

“Risks in Build Operate Transfer (BOT) Infrastructure Project: A Case Study on Shirwal-Lonand-Phaltan-Baramati Road Project”

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Abstract— The construction industry in India is expected to be worth Rs 120 billion per year; the sector caters to the requirements of billions of people and contributes 5.5% to the country's GDP. However construction industry continues to face challenges around skill deficiency, escalation in material and labour expenses, and socioeconomic changes.

The main intent of this research study is to focus on the India construction transportation sector with an emphasis on multiple project risk factors. The progress of the construction sector in India has been comparatively slow compared with the industrial and manufacturing sectors. The Build-Operate-Transfer (BOT) scheme is now becoming one of the usual ways for construction development in India to meet the needs of India's forthcoming economic growth and development. There are great opportunities for overseas investors to finance in India. However, undertaking construction venture in India, involves many risks and difficulties that are due primarily to variances in legal systems, market situation and culture. It is vital for overseas investors to recognize and manage the critical risks linked with investments in India's BOT schemes.

Based on the review, the following critical risks are recognized: 1) delay in approval, 2) change in law, 3) cost overrun, 4) dispatch constraint, 5) land acquisition and compensation, 6) enforceability of contracts, 7) construction schedule, 8) financial closing, 9) tariff adjustment, and 10) environmental risk.

The methods for mitigating each of these risks are also discussed the factors responsible for time overruns for traditional and BOT projects are identified through a survey. The relative importance and significance of these factors are investigated. Purpose of this paper is to investigate the risks associated with Build Operate Transfer (BOT) schemes in India.

Keywords- Build Operate Transfer (BOT), Risks, Infrastructure Construction Industry

I. INTRODUCTION

Civil infrastructure is vital to the country's financial growth. Infrastructure may be considered to be the skeleton on which the society is built. It includes 1) highways, 2) railways, 3) ports, 4) bridges, 5) hydraulic structures, 5) power plants, 6) tunnels, 7) municipal facilities like sanitation and water supply, and 8) other facilities serving public needs. Sufficient funding is required to construct and maintain the requisite infrastructure.

The instant need for such projects coupled with budget shortages experienced by public agencies has encouraged the use of innovative financing. Conventionally public infrastructure has been carried out by the public sector using the DBB procurement system. With the increased demand for innovative developments and for maintaining existing projects, public funding resources were unable to keep pace with the demand.

Public-private partnerships (PPPs) were sought as alternative delivery systems to address some of the funding problems. PPP arrangements are utilized extensively and have found considerable acceptance in several parts of the world. India has seen a rapid increase in private investment in infrastructure since 2003.

PPP program has grown rapidly in the past 5 to 6 years; in 2002–06 more than 150 PPP deals closed, compared with 66 in the last 7 years. Several arrangements of PPPs have been utilized including the common build-operate transfer (BOT).

Based on the original BOT concept, diverse variations have evolved in many countries.

Few of them are listed here.

- 1) BOO (build-own-operate),
- 2) BLT (build-lease-transfer),
- 3) BOOM (build-own-operate-maintain),
- 4) BOOT (build-own-operate-transfer),
- 5) BOOTT (build-own-operate-train-transfer),
- 6) BTO (build-transfer-operate),
- 7) DBFO (design-build-finance-operate),
- 8) DBO (design-build-operate),
- 9) DBOM (design-build-operate-maintain),
- 10) DOT (design-operate-transfer),
- 11) ROO (rehabilitate-own-operate),
- 12) ROT (rehabilitate-operate-transfer),
- 13) DOT (develop operate transfer).

II. OBJECTIVES

- To Develop a Better understanding of the Fundamental Concepts involved in Build Operate Transfer (BOT) Infrastructure Projects.
- To Identify the Risks associated in Build Operate Transfer (BOT) Infrastructure Projects. To categorize / group the Various Risks associated in Build Operate Transfer (BOT) Infrastructure Projects.
- To review the Impact of the Risks Associated with Build Operate Transfer (BOT) Infrastructure Projects.
- To carry out survey by postal questionnaire and personal interviews of the experts to identify principal causes of delay for BOT projects, and

- To obtain the perceptions of three main participants: owner, consultant and contractor to the factors causing project delays.
- To assess Time Delay risks involved in BOT by studying a specific case of BOT road project.

