PROSPECTS OF BUILD OPERATE TRANSFER (BOT) PROJECT DELIVERY METHOD FOR ROAD INFRASTRUCTURE: A CASE STUDY KARACHI-HYDERABAD MOTORWAY M-9

By

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This is to certify that the

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DEDICATED

TO MY FATHER, MOTHER AND

MY WIFE WHO HAD PUT UP SO MUCH THAT HELPED ME

TO COMPLETE THE STUDY

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(Ahmar Jamal)

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
BOT	Build, Operate and Transfer
CDA	Capital Development Authority
ESCAP	Economical and Social Commission for Asia and Pasific
EOBI	Employees Old - Age Benefit Institution
ETTM	Electronic Toll and Traffic Management
FBS	Federal Bureau of Statistics
GDP	Gross Domestic Production
GOP	Government of Pakistan
GoP	Government of Punjab
IPDF	Infrastructure Project Development Facility
IBRD	International Bank for Reconstruction and Development
JICA	Japan International Cooperation Agency
MIGA	Multilateral Investment Guarantee Agency
NHA	National Highway Authority
OPIC	Overseas Private Investment Corporation
PNTP	Pakistan Transport Plan Study
PPIB	Private Power and Infrastructure Board
PSDP	Public Service Development Project
RDA	Rawalpindi Development Authority
SAPO	South Asian Productivity Organization
SPSS	Statistical Package for Social Sciences
UNIDO	United Nations Industrial Development Organization

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ABSTRACT

Better infrastructure network and related services are very much required for flourishing and sustainable economic growth of any country along with social development in human relations. On the other hand, the third world countries have inadequate available capital to be assigned on principal expenditures and stretched out public services. To reduce the bridge between existing public funding and the expenditure on required infrastructure, public authorities are increasingly turning to Build Operate Transfer (BOT). In Pakistan, privatization process of roads falls under National Highway Authority with no vast experience in BOT infrastructure. Expansion and rehabilitation of Karachi – Hyderabad Motorway (M-9) of 136 Km length was awarded to Standard Construction Company in 2006, at the cost of Rs 7 billion and concession period of 25 years, however the project could not take off due to misunderstandings on financial closure between the client and the developer. After a gap of five years same project with similar specifications has now been awarded to Malaysian firm Binapuri Holdings at the cost of Rs 24.93 billion and concession period of 28 years. Failure to execute such attractive projects indicates that the investors are not getting the anticipated response and planned turnover from the public authorities and simultaneously the public agencies are also facing problems in supporting the guarantees thus increasing the risk factor on the limited budget of a developing country. These situations are required to be evaluated to judge the suitability for the planned potential project. For this purpose an already designed template by Dr. Bing Li (School of Built and natural environment Glasgow Caledonian University) was selected for judging the potential Build Operate Transfer projects. The template consisted of two groups of factors, each of positive and negative. An opinion of different categories of construction industry participants on Build Operate Transfer was developed by circulating the template as a survey questionnaire among them for the ranking purpose, later the ranked values of each factor were applied on ranking of Karachi – Hyderabad Motorway (M-9), given by the General Manager of Build Operate Transfer Cell at National Highway

Authority, thereby formulating an evaluation model for assessing the suitability of a understudy project. The results obtained from the model equation were unanimously favorable for the Build Operate Transfer method of project delivery in respect of Karachi – Hyderabad Motorway (M-9). Same template had also been applied by Dr. Cheung E. and Albert P. C. Chan in 2007, during BOT Analysis of Hong Kong Zhuhai Macau Bridge of 29.6 Km, planned to be completed by 2015-2016 and costing 37.4 billion (RMB) worth of 6 billion US $, however found unsuitable for private procurement method. The Government of Pakistan (GOP) has launched various BOT projects in the last decade in order to protect its financial liabilities and to inject the finance from private sector, for this purpose the study recommends development of a conducive environment for private investment which requires bureaucratic support, political will, public acceptance and acceptable profit. Independent suitability analysis for all potential BOT projects should be carried out at regular intervals by the government and the result of the evaluation model worked out would be able to help both the public and private sectors to assess whether potential public projects are suitable for BOT or otherwise.

