	1.86
9	Operation period	30	Years	n/a	n/a	n/a	n/a	30
10	Debt	150	US\$ million	n/a	n/a	n/a	n/a	150
11	Equity	41	% of Project Cost	n/a	n/a	n/a	n/a	32%
12	Tenor	10	Years	n/a	n/a	n/a	n/a	10
13	Grace Period	3	Years	n/a	n/a	n/a	n/a	3
14	Revenue Share	0	% of Gross Revenue	n/a	n/a	n/a	n/a	0
15	Tax Holiday	15	Years	n/a	n/a	n/a	n/a	15
16	Discount Rate	15	%	n/a	n/a	n/a	n/a	15%
17	Income Tax Rate	30	%	n/a	n/a	n/a	n/a	30%

Only cells with this format can be modified

**Figure 9.6** Screenshot of financial risk analysis module: input simulation

After updating all information needed for Monte Carlo Simulation, the user is given an option to run the simulation up to a maximum of 500 iterations. In this example, 500 iterations were used to simulate all financial risk variables randomly. The output of the

simulation is shown in figure 9.7. The authority as the user of this demonstration tool has advantage to predict the project financial viability under various combinations of random scenarios. According to the authority agency’s perspective, the simulation results show that the Project’s NPV and IRR are considered acceptable with 95% confidence level (e.g. Project NPV’s 95% confidence level between US\$106.39 and US\$122.20 million; and Project IRR’s 95% confidence level is 19%). However, it is important that the Authority agency should consider the other stakeholders’ interests of having minimum DSCR not less than 1. Figure 9.7 shows that DSCR minimum with upper 95% confidence level is 0.7 below 1. It implies that the Authority should anticipate the risk of DSCR minimum below 1.

No.	Output	Single Simulation	Monte Carlo Simulation (500x)					
			Mean	Sigma (SD)	95% Confidence Interval		Max	Min
					Upper	Lower		
1	ROA	14%	14%	1%	14%	13%	20%	10%
2	ROE (Equity IRR)	55%	39%	10%	40%	38%	83%	13%
3	Project NPV	202.63	114.30	90.20	122.20	106.39	328.49	-177.01
4	Project IRR	25%	19%	3%	19%	19%	30%	9%
5	DSCR (Min)	1.58	0.61	1.05	0.70	0.51	1.95	-0.65
6	LLCR (Min)	2.62	2.54	0.51	2.58	2.49	3.29	0.93
7	Interest covering ratio	29.82	29.82	6.55	30.39	29.25	67.18	12.06
8	Payback period	4	7	3	7	7	17	3

Run Single Simulation (F9)

Run Monte Carlo Simulation (Ctrl+M)

Back to: Financial Risk Analysis Module (1)

Next: Project Synthesis

**Figure 9.7** Screenshot of financial risk analysis module: output simulation

Furthermore, another possible risk can be identified by running a single iteration of Monte Carlo Simulation. A single random simulated scenario allows the user to identify which input assumption(s) might generate unfavourable financial output(s) as shown in Figure 9.8. In this single simulation, several financial input indicators are significantly higher than the base case such as: Total project cost (US\$ 297.73 million), and Land start-up costs (US\$65.39 million). The demand is also lower than the projected (327926TEU/year). This simulation shows several unfavourable outputs such as: DSCR min (-0.47), Project IRR before Tax (11%) and after Tax (7%), Project NPV (-100.12 Million), and Payback period (15 years). The simulation is also presented in a dynamic graph as shown in Project Synthesis sheet (see figure 9.9).





# Project Synthesis

Financial Viability Module

Back: Risk Identification

Financial Risk Mitigation Module

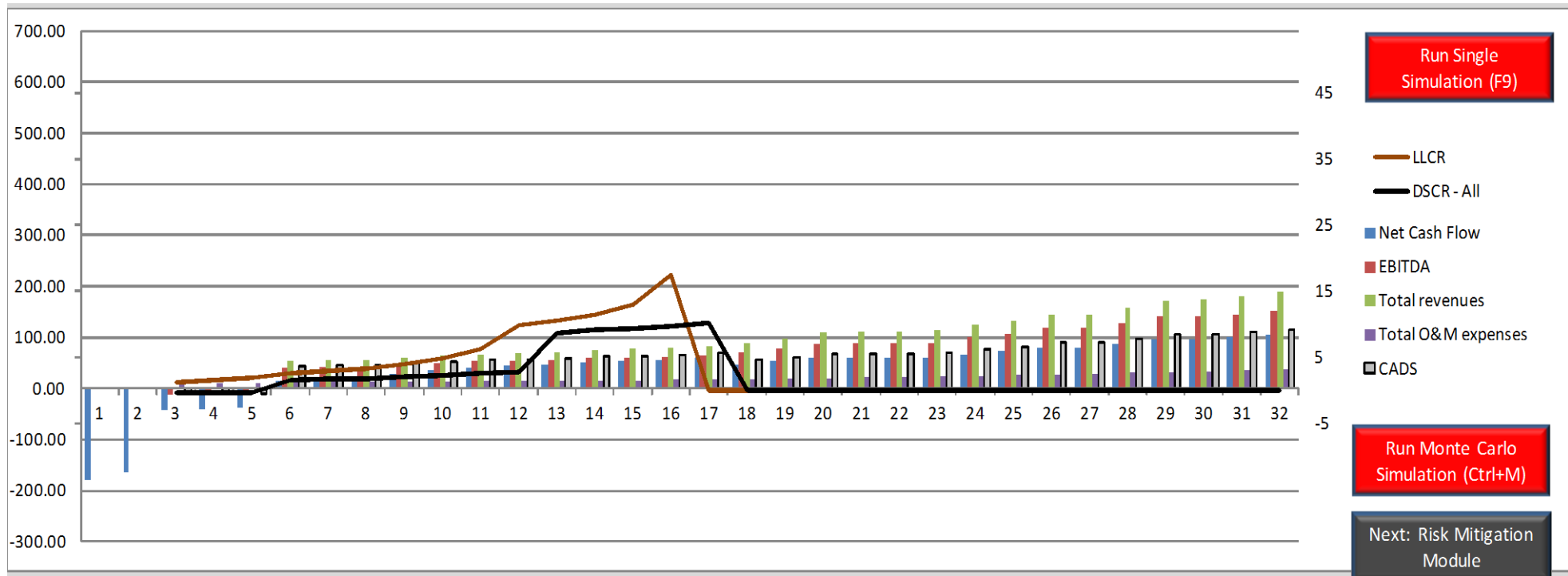
Please leave your feedback here

**Back** In this section, each financial risk variable is simulated using Monte Carlo Simulation. Press F9 or Ctrl + M or the provided buttons to run a single simulation or multiple simulations. **Next**

Project name: **La Paz Container Terminal (LPCT) Project**  
 Sheet: Project Synthesis (Simulated)  
 Presentation currency: All figures are in Million US Dollar, unless otherwise indicated.

Main Stakeholders		Lender				Authority				Sponsor			
		LIBOR	Inflation rate	Financing Cost	Total Project Cost	Construction Period	Tax Holiday (Year)	Discount Rate (MARR)	Demand (TEU)	Interest Rate	Tenor (Year)	Grace (Year)	Revenue Share
Input	(1) Base Case	6%	2%	21.75	252.87	24 Months	15	15%	350000	9%	10	3	0%
	(2) Simulation	Independent	Independent	Independent	Independent	Independent	Dependent	Dependent	Independent	Independent	Dependent	Dependent	Dependent
		● 6.06%	● 1.94%	● 22.91	● 257.60	● 23 Months	15	15%	● 346,830	● 9.50%	10	3	0%
Output		DSCR (Min)	LLCR (Min)	ROA (Average)	Project IRR (Before Tax)	Project IRR (After Tax)	Project NPV		ROE (Equity IRR)	Interest Covering Ratio	Debt	Equity	
	(1) Base Case	1.75	2.71	10%	25%	25%	163.67		57%	24.05	50%	50%	
	(2) Simulation	✘ -0.43	✔ 2.46	14%	✔ 20%	✔ 15%	✔ 151.02		✔ 35%	✔ 29.29	✔ 58%	42%	
	Remarks	(DSCR<=1) Not OK!	(LLCR>1) OK		(IRR>MARR) OK	(IRR>MARR) OK	(NPV>0) OK		(ROE>MARR) OK	(ICR>1.5) OK			

**Figure 9.8** Screenshot of project synthesis: base case vs. single random simulated scenario



**Figure 9.9** Screenshot of project synthesis: a single random simulated scenario result in a graph

### **9.2.3 Financial risk mitigation module**

Since the user (the authority agency) has sufficient information about which financial risk variables he/she anticipates, the next step is identifying the mitigation measures of each financial risk variable including its cause and consequences. This evaluation process is presented in the Financial Risk Mitigation module as illustrated in figure 9.10. The user of this tool is able to visualise all possible risks and its mitigation measures by selecting each financial risk variable on the combo box. Once the authority understands the other stakeholders' expectations by knowing the possible risks and alternative mitigation measures, it is expected that the authority agency can negotiate the best financial and risk sharing mechanism scenario. This can be done by repeating the evaluation process from the initial step of using this tool with different or improved financial assumptions and strategies.

### **9.3 Validation**

This section presents the validation process for IPET. After verifying each module by testing it individually, several experts with experience in the field of PPP projects were invited to review the effectiveness and the applicability of IPET. Swan (2008) stated that a good model is tested by knowing how users respond to it. To validate IPET, four categories were adopted from (Al-Sharif, 2007) such as: (1) Applicability to PPP Seaport Projects, (2) Comprehensiveness, (3) Practical relevance, and (4) Intelligibility. The experts were also asked for their opinions about the strength and weaknesses of IPET by using online survey. Survey invitations were sent through LinkedIn.com, a social network for professionals under several groups of PPP community, such as '*PPPs IN EMERGING MARKETS*', '*Project Finance International (PFI)*', '*Public Private Partnership Research*', '*Global Infrastructure & Project Finance*', etc. Refer to appendix 4 to view the questionnaire form.



