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THREATS ASSOCIATED WITH BUILD, OPERATE and TRANSFER (B.O.T) INFRASTRUCTURE PROJECTS IN SOUTHERN AFRICA AND THE IMPACT IT HAS ON THE RISK PROFILE

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A research report submitted to the Faculty of Engineering and the Built Environment, University of Witwatersrand, in fulfilment of the requirements for a Master of Science in Engineering (by coursework and research) degree.

Johannesburg 2013

Declaration

I Shimah Moloigaswe do hereby declare that this research is my own unaided work, the substance of or any part of which has not been submitted in the past or will be submitted in the future for a degree to any university, and that the information contained herein has not been obtained during my employment or working under the aegis of, any other person or organisation other than this university.

…….. ……..

(Name of Candidate) Signed

Signed this…….. day of…….. 2013 at the University of the Witwatersrand, Johannesburg.

Dedications

I dedicate this work to my late mother and father, Gaothowe and Boitaolo Moloigaswe.

I also dedicate this work to my beautiful daughter Loapi, her mother Thembi Dladla as well as my grandmother Ganetsang Kotewa.

Acknowledgements

I would like to acknowledge my creator for having given me the opportunity in life to achieve what I have achieved.

I will forever be indebted to my supervisor Dr Anne Fitchett without whose guidance and persistence this research project would not have been completed.

I would like to thank my brothers Ernest and Manico for the support and all we have been able to conquer together.

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Lastly I would like to thank the rest of my family and friends, (Lekgotla).

Abstract

The rapid economic growth in many developing countries results in a high demand for infrastructure and governments find that they are unable to fund the vital infrastructure or to maintain the existing ones (Gupta and Sravat, 1998). To remedy this they are increasingly opting for an alternative source of funding through the large international companies which have considerable credit standing for concession contracts such as Build Operate and Transfer (BOT) since those companies have a much larger capacity to fund the large scale projects than the recipient country.

The objective of this research project is to provide a brief review of the South African experience with the utilisation of the BOT approach for infrastructure developments, examining the risks and the measures used to mitigate them. This is so as to draw lessons for policy makers on how to improve the use of this strategic instrument for infrastructure provision. The emphasis will be on overall risks associated with the scheme as well as the mitigating factors in light of the current social, political and economic context of the country and the region.

Data was collected using the Delphi survey method and the study targeted individuals who were knowledgeable and experienced with the issues under investigation and from different sectors involved with execution of BOT infrastructure development projects in South Africa. These included contractors, lenders, operators as well as some from the host government. The questionnaire was designed to identify the perceptions of the individuals regarding risk management in BOT projects as well as identify significant risk associated with the scheme.

The 10 most critical risks were ranked based on the ratings of the respondents in the final phase of the Delphi survey. The risk that was rated the most critical turned out to be **'Political instability in the host country**'. This is defined as the danger of political or financial instability in the host country caused by events such as insurrections, strikes, creeping expropriation and outright nationalization. (Wang et al. 2004)

Key Words: Risk Management, Delphi, Build-Operate-Transfer

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List of Acronyms

BOT	: - Build Operate and Transfer
GFIP	: - Gauteng Freeway Improvement Project
SANRAL	: -South African National Roads Agency Limited
NEMA	: -National Environmental Management Act

Chapter 1: Introduction

1.1 Introduction

The economic progress of any country hinges greatly on its ability to implement its infrastructure development plans. This is because strategically planned and well-connected infrastructure services attract foreign direct investment and also boost local investment. Moreover, these act as a platform from which new forms of partnership and collaboration can be developed. Unfortunately for developing countries, there is a scarcity of budgetary resources and sovereign borrowings which undermine the ability to meet the present and future demand for infrastructure development. To mitigate this, a country can further tap into private sector financing through Build, Operate and Transfer (BOT) infrastructure projects developments. BOT can be defined as a major start up business venture where private organisations undertake to build and operate a project which under normal circumstances would be undertaken by government and then after a fixed pre-agreed concession period return the ownership of this project to the government (Tiong. 1990). The revenues generated from the project during the concession period are the main source of funds for investors and lenders to service and recuperate their debts incurred in the project.

Risk is inherent to all construction projects and more profound in BOT scheme projects due to the long duration and complexity of the contractual relations between the different parties to the contract. The nature of risk and its perception by the role players in the construction industry determines how it is treated or managed (Edwards and Bowen, 2005). Clough (1975) further states that contracting parties have to read carefully all contract articles before signing the contract in order to avoid any disputes and conflicts during the execution of the contract.

Construction projects in South Africa have the management of construction risk embedded in the contract. It is crucial for entities involved with construction projects to protect themselves through risk allocation (Nielsen, 1997). The most effective way to allocate risks is by properly utilizing both insurance and indemnification (Chaklos,2008). Nevertheless this research will be looking at the broader aspect of risk and in particular the risks associated by BOT infrastructure development projects.

1.2 Stages in the BOT Process

BOT according to Yang et al. (2004) is a kind of project schemes falling under Public-Private-Partnerships (PPP) in which a sponsor of the project is given the right by government that during the concession period they should take charge of the designing, financing, construction, operation, protection and transfer of the project back to the government. The sponsor gets to make profit as well as repay its debts from the cash flow generated during the concession period. Governments use

this scheme to encourage private and foreign capital injections for infrastructure that otherwise would not have been feasible to develop using public funds. Government also get to benefit from the high efficiency, high level operational and service concept as well as advanced technologies brought in by the private foreign partners.

According to Llanto (2008) a typical BOT project undergoes six identifiable stages which can crudely be separated into parts comprising those activities carried out before or during the concession period. Initially a financial and technical feasibility study is carried out, followed by the awarding of the concession for the building and operation of the facility. During the concession period the consortium obtains the necessary requirements such as permits, then deigns and constructs the facility. In some instances the principal could be the one tasked with obtaining the necessary permits. After a specified period during which the concessionaire recoups its costs through the revenues generated in the use of the facility, the facility and its assets are then transferred to the government.

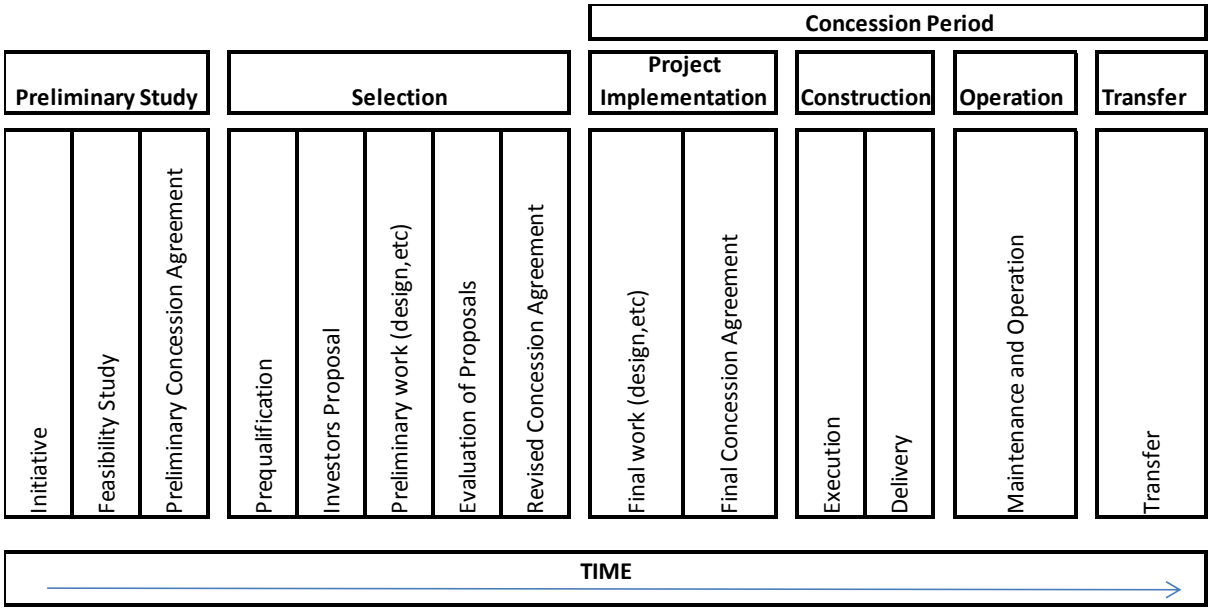


Figure 1 Stages in a BOT process (Source: Llanto, 2008)

1.2.1 Preliminary Study stage

South Africa, like most developing countries, develops and adopts an infrastructure development plan with the sole intent to transform the economy and create a significant number of new jobs (Development Bank of Southern Africa, 1999). In the case of South Africa, a National Development Plan is drawn up under the banner of the National Planning Commission (KPMG, 2012). The primary purpose of this plan is to devise a strategic road map for the country to eliminate poverty and

reduce inequality by uniting South Africans, growing an inclusive economy, building capabilities as well as enhancing the capabilities of the state and its leaders (NPC, 2012).

According to the National Planning Commission's (NPC) 2012 report, some of their enabling milestones include providing affordable access to quality health care while promoting health and wellbeing, providing sufficient energy to support industry at affordable prices as well as ensuring that South Africans have access to clean running water in their homes.

The Department of Provincial and Local Government (DPLG) also has guidelines for drafting Integrated Development Planning (IDP) for Local Governments. According to the guidelines the IDP should take into account the existing conditions and problems as well as the availability of resources for development. It must assess the socio-economic development of the area as a whole as well as set a framework for how the land will be used as well as what infrastructure and services are needed.

1.2.2 Selection

Once the preliminary studies have been completed and the need for a particular infrastructure development is identified then the special government agency has to identify the concessionaire to execute the project. There are ideally two systems of selection for government services that could be used. The one is that of unsolicited proposals being submitted to government agencies from private institutions having identified a market for that particular service. The government entity once having accepted the proposal would then put it out for some form of competition to insure that the most economic price is achieved (Llanto, 2008). Following this, the project would be awarded to the concessionaire. The other selection process commonly used is that of solicited proposals, this is an open competitive tendering process which entails the government agency sending out requests for prequalification, followed by prequalification, and then there is a tender invitation followed by a tender evaluation and short listing. Negotiations are then entered into with the short listed bidders followed by the selection of the best tender and award of the concession (Ababutain, 2001)

Since the tendering process for a BOT project can be very costly if the applicant is not successful, SANRAL has changed the "rules" to provide all prospective bidders with the geotechnical information and proposed basic planning road alignment so that all bidders share the same basic information thus eliminating costly duplications (Horak and Emery, 2001). The submissions are then evaluated on their technical feasibility followed by an evaluation of their financial viability as well as economic benefits. The concession is then awarded to the consortium that best meets the requirements of both the technical and financial evaluations. (Horak and Emery, 2001).

The other approach for selecting an appropriate concessionaire is that requiring a best value approach. In this approach, the owners' objectives are translated into an appropriate tender evaluation package that consists of a set of criteria and their corresponding value functions. The best value approach requires that the client clearly defines the objectives it wishes to achieve, the relative importance of each value item and the contributors to each value item. From this, objective and subjective indicators are developed to evaluate these contributors. (Ababutain, 2001). The author goes on further to state that there might be various conflicting objectives in the best value selection scenario hence there should be a trade-off according to the relative importance of these objectives.

1.2.3 Project Implementation

Once the consortium has been granted the go ahead by a governing body such as SANRAL, they have to start putting together the design for the infrastructure, getting the necessary permits and acquiring the land if that is not a function transferred to the client, as is the case in other countries (Llanto, 2008). There are different considerations that have to be addressed at this stage. According to Llanto (2008), this is where most of the conflicts will be experienced as different stakeholders have differing interests, for example socio-economic impact as well as public participation as attested by Horak and Emery (2001) regarding how the positioning of the toll plazas on the Maputo corridor project separated communities.

1.2.4 Construction

The construction is carried out by the contractor or joint venture between different strategic contractors who could be part of the consortium or not. The construction only commences once all the necessary permits have been approved in terms of environmental impact studies having been approved, as well as the social requirements having been agreed such as participation of the local community and all other necessary legal permits having been granted. (Ahmed et al. 1999).

1.2.5 Operation

Once the construction process is complete then the concessionaire appoints an operator who could also be a strategic partner in the concession to operate and maintain the facility. In the case of the Maputo corridor the appointed operator was TRAC. They will be managing the facility until the end of the concession period when the project is handed back to the government. (Horak and Emery, 2001).

1.2.6 Transfer

At the end of the agreed concession period the ownership of the facility and all assets are transferred to the host government in a pre-specified condition. Should it happen that the transfer is

made prior to the agreed transfer date then the concessionaire is compensated for any outstanding amounts. (Llanto, 2008).

According to Dey and Ogunlana (2004), the long duration and complexity of a BOT agreement presents risks far greater than those faced in a traditional construction contract. This is due to the different role players involved in the contract all having different priorities that sometimes tend oppose each other resulting in dispute.

1.3 Objectives

The objective of this research project is to provide a brief review of the South African experience with the utilisation of the BOT approach for infrastructure developments, examining the risks and the methods used to mitigate them. This is so as to draw lessons for policy makers on how to improve the use of this strategic instrument for infrastructure provision, in view of the different role players involved in the BOT scheme, the long duration as well as the complexity of the agreement. The emphasis will be on overall risks associated with the scheme as well as the mitigating factors in light of the current social, political and economic context of the country and the region.

1.4 Problem Statement

In its most basic form the BOT scheme calls for a government to grant a concession contract to a private sector entity which requires the entity to source finance for the design and construction of a public facility or infrastructure. The private entity then operates the facility for a predetermined fixed period upon which the entity has to recoup the cost of finance plus profit by charging fees or tolls for the use of the facility. At the end of the concession period the operation and ownership of the facility is returned to the government.

There are many potential advantages attributed to the BOT scheme as identified by Askar and Bab-Allah (2002): these include that the use of private finance to provide new sources of capital reduces public borrowing hence improving the credit rating of the country. The scheme also accelerates the delivery of projects which would have otherwise had to wait for scarce sovereign funds. The project delivery efficiencies are greatly improved and construction costs and schedules are reduced due to the use of the private sector initiatives, capital and expertise.

BOT schemes, just like any other form of infrastructural development projects, are not without their pitfalls. Owing to the many uncertainties and risks, projects of this nature cannot be implemented successfully without the necessary support from the host government. This includes providing an adequate legal framework, cultivating a political and commercial environment conducive to carrying out a profitable business, as well as providing minimal guarantees to maintain a balanced risk return

structure (Birgonul & Ozdogan, 1998). The globalisation of international markets has provided multinational companies with greater opportunities to earn higher margins of returns as they extend their market share beyond their borders. However it has been noted that 15% of the top 225 global contractors have sustained losses on their international projects (Han and Diekmann, 2001). This is despite the general norm that international projects are usually more profitable than domestic projects. Numerous authors have written on this matter including Dailami et. al. (1999), Ho and Liu (2002), and Zhi (1995), who attribute most of these losses to inefficiency of assessing and evaluating risk factors in international projects.

The late 20th century saw a proliferation of using private financial resources as a financing method applied to infrastructure projects in comparison to the traditional means of financing. According to the World Bank database, the commitments to invest in transport infrastructure projects with private capital participation in developing countries equalled $144 000m during the decade 1996 – 2006, of which $21 700m corresponded to 2005 and $29 700m to 2006. (World Bank, 2008)

The current financial crisis has called into question the continuity of investment in new infrastructure projects in developing countries. The World Bank's report published in December 2008 states that "although it's too soon to evaluate the total impact on new public private investment (PPI) projects, there is mounting evidence of a fall in the percentage of projects completed by the end of the year and of projects cancelled or postponed". The said report further states that between August and November 2008 about $90 000m out of a total of $120 000m in investment in 173 infrastructure projects included in the Bank's database was cancelled or postponed.

With such a significant number of projects cancelled or postponed it is important to ensure that the few projects that are carried through to completion are done so in a manner that attains or exceeds the project objectives so as to set a precedence and provide confidence in all future projects. For this to be achieved there has to be proper risk management. By nature, construction projects are risky endeavours and according to Dey and Ogunlana (2004) the characteristic of the risk is highly dependent on the type of procurement adopted for managing the project. Their study goes on further to recognise BOT infrastructure projects as one of the riskiest of all project schemes. They also state that there have been instances of project failure when the BOT scheme was adopted and the major contributing factor was identified as ineffective risk management.

The construction process from inception to completion and use of the product is very long and complex. According to Dey and Ogunlana (2004), this is more so on the implementation of BOT infrastructure project. The identification, classification, analysis, attitude and response to risks associated with BOT projects is documented generically by various authors around the world but is

not conceptualised to be specific to the current South African socio-economic conditions. Every country has its own specific context in terms of political and socio-economic conditions that can make the environment conducive to a profitable business venture. As such there is a need to have a specific detailed study on the risks associated with BOT infrastructure developments in South Africa and their mitigating factors.

1.5 Hypothesis

The hypothesis of this research is that there are inherent risks associated with Build Operate and Transfer infrastructure projects. These risks range across the different phases of the project from the preliminary studies to the transfer of the infrastructure to the government. The identification, analysis and mitigation of these region specific risks can make BOT schemes viable despite being one of the most risky of infrastructure development implementation schemes.

1.6 Research Question

- What are the significant threats in BOT infrastructure projects in South Africa?
- What is the impact of such threats on the project viability?
- What are the mitigating measures and their influence relationships?
- How successful is the current risk management system in controlling such risks?

1.7 Research Activities

- To ascertain whether role players are familiar with risk management in BOT projects
- To determine the extent to which risk management is used in the industry
- To identify, categorize and represent the threats associated with BOT infrastructure projects, with a particular focus on South Africa.
- To determine the order of importance in terms if criticality of impact of those risks
- To establish whether the perception of the risks is more prevalent with one particular role player as opposed to others
- To determine the mitigating factors that can be put in place to overcome the identified risks to BOT scheme projects

1.8 Importance of Study

The study contributes to the establishment of a framework for systematic risk management in BOT projects. This will lead to improved awareness of threats at all phases of the project cycle. The results may be used to develop better theoretical financial models for managing threats on BOT

infrastructure projects. The study could also lead to an amendment of policies and procedures on risk management taking into consideration lessons learnt. The results can be used to devise strategies to mitigate the impact of current threats.

1.9 Limitations and Scope of Research

The limitations of this study are that it is based only on South African BOT infrastructure developments projects and the experiences and perceptions with regards to risk management of the parties involved.

With the advent of the BOT scheme having been introduced to the South African environment only as recently as the late 1990s, there is still a limited pool of experienced people on the subject matter to consult on the topic in terms of answering questionnaires. Even with the few experts on this field in the country, most of them were reluctant to answer questionnaires since some are still involved in contentious and sensitive projects such as the Gauteng Freeway Improvement project.

1.10 Structure of the Research Report

After a brief introduction this paper first describes the BOT model and the contractual relationships between the parties involved, as well as how the model is used by developing countries such as South Africa to provide much needed infrastructure. The success factors and the causes for project failure are then identified. The next chapter examines the risks involved in each phase of the project and suggests methods that could be used to mitigate these risks. The report then goes on further to explain the methodology used to carry out the study, followed by the analysis of the data collected and then there is a discussion of the results obtained. Finally there is a conclusion to sum up all that was covered in the research.