Chapter 1

INTRODUCTION

1.1 General

The critical part in the present economy across the orld is the capability to deliver commodities and services in a well-timed and gainful method. Authorities of all types, may it be National, city governments or civic authorities are continuously searching for ways to develop and renew their network of public roads infrastructure and its related services. Disorganized setup of infrastructure creates obstacles and hindrances in the growth of trade and thus, there is a dire need to face infrastructure issues in order to make them efficient and organized existing infrastructure. By making combination of private investment and management and their operational skill, Public Private Partnership (PPP) can relieve financial restrictions and improve efficiency to provide good infrastructure services to public. Build, Operate and Transfer (BOT) project delivery method can assist progress public infrastructure and its related services within lesser time, for good money value thus causing innovation in future projects.

Public sector projects delivered through the private sector normally involve private sector funding. As a result, the government funding required for public services can be minimized and shifted to sustain projects of more importance, e.g., education, healthcare, and community services (Li et al 2005).

1.2 Bridging Infrastructure Gap

Globally, not only poor nations but also developing countries are facing acute shortage of basic infrastructure. The following infrastructure gap requires the amount of investment that a developing country can hardly materialize while the demands are rapidly growing (Levy 2006).

- Paved roads: inaccessible to more than 1 billion people
- Safe drinking water: no facility to 1.2 billion people.
- Electric power: 2 billion people are yet to make use of it.
- Dependable energy: 2.3 billion people have no such sources.
- Sanitation facilities: 2.4 billion people do not have.

- Modern communication: 4 billion people do not have such services.

In brief, maximum of the developing countries had to pay 5 % of their gross domestic product (GDP) yearly on infrastructure investment expenditures for expansion and sustenance of significant public infrastructures. Bold steps and tangible approaches along practical solutions, such as private investment or BOT are required to meet this constant challenge.

1.3 Infrastructure Issues in Pakistan

In Pakistan, the infrastructure set up consists of information technology, telecommunications, power, ports, roads, railways, air transport, waste management, water supply, cyber parks, and industrial estates. These infrastructures are grossly inadequate compared with world standards (See Table 1.1) and this deficiency is recognized as one of the critical reason not permitting efficient economic growth. Decrease in growth impetus in the wake of elevated goods prices, along with the abnormal law and order situation and power losses has also provoked threats to macroeconomic strength. 4.4% of the projected GDP goes for servicing the public debt for year 2009-2010 (www.adb.org/Documents/Reports/PRM.../Pakistan-Public-Debt) . Consequently, development expenditures decreased from 22.8% of GDP in FY2008 to about 18% by FY2011 (www.infopak.gov.pk/EconomicSurvey/04-FiscalDevelopment.pdf).

Table 1.1: Overall Infrastructure Quality (Out of 139 Countries)

Country	Global Compet-itive Index	Quality of Electric Supply	ICT Usage	Quality of Roads	Quality of Railroad	Quality of Port Infrastructure	Quality of Air Transport
Malaysia	26	40	50	21	20	19	29
Thailand	38	42	79	36	57	43	28
China	27	52	78	53	27	67	79
Indonesia	44	97	103	84	56	96	69
Vietnam	59	98	70	117	59	97	88
Philippines	85	101	106	114	97	131	112
India	51	110	118	90	23	83	71
Pakistan	123	128	109	72	55	73	81

Source: www.**competitiveness**.org.pk/downloads/SPCR2010.pdf.

Since long the major investment in infrastructure has always been done by public sector which has now reduced as a percentage of GDP, moreover private sector investment has also failed to address the gap. At present, the needs of economic development as well as the demand arising from population growth are not being satisfied being inadequate in existing infrastructure. At the same time, the Government's capacity to meet growing infrastructure requirements has been restricted due to the large economic deficit and has emerged as a major constraint to the country's efforts to develop its own investment atmosphere. Private quarter participation must be welcomed and encouraged by generating lucrative atmosphere attracting private sector investment and to supplement limited public resources for infrastructure,.