# Financial Risk Mitigation Module

[Financial Viability Module](#)[Financial Risk Analysis Module](#)[Back to: Financial Viability Analysis](#)[Please leave your feedback here](#)

**Financial Risk Mitigation Module provides alternative mitigation measures based on each financial risk variable.**

A Please select financial risk variable for the possible risk and its alternative mitigation

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No.	Possible risk	Caused by	Financial consequence	Mitigation Measures
1	Revenue risk	Low revenue due to failure in forecasting a realistic traffic volume	Actual DSCR lower than 1	Based on the annual average daily traffic and (L., 2012)
2	Revenue risk	Low revenue due to poor quality of infrastructure network	Low DSCR even after first five years	(Innafous, 2012)
3	Cost overruns	Failure to address or underestimate the life cycle costs	Actual DSCR lower than 1	Government intervention to negotiate with the lenders (Cheng, 2010)
4	Calculation risk	EBITDA is used to calculate DSCR	Taxes and timing of cash flows are ignored	Since Project Finance focuses on actual cash flow, CADS should be used in DSCR calculation (Warnelid, 2012)
5	Calculation risk	Incorrect items (e.g. Depreciation; Cash Balances; Reserve Accounts etc.) are included in CADS calculation	Misleading DSCR	DSCR calculation should be checked carefully (Warnelid, 2012)
6	Decision risk	DSCR is used solely without considering project's gearing levels (the level of debt to equity)	Although DSCR appears very attractive, lenders are reluctant to fund the project	The level of debt to equity ratio should be considered in such a way to meet lender's interest (Boussabaine, 2006)

**Figure 9.10** Screenshot of financial risk mitigation module

### ***9.3.1 Response to the prototype presentation and online survey invitation***

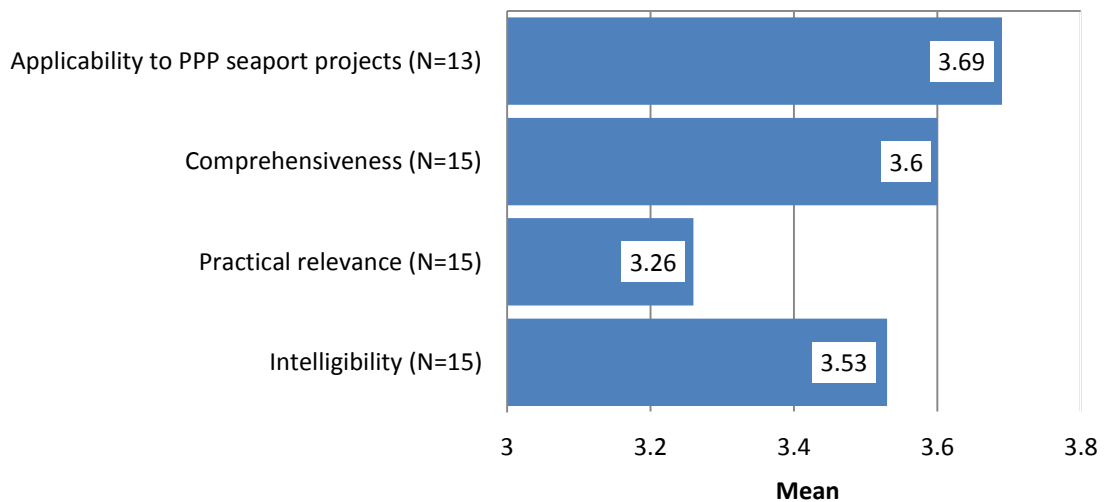
After the prototype of IPET and the online survey were sent to each participant, some respondents replied giving feedback on the research findings. The feedbacks received from experts are in the list below:

- “Thank you very much for sharing this brilliant tool with me”.
- “Due to my limited experience with PPP and the short time I spent on the testing, I am not 100% convinced that I fully understood the model, but it seems that all variables respond in an expected manner to a change in inputs”.
- “My comments were mostly focused on the user-friendliness of the model rather than the technical performance. I hope my feedback was helpful”.
- “Fredy, I will look into this and respond with feedback. I have been looking at software for similar highway/rail projects, and am pleased that our young researchers are developing new tools to solve our infrastructure problems”.
- “Hi, I have also downloaded and will test. Looks like it has covered all the bases”.
- “Congratulations for your PhD work on this important and useful topic. I will look in details at your tool and get back to you with comments”.
- “I’ll certainly do my feedback on your model. At the first view, it looks like a tremendous work! Personally, I am working on a financial model for P3 prior valuation for a French Authority. I will be interested in discussing your risk simulation. Unfortunately, I’m not an actuary and I think my risk modelling could be improved”.
- “I am particularly interested in your research and in its application in complex infrastructure projects. I would be interested in talking to you further about it”.
- “Congratulations on this initiative, Fredy. This is a very innovative and comprehensive model, with potential to be extended to other sectors. Best of luck in finalizing it. Please keep me posted on progress”.

The following section presents the results of respondents’ feedback related to the questions asked in online survey.

### 9.3.2 Results

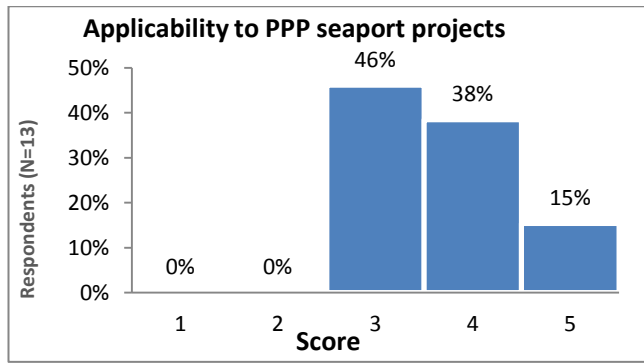
This section presents the findings of validation process. A prototype of IPET was given along with the questionnaire survey to each participant. Respondents were asked to indicate their score of the proposed IPET ranging from 1 (low) up to 5 (high). Figure 9.11 shows the average score for the categories. The rating of the proposed tool applicability to PPP seaport projects was 3.69, which was the highest score. Comprehensiveness of IPET was rated 3.60 out of 5, practical relevance is 3.26 and intelligibility was 3.53.



**Figure 9.11** Concept rating for integrated project evaluation tool

#### 9.3.2.1 Applicability of IPET

The survey was not intended to predict that IPET was applicable to projects of undertaking by the participating experts; but rather to obtain the opinions regarding applicability of IPET to PPP seaport projects and PPP projects in general. Respondents were asked to indicate their score on applicability of IPET ranging from 1 (low) up to 5 (high). The analysis of their responses revealed that the levels of applicability were considered high. The mean value of IPET's applicability to PPP seaport projects was 3.69 with standard deviation of 0.751 as shown in table 9.2. Figure 9.12 shows that all respondents scored above 3 for IPET's applicability. Evaluating IPET's applicability alone was deemed insufficient; however, because an applicable tool does not necessary mean it would add value. Therefore, comprehensiveness tested was needed to validate this tool.



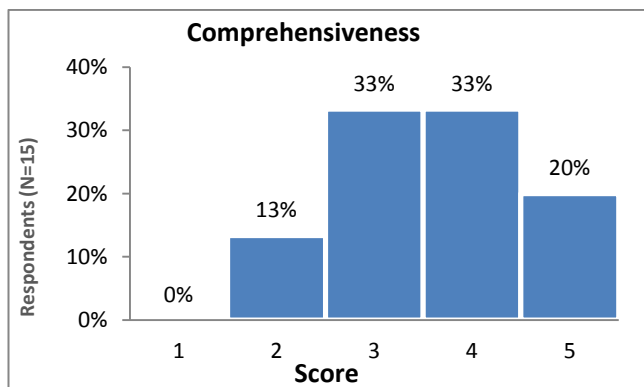
**Figure 9.12** Frequency of the applicability category

Applicability	
N	13
Sum	48
Mean	3.69
Std. Deviation	0.7510

**Table 9.2** Mean and standard deviation of the applicability category

### 9.3.2.2 *Comprehensiveness of IPET*

An examination of IPET’s comprehensiveness was needed to ensure that it covered all important areas in evaluating financial viability of a PPP project. Respondents were asked to give scores of comprehensiveness ranging from 1 (incomprehensive) up to 5 (comprehensive). The analysis of their responses revealed that IPET was comprehensive enough in evaluating a PPP seaport project. The mean value of IPET’s comprehensiveness to PPP seaport projects was 3.6 with standard deviation of 0.9856 (see table 9.3). Despite the comprehensiveness score of IPET not being 100%, it did indicate that it was likely to be more comprehensive than incomprehensive. Figure 9.13 also shows that the majority (33% and 33%) of experts gave a 3 and 4 rate respectively on comprehensiveness to IPET. Notwithstanding, 13% of respondents gave scores under 3, twenty percent of participants thought that IPET was very comprehensive with the highest score of 5.



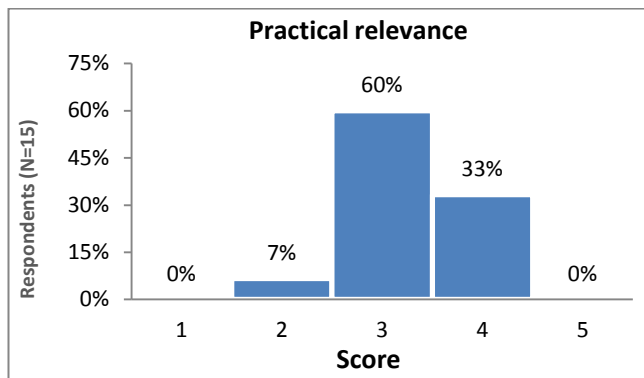
**Figure 9.13** Frequency of the comprehensiveness category

Comprehensiveness	
N	15
Sum	54
Mean	3.60
Std. Deviation	0.9856

**Table 9.3** Mean and standard deviation of the comprehensiveness category

### 9.3.2.3 Practical Relevance

Since the proposed tool was developed by an academician, it was considered necessary to test the practical relevance of the tool. Some experts and practitioners were asked for their opinion on the practical relevance of IPET. The average score of practical relevance was 3.26 with standard deviation of 0.5936. Figure 9.14 shows that ninety-three percent of respondents rated it 3 and above. In spite of practical relevance was rated by respondents as the least category, these findings indicated that the respondents agreed with the practical relevancy of the proposed tool to PPP seaport projects.