Chapter 2: Literature Review

BOT according to Dey and Ogunlana (2004), is defined as a government contractor with a private sector partner (the concessionaire), constructing an infrastructure facility and giving the private partner the right to operate within a certain concession period at the end of which the private partner transfers ownership of the facility to the government. This procurement provides the possibility of access to useful additional funding which would otherwise not be available. It also provides the possibility of an alternative to the conventional financing and operation of infrastructure projects in developing countries.

There are several advantages to the BOT scheme that make it a desirable alternative. These advantages include: the reduction of public borrowing and improvement of host government credit rating by using private financing; the ability to promote project development which otherwise would have to wait for sovereign resources; improving efficiencies of operation through the use of private sponsors; and lastly, according to Askar and Gab-Allah (2002), establishing a benchmark to compare similar public projects for enhancement.

The success or failure of any of those ventures is greatly dependent on how well particular risks are dealt with (Dey, 2001). The nature of the construction industry is such that the industry is more susceptible to risk and uncertainty than most industries and the risk is generally a choice in the environment rather than fate, in the sense that depending on the choice that the industry players make, the risk can have a negative or positive impact on the business. Unfortunately these choices are not always dealt with appropriately by the industry (Thomson and Perry, 1992). In this case we are looking at construction industry as comprised of projects with the unique characteristics of having specific objectives to be completed within certain specifications with defined start and end dates with funding limits while also consuming resources.

All Public-Private Partnership projects have an element of risk inherent in them, just as in any other infrastructure projects (Quium, 2011). The risks arise due to uncertain future outcomes which may have direct effect on the provision of services by the project, and/or the commercial viability of the project. Unfortunately, the traditional mechanisms for project risk allocation that are available in other countries may not be suitable in developing economies (e.g. South Africa) due to the differences in legal systems, market conditions and culture. Therefore in order to implement successful BOT schemes, investors, both local and international, need to identify and find ways to mitigate the critical risks, taking into consideration the diversity in terms of various issues pertaining to political orientation, policy matters and demographic issues along with geographical challenges (Maniar, 2010).

According to Schur (2000), South Africa has a backlog of R170.7 billion in terms of infrastructure developments: also according to a 1999 report by the Development Bank of Southern Africa there is still much needed infrastructure developments in areas such as water, sanitation, heath services, roads and electricity supply in order for the region to meet its strategic development goals. Due to budgetary constraints, governments in the region have opted to partner with private entities to achieve some of these developmental projects. Below is a list of a few examples in which the host government partnered with a private entity on a BOT development scheme project.

Table 1 List of BOT Projects in Southern Africa (Source: Author)

Country	Project	Status
Mozambique/South Africa	N4 Maputo Corridor (440km)	Operational
South Africa	N1 – Bella Bella - Musina	Operational
South Africa	Gautrain	Operational
South Africa	N3 Heidelburg-Pietermaritzburg Toll Road (450km)	Operational
South Africa	N4 Platinum Toll Road (400km)	Operational
South Africa	N1/N2 Winelands Toll Highway (180km)	Operational
South Africa	New Limpopo Bridge	Operational
Zimbabwe	Beitbridge Bulawayo Railway (350km)	Operational
Zambia	Zambia Railways Concession (1200km)	Operational
South Africa	Bloemfontein Maximum Security Prison	Operational
South Africa	Dolphin Coast Water and Sanitation Concession	Operational

2.1 Stakeholders in the BOT process

There is a generic structure of BOT projects; however there are several variations due to the specific issues that the infrastructure project might be addressing. In general there is the principal who in most cases is the government or a designated parastatal body like the South African National Roads Authority Limited (SANRAL) that grants the concession to the concessionaire which could be made up of a consortium of companies. The primary role of the concessionaire is to finance and develop

the project. In order to achieve this they source funds from sponsors and lenders. Then there is a contractor that builds the facility which is managed by the operator.

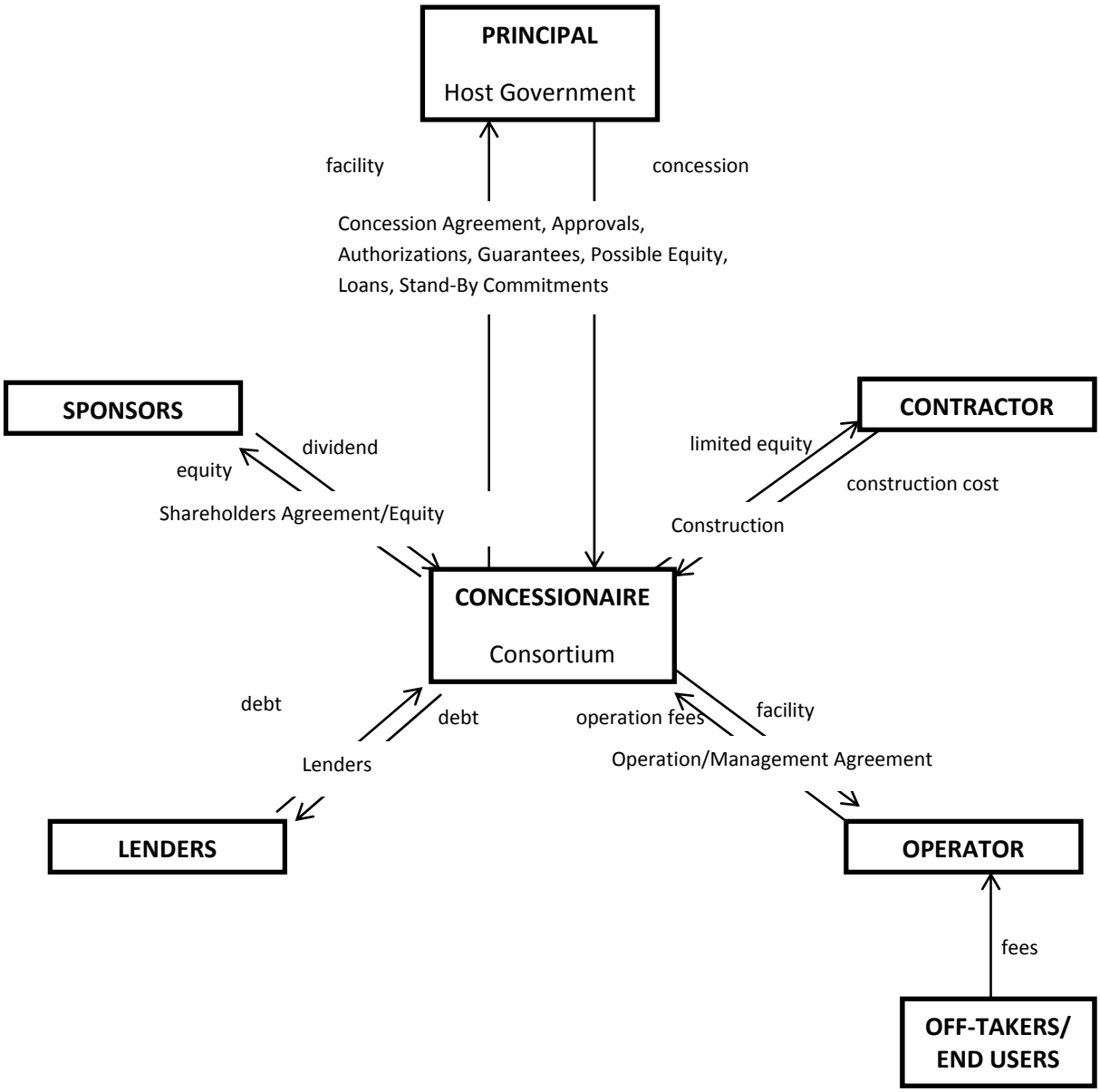


Figure 2 Stakeholders in a BOT process (Source UNIDO, 1996)

2.1.1 The Principal

Depending on the Integrated Development Plans of the country, the host government or its designated agency decides on the need for the infrastructure investment and its scope. It then defines the design, performance and maintenance of the project so that it is tailored to the country's objectives that would set them in the desired growth path. Then the government solicits proposals from private entities via a competitive or negotiated tendering system if the government does not

have the resources to finance such an initiative or if they want to improve efficiencies. Private companies may also submit unbinding unsolicited proposals to develop targeted infrastructure projects depending on the BOT law of the country if they have identified a potential gap in the provision of infrastructure developments. Once approved the private entity is granted a concession ranging between ten and fifty years, after which ownership of the facility and assets is transferred to the government in a pre-defined condition. It should be noted that in some instances the government provides some of the financial backing to the project through guarantees or subsidies as a way of attracting private investors and making the business prospect more viable.

2.1.2 The Concessionaire

The concessionaire comprises a group of strategically selected companies that collectively undertake the responsibility of financing, designing, constructing, operating and maintaining the infrastructure project. It is the onus of this special commercial vehicle to ensure that they recover their investment and earn profits from the project during the concession period while they are still in possession of the rights to the facility prior to its being transferred to the government.

2.1.3 Investors (Shareholders and Lenders)

Like in any other major infrastructure development, the success of any BOT infrastructure development greatly depends on the availability of credible and capable investors to provide the much needed financial resources. The investors comprise shareholders who infuse funds into the project in exchange for equity. Of these shareholders, there are two main categories, namely those that are directly involved in the execution of the project such as contractors, operators or even the host government itself and those that are solely involved as equity investors such as public shareholders or other institutional investors.

The second form of investors comprise lenders who provide a credit facility to the consortium dependent on the negotiated guarantees and credit enhancement negotiated by the consortium with the principal to make the project more appealing to lenders. These lenders usually comprise commercial banks, insurance companies and multilateral lending institutions. The projects can be made more appealing to private lenders by reviewing the main contract documents to assess the risk allocation and the impact it will have on the credit ratings. There have been challenges in attracting this form of debt finance since most debt financiers have modelled their business models around short term finance and the repayment terms on a BOT project can take up to 20 years. Tax incentives for this type of finance has its own limitations, for example in a country like Australia, tax exempt infrastructure bonds are only available to limited types of infrastructure such as land transport, seaport and electricity generation but these tax exempt are not available to water and health care projects. (Kouassi, 2009). In large projects there is usually a syndicate of banks providing

the debt funds to the Sponsor after requiring security over the infrastructure created. The same banks or even a different bank would then provide a stand-by credit facility for any cost overruns not covered by the construction contract. (Kouassi, 2009).

2.1.4 The Contractor

Due to the magnitude and complexity of BOT infrastructure projects, the consortium would source the services of a contractor to execute the construction of the project: in some cases the contractor is part of the consortium. The contractor could be a Joint Venture of strategically positioned contractors. The contractor also engages subcontractors, suppliers as well as consultants.

2.1.5 The Operator

Once the construction of the infrastructure facility has been completed, the concessionaire then appoints an operator to manage and operate the facility. It should be noted that in some instances the operator is one of the entities in the consortium. The choice of an operator is dependent on their intimate knowledge and experience in the local business environment. According to Kreydieh, (1996) the contract between the contractor and the project company is usually a fixed-price design build contract so as to limit some of the risks such as the completion delay risk. In order to facilitate financing, the contractor takes responsibility of the design by assuming risks for longer period of time as opposed to standard construction contracts of shorter concession life.

2.2 Risk Identification

Flanagan and Norman (1993) define risk identification as involving the determination of the source and type of risk. Williams (1995) states that risk identification is the first and most important step in the risk management process, since this entails identifying the origin and nature of risk. According to Flanagan and Norman (1993), once a risk has been identified it ceases to be a risk and becomes a management problem. A systematic approach to risk management has been shown to enable early identification of risks according to Dawood (1998) and this eliminates the need to have contingency plans for almost every eventuality.

More recently, there has been a greater need to take cognisance of political risk triggered by such events as the Tunisian revolution, the political revolutions sweeping across the Middle East, and the emergence of international terrorism as a major concern in the process of international management as attested by Stephenhurst (1995). Even though there is no clear definition yet as to what constitutes a political risk according to Zonis (2000) it has been defined as the “uncertainty that stems, in part or in whole, from the exercise of power by governmental and nongovernmental actors.”

Risks specific to the entire construction industry have been classified into three broad levels according to Hastak and Shaked (2000). These levels are the country level, market level and project level. At a country level, monetary and fiscal policies are a means of controlling the economic stability of a country as well as its capability to absorb economic shocks such as foreign exchange rate depreciation. The market level risks are identified as technological advantages, especially for foreign companies over local competitors, the complexity of local regulatory processes as well as the availability of construction resources. Project level risks are identified as the risks that are specific to a particular project or construction site such as site safety and adherence to environmental regulations, quality control, logistic constraints and design changes.

Another form of risk classification is into the three categories of socio-economic factors, organisational relationships as well as technical problems. (El-Amm, 2003). The socio-economic factors include elements such as environmental protection, which creates uncertainty in the construction industry, particularly with the recent environmental protection legislation in South Africa which results in the inability to know exactly what is required and how long it will take to get approval from regulatory agencies (Sowman et al. 1995). Public safety regulation also creates uncertainty due to the ever-changing guidelines during the different phases of the project which adds ambiguity to the schedule and budgeted cost. The economic conditions of the international market, with recessions resulting in high interest rates and inflation also create a level of uncertainty (Levitt et. al. 1984).

Organisational relationships take into account elements such as contractual relationships, attitudes of participants as well as communication. Due to the fear of litigation, communication and cooperation between the parties is often undermined (Levitt et. al. 1984). Even though Levitt et. al (1984) do not provide any substantiated evidence to attest to this, Wikforss and Lofgren (2007) carried out a substantial survey of the construction industry in Sweden and conclude that improvement in project communication may change the organisation of future projects They also state that it may help enable just-in-time deliverables and lead to a more industrialised and rational business process which is what the construction industry strives for.

Technological problems could include design assumptions that have worked well for the profession in the past but have recently become obsolete in dealing with modern projects that might have greater complexity or scale. Subsurface site conditions also present a significant level of uncertainty. Construction procedures may have to be altered during the course of construction due to some unforeseen factors as such necessitating the need to modify the design after the construction process has begun. (Levitt et. al. 1984)

With regard to Build Operate and Transfer (BOT) projects, a study was carried out to determine the risk perception of major stakeholders in Indian BOT road projects. The study by Thomas et al. (2003) looks at how stakeholders evaluate the risk criticality, how they perceive their risk management capability, how they prefer to allocate and share risk, as well as the factors influencing the acceptance of risk. The study covers participants such as government officials, lenders and consultants and from this; eight types of risk were identified with the risk of traffic revenues being identified as the most critical of them all.

Based on the review of literature, some of the major types and sources of risks that a concessionaire needs to consider before embarking on a BOT project include the following: country risk, which could be brought about by unstable governments and inadequate foreign reserves (Clark and Marois, 1996); financial risks, due to incorrect financial assumptions and packaging, inadequate cash flow and poor feasibility studies (Wiguna and Scott, 2006); construction risk, in the form of poor design report, prolonged construction schedules as well as changes in the factors of production. (El-Amm, 2003). There is also the risk of the inadequacy of the concession contract, this is as a result of major contractual terms and conditions having not been included, an exit clause not having been done or having not provided for variation according to time or economic condition. (Maniar 2010)

Other risks the concessionaire needs to consider include: shareholder risks, which could stem from unsupportive shareholders or disagreement between shareholders; market risk, in the form of a change in market trends or consumer preference; changes in key management personnel as a result of poor working conditions and benefits, and lastly, operational and management risk which could be due to unreliable operations and maintenance teams, poor machinery and equipment installations as well as poor technical feasibility reports and design. (Maniar 2010)

Much of the risk management literature tends to focus more on the political, economic and legal elements of the environment as potential sources of risk in global business. As a result this pushes the significance of cultural risk to the periphery of the body of knowledge on the issue of risk. According to Raval and Subramanian (2002) the reason for that could be because the risk in those other areas is more profound and visible in comparison to cultural risk which is more difficult to identify and even harder to assess.

The initial step in risk management entails identifying the different forms of risks that the project team could come across during the duration of the project. It is important during this identification process to understand the composition of each risk as well as the common causes of such. The understanding of the causes for failure and the description of the various risks is a prerequisite for an efficient risk management framework.

In the context of construction industry, risk could be the likelihood of the occurrence of a definite event or factor, or a combination of events and factors which occur during the whole process of construction to the detriment of the project (Faber, 1979). Different authors have categorised construction risks in various ways for different purposes. Songer et. al. (1997) categorise construction risks broadly into external and internal risks. Other authors such as Shen et al. (2001) categorise them into political risk, financial risk, market risk, intellectual property risk, social risk and safety risk. For the purpose of this research, the classification used shall be that of Hastak and Shaked (2000) whose classification of risks specific to the construction environment entails three broad levels, which are: Country, Project and Market levels. The reason for selecting this classification is that it was found useful in portraying the influence of one risk on the others and in prioritizing the mitigation measures for each of the risks.

Hastak and Shaked, (2000) developed a comprehensive model in the form of the International Construction Risk Assessment Model – I (ICRAM-I) which analyses risks of working in international markets in three levels being macro level, market level and project level. Since BOT scheme development projects involve international companies, this model is best suited for this particular study. The macro/country risk outlines the general risk that an international investor is exposed to when engaging in operations in any given country. The market risks are those risks associated with a specific international construction market which can also be impacted by the macro level risks. Project level risks are risks associated with a project in that particular international construction market. (Hastak and Shaked, 2000).

2.3.1 Project Risks

According to Thobani (1999), project risks are those risks that are specific to a particular construction site. It includes such things as logistic constraints, improper design, site safety, insufficient quality control and environmental protection. According to El-Amm (2001), project risks can be further divided into three categories dependent on the different stages of the project cycle, which is because every stage faces unique challenges.

Development Risks

Development risks are risks faced by the concessionaire after the award of the contract, but before construction commences on the project. At the beginning of the BOT scheme contract, sponsors put forth venture capital to get the project started. These funds are put forth without a full understanding of the challenges that might arise before construction commences such as land acquisition, approvals of Environmental Impact Assessments and the credit worthiness of the other project sponsors (El-Amm, 2001).

Land Acquisition

The acquisition of land for BOT development schemes can be a complex process. In most instances the host government holds title to the land required to develop the BOT infrastructure, but this is not always the case. There are instances where the land can be owned by private entities. Every country has its own provisions in terms of the legislation regarding land rights and how the government leases the land out to concessionaires. Ideally what happens in a BOT scheme is that consultants are engaged to identify the land that will be required for the infrastructure and together with the government entity establish the value of the land. (Stock, 2004)

The acquisition of the land can be carried out by the government or it could be made the responsibility of the concessionaire as delegated in the BOT contract agreement. If the land acquisition is made the responsibility of the concessionaire, then it is up to the private entity to negotiate with the land owners the selling price of the land. Should the agreed selling price be more than the initially agreed assessed value by a certain percentage depending on the contract document then the concessionaire is entitled to recoup the extra cost through provisions in the contract. (Colombian National Road Institute, 1990)

In some instances the government is tasked with the acquisition of the land which is highly favourable to the concessionaire since the government binds itself contractually as to the provision of the land by a certain date, failing which the concessionaire has to be compensated for the delay. Once the land costs are agreed with the owners then the concessionaire pays the land owners through a trust fund specially established for the development of the project. (El-Amm, 2001)

Environmental Impact Approvals

The risk of environmental approvals is two sided; the initial risk comes from the delay in the approval of the Environmental Impact Assessments which would then lead to a delay in the commencement of the construction stage. (Fan, 2005). The South African Department of Environmental Affairs and Tourism developed a user guide based on the National Environmental Management Act 107 of 1998 which gives clarity on how the NEMA act should be interpreted and outlines the processes that the relevant parties need to follow in order to comply with the act. The guidelines can be applied to instances such as when anyone including government causes significant pollution (including radioactivity, noise, heat, harmful substances and waste) or environmental degradation through construction or service provision. NEMA ensures that proper Integrated Environmental Management procedures are followed since this could lead to the risk of delays in commencing construction.