III. SCOPE OF THE STUDY

The following are the points, which form the scope for this study:

- To understand the Build Operate Transfer Projects and the growing need for same in Indian Scenario.
- To understand different types or categories of risks.
- To Identify and understand the Risks in different stages in Build Operate Transfer projects.
- To understand different Stake Holders in a Build Operate Transfer Project and Risks from each ones point of view.
- To study the Time Delay Risk Build Operate Transfer projects and it's Impacts on the project.
- To prepare and recommend a checklist for identification of risks in the projects under consideration.

IV. LITERATURE REVIEW

A. Risk Management on Build-Operate - Transfer Projects

Construction Research Congress 2005: pp. 1-10. doi: 10.1061/40754(183)91 (ASCE) John E. Schaufelberger

This paper reports the results of a study of seven Asian BOT projects undertaken to determine the primary risks the project guarantor faced the risk management strategies that were chosen, and the results obtained. Two major categories of risk were identified, general risks and project-specific risks.

From this analysis, a risk management framework was developed for each type of risk. The results of this study specify that the private sector cannot be the only participant in risk management, but that the host government's active support is essential to have a viable BOT project in Asia.

B. Risk Assessment of BOT Road Projects

IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278- 1684 Volume 5, Issue 3 (Jan. - Feb. 2013), PP 40-59

Engineer Rinaj Pathan & Prof. Dr. S. S. Pimplikar

This study examines the type of capital and debt in project financing. In addition, it examines the financial instruments used in project financing.

It states that due to lack of fund availability, government had taken decision to implement the project of Major Bridge across river along with bypass route outside city through BOT. This BOT was purely based on concession period. Tender has specific clause which affects the rate of interest due to change in prime lending rate issued by State bank of India.

There is wide range of fluctuation in PLR from start of project & up till now. So, concession period is changed according to that. This paper mainly represents the risk of financing in operation period due to fluctuation in prime lending rate.

C. A study on risk assessment and its management in India

American Journal of Civil Engineering 2013; 1(2): 64-67
doi: 10.11648/j.ajce.20130102.13

Kinnaresh Patel

This study identifies the procedures for risk identification, management and its perception from the Indian construction industry players.

Time and cost management need to be fully integrated with the identification process. Time constraints and project managers with sufficient experience are critical when identifying the level of risk for large and/or complex projects. The aim of this study is to advocate for a method of risk mitigation which includes a well-documented procedure which serves as a one stop-solution to all the risks that would emanate in the future.

D. A Review on Critical Risk Factors in the Life Cycle of Construction Projects

Journal of Civil Engineering Research 2014, 4(2A): 31-36
DOI: 10.5923/c.jce.201401.07

S. M. Renuka, C. Umarani, S. Kamal

This study mainly discusses the critical risk factors and its assessment techniques through comparative study of various international construction projects.

About 50 significant articles published over the last 25 years have been reviewed. The review resulted that a simple analytical tool will be developed for each project task to assess the risk easily and quickly, which will encourage the practitioners to do the risk analysis in their project.

This review concluded that the earlier risk identification in the project and assessment during the bidding stage of the construction project will lead to the better estimation of the escalation on cost and time overrun. Such risk assessments help to include in the budget and scheduling for the successful completion of the project.

E. Risk Management in Construction Industry

IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN: 2278-1684, PP: 59-65

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Construction projects are characterized as very complex projects, where uncertainty comes from various sources. Construction projects gather together hundreds of stakeholders, which makes it difficult to study a network as a whole. But at the same time, these projects offer an ideal environment for network and risk management research.

Additionally, construction projects are frequently used in management research, and several different tools and techniques have already been developed and especially for this type of project. However there is a gap between risk management techniques and their practical application by construction companies. This paper deals with the recognition of risk by different methods, types of risks coupled with construction project and different risk mitigation techniques.