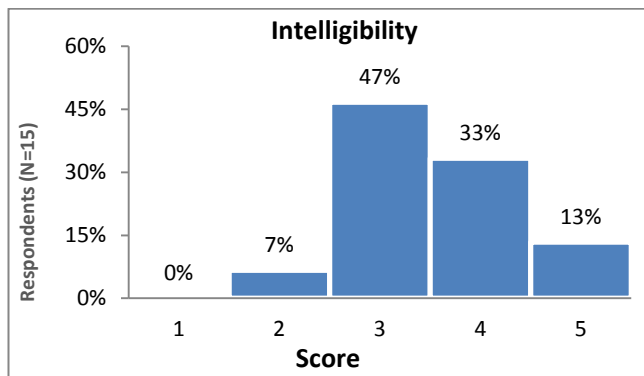


Practical Relevance	
N	15
Sum	49
Mean	3.26
Std. Deviation	0.5936

**Figure 9.14** Frequency of the practical relevance category **Table 9.4** Mean and standard deviation of the practical relevance category

### 9.3.2.4 Intelligibility

In order to evaluate the clarity and understandability of IPET, respondents were given options to rate under the intelligibility category. Figure 9.15 shows that 47% and 33% respondents rated 3 and 4 for intelligibility. The average rank was 3.53 and the standard deviation was 0.6952 as shown in table 9.5. These findings indicated that IPET was clear and easy to understand.



Intelligibility	
N	15
Sum	53
Mean	3.53
Std. Deviation	0.6952

**Figure 9.15** Frequency of the intelligibility category **Table 9.5** Mean and standard deviation of the intelligibility category



### 9.3.3 *Strength*

The next part of the questionnaire survey was asking the respondent to give written opinions about the strong points of the IPET concept. Some comments compliments and suggestion were given for strengthening IPET. Their feedbacks on the model's strengths are presented in the list below:

1. "Limitation of mistake with only one input data place. Same way, OUTPUT data are centralized in only spreadsheet. Model is very simple to handle, surely, it should guarantee a good use of it".
2. "It covered most of all the important factors necessary for any P3 seaport project evaluation irrespective of place or country".
3. "Good and very comprehensive model".
4. "- Easy to navigate; - Separate inputs page; - Comprehensive coverage of financial ratios; - good flexibility of the model; - Well summarised results; - good explanation of the various risks associated with the different financial ratios / metrics".
5. "Good model to start with. Financial aspects have been taken fairly".
6. "Very well structured!".
7. "CLEAR".
8. "Built on an easy-to-use software platform allows easy handling from users. A practical tool that provides a consistent integration of previous work in PPP's appraisal".
9. "Logical".
10. "I think it is a very useful tool. I don't understand how you can define the risk assignment. Is it an exogenous decision? Or you have a decision rule for the assignment?"

The respondents gave strong points of the IPET concept for its simplicity, comprehensiveness, intelligibility and applicability in evaluating PPP seaport projects. The comments given in point (1) and (4) highlighted the effort of minimising mistake by providing only one input data place in a separate page. As suggested by Swan (2008), a separated input sheet should be made up of raw numbers instead of

calculation. IPET was designed to help the user to use a complex financial model in a simple way. This simplicity is reflected by feedbacks given in points (1), (4), (5), (7), (8), and (9). Further, a good financial model should be comprehensive enough to evaluate a complex PPP project. Respondents confirmed that the proposed IPET covered most of all important factors necessary for any PPP seaport project evaluation irrespective of place or country in points (2), (3), (4), and (5). Last but not least, the main idea of building an integrated project evaluation tool was integrating a practical tool with previous work in PPP's appraisal. This was acknowledged in point (8).

#### **9.3.4 Weakness**

In order to ensure a fair validation process and better improvement, the questionnaire survey asked feedback on the possible weak points of IPET. Eight respondents were willing to give feedback on the weak points and suggestions to improve IPET. Their feedbacks on the model's weakness are presented in the list below:

1. "Model seems to be very automatised. It could be anticipated by providing some "blank cells" in order to add some input data and adapt easily your model without having to re-built it entirely".
2. "Too simplified from an operator's point of view, much more detailed revenue and cost modelling would be needed".
3. "On reviewing, there always are chances for improvements and in my opinion 8 out of 10".
4. "- initially difficult to follow; - not clear as to what type of project / company the model refers (until I looked at the input's page); - it is not clearly defined what is the final output of the model and which pages are just summary of results (i.e. your dashboards); "Too many buttons and macros".
5. "This model which is specific to specific container terminal cannot be a generic tool for evaluating other kind of ports as calculations in deriving capital costs, tariff, O&M costs etc would change completely for a dry cargo terminal, Oil jetties and others. The bases for deriving the assumptions are not provided and would change from port to port. Derivation of the peak capacity of 0.35 million TEUs is not clear as in a

port the capacity of any berth can be determined in 3 different ways - (i) capacity of the cranes deployed at jetty; (ii) capacity of backup area provided; (iii) capacity based on the movement of ships (in case of natural ports) considering high tide and low tide. 25% of the capital cost taken has no breakups - Contingency cost of 15% and other yard equipment - 10% which is very high. Construction costs of any berth depend purely on the technical studies undertaken at the site based on which the depth of piling, strength of steel required etc will be derived. This would vary substantially from port to port. No consideration of dredging which is a major component in ports and costs high. Likewise there are many technical aspects which are missed out in the model”.

6. “There could be extenuating factors not accounted for”.
7. “Risk analysis of PPPs involves issues, which are not addressed in the model. Comprehensiveness is always an issue with such type of analyses”.
8. “Financial viability module (1): is there only one financial model? or there should be more options for the comparison? General: sometimes too academic – e.g. Nash equilibrium - I'm wondering how big is the number of administration officers that know the idea of Nash equilibrium model :) neither I know:) - is it possible to use more descriptive language?”.

Since the proposed tool was designed with a limited time and budget, there always are chances for improvements. The feedbacks given by the respondents were straight to the point. The above important points should be taken into consideration, such as the comprehensiveness, clarity, flexibility and so on. Although some respondents complimented the comprehensiveness of IPET, several feedbacks in comment numbers (2), (5), and (7) point to issues related to the model’s comprehensiveness. Since the IPET prototype was presented to demonstrate the idea of integrating financial model with other risk analysis tools, it was decided to use a simple financial model. One should be aware that this tool was not for a real PPP seaport project. Some alterations are definitely needed to evaluate a real PPP seaport project.

Responding to comment (1), IPET was designed to help the user, especially government agency who has limited knowledge and experience in using financial model, evaluate PPP projects. Automatisation with transparent formula was needed to simplify the calculation process without undermining the importance of auditing requirement. Should any modification be needed in the future; the proposed tool was designed and built in a (Microsoft Excel) spreadsheet platform which is easy to modify.

Although some of the respondents praised the model's clarity, an issue related to clarity of the final output of the model was still raised in comment (4). This is something not uncommon in building financial model. Therefore, a manual of use and insight into the tool's assumptions and building details should be provided in order to minimise the clarity issue.

The issues related to extenuating factors as raised in point (6), actually, have been addressed in the financial risk analysis module. A Monte Carlo simulation for various input variables is designed to replicate the uncertainty of the future events.

Responding to point (8), IPET is a decision making tool that utilise a financial model in evaluating a PPP seaport project. It is assumed that each bidder will bring their own financial model. Should several financial models are available for comparison; IPET can be used to determine the best proposal according to their financial model. Another issue raised in point (8) was the presentation of "Nash equilibrium" term in the model's framework. Since the work was undertaken by academia, it was deemed necessary to include this term. Nevertheless, for the sake of applicability, IPET should use more descriptive language.

### **9.3.5 General Comments**

General feedbacks on the concept and prototype of IPET were given by respondents. Seven participants gave comments that were constructive and encouraging in general. Their general feedbacks are presented in the list below:

1. "As project finance consultant for public authorities, our clients are always asking for an itemized presentation of NPV : - Rentals NPV, - Amort. NPV, ... In this way, public authorities could better understand the total cost of the project. I don't know

if your model allows this type of presentation”.

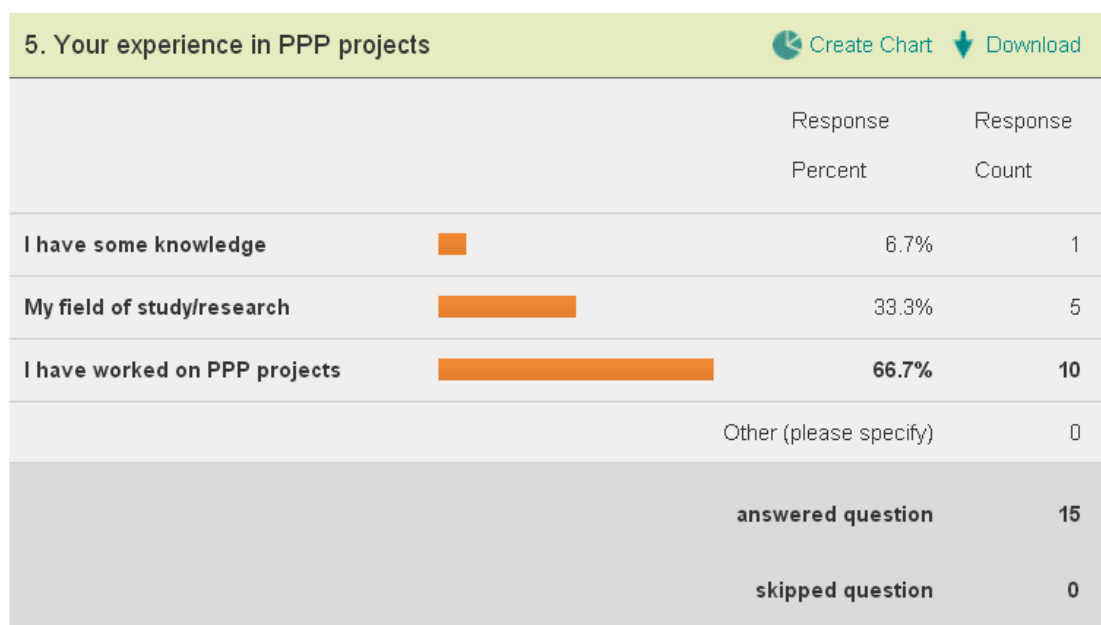
2. “A very good IPET to apply within Seaport P3 projects and this will also help in assessing during my work”.
3. “I do not have experience in working on PPP, however I have had exposure to seaport companies in the past. The model is comprehensive and easy to navigate. It is also easy to run scenario and sensitivity analysis”.
4. “From banking prospective there are too many button, the principal rule in banking financial model is" keep the things simple", no macro (or just a copy and paste macro) no button. Overall it's a great job!”
5. “A thorough judgement of this work from an independent expert requires a considerable time period to be justified and accurate. A first glance indicates a good and useful work but one should study in depth the architecture and content of this tool to provide meaningful comments. Consider developing a manual of use and insight into the tool's assumptions and building details. For sure, it worths the effort!”
6. “If there is only one option - PPP - it is ok. But what if we are still considering other options?”
7. “I haven’t been able to comment much further as I do not know anything about Seaport projects. I would say that, for PPP projects I have worked on, there tends to be a profile of maintenance payments rather than a real amount that increases with inflation each year. This means that maintenance reserve accounts are used and this creates complexity and makes the cost of a project higher”.