In addition to compliance with NEMA act, if the proposed construction has a possibility of a detrimental impact on a water resource then a water use license has to be applied for and obtained under the National Water Act 36 of 1998.

The other aspect of risk regarding environmental issues has to do with the effect it could have on the funding of the project. Organisations such as the World Bank have stringent rules to ensure that they only fund sustainable development projects that are also environmentally sound. (World Bank, 2008).

Creditworthiness

The risk of creditworthiness entails the ability of the project sponsors to raise capital through debt and equity in the financial market. The credit ratings of institutions, be they government, parastatal or private, are provided by credit rating agencies such as Standard & Poor as well as Moody's. On the 4 May 2012, Moody's downgraded SANRAL's long and short term issuer ratings according to the Moody's Global Credit Research dated 04 May 2012. This has led to SANRAL's ratings outlook remaining negative. This was brought about as a result of SANRAL's very high debt levels, uncertainties over Gauteng e-tolling operations, expenditure pressure for maintenance of existing infrastructure and large debt exposure which is only partially guaranteed by the South African national government. (Moody's, 2012)

The creditworthiness of SANRAL could be improved by the stabilisation of the South African government bond ratings which have had a negative outlook due to concerns over South Africa's deteriorating operating environment. (Moody's, 2012) BOT project credits could also be improved by an active and affirmative intervention by the national government by issuing minimum annual guarantees that reduce traffic risks or through shadow tolling. (Kouassi, 1999)

The lack of the said guarantees and the negative credit rating of sponsors, host government or actual projects could lead to a high cost of capital, hence impacting the viability of the project. Thus the consideration of creditworthiness is a significant risk factor.

Construction Risks

Construction projects all have an inherent universal predicament in the form of insufficient information at the beginning of the project. The same problem applies to BOT scheme projects, yet sponsors and contractors have to provide cost estimates, designs, schedules and method statements for construction techniques at the development stages of the project in order to meet their contractual obligations. At the beginning of the construction process, the project faces challenges in

the form of differing site conditions, poor performance of contractors and suppliers as well as other engineering difficulties. (Holland, 2002)

In some cases the contractor might be a foreign company working on an international project only to find that the local manpower lacks the necessary skills, which might lead to the need to establish technical training institutions as was the case with the Bombela Consortium in setting up training institutions for their cadet foremen in the Gautrain project. An amount of about R23 million from the National Skills Fund was allocated to the Gautrain Project for training. This training initiative is over and above the training undertaken by the Bombela Consortium as part of their commitments under the Concession Agreement. (Gautrain, 2008)

Despite the detail of the geotechnical exploration for any particular site, the actual site conditions are usually found to be different from what was initially estimated. This could pose a significant challenge especially in a fixed cost contract; more so if there were no renegotiation terms incorporated in the contract. According to El-Amm (2001), the cost overruns in fixed cost contracts for BOT projects are primarily covered by the project sponsors.

Due to the fluctuating prices of commodities in the open market, the price of building materials is usually not consistent with the estimated cost. Thus it should be established at the beginning as to which materials and machinery could be imported for the project considering possible embargoes for political reasons as well as import quotas for that particular host country. (Kreydieh, 1996)

In the event of cost overruns during the construction stage, the private investors have to contribute additional capital in equity because lenders are unwilling to provide loans that have claims on non-existent assets. This was the case with the Guangzhou-Shenzhen road project in China where an additional $700 million was required due to cost overrun and the capital was raised through equity since the government had approved an increase in the profit sharing during the first ten years of operation. (El-Amm 2001)

Operational Risks

According to Kilvington (1996) the operator must have the financial and technical expertise to operate the project in accordance with the cost and production specifications which form the basis for the financial feasibility of the projects. The risks associated with the operation stage of the contract are as discussed below.

Due to the long duration of a BOT scheme contract, Pahlman (1996) identifies project sustainability as one of the probable risks in the operation stage. This is because the project might have reached its design life by the time it is transferred to the host government. The risk is more apparent in toll

road projects because the usual pavement design life is 10 – 20 years whereas BOT concession periods are usually 15 – 20 years. Thus private investors have little or no incentive to ensure long term sustainability of the project after transfer unless if they are compelled by the legal framework. (Pahlman, 1996).

BOT contracts are executed over a long period of time and there can be a lot of uncertainties over this period of time regarding demand volumes which could result in the risk that the project does not meet its revenue projections. This risk hinges on both the price and demand in the sense that any future fluctuations in the price or changes in the demand of the service will affect the revenue levels and hence the profitability of the project. The risk as a result of this uncertainty is borne fully by the sponsor or shared with the government in projects where the government has provided minimum traffic and revenue guarantees. (Kouassi, 1999)

This risk is significant due to lack of credible forecasting methodologies: despite their recent sophistication there is still an issue with the poor quality of the input parameters. For example, in transport projects the initial traffic forecast could be over optimistic as a result of poor assumptions or neglecting to take into consideration the availability of alternative routes which would then result in income tolls falling short of the initial cash flow projections. (Kreydieh, 1996)

To emphasise the extent of the errors in traffic forecasts, according to Muller (1996), of the fourteen roads researched in the United States for the J.P. Morgan report only two experienced traffic levels greater than those predicted whereas the other twelve had traffic levels between 20% and 75% less than predicted. The M1 Motorway in Hungary only attracted half the expected volume in its first year and the Mexican toll road concessions only experienced traffic volumes amounting to one fifth of the forecasted levels. (PPIAF, 2006)

According to Beidleman (1990), off-take agreements could give lenders some form of security in such instances since loan repayments will be assured despite the fluctuating market demand. An off-take agreement is the agreement between the government agency and sponsor under which the government agency agrees to purchase the output of the infrastructure at agreed prices and volume, the output could be water, health services or electricity (Kouassi, 1999). The government of Malaysia made an undertaking to the concessionaire for the Malaysian north-south highway to provide additional finance to the concessionaire should it be that there is a drop of volume in comparison to the forecast levels for the first 17 years of operation (Walker, 1995). In the case of the Channel Tunnel the two governments of Britain and France promised the concessionaire Eurotunnel that there would be no fixed link across the English Channel before the year 2020 so as not to undermine any future return on investment until then.

Ogunlana (1997) goes on to give an example of two roads that were constructed between 1994 and 1998 in Thailand in agreement between the government and two separate entities despite the roads running parallel to one another. One of the sponsors eventually went bankrupt after unsuccessfully claiming for damages since the second road also under a BOT agreement hurt their business. The government had also promised to provide flyovers to allow radial movement of traffic towards their road and this was also not delivered for more than two years while at the same time the government prevented them from increasing the toll, leaving toll revenues 30% less than expected.

2.3.2 Market Risks

Market risks are the significant elements that could affect the general macroeconomic variables in capital markets across all industries in a particular country. These are more profound in emerging markets since they are well known for the mismanagement of taxation and monetary policies which could result in a negative effect on BOT scheme projects in those particular countries. The macroeconomic risks that will be considered are: foreign exchange risk; currency devaluation risk; currency inconvertibility; interest rate risk; and inflation risk.

Foreign Exchange Rate Risks

The net cash flow of projects is affected by the fluctuation of the exchange rate during the construction phase of the project as well as the long operation stage. According to Ghersi and Sabal (2006), the imbalance between revenue and expenditure has a significant bearing on the impact of the foreign exchange risk especially on strong reference currencies such as the US dollar.

The Bretton Woods system which was used until the early 1970s worked in such a way that traders knew the value of the transaction before concluding a deal. But since the abandoning of the Bretton Woods system, foreign exchange rates have become volatile under the influence of such factors as the country's monetary policy, political situation, balance of payments, Interest rates, market judgement and speculations. These random exchange rate fluctuations may affect the interest payment or other income streams received on a foreign currency-denominated asset.

In emerging economies there is always the risk of what is known as the "exchange rate lag". This occurs when there is a significant disparity between devaluation and inflation rates. If the local currency is devalued at a much slower rate than the difference between the domestic inflation and that abroad, it results in a monetary overvaluation which gives an advantage to those institutions with any debts in foreign currency.

Ghersi and Sabal (2006) further state that balance sheet items such as assets and liabilities are affected by exchange rate fluctuations unequally, thus there should be constant and timely

adjustments to both the items of revenue and expenditure as well as assets and liabilities in different currencies.

Currency Devaluation

According to Bing et al. (1999), fluctuations in currency should be considered as one of the significant problems in international transactions. As such, investors in BOT scheme projects must be constantly conscious of existence of currency devaluation risks since the inflow of funding from international banks and foreign companies can create volatility in the host currency exchange rates.

The problem of currency devaluation such as the one experienced in the late 90s in South Africa could pose a significant challenge for BOT scheme projects. This becomes more profound for the international project sponsors if the loans for funding the project were issued in their home currency and during operation the currency of the host country in which the revenues are collected is devalued. This could result in debt servicing becoming very expensive for project sponsors.

According to Astache et al. (2000), many BOT scheme projects were negatively affected by the lack of an adjustment for currency devaluation with regards to toll road calculation formulas. This matter was henceforth addressed in a project in Peru, whereby the concessionaire negotiated for a devaluation adjustment formula to be incorporated in the concession contract as follows:

$$P_t = P_{t-1} \times (1 - CPI_{t-1}) \times [1 + \beta(d_{t-1} - CPI_{t-1})]$$

Whereby

P_t = the toll level adjusted for devaluation and inflation in the national currency for the period t.

P_{t-1} = the toll level in the national currency for the period t-1.

CPI_{t-1} = the Consumer Price Index in the period t-1.

d_{t-1} = the devaluation with respect to the sponsor foreign currency in the period t-1.

β = a variable between 0 and 1 negotiated between the government and the concessionaire and representing the fraction of the difference between devaluation and inflation that should be passed through tolls.

According to Astache et al. (2000), the toll level is thus adjusted for devaluation and inflation every six months using indices published by the National Statistics Office of the host country.

There are several ways of minimising the impact of currency devaluation risks: one of the methods used by foreign firms is to use a process of hedging currency fluctuations in international money markets, a process that has been found to be ineffective according to Wang et al. (2000). The other method would be to enter into an agreement with the host government to agree on the currency

that would be used for payment. It has been found that it is advisable for the concessionaire to sign a dual currency agreement with the host government so that local and foreign currency can be used for transactions. (Wang et al. 2000)

The other preferred method to mitigate the currency devaluation risk is to finance the project in local currency. The host government could also provide guarantees to mitigate the situation should there be a currency mismatch during the implementation and operation stage of the project. (Bokharey, 2010)

Currency Inconvertibility

Another risk to be considered has to do with the repatriation of revenues generated in the host country back to the home country of the investors (Kreydieh, 1996). Concessionaires have to take into account the measures put in place by the host government regarding the flow of funds in and out of the country. This restriction can be in the form of an active blockage or a passive blockage. An active blockage entails a complete and non-negotiable ban on repatriation of local funds to outside the country. Countries with an active blockade are not very attractive to investors; hence most countries opt for a passive blockade which entails putting in place bureaucratic obstructions to deter investors from repatriating their funds. This can be in the form of a tax deterrent whereby investors are charged a progressively increasing tax rate relative to the amounts of revenues repatriated.

According to Nickesen and Stanfield (2000), this risk was very critical in China where the government has a legal and regulatory framework that discourages investors from sourcing funds from the international money market. This resulted in a shortage of foreign funds and to mitigate this problem, expressway development companies bought existing highway assets with high traffic flows and a stable income. Then stocks were issued by those companies through initial public offerings in the domestic equity market with the proceeds from the sale of those shares being used to finance new projects.

Interest Rate Risks

This has to do with the interest rate on borrowed funds. It is affected by the prevailing commercial interest rates as well as inflation; this is the reason why it is also influenced by the general status of the economy. Cash flows and equity can be negatively affected by fluctuations in interest rates. (El-Amm, 2003)

The interest rate risk could affect the project in the sense that financial institutions can be reluctant to commit to long term rates hence impacting the ability to finance the project through debt. When interest rates are highly volatile, savings banks may end up with long term, low rate loans to

developers that have to be financed with high rates and volatile short term funds. As a result of this banks are reluctant to provide such a loan, as it might lead to a financial crisis. (El-Amm, 2003)

The difference between the interest rate on a bond and the rate of a treasury bill with the same maturity is known as a credit gap. (Ghersi and Sabal, 2006) The credit gap can be used to measure the borrower's credit risk. Modern international financial markets have instruments for managing the interest rate risk associated with the credit gap.

Inflation Rate Risks

The inflation rate represents the general price level in the economy, which has a bearing on the interest rates and toll rates. The volatility of commodity markets can affect the balance sheet items to such an extent that they could put at risk the equity base (Spackman, 2002). In order to mitigate this there should be a constant adjustment by the concessionaire to the composition of assets and liabilities.

Generally concessionaires allow for inflation in the cost estimates to be adjusted during the construction stage and also during the operational stage: concessionaires are allowed to increase toll levels in line with inflation. As a result of this, inflation ideally should not have a significant threat to the project unless there is an unexpectedly high inflation during the construction phase followed by decrease in the inflation rate during the operating stage of the contract. (El-Amm, 2003) This is highly unlikely in South Africa, given the inflation targeting measures of the South African Reserve Bank as part of the country's fiscal policy which specified an inflation target on the basis of an average annual rate of increase of between 3 and 6 per cent. (van der Merwe, 2004)

2.3.4 Country Risks

Country level risks are as a result of the interrelation between the political and macroeconomic stability of a particular country. (Clark and Marois, 1996). They can manifest in the form of government expropriating property, restricting trade and foreign currency exchange. The macroeconomic aspect of the country risks include the country's vulnerability to economic shocks such as the current economic downturn as well as the country's stance on fiscal and monetary policy, for example the South African Reserve Bank's inflation targeting to try to maintain national inflation between 3% and 6%. According to Wang et al (2000), political risks can be defined as government initiatives that may negatively impact on the project. These are recognised as actions taken at any level of governance, be it national or provincial government. In their research they dissect political risk into five categories, being: change in law; corruption; delays in approval; expropriation; and reliability. There is another country specific risk in the form of *force majeure* risk

which has to do with circumstances that are beyond the control of the parties involved in the contract, be it the project sponsors or the host government. These risks include such things as natural disasters, wars, riots, embargoes and import and export restrictions.

Political Risks

The risk of change in law entails any modification or reinterpretation of the host country laws by any of the government authorities after the signing of the concession agreement. (Wang et al. 2000) It could also be in the form of a host country putting in place conditions for any approvals in the different stages of the contract that were not in place at the time of signing the concession agreement. The change in law risk could also be in the form of changes in government policies or laws and regulation, changes to policies dealing with inflation, e.g. inflation targeting, regulation with regard to the expropriation of domestically generated revenue, taxation as well as approval methods for setting electricity tariff such as the recent process by NERSA to consult with stakeholders in view of South Africa's power utility company Eskom's request to increase its tariffs by 16%. (NERSA, 2012).

Corruption risk stems from government officials and representatives soliciting or receiving unlawful compensations in order for them to use their influence or positions of power to award a contract or influence the outcome of an approval process. (El-Amm, 2003) Many companies consider corruption as unavoidable particularly with regards to projects in developing countries such as South Africa. The problem with this is that the money spent on those commissions to government officials can never be recouped by the sponsor. According to MacDonald (1997) it could present a risk of spending too much money in the wrong places or at the wrong time, which might affect the project cash flow. This could also result in another government agency turning against the project developer and the project such as the Competition Commission and other agencies investigating economic corruption cases. (El-Amm, 2003)

The risk of delay in approval entails the risk faced by the concessionaire in terms of getting approvals for land use or approvals by government environmental agencies. The delay in approvals could be from the different levels of government, being the national government or the provincial government. (Kreydieh, 1996) In South Africa the inception of the National Environmental Management Act (NEMA) is seen by contractors as a stumbling block that could lead to delays in getting environmental approvals. (Strategic Environmental Focus, 2012) One reason for this is that one may need approvals from different organs of government; for example in order to mine sand from a river bed, one needs approval from the Department of Environmental Services as well as the Department of Water Affairs and Forestry. (National Water Act 36 of 1998) This could lead to serious delays and time consuming processes including even litigation as was encountered by the author at

the Medupi Power Station in Limpopo, whereby the sand supplier only had a mining permit from the Department of Environmental Management but not a water permit from the Department of Water Affairs and Forestry since they were mining on a flood plain on that particular river.

Another political risk faced by concessionaires is that of expropriation. This is when a government expropriates an asset built by a private entity without any sufficient compensation. (El-Amm, 2003) Expropriation can be in two forms; the first one is that of nationalisation, which is a rare occurrence. (El-Amm, 2003) This entails the government taking over an asset "blatantly", instantaneously and without any consultation. (El-Amm, 2003) The other common type of expropriation is when the government introduces new laws regarding taxation once a project is complete and entering the operation phase, which could gradually undermine the operating profits of the concessionaire and eventually the government, would take over the project or facility. (El-Amm, 2003)

Force Majeure

A *force majeure* risk denotes an event that could occur outside the control of the parties involved in the contract. This event could include such things as wars, earthquakes, floods, fires and storms. All core contracts of any infrastructure project including BOT contracts will have a *force majeure* provision. A *force majeure* clause provides that in the event that a party to the contract is unable to perform its obligations due to the occurrence of such an event, then that party's obligation shall be suspended for the duration of that event. Independent of the terms of the construction contract, a *force majeure* event will increase the sponsor's end cost to complete the infrastructure because the extended term of construction will increase interest costs of the project borrowings. Furthermore, if interest is capitalised for the project borrowings, it may have a dramatic effect on the economics of the project, because these costs are compounded. (Kouassi, 2009)

2.4 Risk Analysis

The element of risk analysis comprises examining and thinking through threats to be faced by the organisation, then evaluating the probability and cost of their occurring. Risk analysis forms the basis for risk management and crisis prevention according to Kouassi (2009), with the emphasis being on cost effectiveness.

A simple method of risk analysis comprises analysing the risks in a particular project independently of each other. In this method there is no attempt to estimate the probability of occurrence of that particular risk. The estimated effects of all the different risks are compounded to come up with a total project outcome value. (Hsiao, 2000)

In order to attain a more realistic picture of the risk profile of a project, then an alternative approach can be used which is more complex and provides results with a confidence level much superior to that of the basic method outlined above. In this method the probability of occurrence, as well as the inter-dependencies of the different risks, are considered. As attested by Smith, et al. (2006), there are numerous techniques that can be used for this process. The selection of the appropriate technique should be dependent upon the type and size of the project, the information available, the cost of the analysis, the time available as well as the experience of the analyst. There are two predominant types of methods used for risk analysis, namely qualitative and quantitative risk analysis.