SUMMARY OF LITERATURE REVIEWED

From the literature survey above important observations are as follows:

- Successful completion of the project is possible only when the risks in the project are spread between the various parties and each risk is handled by the party, which can most efficiently and cost-effectively control or handle it.
- The papers aimed at identification of the different risks involved in different stages of project.
- Identification and allocation of risks within the different stakeholders and suggestions were given for efficient risk mitigation.
- Classification and evaluation of risk by its impact on the various components of portfolio returns were carried out.
- The risks for each type of work are estimated based on their regularity and severity with the understanding that a specific type of risk on a construction site increases the effectiveness of safety management.
- The study suggests an evaluation system integrating associated risks and risk influence factors.
- A risk evaluation system is proposed that considers influence factors and addresses the characteristics of construction sites.
- The critical risks identified are as follows: 1) delay in approval, 2) change in law, 3) cost overrun, 4) dispatch constraint, 5) land acquisition and compensation, 6) enforceability of contracts, 7) construction schedule, 8) financial closing, 9) tariff adjustment, and 10) environmental risk.
- Above points are very useful for framework of risk assessment but neither of above literature focused on the whole life cycle of project and the critical risks encountered at each stage of project and their mitigation measures.

V. RISKS IN BUILD OPERATE AND TRANSFER (BOT) PROJECTS

A. Risk

Risk A risk can be defined as an exposure to the likelihood of the economic and financial loss or gain, physical damages or injury, or delay as a consequence of the uncertainties associated with pursuing a particular course of action.

Risk can also be defined as coalescence of all the uncertain factors which will have a combined negative effect on the objectives of the project. Another point of view is that risk arose when it was possible to make statistical assessment of the particular event. Thus risk could be quantified as

$$\text{Risk} = \text{Probability of Event} * \text{Magnitude of Loss or Gain in BOT projects}$$

B. Different Perspectives of Risks

1. Lender's Perspective of Risks

This is mostly associated with the bankability of the venture. They are as follows:-

1. Clear legal basis and clearances of approvals for the project
2. Control over revenue stream
3. Certainty over Project Costs

4. Monitoring of Project costs
5. Participation of major stakeholders
6. Adequate risk allocation
7. Step in rights

2. Developer's Perspective of Risks

This is the perspective we are focusing on in this report.

1. Ability to implement the project in a commercially viable manner
2. Certainty of costs
3. Return on investment
4. Distribution and management of risks
5. Control over revenue stream

3. Government's Perspective of Risks

This perspective is a broader and more significance is given to the impact to society:-

1. To prevent unjust enrichment by the Developer
2. Prevent Abuse of monopoly
3. Environmental issues and impact
4. Rehabilitation and Resettlement
5. Social impact of the project

4. Contractor's perspective of Risks

1. Financial solvency of the developer
2. Policies and framework of the developer's Firm
3. Contractual liabilities
4. Mobilization Advances
5. Incentives and bonuses if any and penalty clauses

C. Types of Risks

1. Market and Revenue Risks

Revenue risk is the insecurity in relation to the revenue that a project would actually generate which will affect the means of finance and thus return on investment.

This can happen in two cases:-

- If the quantum of sales anticipated for the facility does not take place as predicted.
- If rentals of the facility are not priced appropriately.

2. Design Risks

This risk relates to any defect in the design of the project or the design requirements stipulated for the project. This is an inherent risk in the project as it is very difficult to conclusively ascertain that damage to the facility is actually caused due to the defect in the design parameter or the design itself.

3. Construction Risks

The construction risks are essentially a collection of various individual risk factors that adversely affect the construction of a project within the time frame and costs projected and at the standards specified for the facility.

Construction risks coupled with projects are:-

- Cost Overruns and Time and Quality- These risks have an effect on the contracting company directly.

The available measures are to either claim liquidated damages from the contractor or draw down standby finance from the project lenders.