Overall, the respondents gave positive feedbacks in various ways. Some participants sent e-mails and comments describing that they were interested in learning further or having an update for the final IPET. Point (1) suggested that the manual of use and insight into the tool's assumptions and building details should be considered. Nonetheless, a pertinent feedback (6) asked for other options if the authority is still considering other options for PPP. IPET was proposed to help a government authority to decide whether the project should use PPP or not. According to the findings from literature and interview, it is suggested that PPP should be used when the project is

profitable. It means that when the demand is higher than port capacity it is recommended to invite private partners to participate. Should an authority decide to use traditional procurement, government could use the proposed IPET from both points of view (authority and the sponsor). All risks that belong to the sponsor would be absorbed by the authority.

### 9.3.6 Information about respondents

Respondents were asked again for some simple information to check their background, work experience, and their knowledge about PPP financial management. Among 15 respondents, the majority (66.7%) have worked on PPP projects, while 33.3% are undertaking research/studies on PPP projects. Only one respondent has some knowledge on PPP project (see figure 9.16).



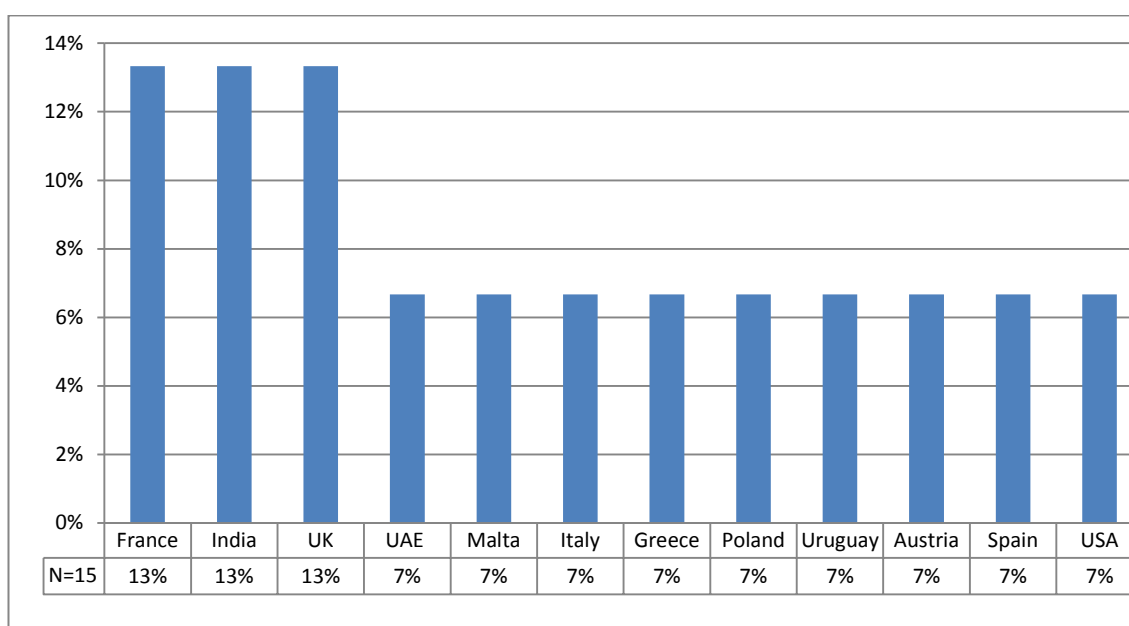
**Figure 9.16** Screenshot of respondents' background

Respondents were working for various organisations with various designations / positions as seen in table 9.6. Two lecturers from Poland and Greece also participated in this validation survey. The rest of the participants were from industry.

**Table 9.6** Respondent's designation and organisation

No.	Designation / Position	Organisation	Country Origin
1	Project Finance Consultant	Public Sector Adviser	France
2	Assistant Audit Officer	Federal Auditor of Government of India	India
3	Regional head of infrastructure projects, APM Terminals	Building and operating ports	UEA
4	Senior analyst	Financial advisory	Malta
5	Senior Associate Consultant	Management Consultancy Firm	India
6	Managing Director	Equity Fund	France
7	Project finance professional	Banker	Italy
8	Financial Researcher	Private Equity Media	UK
9	Lecturer (Faculty member)	University	Greece
10	Lecturer (Faculty member)	University	Poland
11	Evaluation Manager	PPP Unit – State	Uruguay
12	Head of Project Finance	Construction Industry/Sponsor	Austria
13	Associate Director	Financial Advisers	UK
14	Senior Associate	Financier	USA

Respondents from different countries participated in the validation survey, such as UK, India, France, Spain, Poland, United Arab Emirates, Malta, Italy, Greece, Austria, Uruguay, and USA. Figure 9.17 shows the distribution of respondent's country origin. It is clear that many participants from different countries were interested in IPET.

**Figure 9.17** Distribution of respondent's country origin

## 9.4 Summary

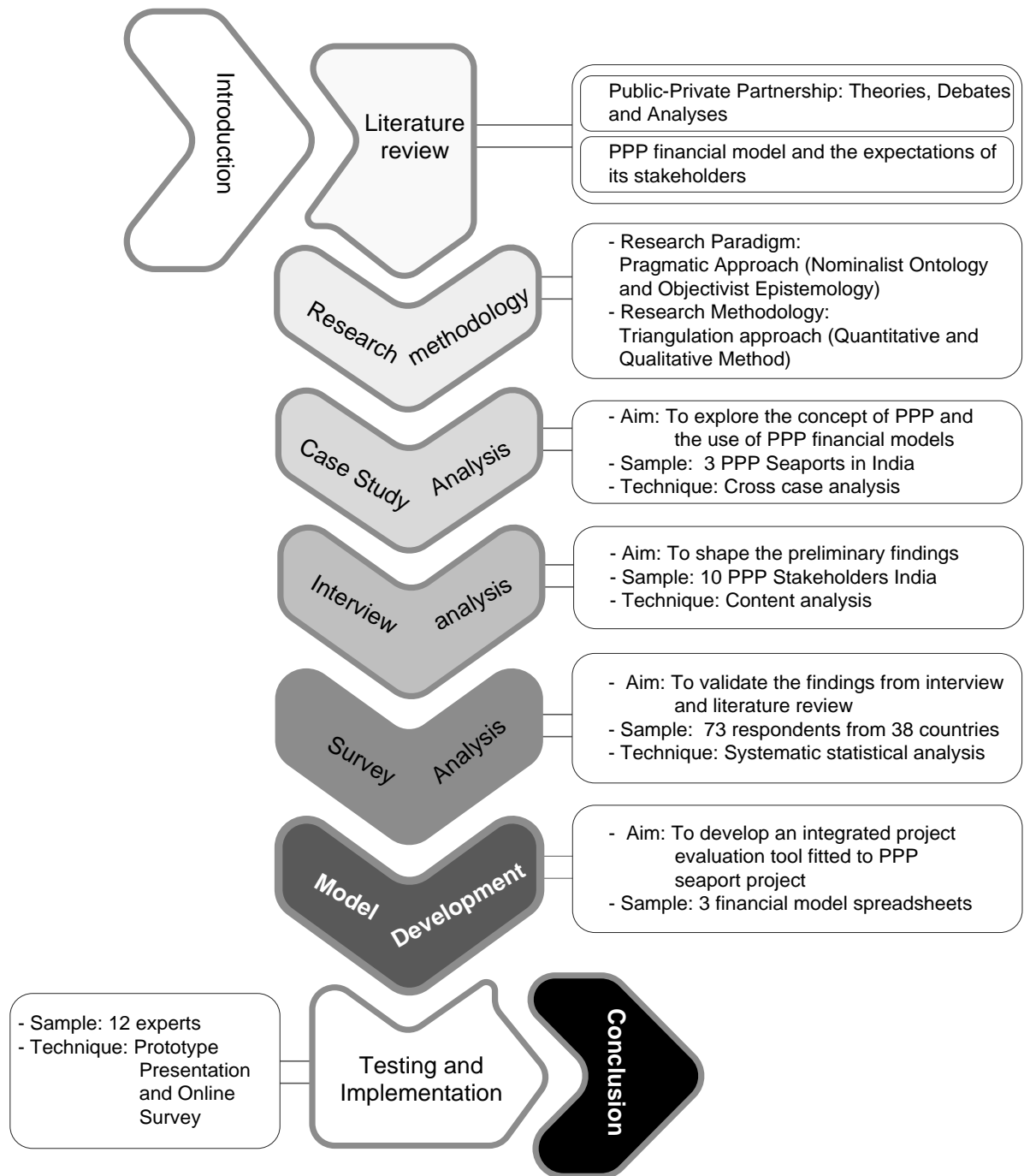
The IPET was tested before distributing the prototype to experts. IPET was checked and tested in computer-based spreadsheet for each entry and output. The precedents and dependent relationships of each equation were traced carefully and judged according to the required results and the right entries. Once errors were found and fixed, IPET was ready to be distributed to the experts for validation and comments.