1.4 The Significance of Road Infrastructure

Access to markets, services, employment and information is as important as providing social benefits and road network is the only mean for providing this basic necessity. In third world countries, transition economies carry 60 to 80 percent of all passenger and freight transport through road network. In reaction to rapid traffic growth the third world countries are expanding their road networks significantly, particularly during the 1960s and 1970s. During 1984–1994 the road networks in Indonesia, South Korea, Malaysia, and Pakistan grew in length by more than 5 percent per year. Today there are nearly 1.5 million km of roads in Africa, 3 million km in Central and South America, 2.6 million km in Asia (excluding China and India), just under 1 million km in the former Soviet Union, and 500,000 km in the Middle East(ESCAP 2005).

In 2010-11, Pakistan had a road network covering 259,463 kilometers including 180,866 Km of paved roads and 78,597 Km of non-paved roads. Since March 2008, National Highway Authority (NHA) has launched/awarded 36 development projects covering a length of above 1000 Km inclusive of a number of bridges, flyovers and interchanges. The modal split of Pakistan transportation modes (road, rail and air) is presently dominated by road transport and is presented in Figure 1.1 (JICA, 2006).

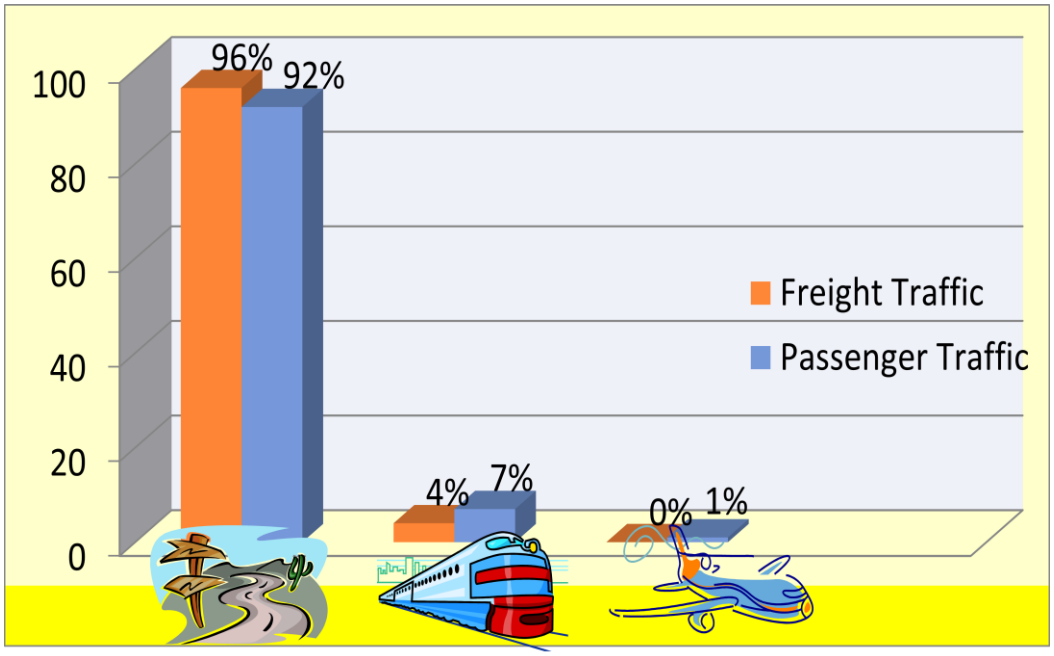


Figure 1.1: Distribution of Transport Sectors in Pakistan

The significance of roads is further emphasized by accepting this fact that expenditure on roads can take up as much as 5 to 10 % of a government's periodic expenses and 10 to 20 % of its development budget. However, financial revenues from road transport also makes up one of the largest assistance country's economy. For example, road-user taxes and charges in the United States of America amounted to $78 billion in 1994 (6.2 percent of federal government revenue) and in the United Kingdom $33 billion in 1995–96 (of which only $10 billion was spent on roads). Due to expensive costs mainly for procuring construction and maintenance equipment, the road sector also absorbs a great arrangement of grant finance. Even a moderately small national road agency often owns $25 to $50 million of plant and equipment. The world's roads are truly big industry, generally bigger than railways or national airlines, in terms of assets and yield, particularly when maintenance is fully funded. Road maintenance and construction is also noteworthy in terms of employment (Levy 2006).

1.5 Research Objectives

The objective of this present study is to assess the suitability of Build Operate Transfer (BOT) project delivery method for road construction in Pakistan and in particular for Karachi – Hyderabad Motorway (M-9), in following manner;

a. Understanding mechanics of Build, Operate and Transfer (BOT) project delivery method.
b. Commercial Feasibility of Karachi – Hyderabad Motorway (M-9).
c. Development and grading of attractive and negative group of factors for BOT project delivery method through survey questionnaire.
d. Statistical analysis of attractive and negative group of factors by using SPSS software and determine the suitability for the considered project.