2.4.1 Qualitative Risk Analysis

In qualitative risk analysis the identified risks are prioritized in terms of their likelihood and impact on the project objectives (Burtonshaw-Gunn, 2009). According to PMI (2004), it lays the foundation for quantitative risk analysis and risk response planning. As a result of these characteristics, it is featured as the most useful part of the risk management process by Smith, et al. (2006). Tools and techniques for qualitative risk analysis include probability and impact matrices (Dallas, 2006). Inputs for this phase are a risk register, data about risks on past projects and the lessons learned, whereas the output is an updated risk register (PMI, 2004). It should be noted that the experience of BOT scheme projects in South Africa is limited in comparison to the more developed countries due to the brief history with this method of project finance.

Probability Analysis

The probability analysis works by means of specifying a probability distribution for each risk and then the effects of these risks is considered in combination. (Hsiao, 2000) From this analysis a range of values are produced as a result within which the final outcome could lie. Of importance in this stage of the process is assessing the range of probabilities within which the possible outcomes of a given process may occur.

It is worth noting that PMI, the NEC3 and other advanced Project Management methods stress the importance of continual risk analysis and management throughout the project cycle, learning from experience and capturing changes in external factors.

2.4.2 Quantitative Risk Analysis

The major objectives of BOT infrastructure development projects are to achieve value for money as well as gain efficiency, both of which are measured in monetary terms. The main objective for a private entity is to make financial profit; therefore it is critical to quantify the effects and impacts of

risks in monetary terms when carrying out a risk analysis for a BOT project (Dey & Ogunlana, 2004). Quantitative risk analysis involves evaluation of the consequences associated with the type of risk, or combination of risks, and assessing the impact of them by using various risk measurement techniques (Flanagan and Norman, 1993). The key purpose of quantitative risk analysis is to combine the effects of the various identified and assessed risk events into an overall project risk estimate. Risk analysis is conducted by the use of computer models employing statistical data (Merna and Al-Thani, 2005). Tools and techniques utilized for quantitative risk analysis are sensitivity analysis, expected monetary value analysis, decision trees and, modelling and simulation such as Monte Carlo (PMI, 2004).

Sensitivity Analysis

According to Flanagan and Norman (1993), a sensitivity analysis is a modelling technique used to determine the impact of a change in the value of an independent variable on the dependent variable. The aim of the analysis is not to quantify risk but rather to identify factors that are risk sensitive. The sensitivity analysis provides an answer as to what the outcome would be should a probable event occur in an infrastructure development project. It would give an analysis, for example, of what would happen to the construction price should there be an acceleration to the programme or the construction period is reduced by 2, 3 or 4 months, or what the impact would be should there be an under estimation of future inflation projections.

A sensitivity analysis does not evaluate risks it terms of the probability of occurrence. The sensitivity analysis tests the different elements of the project that have an impact on the project outcome, thus enabling the project team to focus more attention on those with the biggest variables.

Decision Tree

Decision trees are tools that project sponsors can use to analyse and account for the different uncertainties in a project. (El-Amm, 2003) A decision tree is a chart that graphically compares a decision's possible choices to assess the risks inherent in different scenarios. It is called a tree because each choice is assigned its own branch, with possible outcomes branching in turn from each choice. After laying out the choices and outcomes on the decision tree, estimates are made of the probability that certain outcomes will occur and the resulting gains or losses. These estimates are combined to give each decision a risk score. Decision trees approximately quantify risk. Because the consequences of each decision are not known with certainty, the choice of the most beneficial decision and its value is typically calculated based on the values of each possible result multiplied by

the probability of that result. Thus, the standard presentation of decision tree analysis bases the decision on the expected monetary value (EMV) of the alternatives. (PMI, 2004).

See Figure 2.4 for an example of a decision tree

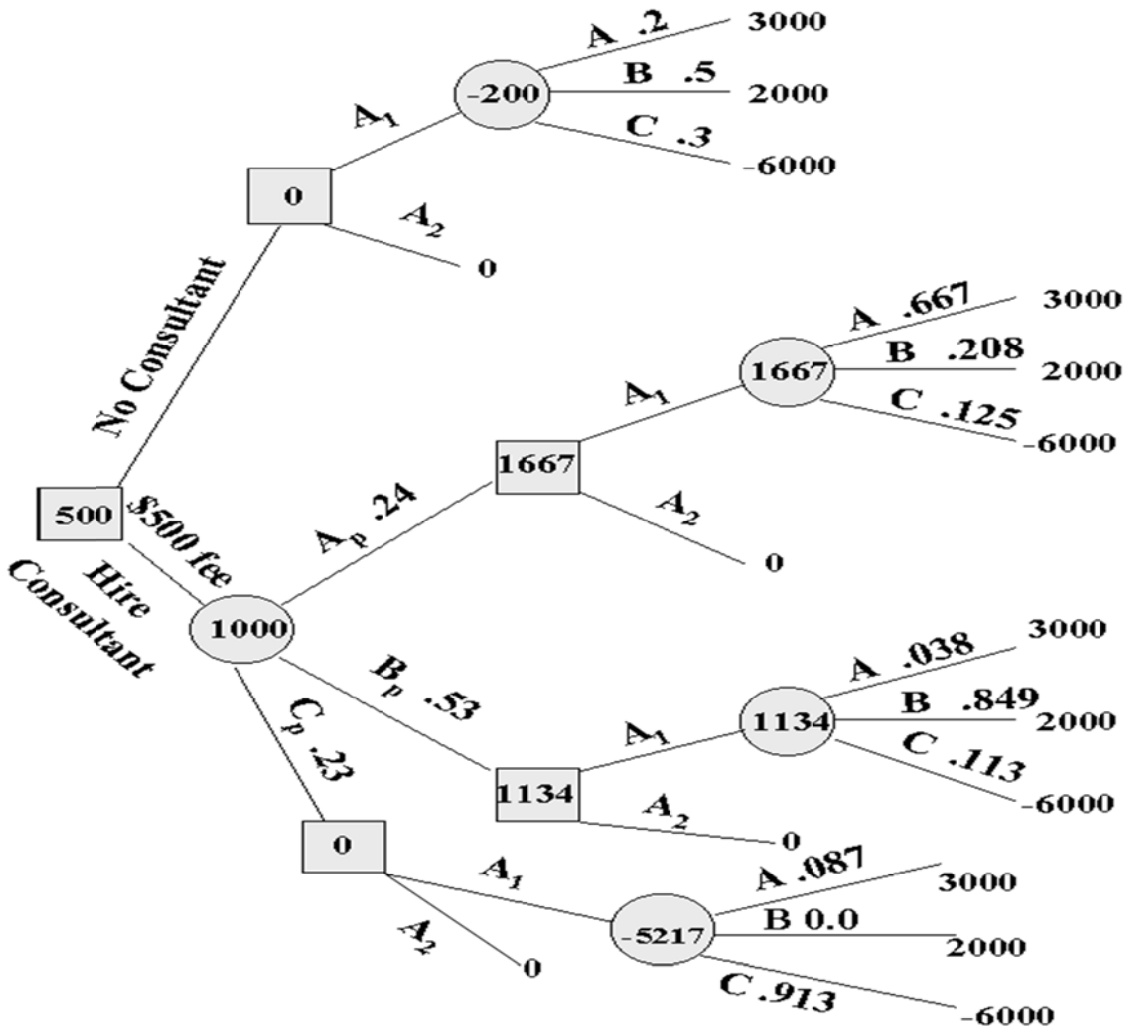


Figure 3 Example of a Decision Tree (Mitchell, 1997)

2.5 Risk Response

According to Hillson (1999), there are four alternative strategies that can be used to respond to risks, these are risk avoidance, risk transfer, risk mitigation and risk acceptance. Hillson (2001) goes on further to state that none of the risk management guidelines and standards he examined were suitable for dealing with positive upside risks/opportunities except for the British Standard BS 6079 Part 3, which recommends four categories for the 'risk treatment' phase, these are: eliminating or avoiding, risk sharing, reducing the possibility and reducing the consequence. (BS6079-3:2000) It should be noted that "risk sharing" strategy is the most relevant to the context of this study.

Avoidance

Risk avoidance is a risk response technique that seeks to eliminate any possibility of risk through taking steps to remove a hazard or the discontinuation of activities determined to entail any level of risk and engaging in alternative activities. It is usually used in extreme situations where the risk exposure creates an extraordinary liability potential.

Examples of avoidance entail the use of exemption clauses to avoid specific risks. (Hsiao, 2000)

Transference

Risk transference entails taking a specific risk from one party who does not wish to have this risk and passing it on to a party who is willing to take on the risk for a fee or premium. It should be noted that risk transference merely transfers the risk to a third party that will take responsibility for its management; it does not necessarily eliminate the risk. There are different modes of transferring risk to third parties which include guarantees, bonds and insurance. (Hsiao, 2000)

Contracts could also be used to transfer risks to third party entities, e.g. the use of fixed price contracts transfers the risk to the contractor provided there are no design flaws in which case the client will be left exposed to risk. (Kouassi, 2009)

Mitigation

Risk mitigation entails acknowledging that the particular risk cannot be done away with in its entirety, therefore it requires putting in place measures at the beginning of the project to ensure that the impact of the risk is minimised to an acceptable threshold and also to lessen the probability of the event occurring. (Kouassi, 2009)

The project team needs to be wary of the cost of implementing mitigating actions plans to ensure that they are warranted, by looking at the likelihood of occurrence and the significance of the impact should such an event occur. Examples of mitigating actions include putting in more resources or increasing the time allocation for an activity. It could also include doing more geological tests or opting for a less complex construction process. Lessening the impact of a risk could be in the form of an overdesign of components of the project, such as the base layer in road construction such that, should the lower layer works fail, then the impact will be reduced. (Bokharey et al. 2010)

Acceptance

There are some risks that the project team accepts cannot be done away with or be avoided; hence they are accepted as part of the project plan since the project team could not come up with a

feasible mitigation strategy. (Hillson, 1999) There are two methods of risk acceptance; active and passive acceptance. (ADEAK, 2010)

Active acceptance entails putting in place contingency plans that will be implemented in the event that the risk event occurs and either it has a high impact or the fall back strategy is not as effective as anticipated. There needs to be constant monitoring of warning signs that a risk event is about to occur, such as changes in government policies. Contingency plans include making allowances for additional funds, or allowance for additional time and resources should the need arise for them during the course of the project duration. (Hsiao, 2000)

Passive acceptance is when the project team adopts a *laissez-faire* approach to the risks incumbent to the project. This is when the project team does not put any contingency measures in place and decides to deal with the risk as and when they occur. It should be noted that putting in place corrective measures once a risk event has occurred has been found to be more costly than having put in place a contingency strategy that could be implemented should the risk event occur. (Hsiao, 2000)

2.6 Risk Attitude

Risk attitude refers to the way an individual or organisation choses to respond to certain uncertainties in a project that are of significant importance, the response of which is determined by the perception of those particular uncertainties. There are primarily three types of risk attitudes that have been identified, which range from risk aversion (being uncomfortable with uncertainty), to risk tolerance (having no strong response) and finally risk seeking (welcoming uncertainty). (Hillson, 2004)

Risk aversion describes individuals or groups that are uncomfortable when faced with uncertainty as is especially the case in the beginning of all BOT projects. They tend to have a low tolerance for ambiguity and they tend to seek safer alternatives and an immediate resolution when faced with a risky situation. This could be in the form of opting for a more conservative and generally used construction method. Risk aversion could lead to an overreaction in the face of risk due to the discomfort caused by threats to people with a risk adverse attitude. According to Hillson and Murray-Webster (1999), risk averse people tend to miss out in maximising on opportunities that presents themselves because they under-react to them and fail to put in place measures to fully harness the possibility of opportunity. This could be the result of focusing more on removing the threats.

Risk tolerance applies to situations in which individuals to a certain extent are comfortable with the prospect of uncertainties that exist as part of the project cycle. The advent of uncertainty in the form of a threat or an opportunity does not tend to have any significant influence on their behaviour. This *laissez faire* attitude towards risk can create challenges in the sense that it could lead to a failure in recognising the relevance of the risk impact in achieving the project objectives.

The risk impact of the threats or opportunities will be negative since due to the perception of risk no prior arrangements would have been put in place in case the risk event occurs. There also may not be any measures in place to fully harness opportunities that could present themselves hence they might be missed. (Jarett, 2000).

The amount of risk an organisation is prepared to tolerate varies according to the type of risk, the timing, the risk attitude and potential for reward. That is why some organisations are prepared to take on large risks in some areas and no risks at all on other areas. This is the reason why some clients might decide to overlap design and construction if they realise that the design team does not have sufficient design information at the beginning of the project. (RICS, 2003). The contingency allowance is in part a reflection of the tolerance level of risk. For example if the contingency allowance has been spent and the project is only half complete then the tolerance level will be low. (RICS, 2003).

Risk seeking individuals or groups have been found to be those people that are not afraid to take action; they tend to be content with the fact that there is a lot of information that is vague at the beginning of the project. They thrive in the environment of many unknowns so that when a risk presents itself they can be resourceful and put their skills to optimal use to resolve the situation. (Hillson,2004)

This possesses its own downfall in the sense that risk seekers perceive risk as part of their everyday lives and hence may overlook the need to implement preparatory measures. Also, since the thrill of facing those particular risk tends to outweigh the potential harm, it could be that some unwise decision might be taken that could eventually negatively impact the project objectives. (Shen, 2005).

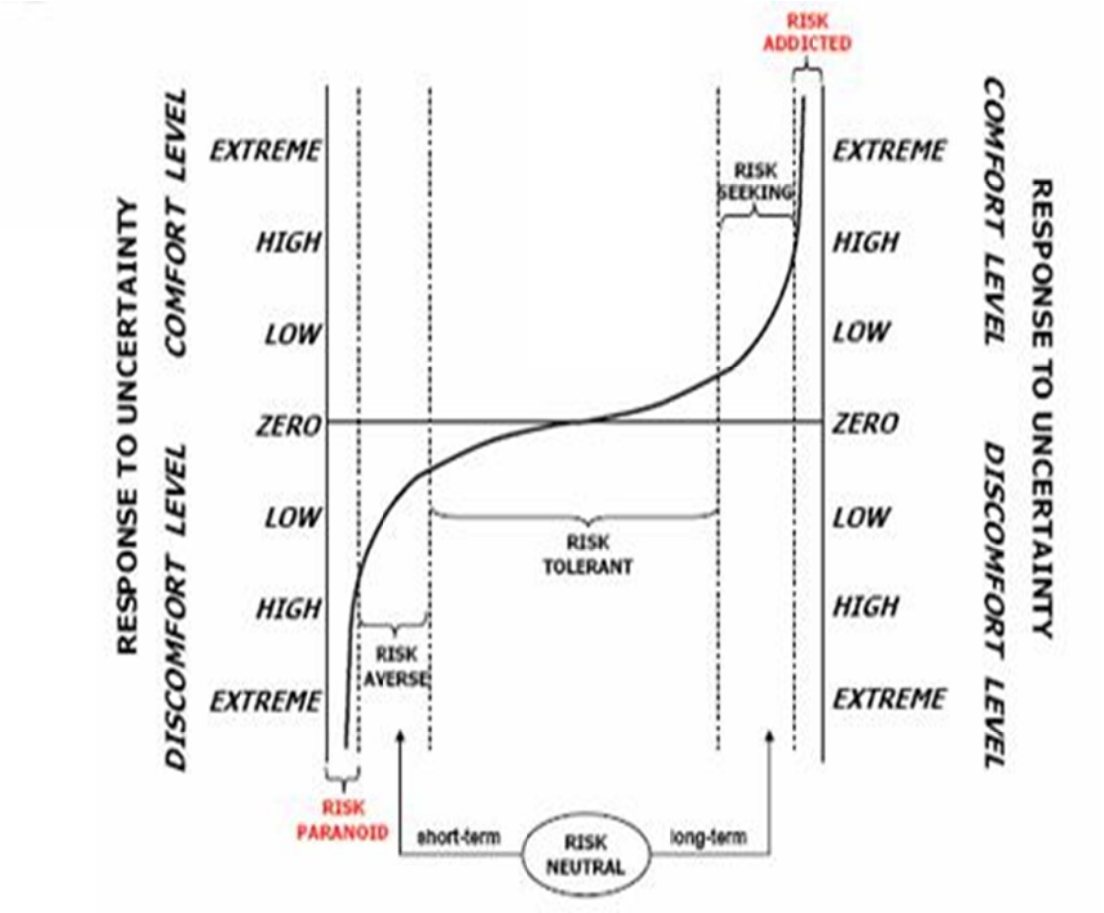


Figure 4 Spectrum of risk attitudes. (Source Hillson and Murray-Webster, 2009)

It should be noted that as much as individuals have a risk attitude which influences how they engage in the whole risk management process, there is also a risk culture which is applicable to a group that affects the way in which the group as an entity deals with uncertainties within a project. (Hillson, 2004).

BOT projects are inherently risky initiatives due to the nature of the complexity of the contractual agreements between the different parties as well the characteristic long period of those agreements. (Li. 2005). As such, project risk sharing is necessary because for the sponsor, a joint venture of one sort or another will have a limited worth being substantially more than the aggregate net worth of the equity parties. (Kouassi, 2009). Also according to Kouassi, (2009) each of the equity participants in the project have be content with the allocation of the risk, the creditworthiness of the risk taker and the reward due to the party taking the risk.

2.7 Risk Management in Standard Forms of Contract

Construction contracts are drafted such that they include provisions that protect the interest of the different parties. In most organisations the contract provisions are reviewed by the legal department

within the contracting entity. It is however important for all the key stakeholders to understand the intent and consequence of all the provisions included in the contract. Clough (1975) further states that contracting parties have to read carefully all contract articles before signing the contract in order to avoid any disputes and conflicts during the execution of the contract.

2.7.1 NEC

One of the key objectives when creating the NEC was for the promotion of good project management. The core terms endeavours to implement this by putting in place mechanisms and procedures that encourage the identification of the risk at the earliest opportunity. (Trowers and Hamlins, 2009).

The five key stages of Risk Management under the NEC comprise of Risk Identification which is noted as the responsibility of both parties to identify project risks by means of the early warning provision under core clause 16. The second and third stages is that of Discussion and Review provided for under clause 16.2 which stipulates for a risk reduction meeting to be held by the Contractor and the Project Manager. Other parties with decision making authority can also be invited. The provision under 16.2 is a reactive event, but at the same time it is preferable to have regular timetabled risk reduction meetings. The fourth stage is that of recording the decisions made at the risk reduction meeting and updating and agreeing on the risk register. The responsibility of the risks should also be allocated to the relevant parties to action. The last stage is that of action whereby the relevant parties have to report back on the next risk reduction meeting as to what actions have been taken. In the event that a risk cannot be avoided then a compensation event would be required but only as a last resort after following proper pro-active management of the risk. (Trowers and Hamlins, 2009).