The concept and prototype of IPET was validated and commented. The participants, the majority of whom were experts and practitioners, rated the IPET's applicability, comprehensiveness, practicality, and intelligibility as relatively acceptable. The rating scale was from 1 (lowest) to 5 (highest). The average score for applicability of the proposed IPET to PPP seaport projects was 3.69. The mean value of IPET's comprehensiveness was 3.6. The average score of practical relevance was 3.26 and the respondents rated the model intelligibility as 3.53. These scores gave the proposed IPET a positive overall evaluation.

Some pertinent comments were received. The respondents gave positive feedbacks in various ways. Some participants replied by e-mails and gave comments describing that they were interested in learning further or having an update for the final IPET.



# CHAPTER TEN: CONCLUSIONS AND RECOMMENDATIONS



## **Chapter 10: Conclusions and Recommendation**

*“Reasoning draws a conclusion, but does not make the conclusion certain, unless the mind discovers it by the path of experience.”*

(Roger Bacon 1214 – 1294)

### **10.1 Introduction**

Referring to the aim of the research, an attempt to minimise the knowledge gap between public authority and private entities in PPP project has been made. A PPP financial model has been selected as the object of this study because it is one of the most common tools used for evaluating a new project and facilitating negotiations among lenders, sponsor(s) and a government agency. This chapter synthesises the research findings related to the development of an integrated project evaluation tool for PPP seaport projects. It concludes the research and elaborates on the achievements of the research objectives. Limitation of this research and recommendations for future research are presented in this chapter. Contributions to the body of knowledge are also highlighted at the end of the chapter.

### **10.2 Research background**

When large infrastructure projects require huge capital investments, public-private partnership (PPP) is an alternative in cases of shortage of public funds. However, the complexity of PPP arrangement has created a dilemma for government authorities to balance the interests between public and private parties (stakeholders). Toor and Ogunlana (2009) asserted that different stakeholders from diverse socio-economic and cultural backgrounds have their own motivation to accomplish project objectives. In the case of PPP projects, the uncertainties with long-term agreement and the complexity of project financing arrangement generate additional risks to all stakeholders (Zhang, 2005a). By considering the higher level of risks, their expectations mostly converge on the ability of the project to generate enough cash flow over the concession period in order to attract or to comfort investors regarding their capital investment (Kurniawan, 2010).

Meanwhile, PPP scheme projects, believed to deliver better value for money, have been criticised by many as the highest influence level from either political patronage or corporate political power (Heald and Georgiou, 2000; Crane and Matten, 2004; Beh, 2010; Siemiatycki, 2010). Therefore, it is anticipated that the reconciliation from financial models have potential in helping to achieve value for money in PPP projects. A financial model is a tool (typically arranged in a spreadsheet format in different worksheets that have three major categories: input worksheet, calculation worksheet, and output worksheet) employed by the stakeholders to conduct negotiations and to prepare project appraisal. Furthermore, a financial model can be used for preliminary due diligence, negotiations, and project performance monitoring (Kurniawan, 2010). Since each stakeholder employs a financial modeller to develop a model based on own expectations, stakeholders sometimes have different financial models derived from their own assumptions. The discrepancies among stakeholders' expectations need to be further negotiated. Nevertheless, there are some challenges (i.e. the effectiveness of PPP as an alternative of procurement strategies to deliver better value for money is still open to question, the existence of risk in PPP project is inevitable, and the uncertainties due to long-term agreement and the complexity of the project financing arrangement have to be allocated in a simple and error-prone PPP financial model) that have to be considered in achieving the aim of this study.

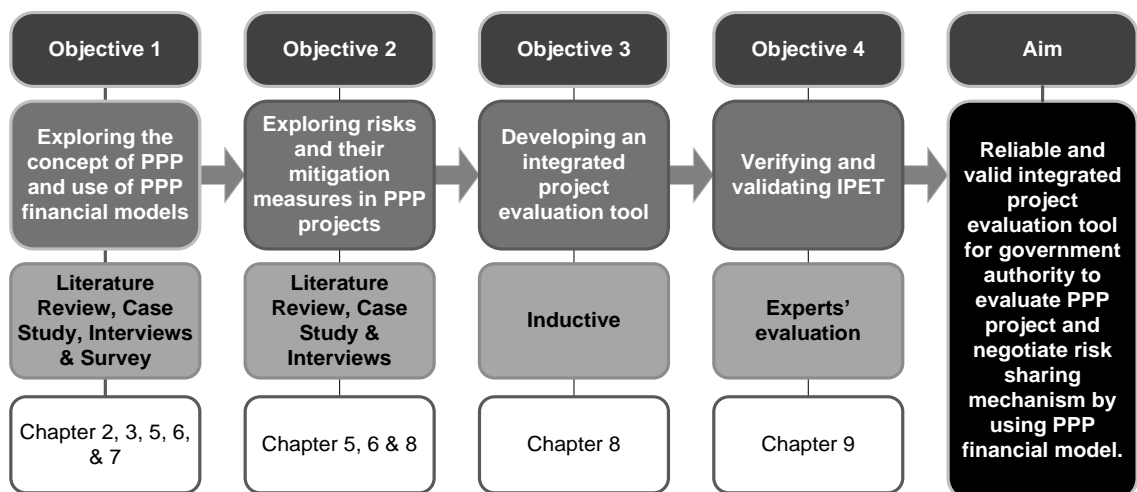
### **10.3 Methodology**

Knowledge gap was identified as a problem that might be minimised when PPP financial model is properly utilised. This problem (ontologically) belongs to nominalism reality because knowledge gap is related to human's cognitive abilities. Meanwhile, the proposed strategy in minimising the knowledge gap through proper use of financial model has to be verified and validated, which adopts objectivist epistemology. Consequently, both positivism and interpretivism approaches were considered. This combination is called a pragmatic paradigm, which utilises a combination of qualitative and quantitative techniques or triangulation technique (Jupp, 2006). A triangulation strategy has been adopted to meet the research objectives. In order to develop an integrated project evaluation tool in the right direction, several research questions were produced (i.e. what is the best PPP approach and how is the effectiveness of partnership concept evaluated? who are the stakeholders using PPP financial models? how to

develop an understandable financial model with minimum error? And what are the most important stakeholders' expectations in utilising PPP financial models?).

#### 10.4 Achievement of the aim and objectives

This research aims to ascertain the rationale of the public sector authority in evaluating PPP projects through an integrated project evaluation tool (IPET). This tool is expected to assist the stakeholders in utilising PPP financial models at different project stages. This will take place by developing a reliable and valid tool for project evaluation and risk sharing negotiation in PPP seaport projects. The aim has been achieved through assembling four objectives. As shown in Figure 10.1, the first and second objectives are addressed in several chapters, while the third and fourth objectives are presented in a specific chapter.



**Figure 10.1** Research objectives in relation to thesis chapters

##### 10.4.1 Achievement of objective one: exploring the concept of ppp and the use of ppp financial models

The concept of Public-Private Partnership has been explored from the perspective of infrastructure approach in chapter 2. The roles exchange and risk sharing mechanism between public and private over long-term concession period have been debated and criticised by researchers. The public expects that PPP is preferred due to efficient services promised by the private party. Meanwhile, private company is mostly motivated by profit maximisation. Therefore, the public authority has to choose the best approach based on their policy and economic conditions. This suggestion raises up a

research question that needs to be addressed in this study. Since the effectiveness of PPP as an alternative procurement strategy to deliver better value for money is still open to question, then, *what is the best PPP approach and how is the effectiveness of the partnership concept evaluated?*

To find out the best approach, two main PPP approaches and some theories related to PPPs have been discussed. The PPP approaches can be viewed from the revenue mechanism. The first approach is service-based approach, and the second is finance-based approach. While revenue mechanism of service-based approach is derived from annual unitary charge, the revenue mechanism of finance-based approach is generated from tariff operation and ancillary revenues. Finding the best approach for a particular PPP project requires an extensive evaluation process. Several considerations related to large project evaluation (e.g. problems in evaluating large project, project evaluation tools and techniques, and risk management in PPP) were also discussed in chapter 2.

Agency theory addresses goal conflict between agent and principal commonly called the agency problem. The agency problem exists in PPPs because the private companies as an agent receives residual revenues, which triggers conflict of interest with the public interest of maximising consumer surplus. Other theories (e.g. Stakeholder Theory, Incomplete Contract Theory, Transaction Cost Economics Theory and Positive Theory Perspective of PPPs) have been reviewed in order to mitigate the problems related to the Agency Theory.

Besides exploring the concept of PPP from theoretical perspectives, the implementation of PPP seaport projects in India has been studied and discussed in chapter 5. The study shows that there have been major drawbacks in the evaluation and implementation process of PPP projects as influenced by some important actors in India. With the use of cross case study for in-depth investigation, some commonality patterns have emerged from the study. First, the independent regulator played an important role in protecting lenders' interest by scrutinising the capital expenditure of port terminals for the purpose of tariff setting. Second, unrealistic traffic projections resulted in cancellation of tendering and tariff setting issues in the operation phase. Third, concessionaires could not achieve the required financial closure within 180 days (plus a grace period of 120 days) from the date of the agreement due to poor project preparation at the pre-bid stage. Therefore, it is suggested that PPP stakeholders devote sufficient time to pre-

project planning as a means of ensuring success in early project closure. Fourth, the three cases reviewed have successfully demonstrated the ability to deliver value for money in terms of time efficiency, cost overrun anticipation, traffic performance, attractive interest rates and tenor of debt. These lessons can be learned by other developing economies. The study also shows that the Indian government has successfully developed a PPP toolkit based on the experience from previous PPP projects.