e. To recommend modalities to improve BOT project delivery method in Pakistan.

The potential project has been selected being the one at initial stage of selection or documentation or having potential to go through BOT project delivery method. For the assessment purpose of Karachi – Hyderabad Motorway (M-9), an expert user of the considered project will rank or grade the positive and negative factors depending on his personnel degree of experience, information and satisfaction for the considered project. The user information may be based on following:

- History
- Development
- Future
- Parties involved
- View of general public
- Preference of public and private sector
- Normal practice
- Advantages and disadvantages
- Political situation
- Time frame

- Opportunities
- Obstacles
- Culture

The factors for all the BOT projects cannot always be same because of the uniqueness of each project as well as the economical, social and political environments which plays a peculiar role in the construction culture. Therefore additional factors can also be considered and may be included in the survey questionnaire for any project whose BOT suitability has to be determined.

1.6 Scope and Limitation of Research

There is very little study and no related books on BOT in road construction industry particular to Pakistan. However, United Nations Industrial Development Organization (UNIDO), Infrastructure Project Development Facility (IPDF), Private Power and Infrastructure Board (PPIB), PPP Unit Punjab and Sindh and National Highway Authority (NHA) for road privatization in particular, has developed policy guidelines and few are in the process of formatting the "Act for BOT Infrastructures" and few have already made the Guidelines approved. These policies and guidelines of privatization process and personnel interviews from the respondents i.e. Clients, Consultants, Developers and Financers have formed the basis of this study.

1.7 Organization of Thesis

The thesis is organized in seven chapters with Chapter 1 covering an introduction to the significance of infrastructures in developing countries and road infrastructure in particular. Chapter 2 covers literature review while Chapter 3 covers the mechanics of BOT method of project delivery, Chapter 4 is related with the familiarization of Karachi – Hyderabad Motorway (M-9) and its commercial feasibility. Research methodology has been covered in Chapter 5 and Chapter 6 contains the result analysis and discussion. The final Chapter 7 presents the conclusion and recommendations.

1.8 Summary

In this chapter, the focus is made on the importance of infrastructures in the development of developing countries and particular emphasis on road infrastructure. Like all other developing countries Pakistan is also facing economical crisis and does not have financial strength to carry out public infrastructure projects though public money. The way out is the inclusion of investment from private sector for infrastructure development and for that purpose efforts has-been put in to find whether BOT project delivery method is favorable for Pakistan infrastructure development or not.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