2.7.2 FIDIC

According to Ugur et al. (2006) FIDIC examines the relationships between the employer and the contractor in detail: the risks are well defined in FIDIC conditions and also most of the risks are borne by the contractor. These risks include, but are not limited to, unfavourable ground conditions, strikes, weather conditions and shortages of labour and material. In general the contractor accepts all the risks that are not specifically borne by the employer. (Aljarosha, 2008). The employer's liabilities comprise what is termed special risks, which are described in Clause 17.3.

According to Murdoch (2003) FIDIC is more inclined towards providing for a total limitation of the Contractors responsibility which can be agreed at any level depending on what the parties wish: alternatively they can default to the contract price. Zhang et al. (2006) further state that their analysis of the risk allocation in FIDIC conditions of contract for construction shows that, while a number of risk allocation principles are theoretically correct, more realistic considerations should be

made of risk allocation in the construction contract, which include such things as language clarity and the contextual construction culture.

2.7.3 PMBOK

Risk is also defined as an uncertain event or condition that, if it occurs, has a positive or negative effect on the project objective. (PMBOK Guide, 2003). Kouassi, (2009) goes on further to state that the project risk management process outlined in PMBOK has a restricted focus in the sense that it is confined to the management of project uncertainty related to the down-side of occurrence.

2.8 Conclusion

Guidance from the literature for the research study shows that the BOT scheme and its variations is pursued by more and more governments across the world, especially in developing countries, with the aim of tapping into private funding to develop modern facilities that will lead to the development of specific strategic regions that would have otherwise been stifled by lack of infrastructure and development facilities. According to the World Bank database, commitments to invest in transport infrastructure projects with private capital participation in developing countries equalled $144, 000million during the decade 1996 – 2006 of which $21,700 million corresponded to 2005 and $29, 700 million to 2006. (EIC, 2009).

The consensus in the literature is that each and every BOT scheme project is subject to multiple risks. Despite some of the problems that are encountered that could result in project failure in a BOT scheme project, the project participants are able to allocate some of the risks successfully among themselves. Some of these risks identified include: technical problems faced during the construction phase of the project; delays in the completion of the project due to failure to perform by any one of the parties; lack of experience in large infrastructure developments; completion risks being placed mostly on the lenders; the underestimation of the project cost by the concessionaire; unbalanced sharing of risks between the banks and the project company; and the inadequate allocation of risk between the developer and the contractor.

These risks have to be studied, evaluated and negotiated taking into consideration the advantages and disadvantages that each party will experience for assuming them. The aim should be to allocate the risks efficiently and at the lowest possible cost.

Due to the fact that BOT scheme projects rely on the revenue generated during operation to service their debts, if there are any delays in the project the rolled up interest can be quite significant and hence have a serious impact on the project's profitability. This has been witnessed on previous projects where substantial cost increases were incurred due to delays.

In a typical BOT project, the project promoters and contractors make sure that they place most of the pre-completion risk with the lenders whenever possible. The experience from different projects shows that a typical completion risk in a BOT contract is addressed by a fixed-price, fixed-time construction contract awarded to a reputable contractor with an adequate provision for delay and cost overrun penalties. This is usually accompanied by a completion guarantee from the shareholders binding themselves to cover any cost overruns and delays that come about not as the responsibility of the contractor.

The project promoters require support from the host government to assist in accomplishing the project objectives, the host government needs to play a more active role by providing guarantees on BOT projects since they end up benefiting the public. At the same time, it has become apparent that governments are risk averse and opt not to provide financial guarantees that will assure project promoters high returns while on the other hand promoters are expected to provide guarantees for completion, performance and financial risks.

The important factor is for the cost of capital required to finance the project to be as low as possible. The project should be servicing a strategically important sector of the host country: also of great importance is that it should be easily possible to channel the cash flow generated to outside the local financial system so as to entice international investors. The provisions in all of the contracts covering the BOT project should suffice in dealing with each and every eventuality that might be encountered during the course of the project; also these contracts should be enforceable and tied to a highly credible legal framework in the host country.

The lack of expertise and specialised institutional entities capable of handling BOT projects has been identified as one of the major problems that might hinder the implementation of the projects from the identification, negotiation, development and operation through to the transfer phases. According to a study by Carl Bro International (1997) the most important reason for delay in projects was found to be project procurement. According to their study in Tanzania, the procurement of the International Development Agency (IDA) components took an average of 189 weeks for civil works and 90 weeks for consultancy services, against benchmark targets of 80 weeks for civil services and 30 weeks for consultancy services.

The long term project sustainability has also been identified as one of the matters of concern since the project might have reached its design life by the time it is transferred to the host government. This is more apparent in toll road projects because the usual pavement design life is 10 – 20 years whereas BOT concession periods are usually 15 – 20 years. Thus according to Pahlman (1996) private investors have little or no incentive to ensure long term sustainability of the project after transfer unless if they are compelled by the legal framework.

Risk identification is a very important stage of the risk management framework, there is a lot of literature on risk management regarding BOT scheme projects but non applicable to the influence of the current socio-economic conditions in South Africa which is the basis of this study.

Chapter 3: Research Methodology

3.1 Introduction

This section describes the research techniques used in the report. This will include the procedure used for sampling, the data collection procedure as well as the criteria used for the panel identification and selection. Finally it will conclude with the tools and techniques used to analyse the data as well as outline the tools used to check the reliability and validity of the data.

3.2 Research methodology and design

3.2.1 The Delphi Method

Instead of conducting a traditional survey to gather input from the major stakeholders involved in BOT projects in Southern Africa, the Delphi method has been identified as the stronger methodology for a rigorous query of experts and stakeholders. The Delphi method is identified as being well-suited when the goal is to improve understanding of problems, opportunities, solutions, or to develop forecasts (Skulmoski et al. 2007). This is an iterative process that collects and distils the anonymous judgements of experts using a series of data collection and analysis techniques interspersed with feedback.

The Delphi method has been selected for the following reasons.

1. The study investigates threats associated with BOT infrastructure projects in Southern Africa and this complex issue requires the expertise and knowledge of people who understand the different economic, social and political issues.
2. According to Rohrbaugh (1979) the Delphi method is a more desirable method among other high-performing group decision analysis methods, such as nominal group technique and social judgement analysis, since the Delphi method does not require experts to meet physically, which could be unpractical for international experts.
3. There are a relatively limited number of experts knowledgeable about the threats associated with BOT projects. The Delphi panel size requirements are modest and it is practical to vary the sample size from four to well over a hundred participants (Skulmoski et al. 2007).

4. The Delphi method is flexible in its design and amenable to follow-up interviews. This permits the collection of richer data leading to a deeper understanding of the fundamental research questions.
5. A similar procedure to that outlined by Schmidt *et.al.* (2001) is to be selected since it serves the dual purpose of soliciting expert opinions and having them rank the opinions according to their importance.
6. The anonymity of Delphi participants allows the participants to freely express their opinions without undue social pressures to conform from others in the group. Decisions are evaluated on their merit rather than who has proposed the idea. (Rowe and Wright 1999)
7. Iteration allows the participants to refine their views in light of the progress of the group's work from round to round. (Rowe and Wright 1999)
8. Controlled feedback informs the participants of the perspective of other participants and provides the opportunity for Delphi participants to clarify or change their views. (Rowe and Wright 1999)
9. Statistical aggregation of response allows for a quantitative analysis and interpretation of data. (Rowe and Wright 1999)

Rowe and Wright (1999) suggest that only those studies true in their origins that have the last four characteristics as mentioned above from their literature should be classified as Delphi studies while others like Adler and Ziglio (1996) show that the technique can be effectively modified to meet the needs of the given study. Thus the term Classical Delphi shall be used to describe a type of method that adheres to the characteristics of the original Delphi as summarized by Rowe and Wright (1999).

One of the characteristics of this method as captured by Linstone and Turoff (1975) is that it allows a group of individuals to deal with a complex problem in a structured form of communication that affords some degree of anonymity for the individual responses. The evaluation of risk is a key factor in a contractor's decision to take on a project because it relates to the contractor's estimation of the ability to make a profit: this would affect a tender price or the parameters for a negotiated contract. Because of this, contractors would be unwilling to divulge their opinions or strategies, as this would compromise their competitive advantage. The problem is exacerbated in BOT projects, in part because of the longer timeframes for which risk would need to be evaluated, but also because of the complexity of two risk environments – during design and construction, as well as through the operational phase of the concession. Delphi allows for confidentiality while sharing opinions.

3.2.4.1 Data Collection

For the purpose of this study a three round Delphi was adopted, because the Delphi technique is particularly suited for evaluations which focus on the identification of problems and their possible

solutions. Many researchers including Pill (1971) affirm that the cognitive value of the Delphi technique is a rapid, effective process of collecting and distilling expert opinion, and gaining consensus from a group of knowledgeable people (Green et al, 1990).

The Delphi process is widely acclaimed for being able to obtain divergent opinions from respondents across different organisations and localities without the logistical challenges of bringing the respondents together physically. There are some pitfalls that one needs to be wary of during the research, as documented by Linstone and Turroff (1975):

- Imposing preconceptions or views of a problem upon the respondent group;
- Poor techniques of summarising and presenting the group response;
- Ignoring and not exploring disagreements so that discouraged dissenters drop out and an artificial consensus is generated;
- Underestimating the demanding nature of a Delphi and the fact that respondents should be recognised and compensated for their time if the Delphi is not an integral part of their job function.

When done correctly the Delphi method has an inherent ability to protect against the decision making process typical of group decision making: pitfalls including "group-think) and over-dominating group members are avoided, since it provides for equal input from all group members (Cline, 2000). To achieve this Linstone and Turoff (1975: 241) put forth recommendations to researchers using the Delphi method as follows:

- "When presenting statements for a vote, be aware of ambivalent wording. Two statements may appear to mean the same thing. Vague wording may also lead to misinterpretation.
- "When editing respondents comments, try to preserve the intent of the originator.
- "Design the handling of data so that each response can be processed as it comes in.
- "Keep track of how different sub-groups in the respondent group vote on specific items.
- "Pre-test questionnaire on any willing candidates. Go over the design of the questionnaire with a sponsor."

The Delphi method has been identified as being ideal when there is a "political" attempt to involve many different people in the process (Eto, 2003). The nature of the Delphi method expedites this process without the socially inhibiting behaviour of opposing factions which frequently hampers consensual opinion forming in group discussions (Green et al, 1990).

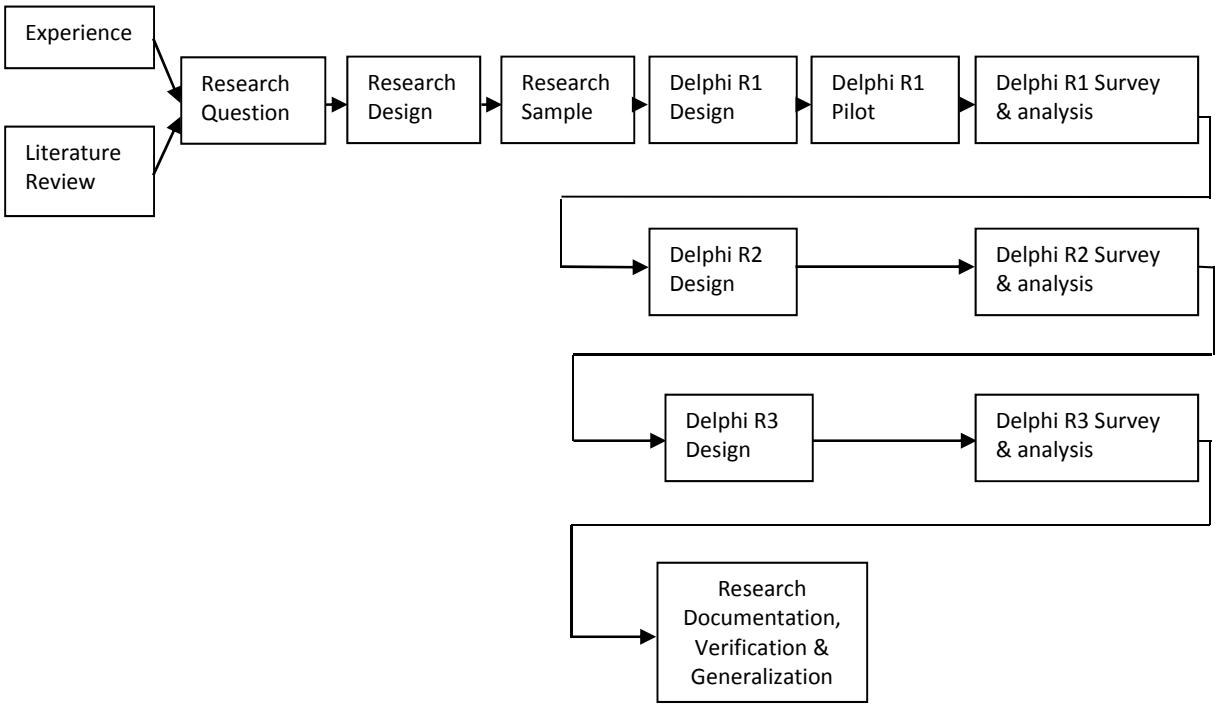


Figure 5 Three Round Delphi Process (adapted from Skulmoski et al. 2007)

A Typical Delphi Process

1. Develop the Research Question – Once the research question has been developed, a literature review is conducted to determine the gap that might exist in the body of knowledge.

2. Design the Research – After developing a feasible research question the Delphi method is identified as the most valuable for collecting the judgements of experts in a group decision making setting.

3. Research Sample – One of the most critical components of a Delphi research has been identified as selecting the research participants. Bolger and Wright (1994) identify four requirements for selecting the expertise: i) knowledge and experience with the issues under investigation; ii) capacity and willingness to participate; iii) sufficient time to participate in the Delphi process; and iv) effective communication skills (Adler& Ziglio 1996). According to Fink and Kosecoff (1985) since only expert opinion is sought, the selection of the sample is based on expert ability to answer the research question rather than trying to get a representative sample of the general population.

   The research sample comprises experts from different institutions, these included risk managers from Tolplan, which has rendered significant toll consulting services in South

Africa since the inception of modern toll roads in 1982; A junior economist from the Department of Trade and Industry, in particular the Competition Commission for an understanding of the new challenges that firms are subjected to when they enter a South African market, particularly on BOT contracts; A financial analyst from NLPI Limited, an investment company which, under its subsidiary New Limpopo Bridge (Pvt) Ltd, commissioned its first BOT project, the New Limpopo Bridge. For a regional perspective there is input sourced from a project manager with the Railways Systems of Zambia Limited which operates a railway concession stretching almost 1200km as well as Beitbridge-Bulawayo Railway (Pvt) Ltd, a subsidiary company which implemented the Beitbridge to Bulawayo railway line on a BOT basis. Commercial managers were also targeted from leading South African contractors like Murray and Roberts, Aveng Grinaker-LTA, Group 5 and Basil Read. Also responses were sought from senior Project Managers at the South African National Roads Authority Limited (SANRAL).

4. Develop Delphi Round One Questionnaire – The purpose of the first round of the Delphi is to brainstorm (Schmidt 1997). The literature survey provided a basis for this part of the research. Care was taken when developing the initial broad questions to ensure that the respondents understood the questions to prevent inappropriate answers or any frustrations. The questions on this first phase of the questionnaire were mostly 'open' questions so that participants could respond in a free manner without prejudice from the researcher (Young 1986). Some of the questions were closed questions requiring a "yes" or "no" answer. These questions were asked in the section on specific project details (Bateson, 1984). The questions were designed around the research objectives that the Delphi survey aimed to address, comprising the following:

    a) Risk Management in BOT scheme projects was described and the level of awareness amongst the target group was queried.
    b) The level of risk management adoption and use amongst the target group was determined.
    c) The respondents were asked to provide a list of a minimum of ten risks; they were then requested to provide a brief explanation justifying each particular risk so as to clarify in case the same risk was worded differently.
    d) The results were then collected and consolidated. In the case where descriptions of risks were unclear the respondents were contacted and requested to clarify the matter.

    In accordance with Patton (1990), inductive analysis of data was used when critical themes emerged from the data necessitating the need to group the different risks according to broad categories. These categories were not predetermined but they became apparent from

the responses. The categories included development risks, construction risks, operation risks and on-going risks.

5. Delphi Pilot Study – Due to the inexperience of the researcher there was a pilot study to refine the scope of the research as well as improve understanding and adjust the Delphi questionnaire. This also provided a reference for the time it takes for research participants to respond to the Delphi survey.

6. Release and Analyse Round One Questionnaire – The questionnaire was then sent to the research participants, who completed and returned them for analysis according to the research paradigm, e.g. qualitative coding. From this, a list of the risks associated with BOT infrastructure projects being faced by the concessionaire in developing countries was compiled. In total 30 questionnaires were emailed to the selected sample of experts and 26 responses were received back on the first phase. From these 20 distinct risks were identified falling within the different risk categories as outlined above.

7. Develop Round Two Questionnaire –The responses received from Round One formed the basis for the questions asked in the Round Two Questionnaire with additional questions added to verify the results. Thus the focus of the second part of the research was directed by the opinions of the participants on the first round. Schmidt (1997) states that if the purpose of Round One was to generate a list then it is common to pare down that list in Round Two.

   Thus the main objective for this round was to trim down the list of risks to a manageable size that the research participants could rank. Firstly feedback was sent to the participants for them to confirm and acknowledge that the risks collated were as they had highlighted in the first round. Care was taken to ensure that the risks were not listed in any particular order so as not to prejudice their ranking decisions. The respondents were then asked to select the top ten risks that they saw as possibly having the biggest impact on a BOT project's ability to attain its objectives.

8. Release and Analyse Round Two Questionnaire - The Round Two Questionnaire was released to the research participants and the analysis of the responses was similar to that of the previous round. However, the participants were first given the opportunity to verify that the Round One responses did indeed reflect their opinions and were given the opportunity to

change or expand their Round One responses now that the other research participants' answers were shared with them.

9. Develop Round Three Questionnaire: –The responses received from Round Two formed the basis for the questions asked in the Round Three Questionnaire. The participants were presented with feedback on the pared down list of top ten risks and they were asked to rate the top ten risks in terms of the significance of the impact so as to reach consensus.

10. Verification, Generalization and Documentation of Research Results – The Delphi results were then verified and the extent of the generalisation was also investigated whereby the relevancy of the risks and the mitigation measures identified were filtered, based on the relevant current socio-economic data, current political situation and development plans for South Africa.

Chapter 4: Data Analysis

4.1 Reliability and Validity

The validity and reliability of any research instrument are the fundamental components of any competent and effective study. Reliability is defined as the degree to which measures are free from error and therefore bound to yield consistent results, whereas validity has been defined as an extent to which a test measures what it claims to measure and doing so cleanly without including other factors (Gregory, 1992). Lincoln and Guba (1985:316) go on to state that, "since there can be no validity without reliability, the demonstration of the former is sufficient to establish the latter."

There are two essential parts to validity in research; these are internal and external. Internal validity encompasses whether the results of the study are legitimate because of the way the groups were selected, how the data was recorded and the analysis performed. On the other hand the external validity involves whether the results given by the study are transferable to other groups of interest (Last, 2001).