In order to answer the second part of the first objective, stakeholders' expectations in utilising PPP financial models and the most important financial indicators were identified by undertaking literature review in chapter 3. Evaluating a large infrastructure project requires extensive collaboration among project stakeholders. A financial model has been identified as one of the most common tools used for evaluating a new project and facilitating negotiations among lenders, sponsor(s) and a government agency. However, the complexity of project financing transactions and the diversity of stakeholders' interests are the major reasons that make financial models hard to understand and error prone. These problems have been discussed to formulate research questions about PPP financial models and the stakeholders who are using them: *Who are the stakeholders using PPP financial models? And what are the most important stakeholders' expectations in utilising PPP financial models?*

Although these research questions were addressed and discussed chapter 3, a further research investigation is still needed to confirm its validity. Semi-structured interviews was conducted in India and discussed in chapter 6. Content analysis technique was employed in analysing the interview findings. Contents regarding different aspects of stakeholders' expectations and PPP financial indicators were interpreted and corroborated in a similar and progressive fashion where construct validity was used to ground the findings. This chapter also addresses the answers to the two research questions stated earlier. The first question is: *who are the stakeholders going to manage the risks related to developing large infrastructure projects?* This question is limited to the stakeholders who are using PPP financial models. Ten participants gave their answer as follows: Sponsor, Authority, Other potential sponsor, Investor, Lender, Independent Engineer, Advisory Agency, Modelling bank, Inter-creditor Agent, Consultant, and Transaction adviser. And the second question is: *what are the stakeholders' expectations in utilising PPP financial models?* To answer the second question, the

importance of the pre-determined 64 expectations in five project stages was analysed. The most important financial input assumptions and output indicators were identified in Table 6.8. A further validation process with a structured questionnaire survey was conducted and discussed in chapter 7.

In general, 40 stakeholders' expectations passed all systematic analysis tests. And all preferred financial indicators (26 input assumptions and 16 output variables) also passed all tests of systematic statistical analyses, e.g. Principal component analysis (PCA), Pearson bivariate correlation (parametric) and Spearman's rank correlation (non-parametric) analyses, Cronbach alpha Internal Consistency Reliability Test, Agreement Analysis One-Way ANOVA test, Post Hoc Test and Means Plot.

The systematic statistical analyses were designed to test two hypotheses addressed in the earlier part of this chapter. The first hypothesis is related to the agreement among stakeholders on their expectations in using PPP financial models. Results using ANOVA test and Robust Tests of Equality of Means indicate that government authorities, sponsors, lenders, and consultant agencies considered all expectation variables in using PPP financial models ( $H_01$  is accepted) at the pre-proposal and finance-raising stages. Meanwhile, not all stakeholders had the same expectations in using PPP financial models ( $H_01$  is rejected) at the contract negotiation, construction, and operation stages. In order to identify how stakeholders differ from each other, Post Hoc Tests were conducted. The stakeholders that had different expectations at the contract negotiation stage are (1) Developer Vs Authority (CN – 2, CN – 5, and CN – 12); (2) Consultant Vs Authority (CN – 3); (3) Lender Vs Authority (CN – 7 and CN – 9); (4) Lender Vs Consultant (CN – 7 and CN – 9). And the stakeholders that had different expectations at the operation stage are: Consultant Vs Authority (O – 2) and (O – 6).

The second hypothesis is proposed to test the agreement among stakeholders on financial indicators (input assumptions and output variables). The results indicate that not all stakeholders have the same preferences on input assumptions and financial model output ( $H_02$  is rejected). The stakeholders that have different preference on input assumptions are: (1) Consultant Vs Authority (e.g. Initial working capital, Tax Information, Exchange rate parity, Loan commitment, and Maintenance cost); and (2) Lender Vs Consultant (e.g. Target of equity). And the stakeholders that have different

preference on financial model output are: (1) Consultant Vs Authority (e.g. Internal Rate of Return, Net Present Value, Revenue, Operating Cost, and Principal payback); and (2) Developer Vs Authority (e.g. Net Present Value). The links between stakeholders and financial indicators are presented in figure 7.10.

#### ***10.4.2 Achievement of Objective Two: Exploring risks and their mitigation measures in PPP projects***

The risks and their mitigation measures in PPP projects were identified through literature review, case study and interviews. The possible risks including their causes and financial consequences in PPP projects were explored through an extensive literature review. Cross case studies were also undertaken to study the implementation of PPP seaport projects in India. Major drawbacks and the suggested mitigation measures in the evaluation and implementation process of PPP projects in India were discussed in chapter 5. Since financial model is the object of this study, the risk identification is limited to the risks related to the financial risk variables. The connections between financial risk variables and financial risks, including the decision rules for avoiding risks are discussed in chapter 8 and presented in table 8.4 and table 8.5. The alternative mitigation measure(s) for each financial risk are presented in table 8.7. Several influence diagrams that were developed in this research can be considered as representing financial risk analysis for PPP projects. One of these influence diagrams can be seen in figure 8.12.

#### ***10.4.3 Objective three: develop an integrated project evaluation tool (IPET) fitted to PPP seaport project***

In order to develop an integrated project evaluation tool (IPET), the concept and development of the IPET were discussed in chapter 8. IPET comprises three modules:

- Financial viability module to evaluate the decision of selecting the best PPP strategy.
- Financial risk analysis module to identify the potential risks that affect the best scenario and to analysis the level of project at risk.
- Financial risk mitigation module to determine the response strategy based on the level of risk and the condition of the project.



Financial model was used as the platform of financial viability module. The input and output of three financial models were compared to find the similarity and develop the best practice of financial model. Since financial viability module was developed into five stages of PPP project, the correlations between the most important expectations and the most preferred financial indicators were highlighted through the five project stages.

The most preferred financial indicators of financial viability module are adopted as financial risk variables for financial risk analysis module. This module is designed to help users in identifying the possible financial. The link between financial indicators and financial risks was identified by Influence diagram method. This module also analyses risks at the project level through Monte Carlo simulation with a maximum of 500 iterations. The outcome of the simulation are the upper and lower values of financial indicators at 95% confidence level (e.g. ROA, ROE, NPV, IRR, DSCR min, LLCR min, Interest Covering Ratio, and Payback Period). A single simulation with random probability of future events can also be used in the second module in order to reveal the possible financial risks. In other words, a single simulation randomly creates different combination of financial input indicators (i.e. when land acquisition cost is significantly increased while traffic volume is also below the projection, it is possible that DSCR min, IRR, and NPV fall below the acceptable rates).

At the end of the preliminary evaluation with IPET, under the financial risk mitigation module, the financial and economic outcomes are accompanied by the information of source(s) and consequence(s) of risks, and optimised mitigation measures. The influence diagram of each financial risk variable that includes its alternative mitigation measures was also discussed in chapter 8.

#### ***10.4.4 Achievement of objective four: evaluating IPET and its applicability***

In order to ensure that the proposed tool would be applicable to PPP seaport projects, verification and validation of IPET were needed to achieve the fourth research objective. The IPET was tested before distributing the prototype to experts. IPET was checked and chased in computer-based spreadsheet for each entry and output. The precedents and dependent relationships of each equation were traced carefully and judged according to the required results and the right entries. Once errors were found

and fixed, IPET was ready to be distributed to the experts to be validated and commented on.

The participants who were mainly experts and practitioners rated IPET's applicability, comprehensiveness, practicality, and intelligibility as relatively acceptable. The rating scale was from 1 (lowest) to 5 (highest). The average score for applicability of the proposed IPET to PPP seaport projects was 3.69. The mean value of IPET's comprehensiveness was 3.6. The average score of practical relevance was 3.26 and the respondents rated the model intelligibility as 3.53. These scores gave the proposed IPET a positive overall evaluation.

Some pertinent comments were received. The respondents gave positive feedbacks in various ways. Some participants replied by e-mails and gave comments describing that they were interested in learning further or having an update for the final IPET.

### **10.5 Limitations of the research**

A comprehensive research is reflected by the achievement of its aim and objectives within reasonable time and budget constraints. Meanwhile, developing a project evaluation tool can be a long process depending on the number of variables involved and the range of assumptions considered. The final IPET presented in this research has a number of constraints:

- This research is limited to the infrastructure approach, where private investment is involved, and where different elements such as construction, operation and maintenance are integrated.
- The proposed IPET is limited to PPP seaport projects.
- IPET is designed to be used with financial model, hence will require actual PPP financial model.
- Financial models are selected as the object of the study for identifying, evaluating, and managing risks in PPP projects. Hence, the context of managing risks in this study is limited to the quantitative perspective.

- The definition of stakeholders is also limited to the actors (e.g. sponsor(s), lenders, government authority, consultant companies, insurance company, contractor, operator, etc.) who use financial models as tools for project evaluation, contract negotiation, appraisal report, tariff adjustment, and project performance monitoring.
- Although this research benefits from previous case studies on the identification of various risks in general PPP projects (e.g. Bing *et al*, 2005; Schaufelberger and Wipadapisut 2003; Wang *et al*, 2000; Xenidis and Angelis, 2005; Askar and Gab-Allah, 2002; Zhang, 2005c; etc.), it specifically reviews financial indicators of PPP financial model which are associated with the risks especially for PPP seaport projects. The exploration of the risks is attributed to the identification of financial risk variables from PPP seaport financial models.
- A real PPP project data was not available to meet the research requirements; therefore, a hypothetical project data was used in the IPET's development.

## 10.6 Value of the findings

There are some empirical evidences to support the argument that knowledge gap between government authority and private partners in evaluating a PPP project can be minimised by linking financial model indicators, financial risks, and mitigation measures with an integrated project evaluation tool. A list of empirical evidences is shown as follows:

- The empirical evidence from the statistical analysis supports the view that an efficient negotiation is possible if PPP financial models are used at the pre-proposal stage to examine a project's ability in generating enough cash flow. It has been reported that many planned PPP projects fail because their terms are negotiated without taking into account whether the project is bankable or not (World Bank and PPIAF, 2007).
- There was a mean significant difference between Lender and Authority groups for the project's borrowing capacity expectation (CN-9) at the contract negotiation stage. Whereas lenders selected CN – 9 as the most expectation (5.5), authority scored CN – 9 lower at 4.6364. The statistic and means plots suggest that government must ensure that the project has enough borrowing

power (or robust cash flow) for lenders to be interested in supporting the project. The support from the government could be a no competing clause for first 7 years or 5 years after completing the project as recommended by the Task Force for Indian Seaports (Government of India, 2007).