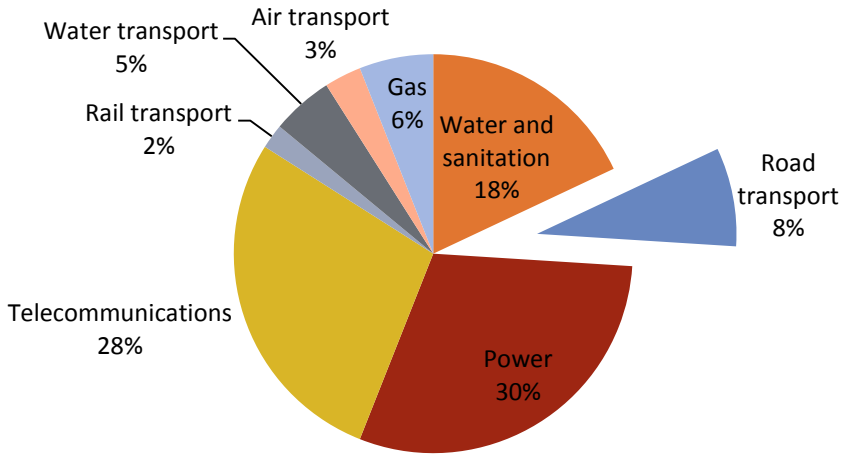
This chapter presents the definitions of BOT and general familiarization with privatization process in public infrastructure development. It also focuses on the successful and unsuccessful BOT delivered projects across the world along with reasons of failures. The last part of the chapter highlights the present progress of road construction in Pakistan though BOT method of project delivery.

2.2 Privatization of Public Sectors

Privatization is a word frequently used during the first half of the 1990s. But what does it mean? When describing events taking place like state owned industries are being sold to private investors, the term has a readily understood meaning. However, there is another form of privatization, more aptly referred to as "limited term privatization" or perhaps a "public/private partnership", being undertaken in maximum of countries. It involves the investment of private risk capital to design, finance, construct, operate, and maintain a project for public use for specific term during which a private investment consortium is able to collect revenue from the users of the facility. When the consortium's limited term of ownership expires, title to the project reverts to the government at no cost. By then, the consortium should have collected enough revenue to recapture its investment and turn a profit on the investment. Both forms of privatization have resulted from the acknowledgement by the government that the private sector can in many cases produce a much more cost effective end product than can the public sector (Levy 2006).

Governments the world over, whether they administer emerging, developing, or developed nations, are embracing the concept that the private sector, spurred on by the profit motive and uninterrupted by unnecessary demands of bureaucracy, can perform certain tasks more efficiently than they can. Timely

implementation of projects in the private sector can reap the benefit of greater efficiencies and productivity. The private sector's enhanced decision making capability allows for more effective use of the available human resources. The World Bank has estimated that private toll road development accounts for 8 percent of the $60 billion annual market for private infrastructure projects worldwide as shown in the figure 2.1.



Source: World Bank (2006-2007)

Figure 2.1: Private Infrastructure Projects, By Sector

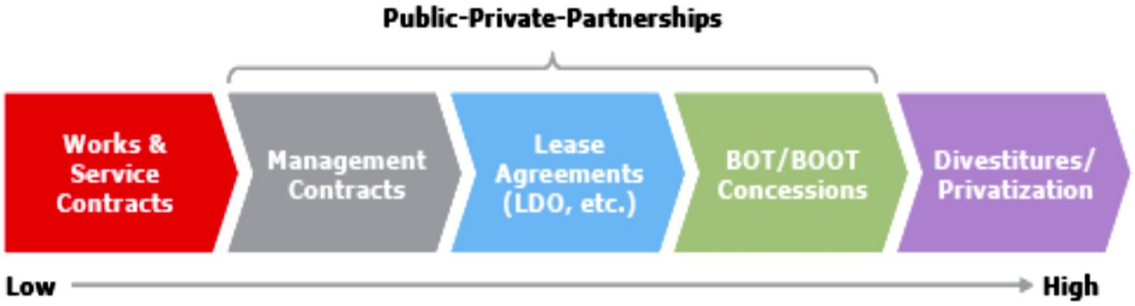
There had been rapid development of private investment in public infrastructure and a sharp increase in private management of the services related with BOT infrastructure The last two decades and particularly the period to 2006, saw both. Development of new forms of Public Sector Privatization including varying forms of public/private partnerships have been fuelled by the investment from private sector, e.g: BOT (build- operate-transfer), BOO (build-own-operate), build-own-operate- transfer (BOOT), and concessions. In most countries, an important role in the increase of the infrastructure sectors has been played by introducing new financial methods, especially project finance and the globalization of private investment funds.