The Likert scale was used to measure the respondents' attitude. Likert-type or frequaecy scales use fixed choice response formats and are designed to measure attitudes or opinions, these ordinal scales measure levels of agreement/disagreement (Bowling, 1997). A Likert-type scale assumes that the strength /intensity of experience is linear, i.e. on a continuum from strongly agree to strongly disagree, and makes the assumption that attitudes can be measured. The respondents were offered a choice of five pre-coded responses with the neutral point being neither agree nor disagree.

The Likert scale used is a five point scale which was used to allow the individuals to express how much the agree or disagree with a particular statement. Each of the five responses would have a numerical value which would be used to measure the attitude under investigation. Examples of a Likert scale could be, strongly agree/agree/don't know/disagree/strongly disagree.

Below are the steps that were followed for the analysis of data received from respondents per survey question linked to each research objectives.

Table 2 Data Analysis

Research Objective	Survey Questions	Analysis Step
1.To confirm that role players are familiar with risk management in BOT projects	5.1.How would you rate your understanding of Risk Management on BOT projects on a scale of 1-5 (1=not good; 5=excellent) 4.1. If your organisation is using Risk Management in BOT projects please rate the following items on a scale of 1-5 (1-weak; 5 = strong) in terms of the extent to which each characteristic is emphasised in your organisation. a) BOT Projects Risks are actively managed. Projects Risks are selected, prioritized, de-prioritized (if strategic objectives have changed). b) Risk Management tools and methods are used to measure and control the Risk Management performance in BOT projects. c) Risk Management resource allocation is managed across all BOT projects. d) A risk management committee or similar forum meets regularly to actively manage the BOT project risks.	5.1. Determine the percentage of respondents that score 3 or more (i.e. how successful is each of the characteristics being applied) 4.1. Determine the percentage of respondents who confirm that their companies use Risk Management in BOT projects.
2.To Confirm the extent to which risk management is used in BOT projects	2.1. Does your organisation translate its business strategy into specific Risk Management strategy? 2.2. Does your organisation translate its Risk Management strategy into specific executable actions? 3.1. Does your organisation specifically	Determine the extent to which Business strategy is translated to Risk Management strategy and to explicit executable actions. Also to determine if the project selection process considers risk and return on

	select or identify projects that fulfil the business and Risk Management strategic objectives? 3.2. Are the projects or programs that are undertaken by your organisation balanced in terms of risk and return on investment? 3.3. Does your organisation involve the risk management steering committee during the development stage of the project?	investment.
3. To identify, categorize and represent the threats associated with BOT infrastructure projects, with a particular focus on South Africa	Delphi Phase 1 and 2 What would you consider to be the significant threats to BOT infrastructure development projects in South Africa? "Threats" here refers to circumstances that could negatively affect the project to an extent that the project objectives would not be attained. Please provide a brief rationale for each item placed on the list.	Analyse the list of threats received per respondent and determine any obvious categories for the risks.
4. To determine the order of importance in terms of criticality of impact of those risks.	Delphi Phase 3	From the initial list of threats from Phase 1 the most important ones are determined by selecting the top ten (individual's choice) in Phase 2 and then rating them in Phase 3. The results from Phase 3 are then ranked.
5. Establish whether the perception of the risks is more prevalent	Delphi Phase 2 and 3	Draw a comparison of input across respondent companies taking into account the

within one particular role player as opposed to others		demographic information.
6. Determine the mitigating factors that can be put in place to overcome the identified risks to BOT scheme projects	Literature	Mitigating strategies for overcoming the threats will be sought from literature.

4.2 Findings

4.2.1 Delphi Survey Round 1

4.2.1.1 Response Rate

For the first round of the Delphi survey, a total of 30 questionnaires were sent out to participants and from those, 26 responses were received. According to Okoli and Pawlowski (2004), non-responses are typically very low in Delphi surveys since most researchers would have personally obtained assurances of participation. The four non-responses were attributed to some of the respondents not feeling comfortable with participating in the study because they were concerned with anonymity and potentially a conflict of interest, since their organisations were involved in the litigation for the e-tolling of the GFIP.

4.2.1.2 Data screening

The results received from the respondents were screened to ensure that the responses were captured exactly as the respondents intended them. Also all inconsistencies or where further clarification was necessary the relevant respondent was contacted to explain further.

4.2.1.3 Demographics of respondents

The participants contacted for this research comprised people from different aspects who are fully immersed in the development of BOT infrastructure projects. Purposive sampling was used instead of trying to get a sample that would be representative of the industry demographic, so that the selected sample would be deemed to be capable of providing the most accurate data so as to satisfy the research objectives.

The selected participants were knowledgeable individuals with proven or verifiable experience and proficiency in BOT infrastructure development; thus it was possible to obtain to required information since they had direct personal experience.

The respondents were deliberately chosen such that they represented the different stakeholders in the BOT infrastructure development. This was so as to get a better representation of the different stakeholders in terms of their perception of prominent risks in these types of projects. The respondents also ranged across different levels of responsibility in the organisations with the majority of the respondents being Commercial Managers working for contractors who have been part of a concessionaire involved in BOT infrastructure development. This group would be highly influential in evaluating and managing risk in their respective organisations. The different stakeholders represented in the survey are as follows in the table below.

Table 3 Different Stakeholders represented in the survey

INDUSTRY	No
Contractor	14
Operator	3
Host Government	4
Concessionaire	3
Lender	1
Sponsor	1

4.2.2 Delphi Survey Round 2

4.2.2.1 Response Rate

There was a slight decline in the responses received for Phase 2 of the research in comparison with the initial survey. The reason for the non-response could be attributed to some of the individuals having been too swamped with workloads and not having spare time to dedicate to the survey. In total only 23 responses were received on the second leg of the survey. Once again this yielded a low non-response rate as noted by Okoli and Pawlowski (2004), since the researchers had personally obtained assurances of participation.

From the Phase 1 survey, 84 risks we submitted by the respondents and these were thoroughly scrutinised by also assessing the rationale provided for the selection of that particular risk. Based on what was apparent form the data received from the respondents these risks were then classified into the three broad categories as suggested by Hastak and Shaked (2000) being; Country, Market and Project levels. The reason for selecting this classification is that it was found useful in portraying the influence of one risk on the others and in prioritizing the mitigation measures for each of the risks.

A review of the literature on this subject matter was used to identify some of the risks that the respondents might have overlooked but which were relevant to BOT infrastructure projects in developing countries. From this exercise, a consolidated list of 21 risks was compiled and sent to the respondents in Phase 2 for them to select the top ten risks that they saw as being relevant to the South African environment. It was emphasised to the participants that the selection was to be in no particular order.

4.2.2.2 The consolidated list of risks

The list of risks from Phase 1 was consolidated to produce the list as shown in the table below. The respondents then had to select their top ten risks from this particular list.

Table 4 The consolidated list compiled as part of Phase 2 of the study

Number	Risk
1	Force majeure events
2	Foreign exchange and the expropriation of revenue
3	Inflation and interest rates
4	Corporate fraud and corruption
5	Creditworthiness of role players
6	Market demand of the service or product
7	Lack of competent Human resources
8	Project cost overruns
9	Health and safety onsite
10	Improper designs
11	Construction productivity lower than anticipated

12	Improper quality control
13	Political instability in the host country
14	Cultural differences
15	Quota allocation on imports
16	Government policies
17	Enforceability of the legal system
18	Change in laws
19	Environmental protection
20	Government influence on disputes
21	Competition

4.2.2.3 Phase 2 results

The results from Phase 2 were then consolidated after the respondents had selected their 10 most significant risks facing South African BOT infrastructure development projects. Below is a graph showing the distribution of nominations.

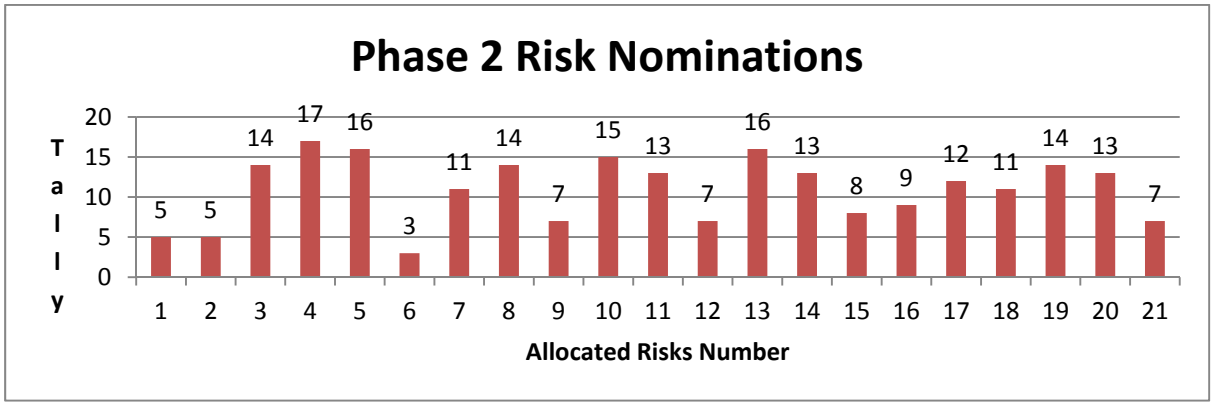


Figure 6 Distribution of the nominations of risks as received in Phase 2 of the survey

Table 5 The Selected Top 10 risks

Risk No	Risk	Nominations
3	Inflation and Interest Rates	14
4	Corporate Fraud and Corruption	17
5	Creditworthiness of role players	16
8	Project cost overruns	14
10	Improper designs	15
11	Construction productivity lower than anticipated	13
13	Political instability in the host country	16
14	Cultural differences	13
19	Environmental protection	14
20	Government influence on disputes	13

It should be noted that the risk number on the first column denotes the initial number allocated to the risk in Phase 1 of the survey.

4.2.3 Delphi Survey Round 3

4.2.3.1 Response Rate

The 10 most frequently selected risks were then sent back to the respondents for them to confirm that indeed the risks as selected seemed credible to them, which they confirmed. Then the respondents were asked to rank the risks according to how they perceived their importance in terms of criticality and impact. The ranking was on a scale of 1 to 10, with 1 denoting low level of importance while 10 represented a high level of importance.

Due to the close timing of the second and third rounds of the survey, all 23 of the participants from the second round responded.

4.2.3.2 Phase 3 results

The responses received from the 23 respondents were analysed and consolidated as captured in the below.

Table 6 The summary of responses

		Low		Level of importance						High	
Risk No	Risk	1	2	3	4	5	6	7	8	9	10
3	Inflation and Interest Rates	0	0	3	2	5	4	8	5	3	2
4	Corporate Fraud and Corruption	1	3	3	2	5	5	4	5	3	1
5	Creditworthiness of role players	0	4	2	3	8	4	2	4	3	2
8	Project cost overruns	2	1	0	3	4	6	3	4	4	5
10	Improper designs	1	1	3	1	4	3	4	5	4	6
11	Construction productivity lower than anticipated	2	4	3	3	4	4	6	2	1	3
13	Political instability in the host country	0	1	1	4	3	5	3	5	6	4
14	Cultural differences	1	1	3	4	2	4	6	4	5	2
19	Environmental protection	2	2	4	3	2	4	3	3	4	5
20	Government influence on disputes	0	2	3	5	3	4	2	5	4	4

4.2.4 Presentation of results grouped by survey question

1. RISK MANAGEMENT STRATEGY DEFINITION

1.1. **How frequently does your organization review its overall business strategy?**

… Every year ……. 88%
… Once every two years ……..... 8%
… Less frequently than once every two years …… 4%

1.2. **How frequently does your organization review its Risk Management strategy?**

… Every year ……..... 80%
… Once every two years …… 12%
… Less frequently than once every two years …… 8%

Figure 7 Risk Management Strategy Definition

Interpretation:

From the survey it can be interpreted that 88% of organisations involved with BOT infrastructure developments in South Africa do review their business strategies on an annual basis, whereas a slightly lesser proportion of just 80% review their risk management strategies on an annual basis. A

majority of the companies that review their business strategy frequently do not review their risk management strategy as well to ensure that the two are synchronised.

2. RISK MANAGEMENT STRATEGY TRANSLATION

2.1. Does your organization translate its Business strategy into specific Risk Management strategy?

Yes	85%
No	15%

2.2. Does your organization translate its Risk Management strategy into specific executable actions?

Yes	73%
No	27%

Figure 8 Risk Management Strategy Translation

Interpretation:

The results shows that over 80% of organisations in South Africa actually translate their business strategies into specific risk management strategies, whereas a slightly lesser proportion translate the risk management strategies into executable actions that the "man on the ground" could implement.

3. B.O.T. RISK MANAGEMENT PLANNING AND IMPLEMENTATION

3.1. Does your organization specifically select or identify projects that fulfil the Business and Risk Management strategic objectives?

Yes	77%
No	23%

3.2. Are the projects or programs that are undertaken in your organization balanced in terms of risk and return on investment?

Yes	85%
No	15%

3.3. Does your organization involve the risk management steering committee during the development stage of the project?

Yes	81%
No	19%

Figure 9 Extract from survey: "BOT Risk Management Planning and Implementation"

Interpretation:

The data reflects that a majority of organisations do select projects that are in line with their Business and Risk Management strategies, even though only 77% do so. What has become apparent is that most companies do weigh the risk and benefit associated with particular projects prior to engaging on them. It has also become apparent from the study that 80% of organisations do involve their Risk Management steering committees in the development stages of the project.

4. B.O.T. RISK MANAGEMENT PERFORMANCE MEASUREMENT

4.1. If your organization is using a Risk management approach, please rate the following items (characteristics) on a scale of 1-5 (1 = weak; 5 = strong) in terms the extent to which each characteristic is emphasized in your organization.

4.1.a. BOT projects risks are actively managed. Projects Risks are selected, prioritized, de-prioritized (if strategic objectives have changed).

1	2	3	4	5
5%	23%	38%	19%	15%

4.1.b. Risk management tools and methods are used to measure and control the Risk Management performance in BOT projects.

1	2	3	4	5
29%	24%	19%	13%	15%

4.1.c. Risk Management Resource allocation is managed across all BOT projects.

1	2	3	4	5
19%	21%	28%	18%	14%

4.1.d. A risk management steering committee or similar forum meets regularly to actively manage the BOT project risks.

1	2	3	4	5
27%	23%	18%	13%	19%

Figure 10 Risk Management performance measurement

Interpretation:

Overall most of the respondents felt that the risks were being actively managed in BOT infrastructure projects, but there was a general feeling that the risk management tools were not implemented accordingly, also that not enough resources were allocated for this purpose. This is

evidenced by the observation that the risk management committees did not meet frequently enough.

5. LEVEL OF UNDERSTANDING OF RISK MANAGEMENT IN B.O.T

How would you rate your understanding of Risk Management in BOT projects on a scale of 1-5 (1 = not good; 5 =excellent)

1	2	3	4	5
8%	18%	29%	24%	21%

Figure 11 Level of understanding of Risk Management in BOT

Interpretation:

The majority of respondents alluded to the fact that they are very familiar with Risk Management in BOT infrastructure development projects, with well over 70% of the respondents giving an indication of being familiar with the subject matter. There were nevertheless still 26% of the respondents who rated their Risk Management on a below average scale. It should be noted that they rated their understanding as below average possibly due to not having undergone formal training on the subject matter or similar reason. It does not mean that they are incompetent in executing their duties; hence their input in the study is just as credible as any of the other respondents.

Table 7 Summary: Interpretation of findings matched to survey questions and research objectives

Research Objective as previously stated	Survey Questions	Interpretation and links to literature
1.To confirm that role players are familiar with risk management in BOT projects	5.1.How would you rate your understanding of Risk Management on BOT projects on a scale of 1-5(1=not Good; 5=excellent) 4.1. If your organisation is using Risk Management in BOT projects please rate the following items on a scale of 1-5 (1-weak; 5 = strong) in terms of the extent to which each characteristic is emphasised in your organisation. a) BOT Projects Risks are actively managed. Projects Risks are selected, prioritized, de-prioritized (if strategic objectives have changed). b) Risk Management tools and methods are used to measure and control the Risk Management performance in BOT projects. c) Risk Management resource allocation is managed across all BOT projects. d) A risk management committee or similar forum meets regularly to actively manage the BOT project risks.	Most of the respondents did answer affirmatively to being familiar with risk management on BOT infrastructure development projects. Respondents alluded to the fact that there is an effort within their organisations to manage risks in BOT projects but that there is a lack of resources to implement the risk management tools and techniques. Also the low frequency of meetings to discuss risks could be indicative of lack of support from senior management with regards to risk management within BOT projects which could be due to the different entities working together from different corporate cultures.

2.To Confirm the extent to which risk management is used in BOT projects	2.1. Does your organisation translate its business strategy into specific Risk Management strategy? 2.2. Does your organisation translate its Risk Management strategy into specific executable actions? 3.1. Does your organisation specifically select or identify projects that fulfil the business and Risk Management strategic objectives? 3.2. Are the projects or programs that are undertaken by your organisation balanced in terms of risk and return on investment? 3.3. Does your organisation involve the risk management steering committee during the development stage of the project?	From the study it has emerged that most organisations actually do make an effort to align their risk management strategy with their business strategy based on the probability of occurrence as well as the severity of the impact should it be that an uncertainty does occur. The shortcoming emerged to be the practicality in implementing the drafted risk management guidelines. It has emerged from the data that most organisations select projects that satisfy their business as well as risk management strategies. The projects are chosen on the basis of the risk versus return and a majority of organisations do include their risk management teams during the development stages of BOT infrastructure development projects.
3. To identify, categorize and represent the threats associated with BOT infrastructure projects, with a particular focus on South Africa	Delphi Phase 1 and 2 What would you consider to be the significant threats to B.O.T infrastructure development projects in South Africa? Threats here refers to circumstances that could negatively affect the project to an extent that the project objectives would not be attained. Please provide a brief rationale for each item placed on the list.	At the end of the second round of the Delphi survey, the risks that received 15 or more nominations were: **Corporate Fraud and Corruption** Wang, et al. (2000) recognise developing countries as having high political risks in the form of corruption at various levels of the government which impedes investment from many engineering procurement companies.

		Creditworthiness of role players According to Claessens, et al. (2000) credit risk is measured by the rating of the issuer and according to the Moody's Global Credit Research dated 04 May 2012, the South African Roads Agency LTD (SANRAL) had its long and short term issuer ratings downgraded due to the uncertainty over the e-tolling operations on the company's largest road, the Gauteng Freeway Improvement Project. **Improper designs** Poor interface coordination as well as late design changes are cited as common reasons that lead to delays in projects. **Political instability in the host country** According to international business risk consultancy Control Risks 2013 report, South Africa is rated with a low political risk meaning that political institutions are stable but with a possibility of negative policy change and also a high likelihood of some non-state actors occasionally hampering operations especially in the country's poorer urban areas.
4. To determine the order of importance in terms of criticality of impact of those	Delphi Phase 3	In Phase 2 of the Delphi study it was emphasised to the respondents to **rate** the Top 10 risks in no particular order and in Phase 3 the respondents had to **rank** the selected Top 10 risks.

risks.		The individually ranked risks were then ranked collectively, using a cumulative rating score.
5. Establish whether the perception of the risks is more prevalent within one particular role player as opposed to others	Analysis	There generally was a balance between the public and different domestic private partners with regards to their perception of general and project specific risks. The four risks below were specifically raised by contractor respondents. • Improper designs • Construction productivity lower than anticipated • Environmental protection • Cultural differences Due to the researcher having been involved with the construction industry, most of the respondents (14/23) we also contractors, hence there is a possibility of bias in terms of most of the risks being those affecting the construction stages of the project.
6. Determine the mitigating factors that can be put in place to overcome the identified risks to BOT scheme projects	Literature	Mitigating strategies for overcoming the threats were sought from literature and they are discussed in detail in the following chapter.