- Cost and Scope of Identified but Unspecified Work and Variations-

These risks flow directly to the contractor and the company and represent a possible area of future disputes. (i.e. subsurface conditions are a major issue here. Who bears the risk and cost?)

- Increased Financing Costs-
This risk flows directly to the contracting company, which may try to mitigate the risk either by a new injection of equity or subordinated debt from the sponsors. On the other hand, the company may draw down stand by finance from project lenders.
- Contractor non-payment-
This is a risk to the company, which may claim liquidated damages from the contractor or make a claim against the contractor's performance bond and bonding company.
- Default by Contracting Company-
This is the flip side of the previous risk. This risk is to the contracting company, with the key mitigating measure being claim of liquidated damages from the company.
- Environmental Damage-
This risk accrues to the company largely and may result in claims on insurers or the party causing the damage.
- Force Majeure -
This risk accrues to the contracting company primarily and would result typically in a claim to the project insurers.

4. Operating Risks

Some of the risks we may face in a project apply also when there is provision of operations and maintenance. These risks flow directly to the company. Some of them are:-
Performance Risk- Completed facility cannot be effectively operated or maintained.

- Operation Cost overrun- Operating costs exceed the original estimates.
- Force Majeure or Environmental Damage- In this type of event the company would most likely place a claim with the insurers because risks of these types would be normally insurable.
- Default-The default may be caused by the actions of a third party, in which case the company could make claims of damage against that party.

5. Financial Risks

Interest rate risk is one of the major financial risks that could force the project to bear additional financing costs. This risk may be significant in projects that have large sums borrowed and the long duration of projects, with some loans extending over a period of several years.

Loans are usually given at fixed rate of interest to reduce the risk of interest rate. In addition the finance package may include hedging facilities for example by way of interest rate swaps or interest rate caps.

6. Political Risks

The project company and lenders face the risk that the project execution may be negatively affected by acts of the government or the host's country's legislature

- Changes in Policies
- Development Approvals

- Adverse government action or inaction
- Increase in taxes
- Unplanned competition

7. Legal Risks

Some of the legal risks related to a large project are:-

- Title/lease of property
- Ownership of assets
- Corporate and security structure
- Financial failure
- Breach of financing documents
- Enforceability of security

8. Environment Risk

These are risks relating to occurrence of environmental incidents during the course of Implementation of the project. These risks are generally within the control of the Construction and the company. This risk has increased due to the presence of strict legal liability in relation to such environmental incidents, which can result not only in adverse effects on the financials of a project but may also cause a closure of any work in relation to the project.

9. Force Majeure Risks

These are risks regarding the events that are outside the control of any party and cannot be reasonably prevented by the concerned party. These risks generally arise due to causes extraneous to the project. The defining of force majeure events includes:-

- Natural Force Majeure events
- Direct political force majeure events
- Indirect political force majeure events

Natural Force majeure events comprise of all events that can be attributed to natural conditions or acts of God such as earthquakes, floods, cyclones and typhoons these risks should be shared equally by both parties.

Direct political force majeure events are events attributable to political events that are specific to the project itself such as exploration, nationalization.

Indirect political force majeure events are events that have their origin in political events but are not project specific such as war, riots, etc.

VI. METHODOLOGY

This study adopted a well-defined methodology which is as follows"

- Identification Phases of BOT Projects
- Identification risks involved at every phase
- Preparation of questions for every stage & Checklist
- Circulation of checklist, site visits, interviews
- Collection of Checklist
- Analysis of responses
- Observation & Discussion
- Conclusion

1. Identification Phases of BOT Projects

Literature referred are deals with the project risk involved while execution only, but risks involved in preconstruction

phase and post construction phase are neglected. This study involves the study of risk according to their life cycle. It is prime work to identify phases of life cycle of project.