2.3 An Overview of Public-Private Partnerships

No explicit definition of public-private partnerships is available as well as no single one is universally accepted. Different people have different understanding on PPPs, so they frequently mean different things and makes assessment and comparison of international experience in such partnerships difficult. PPPs in general sense is related to various forms of collaboration between private sector and the public authorities to manage, finance, construct, restore, operate or maintain an infrastructure or service. Risk allocation in all PPPs is the main component distributed between the public and private sector to provide the infrastructure or service. In order to distinguish a PPP from the more conventional public sector model of public service delivery, the distribution of sizable and at times significant risk to the private partner is the key element. Contractual and institutional are two basic types of PPP. In some circumstances institutional PPPs have been more successful, particularly in countries with well-developed regulatory and institutional capacities. In third world economies, contractual PPPs are appreciably more common. While there is no universal consent on the definition of public-private partnerships, but PPP is best characterized through the following elements (Deloitte 2009).

a. The private partner funds the infrastructure or service, in whole or in part.
b. Private and public partners allocate the risks among them and are owed to the party best found to deal with each risk.
c. Relatively high business costs and multiple parties are involved in PPPs being intricate structures.
d. In PPPs, the performance risk is transferred to the private partner as it is a procurement instrument in which the focus is on payment for the successful delivery of services.
e. Output-/performance-based measures are involved in PPPs are– whereas public service delivery method involves the conventional input-based measures.
f. Combination of services are dealt through PPPs (i.e., design, construction, repairs and operation) to increase synergies and decrease low-capital/high-operating-cost proposals.

Total privatization and conventional public sector model of public service delivery are the exterior limits where PPPs can be applied. But the nature of projects can allow within this division, countless types of potential PPP business structures that can be employed, basing on the objectives and requirements of public sector. Calculated and targeted risk transfer, the legal and institutional environment, established industry norms and the financial realities of the anticipated business are the factors on which any particular transaction design will be dependent. The transfer of risk progressively increases as greater the degree of privatization is integrated in construction agreements and transactions (Deloitte Financial Consultancy Report 2009)



Source: Deloitte (2009)

Figure 2.2: Multiple Types of PPP Transaction Structures and levels of Risk

2.4 BOT Approach

The Build, Operate and Transfer (BOT) approach to grow infrastructure projects and facilities of public interest such as bridges, airports, power plants, detention facilities, parking facilities etc is an substitute for a country that lacks the appropriate funds to undertake on its own projects of this scale (Yiannis and Demos, 2005).When we use BOT approach in infrastructure development, it is renamed also as a public private partnership. The capability of the concessionaire is control in a BOT approach through liberal and flexible means, while increasing the service efficiency for the project owner and minimizing the operating expense.

In order to undertake a BOT project, the most frequent and effective means of mobilizing resources is arrangement of a consortium or syndicate of contributing companies around a project company created exclusively for the tenure of the venture. In this manner the project company is subcontracted by each

contributor and all of them offer the benefit of minimizing the risk for individual contributors.

2.5 What is BOT?

Built-Operate-Transfer is an approach for project financing and this has found its application in recent years largely in the area of infrastructure privatization in the third world countries. The concept of term BOT is not new one, it has been in utility for centuries. In America and in France, most of the early turnpikes and canals were functioning on the principle that a grantor, may it be a government agency but not always the same, would authorize an operating license to an authorized party for a long term contract to build up and run a haulage company with restricted rights to a length of road or river. For developing countries, financial markets are shuffling the way in which debt capital is raised to found the development of infrastructure. In the past, debt was raised directly from multilateral and export credit agencies or from sovereign governments themselves to provide turnkey financing. Recently, infrastructure developers have turned increasingly to investment style credit in the form of capital pools, operating concessions and separate utilities. This has changed the traditional contractor's role from being a service provider to being a business partner in the operation of the enterprise (UNIDO 1996).