Chapter 5: Discussion

Research objective 1: To confirm that role players are familiar with risk management in BOT projects

Respondents were asked in Question 5 of the first stage of the Delphi survey to rate their level of understanding of BOT risk management on a scale of 1 to 5, with 1 being the least and 5 being the highest level of understanding. Over 70% of the respondents answered to be having above average understanding of risk management in BOT infrastructure development projects. There were nevertheless still 26% of the respondents who rated their Risk Management on a 'below average' scale. It should be noted that they rated their understanding as 'below average' possibly due to some having not undergone formal training on the subject matter or having had limited knowledge on risk management on the particular contract they were using at the time of the survey. It does not mean that they are incompetent in executing their duties hence their input in the study is just as credible as any.

This set a good precedent in the sense that the same respondents are expected on later sections of the survey to provide insight into the critical risks associated with BOT infrastructure development projects in South Africa. The nature of risk and its perception by the role players in the construction industry determines how it is treated or managed (Edwards and Bowen, 2005).

Question 4 was also used to reiterate the awareness of respondent to risk management in BOT infrastructure developments.

a) A majority of the respondents answered affirmatively that their companies manage risks in BOT projects actively and also that the project risks are selected and prioritised or de-prioritized in accordance with the strategic objectives of the organisation.
b) Less than half of the respondents affirmed that risk management tools and methods are used to measure and control the risk management performance in BOT projects within their organisations.
c) Most of the respondents answered that risk management resource allocation is not managed across BOT projects in their organisations.
d) In most of the organisations who participated in the survey there seemed to be a lack of senior management support which was evidenced by the infrequent meetings by the risk management steering committee or similar forums to actively manage the BOT project risks.

A further analysis was carried out using a colour coded matrix to establish if there was a correlation between the responses to this part of the survey and the low ranking respondents in Question 5. What emerged from the analysis on Table 5.1 below is that indeed there is a reasonable correlation between the low rated responses on knowledge of risk management for BOT projects and the low rating of risk management tools applications in their particular organisations.

The low levels of understanding could have been attributed to the fact that the organisation itself does not have an active risk management framework and also the low levels of support from senior management in terms of the risk management tools application. From the follow up clarification process with the respondents it became apparent to the researcher that the rated low levels of understanding do not invalidate any of the results since a low rating of understanding does not reflect total ignorance of the subject matter but a lower level of understanding than other experts.

Table 8 Colour Matrix Analysis of responses

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Average	Benchmark Target
		0																												
Q4	**B.O.T. RISK MANAGEMENT PERFORMANCE MEASUREMENT**																													
Q4.1	**If your organization is using a Risk Management approach, please rate the following items (characteristics) on a scale of 1-5 (1 = weak; 5 = strong) in terms the**																													
	extent to which each characteristic is emphasized in your organization.																													
Q4.1a	BOT p*rojects risks are actively managed. Projects Risks are selected, prioritized, de-prioritized (if strategic objectives have changed).*	Score 1 - 5	2	3	3	4	1	5	5	2	4	3	5	3	3	2	4	2	3	5	2	3	4	3	2	4	3	3	3	5
Q4.1b	*Risk management tools and methods are used to measure and control the Risk Management perfomance in BOT projects*	Score 1 - 5	1	2	1	3	3	1	5	4	1	3	5	2	4	1	3	1	3	5	2	2	1	5	2	4	1	2	3	5
Q4.1c	Risk Management *Resource allocation is managed across all BOT projects*	Score 1 - 5	1	4	3	4	1	4	5	1	3	5	2	2	3	1	3	2	4	3	5	2	5	3	4	3	1	2	3	5
Q4.1d	*A risk management steering committee or similar forum meets regularly to actively manage the BOT project risks*	Score 1 - 5	3	5	1	3	1	5	1	3	2	2	4	5	1	2	2	1	4	3	5	1	2	5	2	3	1	4	3	5
Q5	**LEVEL OF UNDERSTANDING OF RISK MANAGEMENT IN B.O.T**																													
Q5.1	**How would you rate your understanding of Risk Management in BOT projects on a scale of 1-5 (1 = not good; 5 =excellent)**	Score 1 - 5	2	5	4	5	1	4	5	3	5	4	3	2	3	2	3	1	4	4	3	2	5	3	4	3	2	3	3	5

Research objective 2: To confirm the extent to which risk management is used in the industry

It has become apparent that the theoretical process of establishing business strategies, then translating them into a risk management strategy is carried out by a significant majority of organisations in South Africa. The results shows that over 80% of organisations in South Africa do partake in this exercise, unfortunately a slightly lesser proportion translate the risk management strategies into executable actions that are implemented. As such, the risk management strategy ends up being just a paper exercise that the people in the lower levels of the organisation neither know anything about nor know how to implement.

Research objective 3: To identify, categorize and represent the threats associated with BOT infrastructure projects, with a particular focus on South Africa.

The following risks were identified by the respondents as being the ten most critical risks associated with BOT infrastructure development in South Africa. See Table below.

Table 9 Top ten most critical risks

Risk No	Risk	Nominations
3	Inflation and Interest Rates	14
4	Corporate Fraud and Corruption	17
5	Creditworthiness of role players	16
8	Project cost overruns	14
10	Improper designs	15
11	Construction productivity lower than anticipated	13
13	Political instability in the host country	16
14	Cultural differences	13
19	Environmental protection	14
20	Government influence on disputes	13

The risks can be seen to range across all three categories of specific project risks, namely developmental risks, construction risks and operating risks as identified by Taon and Ozawa (2008).

Research objective 4: To determine the order of importance in terms if criticality of impact of those risks.

A total of 32 responses were received from participants on the third round of the Delphi survey. The number of nominations per level of importance was then multiplied by a number from 1-10 denoting the particular level of importance attributed by each respondent, to come up with a cumulative rating score. The data is presented below.

Rating = No. of nominations X No. Denoting the Level of importance

Table 10 Rating of Top ten most critical risks

			Low		Level of importance						High			
Risk No	Risk	Mean	1	2	3	4	5	6	7	8	9	10	Total	Rank Order
3	Inflation and Interest Rates	3,2	0	0	3	2	5	4	8	5	3	2		
	(Nomination X Level of importance)		0	0	9	8	25	24	56	40	27	20	209	4
4	Corporate Fraud and Corruption	3,2	1	3	3	2	5	5	4	5	3	1		
	(Nomination X Level of importance)		1	6	9	8	25	30	28	40	27	10	184	8
5	Creditworthiness of role players	3,2	0	4	2	3	8	4	2	4	3	2		
	(Nomination X Level of importance)		0	8	6	12	40	24	14	32	27	20	183	9
8	Project cost overruns	3,2	2	1	0	3	4	6	3	4	4	5		
	(Nomination X Level of importance)		2	2	0	12	20	36	21	32	36	50	211	3
10	Improper designs	3,2	1	1	3	1	4	3	4	5	4	6		
	(Nomination X Level of importance)		1	2	9	4	20	18	28	40	36	60	218	2
11	Construction productivity lower than anticipated	3,2	2	4	3	3	4	4	6	2	1	3		
	(Nomination X Level of importance)		2	8	9	12	20	24	42	16	9	30	172	10
13	Political instability in the host country	3,2	0	1	1	4	3	5	3	5	6	4		
	(Nomination X Level of importance)		0	2	3	16	15	30	21	40	54	40	221	1
14	Cultural differences	3,2	1	1	3	4	2	4	6	4	5	2		
	(Nomination X Level of importance)		1	2	9	16	10	24	42	32	45	20	201	6
19	Environmental protection	3,2	2	2	4	3	2	4	3	3	4	5		
	(Nomination X Level of importance)		2	4	12	12	10	24	21	24	36	50	195	7
20	Government influence on disputes	3,2	0	2	3	5	3	4	2	5	4	4		
	(Nomination X Level of importance)		0	4	9	20	15	24	14	40	36	40	202	5

This analysis yielded the following results in terms of the ranking of risks according to the respondents.

Table 11 Rank order of the Top ten most critical risks

Risk No	Risk	Rank Order
13	Political instability in the host country	1
10	Improper designs	2
8	Project cost overruns	3
3	Inflation and Interest Rates	4
20	Government influence on disputes	5
14	Cultural differences	6
19	Environmental protection	7
4	Corporate Fraud and Corruption	8
5	Creditworthiness of role players	9
11	Construction productivity lower than anticipated	10

The majority of the risks selected are those affecting the construction stage of the project. This could have been due to the significantly large number of respondents who were contractors; hence they identified those risks that were the most relevant to their line of work. As indicated in the Literature Review, there is consensus that the majority of risk in BOT projects is taken by the contractor/concessionaire, which justifies the predominance of contractors in the group of experts. Also the identification of political instability as the most critical risk could have been influenced by the extensive media coverage of the protests against e-tolling in the GFIP as well as the wildcat strikes in the mining sector at the time of the survey.

Research objective 5: Establish whether the perception of the risks is more prevalent within one particular role player as opposed to others.

There was generally a balance between the public and the various domestic private sector respondents with regard to their perception of general and project specific risks. The responses received showed that most respondents were more inclined towards selecting those risks most applicable to their line of work. Contractors identified more risks that were affecting the construction stage of the project such as improper designs, political instability in the host country and environmental protection, whereas the respondent from the host government raised the risk of corporate fraud and corruption.

Table 12 Top ten most critical risks identified per sector

Rank Order	Risk	Identified By
1	Political instability in the host country	Contractor
2	Improper designs	Contractor
3	Project cost overruns	Across Board
4	Inflation and Interest Rates	Across Board
5	Government influence on disputes	Operator
6	Cultural differences	Across Board
7	Environmental protection	Contractor
8	Corporate Fraud and Corruption	Host Government
9	Creditworthiness of role players	Host Government
10	Construction productivity lower than anticipated	Contractor

Research objective 6: Determine the mitigating factors that can be put in place to overcome the identified risks to BOT scheme projects

Risk 1: Political instability in the host country

This is the danger of political or financial instability in the host country caused by events such as insurrections, strikes, suspension of foreign exchange, creeping expropriation and outright nationalization. According to Dey and Ogunlana (2004) political risk is, in general, proportional to instability of the host country's political system, the indices of which are represented as a summation of rating various indicators of the country's conditions such as GDP, debt and others. According to the international business risk consultancy Control Risk's 2013 report, South Africa is rated with a low political risk meaning that political institutions are stable but with a possibility of negative policy change and also a high likelihood of some non-state actors occasionally hampering operations especially in the country's poorer urban areas.

This can be mitigated by:

a) Passing on of the political risk to the host government under an Implementation Agreement according to Egbe (2001) and Nielsen (1997).
b) Involving financiers from a number of different countries, national export credit agencies and multilateral lending institutions such as a development banks. (Dahel, 1997)
c) Setting up accounts in stable countries into which proceeds from the operation stage will be transferred into. (Kouassi, 2009)
d) There should be a provision in the Concession Agreement for the termination of the contract in the event that certain politically motivated events affect the project. In such an instance, the compensation payable by the government for the transfer of project assets should at least be equal to the outstanding dues to the project lenders, thereby fully protecting the lenders. (Dahel, 1997)

Risk 2: Improper designs

Poor interface coordination as well as late design changes are cited as common reasons that lead to delays in projects. For example, out of the seven year construction contract for the Channel Tunnel, a delay of one year resulted from late changes to the signalling system specification and the shuttle design (Walker 1995). The following could be considered to mitigate these risks:

a) Consulting earlier in the process with contractors and local communities to establish project standards and completion schedules so that environmental and social concerns could be better incorporated into the project design. (Wang, et al. 2004)
b) The concession company has to manage the design and operation interface carefully to ensure that design of the facility incorporates the recommendations of the operator, looking at the entire duration of the facility's design life. (Tladi, 2012)
c) According to Kumaraswamy and Zhang (2001) the concessionaire needs to appoint an independent design checker and a works checker to ensure the quality of design and construction. They recommend that the procedure should be divided into three steps: design approval-in-principle, design development and checking as well as works checking.

Risk 3: Project cost overruns

According to a survey by Akintoye et al. (1998) of various stakeholders involved with BOT projects in the UK, the risk of project cost overrun was identified as an important factor. The mitigating factors for this risk include:

a) The common approach entails project owners entering into a fixed time/fixed price turnkey contract with the contractor. (Kouassi, 2009)
b) The concession company also needs to ensure that it has appropriate and sufficient remedies against the construction contractor in project contract. (Wang et al. 2004)
c) The concession company needs to raise additional capital from shareholders in the form of a standby subordinate loan or as a standby capital contribution. (Liang, 2006)
d) The concession company could also ask lenders to provide a standby credit facility for cost overruns, although this is usually a daunting task since lenders are usually unwilling to provide loans that have claims on non-existent assets. (Kouassi, 2009)

Risk 4: Inflation and Interest Rates

Interest rate on borrowed funds is directly affected by the status of the general economy which is a function of prevailing commercial interest rates and inflation. (Banaitiene, et al. 2010) Inflation risks comes about as a result of the volatility in the commodity markets which account for inflation in construction costs as well as probable future increases to toll levels. This risk was identified among the top three external risks by Banaitiene et al. (2010)

a) To mitigate this risk there should be a provision in the concession agreement to adjust the tariffs for inflation during the operation stage. (Astache et al. (2000),
b) The other mitigating factor would be Indexation of user-fees and revenues from off-take contracts to cover for the risk of inflation. (Kouassi, 2009)
c) The concessionaire could also ask the host government to provide sufficient foreign currency in case of supply disruptions or to index the tariff rates to the rate of inflation to preserve the real value of profits. (Llanto 2008)

Risk 5: Government influence on disputes

This risk is defined by Wang, et al. (2004) as unnecessary and unjust influence by local government on court proceedings regarding project disputes. Sabal and Ghersi (2006) explain it as unexpected government intervention causing default of obligations or significantly affecting the returns expected by the suppliers of funds. This can be managed by:

a) Maintaining good relations with the concerned host government officials and concerned authorities. (Wang, et al. 2004)
b) The correct government departments must be used to source approvals and permits. (Kouassi, 2009)
c) The concessionaire establishing a Joint Venture with renowned local partners, especially the central government agencies such as SANRAL for road projects or state owned enterprises like Eskom for power projects. (Wang, et al. 2004)
d) Obtaining legal counsel as to the applicable laws and the enforceability of contracts with government entities. According to the European International Contractors position paper on PPP's in developing countries (EIC, 2009), they state that countries with Anglo-US law provide best practice examples of transparent and predictable legal systems. Hall and Bayliss (2000) cite an example in which a private telecommunications provider in Zimbabwe was awarded a license in the 1990s by the Supreme Court only to be simultaneously branded as an illegal operation by a presidential decree which resulted in delays and significant losses while the matter was being resolved.

Risk 6: Cultural differences

Cultural difference is the difference in work culture, education, values, language and racial prejudice between foreign and local partners (Wang, et al. 2004). They further propose the following mitigating measures:

a) The project owners should try to have as large a share in equity as possible so as to be able to have control over the Board of Directors.
b) The company should hire its own competent native language speaking employees even if it has some staff members that understand the native language.
c) There should be a dispute settlement provision in every contract.
d) The concessionaire also needs to undertake comprehensive negotiations and agreements with local government and partners such as labour unions before commencing with the project.

Risk 7: Environmental protection

The risks associated with environmental protection creates a lot of uncertainty in the construction industry, particularly with the recent environmental protection legislation such as the NEMA act of 1998 which results in the inability to know exactly what is required and how long it will take to get approval from regulatory agencies. Elkinson (1997) states that the destruction of eco systems, loss of jobs, displacement of habitats and potential health repercussions due to land, air and water pollution could lead to protests and resistance by groups representing local stakeholders. To mitigate this, the following applies:

a) Using metrics and toolsets developed by multilateral development banks such as the IFC to assess environmental concerns at the earlier stages of the projects (Davis, 2004).
b) There needs to be an adoption of strict pollution control measures, which can be achieved by engaging both local and international pollution control specialists. (Wang, et al. 2004)
c) Ensuring compliance with local and international environmental laws, standards and regulations. (Wang, et al. 2004)
d) There should be a survey carried out to get a clear picture of the current pollution levels at the beginning of the project; then there should be a disclaimer included in the contract for the present pollution levels (Wang et al. 2004).

Risk 8: Corporate Fraud and Corruption

According to Transparency International (2007), corruption is defined as the abuse of entrusted power for private gain, whereas corporate fraud is defined as activities undertaken by an

individual or company that are done in a dishonest or illegal manner and are designed to give an advantage to the perpetrating individual or company. This risk is identified by Wang et al. (2000) as one of the most critical in BOT projects. Mitigating measures include:

a) Foreign companies need to get information about their prospective local partner's credibility from other organisations that are currently doing business with them and those that have done business with them in the past. (Wang, et al. 2000)
b) There should be a close scrutiny of the current status and par value of the share dealings of the Joint Venture. (Wang, et al. 2000)
c) Despite different organisations coming to work together there should be one accounting standard agreed upon to be used by all parties and use one independent auditor. (Llanto, 2008)

Risk 9: Creditworthiness of role players

Llanto (2008) identifies credit worthiness and reliability of parties as one of the most critical risk categories. Lenders need to look at the creditworthiness of the borrowing entity since knowing this risk is essential from a lender's point of view. The following mitigating measures apply:

a) Making a credit judgement on the financial ability and integrity of the contracting party to live up to its contractual obligation (Maniar 2010).
b) Accurate financial information should be sourced from international and independent security and risk evaluation agencies such as Moodys and Global Risk. (Wang, et al. 2000)
c) Guarantees can be sourced from reliable and credit worthy local and international entities. (Llanto, 2008).
d) There should be a thorough scrutiny of the local partner's financial viability, technical and management competency as well as their connections with the host government. (Malhotra, 1997).
e) When merging with a local partner there should be a clear definition of the merging scope of assets, employees, shares, organization and strategies. (Wang, et al. 2004)

Risk 10: Construction productivity lower than anticipated

Wang et al. (2010) define this risk as having to do with the use of obsolete technology and practices by the local partner, or low productivity of local workforce owing to poor skills or inadequate supervision. They go on to suggest the following mitigating measures:

a) Apply innovative production philosophies like Lean Construction, Just-in-Time and Total Quality Management to decrease variability and rework during construction.
b) Construction activities should be benchmarked against international standards and monitored closely.
c) Site should be organised properly in order to achieve maximum productivity.
d) The impacts of adverse weather should be incorporated into projects schedules.

From the results of this study above it has become evident that the majority of players in the South African BOT infrastructure development sector are aware of risk management principles and also that risk management is planned for as part of the strategic alignment of their organisations. The implementation of these risk management policies though, at the lower levels of the organisations, seems to be lacking. The pertinent risks to the South African BOT projects were also identified and found to concur with literature. The most critical risk rated was political risk which is defined as having to do with the threat of civil unrest, strikes and also nationalisation.