- Authority had several expectations that significantly differed from sponsor such as Transparency (PP – 4), Lowest equity (CN – 2), Securing cash flow (CN – 3), Transparency (CN – 5), Agreements on risk allocation (CN – 12), and Securing the operational cash flow (O - 1). There is demand from the public to keep the procurement process transparent, while in the other side, sponsors need to protect their business in the competition. This expectation is regarded as the starting point in the contract negotiation process. Since transparency and accountability are an integral part of PPP processes especially in the UK (Demirag and Khadaroo, 2011), government authorities should maintain transparency of the PPP procurement process. A transparent financial model should also show all calculation formulas. Any results from the financial model computation can be easily traced for auditing purposes. Once private parties are willing to be transparent in presenting their financial model, government must ensure that the project has enough borrowing power (or robust cash flow) for lenders to be interested in supporting the project.
- Among all stakeholders, only the group of authority rated CN – 2 (Lowest equity) as the least important expectation at 3.2 (close to “disagree). It implies that the authority requires a fair equity level for the sponsor at the contract negotiation stage.
- Although both authority and sponsor opted for securing cash flow (CN – 3) higher than lender and consultant, the authority group significantly demanded more expectation than the sponsor in using PPP financial model to secure the project’s cash flow. This was also a sign that the authority group expected the financial model not solely to secure the project’s cash flow but also to negotiate risk sharing mechanism (CN – 12) in the contract negotiation stage.
- At the operation stage, authority group also dominated the expectation in securing the operational cash flow (O - 1) because government authority had to make sure that PPP project should be able to demonstrate value for money throughout in the delivery of services by the sponsor (Robinson and Scott,

2009). In connection to value for money requirement, from the post hoc test, the authority also preferred NPV more than the sponsor.

- It was important for the authority to understand how to use financial model properly (O – 2) so that a reasonable tariff (O – 6) could be achieved to maintain healthy competition in delivering public services. Meanwhile, consultants rated reasonable tariff (O-6) as the least important expectation in using PPP financial model at the operation stage. This is evidence that consultants should pay attention to what authority expected in using PPP financial model at the operation stage.
- Consultant and authority disagreed on some financial output indicators, such as: IRR, NPV, Revenue, Operating Cost, and Principal Payback. Authority's scores were higher than consultant on these financial output indicators. The findings indicated that consultants had different preference on the most important output of PPP financial model. This is an interesting finding because consultants' expectations on PPP financial model at contract negotiation stage were dominant at the authority side. Since the authority needs recommendation from consultants, this finding suggests that the consultant preference on most financial output indicators should be considered by the authority. A summary of the research findings is shown in table 10.1.

### **10.7 Originality of the proposed IPET and contribution to knowledge**

An original research paper is built on the existing research. Many researches mostly concentrate on identification of general expectations in PPP projects and on how stakeholders' interests in PPP projects are managed. Since there is no specific research on identification of stakeholders' expectations in utilising PPP financial models, this research bridges the gap. An integrated project evaluation tool was developed and tested as part of a PhD research project aimed at contributing to the body of knowledge. Furthermore, this research engages different stakeholders into the selected expectations; thereby allowing further information on mutual and opposing expectations for the stakeholders to be identified. Original contributions to stakeholder management in PPP projects are presented as follows:

- Developing an integrated project evaluation tool for evaluating financial viability of PPP project. It is the first project evaluation tool to be undertaken in academia and industry for integrating financial model and risk management tools for PPP projects.
- The integration between PPP financial model and the risk management tools is established in order to assist the user (especially government authority) in evaluating the financial viability of a PPP project and controlling the project continuously at five project stages. This shows the possibility of developing such an integrated project evaluation tool to be used for assessing project financial viability through the project life cycle.
- Long financial closure is seen as a sign that financial model has not been used efficiently in a PPP project. When financial closure is longer than the anticipated, the sponsor cannot commence the construction until all the financing required by lenders are fully mobilised to commission the facility. Although some lender's financial requirements such as loan commitment, schedule of disbursement, loan repayment schedule, interest and fees, assumptions related to the interest rate hedge, LLCR, and DSCR are not directly influenced by government authority, these requirements have to be negotiated between sponsor and lender. In the negotiation process, the sponsor is not only subjected to the requirements and policy of the host government, but also will be affected the commitment of the government in supporting PPP. The proposed IPET helps government authority understand the other stakeholders' point of views when it comes to negotiation between the sponsor and the lender, so that government authority could effectively support and make better policy in PPP.
- One argued that a good financial model is not the main consideration in making decision; nevertheless, any decision will have impact on the financial viability of the project. IPET shows all possible risks related to financial indicators in PPP financial model and their mitigation measures. Thus, it allows government authority to make better decisions.

## 10.8 Recommendations for further research

Recommendations for further research have been identified during the progress of this research. The following areas are related to either the proposed IPET or to PPP projects and modelling issues that can be done for further research:

- The proposed IPET was designed to be used at five project stages. However, due to time constraints, the final IPET was built for evaluating PPP project at the pre-proposal stage. Further studies are needed to develop a complete IPET for five project stages.
- There is always room for improvement of the IPET. As suggested by some experts, much more detailed revenue and cost modelling would be needed, a feature for an itemized presentation of NPV (e.g. Rentals NPV, Amort. NPV, etc.), a manual of use and insight into the tool's assumptions and building details would be worth the effort, and financial model without macro and button would keep things simple.
- UIPET was acknowledged by Cesar Queiroz, a former World Bank Highways Adviser, as being very innovative and comprehensive, with the potential to be extended to other sectors. As such, extending IPET to focus on other sectors besides seaport development would be a worthwhile exercise.

**Table 10.1a** Summary of the findings from authority perspective

Stakeholder	Function of PPP Financial Models	Stage	The most important expectations in utilising PPP Financial model	Financial risk variables related to stakeholders' expectations	The most preferred financial indicators
Authority	Evaluate the estimated cost of two procurement alternatives either PPP or public sector comparator (PSC)	Pre-proposal stage	Generate enough cash flow (Zhang, 2005a)	Concession period, tariff, demand (traffic), etc. (Zhang, 2005)	Input: <ul style="list-style-type: none"> <li>• Traffic</li> <li>• Revenue forecast</li> <li>• Operating and Maintenance costs</li> <li>• Project time lines</li> </ul> Output: <ul style="list-style-type: none"> <li>• IRR</li> <li>• NPV</li> <li>• DSCR</li> </ul>
			Bankable (Lamb and Merna, 2004; Khan and Parra, 2003)	DSCR, LLCR, repayment cover ratio, drawdown cover ratio, etc. (Lamb and Merna, 2004)	
			Transparency of the award process (World Bank and PPIAF, 2007; Coulson, 2008)	Tax information, transaction costs, lifecycle and residual costs, cost of capital, returns to holders of equity, and issues relating to the discount rate (Coulson, 2008)	
Authority	Negotiate risk sharing mechanism with bidders and evaluate bidders' competitive proposals	Bidding and contract negotiation stages	Transparency during negotiation process (Demirag and Khadaroo, 2011)	Financing costs such as: financial service charges, interest rate financing, loan financing period and costs from fluctuations of currency and exchange rates (Zhang, 2005b)	
			Securing the project cash flow from the risks (Wibowo, 2006; Kong et al., 2008)	Cost of debt, cost of equity, ROE, and the project's NPV (Wibowo, 2006). Total project cost, annual revenue, operation & maintenance cost, escalation rate, interest rate, discount rate, concession period, and construction time (Yun et al., 2009)	
			Risk allocation through all project agreements (Jun, 2010)	IRR, revenue, and traffic volume (Jun, 2010)	
Authority	Ensure that the PFI projects built to budget and on time	Construction stage	Ensuring the impact of cost overrun and other events does not have adverse effect on DSCR or LLCR (Khan and Parra, 2003)	DSCR, LLCR, construction period, project cost, financing cost, and premium (Schaufelberger and Wipadapisut, 2003; Khan and Parra, 2003; Shaoul et al. 2006)	
Authority	Evaluate a new tariff.	Operation stage	Securing the operational cash flow (Farrell, 2003; Robinson and Scott, 2009)	Capex and Opex (Scott and Robinson, 2009)	
			Reasonable tariff (HM Treasury, 2007; Ng et al., 2010; Zhang, 2005b; Tiong, 1996)	Construction costs and its associated financing cost (payment of interests on loans) during the economic life of the asset, tariffs, concession period (Trujillo and Nombela, 1999).	
			Understandable financial model (Tjia, 2009; Shaoul et al., 2010)	Unitary charges, capital and revenue costs (Shaoul et al., 2010).	