According to literature and books, following are the life cycle of project;

A. Conception & Definition Phase	B. Planning Phase
C. Execution Phase	D. Closure of Project

A. *Conception & Definition Phase*

This phase involves following activities;

- Concept of the project
- Scope of the project
- Category of the project
- Tendering and bidding
- Work order

B. *Planning Phase*

This phase involves following activities;

- Allocation of sub contractor
- Estimation
- Cost estimation
- Scheduling
- Presenting milestones
- Quality & safety plans
- Cash flow

C. *Execution Phase*

This phase involves following activities;

- Priorities of work
- Work breakdown structures
- Resource allocation
- Daily quantity consumption
- Maintaining daily progress
- Achieving desired quality and safety

D. *Closure*

This phase involves following activities;

- Handing over and taking over
- Maintenances
- Extra work claims

Life cycle of the projects for real estate and for accuracy, this study segregated phases into six categories. This leads to an accuracy at each set of activity (phase) in study and betterment in analysis. These phases are set by over a discussion with real estate experts and literature. Followings are the phases of life cycle:

- STAGE – I : CONCEPT AND FEASIBILITY STUDY
- STAGE – II : FUND RAISING & FINANCIAL CLOSURE
- STAGE – III : TENDERING, BIDDING & AWARD OF PROJECT
- STAGE – IV : PROJECT PLANNING & MAIN PROCUREMENT
- STAGE – V : CONTRACT EXECUTION, MONITORING AND CONTROL
- STAGE – VI : PROJECT CLOSURE, SALE /

OPERATIONS AND MAINTENANCE

2. *Identification risks involved at every phase*

Risk involved at every stage is identified in terms of problem statement or hazard. Risks were identified on the basis of literature review and interviewing some professionals who are working in the field from the last 10yrs.

The study of following point is very necessary;

- Are risks identified or not in particular phase?
- Which types of risks are involved?
- Categories of risks need to be identified?
- Hazards of risks
- Severity of risk
- Impact on project
- Cost impact of risk
- Time impact of risk
- Occurrence and Probability of risk

These points are discussed and analyze, following major groups are selected out of above this are;

- Can Detect this Risk in Advance
- Rating for Severity of Loss due to this Risk
- Rating for Probability
- Impact on Project Delays

VII. CONCLUSION

In this research, the critical risks associated with India's BOT projects were investigated. The main conclusions are as follows:

- The identified critical risks in order of importance are: delay in approval, change in law, cost overrun, dispatch constraint, land acquisition and compensation, enforceability of contracts, construction schedule, financial closing, tariff adjustment, and environmental risk.
- The risks are then assessed through the various life cycle phase of a BOT project and a Checklist / Questionnaire is prepared which can be circulated to personnel's working on Different BOT projects to pick out the critical risks affecting the Time and Cost overruns of BOT projects.
- Once the critical risks affecting the Time and Cost overruns of BOT projects are identified, analysis can be done to see the impacts of these critical risks on BOT projects and accordingly mitigating measures can be suggested.

VIII. REFERENCES

[1] Risk Management on Build-Operate - Transfer Projects Construction Research Congress 2005: pp. 1-10. doi: 10.1061/40754(183)91 (ASCE) John E. Schaufelberger
[2] Risk Assessment of BOT Road Projects IOSR Journal of Mechanical and Civil Engineering (IOSR- JMCE) e-ISSN: 2278- 1684Volume 5, Issue 3 (Jan. - Feb. 2013), PP 40-59 Engineer Rinaj Pathan & Prof. Dr. S. S. Pimplikar

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- [3] A study on risk assessment and its management in India American Journal of Civil Engineering 2013; 1(2): 64-67 doi: 10.11648/j.ajce.20130102.13 Kinnaresh Patel
- [4] A Review on Critical Risk Factors in the Life Cycle of Construction Projects Journal of Civil Engineering Research 2014, 4(2A): 31-36 DOI: 10.5923/c.jce.201401.07 S. M. Renuka, C. Umarani, S. Kamal
- [5] Risk Management in Construction Industry IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN: 2278-1684, PP: 59-65 Mr. Satish K. Kamane, Mr. Sandip A. Mahadik
- [6] Sharmila Mane, Dr. S.S.Pimplikar (August 2013). "Risk Assessment of BOT Projects". International Journal of Computational Engineering Research||Vol, 03||Issue, 8||