Chapter 6: Conclusions and Recommendations

The main focus of this study is to identify and rank the critical risks affecting BOT projects in South Africa. The nature of a BOT scheme and the structure of the financing of such an initiative is explored in the earlier chapters so as to build a firm foundation from which to explore the different risks associated with this procurement method.

6.1 Activities of the study:

- To ascertain whether role players are familiar with risk management in BOT projects;
- To determine the extent to which risk management is used in the industry;
- To identify, categorize and represent the threats associated with BOT infrastructure projects, with a particular focus on South Africa;
- To determine the order of importance in terms if criticality of impact of those risks;
- To establish whether the perception of the risks is more prevalent with one particular role player as opposed to others;
- To determine the mitigating factors that can be put in place to overcome the identified risks to BOT scheme projects.

6.2 What was accomplished?

- **To ascertain whether role players are familiar with risk management in BOT projects**

  In order to affirm the credibility of the information obtained from the respondents, the researcher established that they were fully conversant with the concept of BOT infrastructure development and the risk management thereof. The majority of the respondents do think that they are fully conversant with the subject matter.

- **To determine the extent to which risk management is used in the industry**

  From the survey it is apparent that a majority of the companies selected indeed did have a risk management strategy that was conceived from the overall business strategy. What has emerged and is of great concern though, is that most of the companies responded that the risk management plans were not executable due to the inappropriate action plans, lack of resources and lack of senior management support.

- **To identify, categorize and represent the threats associated with BOT infrastructure projects, with a particular focus on South Africa.**

  The participants provided an initial list of risks from which they had to select the ten most critical for South African projects, based on their experience in the industry. These risks can now be beneficial to participants in BOT infrastructure development projects in South

Africa since they will know which risks they should dedicate more of their resources into mitigating. The risk evaluation could also be beneficial to further academic research since they can be explored further.

- **To determine the order of importance in terms if criticality of impact of those risks**

  The ten risks identified with the highest rating were then sent back to the respondents to rank them in Phase 3 of the Delphi survey. From this exercise it emerged that political instability in the host country risk, risk of improper design, project cost overruns risk, and inflation and interest rates risk emerged as the top four risks. Political instability was defined as instability in the host country caused by events such as insurrections, strikes, suspension of foreign exchange, creeping expropriation and outright nationalization.

  This risk may have been inflated because the survey coincided with the on-going COSATU demonstrations against e-tolling in Gauteng. Moreover, the strikes in the platinum and gold mining sectors which led to the killing of demonstrators by police was also still fresh on people's minds hence the inclination for most participants to recognise this risk above others.

- **To establish whether the perception of the risks is more prevalent with one particular role player as opposed to others.**

  Most of the risks identified are spread across the different sectors but what is apparent is that most respondents identified risks that are more associated with the role they play in the implementation of a BOT scheme project. Contractors identified risks associated with the construction stage, while operators identified risks in the operation stage.

  With that said, it should be noted that most of the risks identified were to do with the construction stage since the largest group of respondents were from the construction sector. Hence the proportion of respondents was biased in that regard.

- **To determine the mitigating factors that can be put in place to overcome the identified risks to BOT scheme projects.**

  Literature on risk management for BOT infrastructure development was explored for mitigating measures that could be used to address the risks identified in the survey. Most of the mitigating measures were sourced from Wang et al. (2004) since their work is relevant to developing economies such as that in South Africa. The recommended mitigating measures in the study are not exhaustive of all the options available: different

organisations involved with different BOT scheme projects should consider every project on its own merits and implement the measures best fitting that particular situation.

6.3 Limitations of the study:

The limitations of the study included the following:

Due to the nature of the BOT infrastructure development scheme and its infancy in developing economies, there are only a limited number of experts well versed in the concept from which to involve in the study.

Due to the researcher being involved in the construction industry as a contractor, most of the respondents are also contractors; hence the large number of respondents in this group. This could have led to most of the risks identified having been those involved with the construction stage instead of the development or operational stage of the project development cycle.

The respondents might also have not answered objectively since their perceptions might have been influenced by what was in the media at the time when the study was carried out. This was evidenced by the risk that got the highest ranking which had to do with strikes. At the time of the study the local media was covering the on-going COSATU strike against e-tolling, as well as the strikes in the gold and platinum mine sector which had resulted in the death of miners shot by the police.

6.4 Risk Management Framework

From literature, the following risk management framework is recommended by Liang (2006):

Step 1: List all risks associated with the proposed BOT infrastructure project and then analyse these risks in order of importance. The more critical the risk, the more attention should be paid to that particular risk.

Step 2: For each risk, list as many corresponding mitigating measures as possible and then examine the viability of mitigating measures in sequence based on their effectiveness. The more effective the measure the higher the priority for adoption should be. Sometimes a combination of several mitigating measures is needed.

Step 3: For each risk and its mitigating measures, negotiate with the host government and related entities to incorporate the risk mitigating measures and fine tune the concession agreement and other agreements as applicable to ensure that all these risks are adequately covered.

Step 4: Allocate risks to related parties according to the principle the risk should be borne by the party most capable of controlling it. An optimal allocation of risk depends on the relative bargaining power of the parties and the potential of reward for taking the risk.

Step 5: Adopt the risk allocation and security structure, and then enter into financing process for the project.

The risk management model below in Figure 6.1 is also suggested by Mubin and Mubin (2008) to be used to resolve and manage risks involved in the implementation of BOT infrastructure development projects.

The economic growth in South Africa has resulted in a massive demand for basic infrastructure such as roads, tunnels, power plants, water treatment plants, health care and other social services. However, characteristic to the nature of a developing economy, there is limited funding available to finance such projects. There is also the need to harness the technological capability and efficiency of the private sector, which has necessitated the attraction of new investment in the form of BOT procurement schemes.

Unfortunately, risk and uncertainty are inherent in all construction work regardless of the size of the project, but are compounded in BOT projects due to the long duration and complex nature of the contract. As such it is essential for all the project participants to have a thorough understanding of the different risk scenarios in the sense of being able to pre-empt those scenarios and being able to deal with them accordingly, should they occur. This is because the thorough understanding of the risk scenarios in this type of procurement scheme is essential in making it attractive to all of the project participants, especially from the viewpoint of private participants.

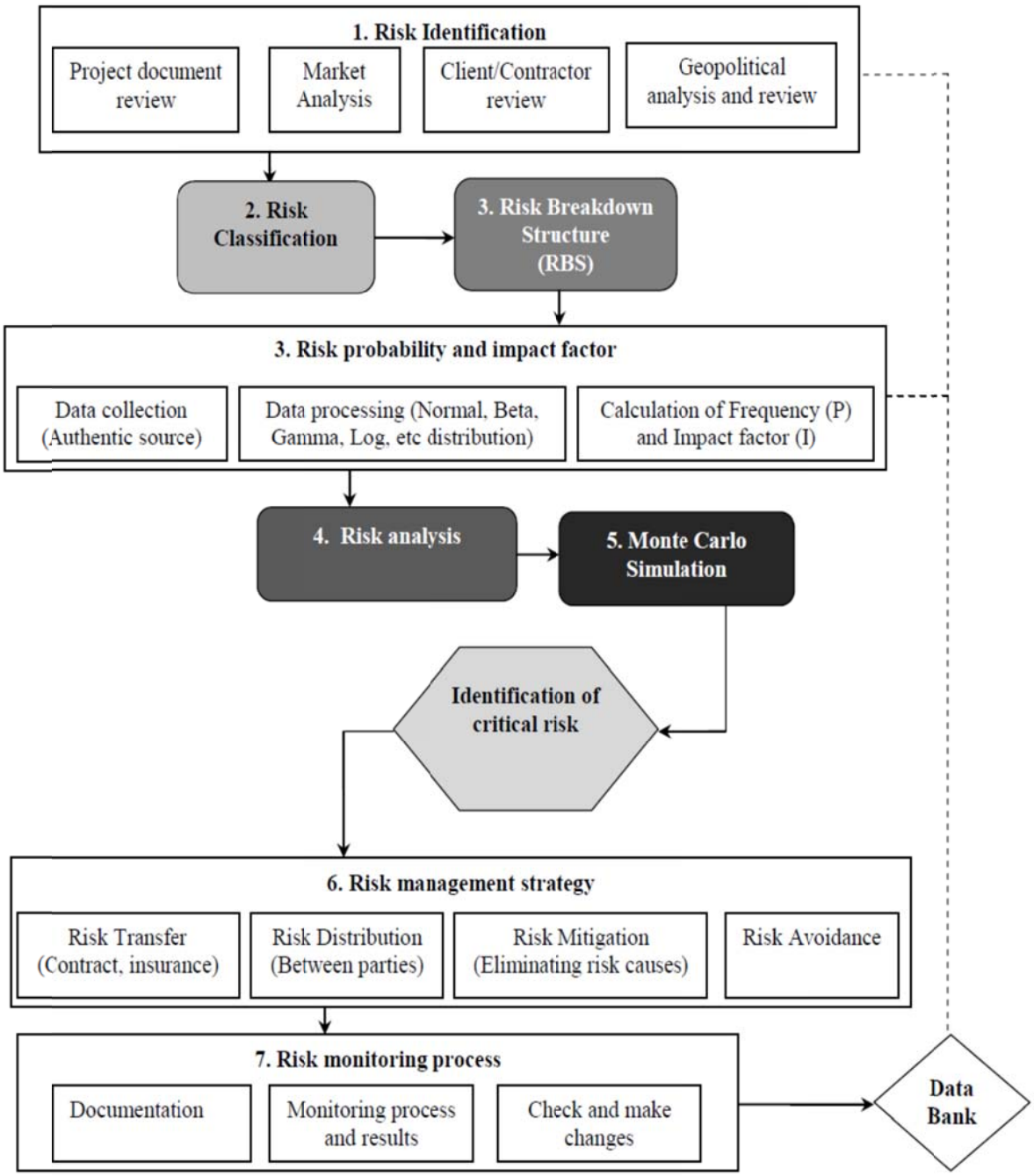


Figure 12 Risk Management Model for BOT projects. (Source: Mubin and Mubin, 2008)

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Appendix A

Delphi Survey Questionnaire

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON MEDICAL)
H120903 Moloigaswe

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER H120903**
PROJECT TITLE	Threats associated with BOT (Build Operate and Transfer) infrastructure projects in Southern Africa and the impact it has on the risk profile.
INVESTIGATOR(S)	Mr S Moloigaswe
SCHOOL/DEPARTMENT	Civil Engineering
DATE CONSIDERED	21 September 2012
DECISION OF THE COMMITTEE	Approved Unconditionally
EXPIRY DATE	30 September 2014

DATE 15 October 2012

CHAIRPERSON
(Professor T Milani)

cc: Dr. A Fitchett

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

Signature

23 / 10 / 2012
Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

University of the Witwatersrand

UNIVERSITY OF THE WITWATERSRAND

THREATS ASSOCIATED WITH B.O.T (Build Operate and Transfer) INFRUSTRUCTURE PROJECTS IN SOUTHERN AFRICA AND THE IMPACT IT HAS ON THE RISK PROFILE

DELPHI RESEARCH INVESTIGATION

Phase 1 of 3

FACULTY OF ENGINEERING AND THE BUILT ENVIROMENT

Please return this form to:

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PURPOSE OF INVESTIGATION

Thank you for agreeing to participate in this research study. The main objective of this study is for the researcher to solicit from respondents their opinions regarding threats associated with BOT infrastructure development projects in South Africa. Also through the study to come up with a rank order of the most critical risks associated with BOT scheme projects.

This research is part of the requirements to attain a qualification in MSc Eng. Construction Project Management. It is solely for academic purposes.

Process:

For the purpose of this study a multi stage three round Delphi survey will be carried out. Delphi technique is a rapid, effective process of collecting and distilling expert opinion, and gaining consensus from a group of knowledgeable people. (Green et al, 1990).The Delphi process is widely acclaimed for being able to obtain divergent opinions from respondents across different organizations and localities without the logistical challenges of bringing the respondents together physically.

Delphi Round One Questionnaire – The purpose of the first round of the Delphi will be to brainstorm as per Schmidt (1997). The questions on this first phase of the questionnaire are mostly 'open' questions so that participants could respond in a free manner without prejudice from the researcher as mentioned by Young (1986). Some of the questions will be 'closed' questions requiring a yes or no answer. These questions are asked in the section on specific project details. (Bateson, 1984).

Delphi Round Two Questionnaire: –The responses received from Round One will form the basis for the questions asked in the Round Two Questionnaire with additional questions added to verify the results. Thus the focus of the second part of the research will be directed by the opinions of the participants on the first round.

Thus the main objective for this round will be to trim down the list of risks to a manageable size that the research participants could rank. Firstly feedback will be sent to the participants for them to confirm and acknowledge that the risks collated were as they had highlighted in the first round. Care must be taken to ensure that the risks are not listed in any particular order so as not to prejudice ranking decisions. The respondents will then be asked to select the top ten risks that they perceive as possibly having the biggest impact on a BOT project's ability to attain its objectives.

Develop Round Three Questionnaire: –The responses received from Round Two will form the basis for the questions asked in the Round Three Questionnaire. The participants will be presented with feedback on the pared down list of top ten risks and they will be asked to rate the top ten risks in terms of the significance of the impact so as to reach consensus.

The identity of respondents to this survey will remain confidential.

S

1.	**What is the approximate annual revenue of your organization?**	
	…..……..……... Less than 1 million ……..…..……	[ ]
	……... 1 million - 5 million ……..…….	[ ]
	……..…. 5 million – 10 million …….	[ ]
	……..……... 10 million – 20 million …….	[ ]
	……..……. More than 20 million …….…….	[ ]
2.	**What is the size of the organization in terms of number of employees?**	
	…..……..…….... Less than 1 hundred ……..…...…….	[ ]
	……..……..…. 100 – 500 ..…….……...…….	[ ]
	……..…….....…. 500 – 1 000 ……..…….	[ ]
	……..…….... 1 000 – 5 000 ..……..…….	[ ]
	……..…….. More than 5 000 ……..…..…….	[ ]
3.	**Is your organization operating …**	
	…..…….....Locally only ……..…...…….	[ ]
	…….. Countrywide ……..…..…...…….	[ ]
	……..……....…. International ……..……	[ ]
4.	**What is the primary role of your organization with regards to BOT?**	
	……..……..Contractor ……..…….……....	[ ]
	……..... Operator …….....	[ ]
	……..……Lender…..…..……....	[ ]
	……Shareholder ……..…….....	[ ]
	……..…….....Supplier ……..…….……....	[ ]
	……Host Government ……..…….……....	[ ]
	……..……..Concessionaire……..…….……....	[ ]
	……..……Sponsors ……..…….……....	[ ]

SECTION B – Definition of BOT and Risk Management

The rapid economic growth in many developing countries results in an excess demand for infrastructure and governments find that they are unable to fund the vital infrastructure or to maintain the existing ones (Gupta and Sravat 1998). To remedy this they are increasingly opting for an alternative source of funding through the large international companies which have a larger credit standing for concession contracts such as Build Operate and Transfer (BOT) since those companies have a much larger capacity to fund the large scale projects.

All Public-Private Partnership projects have an element of risk inherent in them, just as in any other infrastructure projects. (Quium, 2011) The risks arise due to uncertain future outcomes which may have direct effect on the provision of services by the project, and/or the commercial viability of the project. Unfortunately, the traditional mechanisms for project risk allocation that are available in other countries may not be suitable in developing economies (e.g. South Africa) due to the differences in legal systems, market conditions and culture. Therefore in order to implement successful BOT schemes, investors, both local and international, will need to identify and find ways to mitigate the critical risks, taking into consideration the diversity in terms of various issues pertaining to political front, policy matters and demographic issues along with geographical challenges. (Maniar, 2010).

Flanagan and Norman (1993) defined risk identification as involving the determination of the source and type of risk. Risk identification is the first and most important step in the risk management process according to William (1995), since this entails identifying the origin and nature of risk. According to Flanagan and Norman (1993), once a risk has been identified it ceases to be a risk and becomes a management problem. A systematic approach to risk management has been shown to enable early identification of risks according to Dawood (1998) and this eliminates the need to have contingency plans for almost every eventuality.

The following are specific questions to identify your organizations use of risk management tools in BOT infrastructure development projects as well as the implementation there of. Finally you will be requested to provide a list of risks that you perceive as critical to the implementation of BOT scheme projects in South Africa as well as provide a rationale as to why you think that risk is critical.

1.		
1.1.	**How frequently does your organization review its overall Business Strategy?**	
……..	Every year ……	[ ]
… ……..Once every two years …….....		[ ]
… ……..Less frequently than once every two years …….		[ ]
1.2.	**How frequently does your organization review Risk Management strategy?**	
… …….Every year ……		[ ]
……. Once every two years …….....		[ ]
… …….Less frequently than once every two years …….		[ ]

2.		
2.1.	**Does your organization translate its *Business* Strategy into specific Risk Management strategy**?	Yes [ ] No [ ]
2.2.	**Does your organization translate its Risk Management strategy into specific executable actions?**	Yes [ ] No [ ]

3.		
3.1.	**Does your organization specifically selects or identify projects that fulfill the *Business* and Risk Management strategic objectives?**	Yes [ ] No [ ]
3.2.	**Are the projects or programs that are undertaken in your organization balanced in terms of risk and return on investment?**	Yes [ ] No [ ]
3.3.	**Does your organization involve the Risk Management steering committee during the development stage of the project?**	Yes [ ] No [ ]
4.		
4.1.	**If your organization is using a Risk Management approach, please rate the following items (characteristics) on a scale of 1-5 (1 = weak; 5 = strong) in terms the extent to which each characteristic is emphasized in your organization.**	
4.1.a.	BOT p*rojects risks are actively managed. Projects Risks are selected, prioritized, de-prioritized (if strategic objectives have changed).*	
	2 **4**	
4.1.b.	*Risk management tools and methods are used to measure and control the Risk Management performance in BOT projects.*	
	2 **4**	
4.1.c.	Risk Management *Resource allocation is managed across all BOT projects.*	
	2 **4**	
4.1.d.	*A risk management steering committee or similar forum meets regularly to actively manage the BOT project risks.*	
	2 **4**	

5.

How would you rate your understanding of Risk Management in BOT projects on a scale of 1-5 (1 = not good; 5 =excellent)

2 **4**

6. **JRE**

What do you consider to be the significant threats to B.O.T infrastructure development projects in South Africa? Threats here refers to circumstances that could negatively affect the project to such an extent that project objectives would not be attained.

Please provide a brief rationale for each item placed on the list.

{see table on next page}

#	RISK
1	
Rationale	
2	
Rationale	
3	
Rationale	
4	
Rationale	
5	
Rationale	
6	
Rationale	
7	
Rationale	
8	
Rationale	
9	
Rationale	
10	
Rationale	

RESPONDENT'S PERSONAL INFORMATION

NAME: _____ PHONE: ( ) _____

ADDRESS: _____ FAX: ( ) _____

_____ MOBILE: _____

_____ E-MAIL: _____

_____