**Table 10.1b** Summary of the findings from consultant perspective

Stakeholder	Function of PPP Financial Models	Stage	The most important expectations in utilising PPP Financial model	Financial risk variables related to stakeholders' expectations	The most preferred financial indicators
Consultant	Develop and audit the financial models.	Pre-proposal stage	Bankable (Lamb and Merna , 2004; Khan and Parra, 2003).	DSCR, LLCR, repayment cover ratio, drawdown cover ratio, etc. (Lamb and Merna, 2004).	Input: <ul style="list-style-type: none"> <li>• Project cost</li> <li>• Revenue forecast</li> <li>• Traffic</li> <li>• Capital structure</li> <li>• Operating and Maintenance costs</li> </ul> Output: <ul style="list-style-type: none"> <li>• DSCR</li> <li>• LLCR</li> <li>• CADS</li> <li>• Net cash flow</li> <li>• IRR</li> </ul>
	Assist the sponsor, the lender and the government authority in evaluating the project.		Reflects the project and the financing terms (Hucknall, 2010; Khan and Parra, 2003).	Financing options, loan amounts, tenors, interest rate, grace period, upfront fees, payback structure, etc. (Khan and Parra, 2003).	
Consultant	Develop and audit the financial models.	Bidding and contract negotiation stage	Transparency during negotiation process (Demirag and Khadaroo, 2011)	Financing costs such as: financial service charges, interest rate financing, loan financing period and costs from fluctuations of currency and exchange rates (Zhang, 2005b).	
	Assist the sponsor, the lender and the government authority in evaluating the project		Credit Committee requirement for approving the sponsor's credit application (Asenova and Beck, 2003).	Operational cost, inflation, construction cost, construction period, life-cycle costs, senior debt, and equity (Asenova and Beck, 2003).	
			Knowing how much senior debt that the project is able to carry (Khan and Parra, 2003).	Project costs, equity, loan tenor, discount rate, CADS, DSCR, and LLCR (Khan and Parra, 2003).	
Consultant	Develop and audit the financial models.	Finance-raising stage	Achieving financial closing on acceptable terms and construction start (Cartlidge, 2006; World Bank and Ministry of Construction Japan, 1999)	Unitary charge or tariff, project cost, capital expenditures, operational expenditures, concession period, construction period, and operation period (Cartlidge, 2006).	
	Assist the sponsor, the lender and the government authority in evaluating the project		Conducting sensitivity analysis for key commercial issues as needed (Woodward, 1995)	Construction cost, construction period, operation period, inflation rates, operating costs, etc. (Khan and Parra, 2003).	
Consultant	Develop and audit the financial models. Assist the sponsor, the lender and the government authority in	Construction stage	Ensuring the impact of cost overrun and other events does not have adverse effect on DSCR or LLCR (Khan and Parra, 2003)	DSCR, LLCR, construction period, project cost, financing cost, and premium (Schaufelberger and Wipadapisut, 2003; Khan and Parra, 2003; Shaoul et al. 2006).	

	evaluating the project				
Consultant	Develop and audit the financial models.	Operation stage	Securing the operational cash flow (Farrell, 2003; Robinson and Scott, 2009)	Capex and Opex (Scott and Robinson, 2009)	
	Assist the sponsor, the lender and the government authority in evaluating the project		Making the model to represent reality (Derman, 2009)	Dividends payment, repayment of debt, equity, debt, operational cost, revenue, tariff, demand (Schaufelberger and Wipadapisut, 2003)	

**Table 10.1c** Summary of the findings from sponsor perspective

Stakeholder	Function of PPP Financial Models	Stage	The most important expectations in utilising PPP Financial model	Financial risk variables related to stakeholders' expectations	The most preferred financial indicators
Sponsor	Facilitate the submission of proposal.	Pre-proposal stage	Generate enough cash flow (Zhang, 2005a)	Concession period, tariff, demand (traffic), etc. (Zhang, 2005).	Input: <ul style="list-style-type: none"> <li>• Project cost</li> <li>• Loan repayment schedule</li> <li>• Traffic</li> <li>• Operating and Maintenance costs</li> <li>• Revenue forecast</li> </ul>
			Reflects the project and the financing terms (Hucknall, 2010; Khan and Parra, 2003).	Financing options, loan amounts, tenors, interest rate, grace period, upfront fees, payback structure, etc. (Khan and Parra, 2003).	
			Competitive pricing (Tiong, 1996; World Bank and PPIAF, 2007).	Tariff, project capacity or throughput, demand, revenue share, project costs, tax, etc. (Kulkarni and Prusty, 2007; World Bank and PPIAF, 2007; and Tiong, 1996)	
Sponsor	Negotiate risk sharing mechanism and capital structure of the project with other potential sponsor(s), lenders and government authorities.	Bidding and contract negotiation stages	Knowing how much senior debt that the project is able to carry (Khan and Parra, 2003).	Project costs, equity, loan tenor, discount rate, CADS, DSCR, and LLCR (Khan and Parra, 2003).	Output: <ul style="list-style-type: none"> <li>• Net cash flow</li> <li>• IRR</li> <li>• Repayment period</li> <li>• CADS</li> <li>• LLCR</li> <li>• EBITDA</li> <li>• Interest Covering Ratio</li> </ul>
			Reaching an agreement on forecast for CADS (Khan and Parra, 2003).	CADS, Net operating profit, interest, revenue, operating cost and loan tenor (Khan and Parra, 2003).	
			Attractive IRR (Zou <i>et al.</i> , 2008).	IRR, concession period, tariff rate and demand (Zou <i>et al.</i> , 2008).	
Sponsor	Negotiate risk sharing mechanism and capital	Finance-raising stage	Conducting sensitivity analysis for key commercial issues as needed (Woodward, 1995)	Construction cost, construction period, operation period, inflation rates, operating costs, etc. (Khan and Parra, 2003).	

	structure of the project with other potential sponsor(s), lenders and government authorities.		Amending the model to reflect the results of the negotiation of commercial issues (HM Treasury, 2007).	a. Capital structure: Senior debt, equity, project costs, project borrowing capacity. b. Loan profile: The loan availability period, first repayment date, grace period, final maturity, repayment schedule, percentage of equity to be infused by sponsor(s) before first loan draw, and pace of subsequent equity draws. c. Quantitatively driven covenants: DSCR, LLCR, and CADS (Khan and Parra, 2003).	
			Assessing the issues that affect price, availability, quality, or transportation thereof (Mols, 2010)	Tariff, demand, and project cost (Khan and Parra, 2003).	
Sponsor	Monitor and track the performance of the project.	Construction stage	Ensuring the impact of cost overrun and other events does not have adverse effect on DSCR or LLCR (Khan and Parra, 2003)	DSCR, LLCR, construction period, project cost, financing cost, and premium (Schaufelberger and Wipadapisut, 2003; Khan and Parra, 2003; Shaoul et al. 2006).	
			Anticipating to claim the declaration of the loan agreement breaching (Schaufelberger and Wipadapisut, 2003)	Construction cost, construction period, senior debt, equity, loan availability period, and DSCR (Khan and Parra, 2003).	
Sponsor	Monitor and track the performance of the project.	Operation stage	Monitoring the ability of the SPV to meet conditions related to the payment of dividends (Schaufelberger and Wipadapisut, 2003)	Dividends payment, repayment of debt, equity, debt, operational cost, revenue, tariff, demand (Schaufelberger and Wipadapisut, 2003)	
			Easy to update the financial model (Tjia, 2009)	Dividends payment, repayment of debt, equity, debt, operational cost, revenue, tariff, demand (Schaufelberger and Wipadapisut, 2003)	
Sponsor	Negotiate a new tariff with the government authority.	Operation stage	Reasonable tariff (HM Treasury, 2007; Ng <i>et al.</i> , 2010; Zhang, 2005b; Tiong, 1996)	Construction costs and its associated financing cost (payment of interests on loans) during the economic life of the asset, tariffs, concession period (Trujillo and Nombela, 1999).	

**Table 10.1d** Summary of the findings from lender perspective

Stakeholder	Function of PPP Financial Models	Stage	The most important expectations in utilising PPP Financial model	Financial risk variables related to stakeholders' expectations	The most preferred financial indicators
Lender	Determine the project's borrowing power, which is based on the results of negotiation and project agreements along with the financial model.	Bidding and contract negotiation stages	Knowing how much senior debt that the project is able to carry (Khan and Parra, 2003).	Project costs, equity, loan tenor, discount rate, CADS, DSCR, and LLCR (Khan and Parra, 2003).	
			High equity level to minimise the repayment debt risk (Zhang, 2005a; Yun et al., 2009; Bakatjan <i>et al.</i> , 2003 )	Equity and project cost (Bakatjan et al., 2003)	
			Credit Committee requirement for approving the sponsor's credit application (Asenova and Beck, 2003).	Operational cost, inflation, construction cost, construction period, life-cycle costs, senior debt, and equity (Asenova and Beck, 2003).	
Lender	Modify the initial model into lender base case financial model in order to test the project's financial viability.	Finance-raising stage	Conducting sensitivity analysis for key commercial issues as needed (Woodward, 1995)	Construction cost, construction period, operation period, inflation rates, operating costs, etc. (Khan and Parra, 2003).	Input: <ul style="list-style-type: none"> <li>• Traffic</li> <li>• Revenue forecast</li> <li>• Operating and Maintenance costs</li> <li>• Project cost</li> <li>• Interest and fees</li> </ul> Output: <ul style="list-style-type: none"> <li>• DSCR</li> <li>• IRR</li> <li>• CADS</li> <li>• ROE</li> <li>• LLCR</li> </ul>
			Assessing the issues that affect price, availability, quality, or transportation thereof (Mols, 2010)	Tariff, demand, and project cost (Khan and Parra, 2003).	
			Amending the model to reflect the results of the negotiation of commercial issues (HM Treasury, 2007).	a. Capital structure: Senior debt, equity, project costs, project borrowing capacity. b. Loan profile: The loan availability period, first repayment date, grace period, final maturity, repayment schedule, percentage of equity to be infused by sponsor(s) before first loan draw, and pace of subsequent equity draws. c. Quantitatively driven covenants: DSCR, LLCR, and CADS (Khan and Parra, 2003).	
Lender	Maintain financial model and monitor project costs.	Construction stage.	Ensuring the impact of cost overrun and other events does not have adverse effect on DSCR or LLCR (Khan and Parra, 2003)	DSCR, LLCR, construction period, project cost, financing cost, and premium (Schaufelberger and Wipadapisut, 2003; Khan and Parra, 2003; Shaoul et al. 2006).	
Lender	Assess the impact of any annual operations budget submitted by the project vehicle to lenders.	Operation stage	Understandable financial model (Tjia, 2009; Shaoul <i>et al.</i> , 2010)	Unitary charges, capital and revenue costs (Shaoul et al., 2010).	
			Making the model to represent reality (Derman, 2009)	Dividends payment, repayment of debt, equity, debt, operational cost, revenue, tariff, demand (Schaufelberger and Wipadapisut, 2003)	

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