2.6 Definition of BOT

BOT is the terminology for a model or structure that uses private investment to undertake the infrastructure development that has historically been the preserve of the public sector (UNIDO 1996).

OR

BOT is a form of project financing, where a private unit receives a concession from the private or public division to finance, design, construct, and operate a facility for a specified period, often as long as 20 or 30 years. After the concession period expires, possession is transferred back to the granting unit, (http://en.wikipedia.org/wiki/Build-operate-transfer).

2.7 How does it Work?

In a BOT project, a private company is given a concession to build and operate a facility that would normally be built and operated by the government. The facility might be a power plant, airport, toll road, tunnel or water treatment plant. The private company is also responsible for financing and designing the project. At the end of the concession period, the private company returns ownership of the project to the government. The concession period is determined primarily by the length of time needed for the facility's revenue stream to pay off the company's debt and provide a reasonable rate of return for its effort and risk. For the period of the concession the project operator is allowed to charge the commuters an appropriate toll or fees rentals and charges stated in the concession agreement. This enables the project operator to recover its investment, operating and maintenance expenses in the project. Due to the extended duration of the arrangement, the fees are usually raised during the concession period. The rate of increase is often ties to a arrangement of internal and external variables, allowing the operator to reach a satisfactory internal rate of return for its investment.

In the contemporary situations, a currency-deprived agency or state will be interested to agree to a profit sharing contract with a concessionaire. Here the BOT approach differentiating from the conventional subcontracting arrangements generally undertaken in the country is the key aspect in this profit sharing principle. All the responsibility for a series of technical, operational and service related objectives lies with concessionaire which will function as an autonomous business organization. A predetermined fee payment commitment to the owner will be tailored in the contract so that any risk of revenue variation will be offset to the concessionaire (http://www.mcmullan.net/eclj/global.htm).

2.8 BOT in Different Forms

Various forms of themes on Build-Operate-Transfer have emerged and the differences are mainly in the understanding of precise ownership and stages of payment between the owner and the concessionaire at the end of infrastructure construction. The main approaches are summarized in the Table 2.1.

Table 2.1: BOT Variants

Build-Transfer-Operate (BTO)	This type of contract allows the concessionaire to build and operate for a preset period of time followed by the relocating all the facilities and paraphernalia to the client.
Build-Own-Operate (BOO)	The developers purchase the facility through installments from the client. Here keeping facility running and the expenditure involves over the repayment period is saving to owner. After this, ownership reverts to the concessionaire.
Build-Transfer-Operate (BTO)	The facility is built by a concessionaire under agreement and payment is partially made however the concessionaire remains the operator and earns the balance expenditures or revenue.
Build-Lease-Transfer (BLT)	The developer builds a facility and after completion leases out the facility to other party till completion of the contract period. Later it is handed back to the owner
Design-Build (DB)	A turnkey method is similar to this, the developer not only designs but also construct and monitor progress.
Build-Operate-Transfer (BOT)	In BOT permission is given to constructor to design, finance, maintain, and operate a facility for a specific time period. During this tenure the constructor is allowed to toll the facility and earn its share for the investment made in the facility.
Build-Own-Operate-Transfer (BOOT)	This method allows the construct to invest, build and then lease out on long term ownership, till revenue is sufficiently generated through charging the users, at end of contract period it is returned back.
Design-Build-Finance-Operate (DBFO)	This type of BOT is complete privatization. The projects after financing, designing, construction and maintenance are left with the developers. The charges of the facility are also taken by the constructor.
Build-Lease-Transfer-Maintain (BLTM)	In this BOT, the constructor finance the project as well as design and construct and later return to government on lease for some fixed period of time at a determined cost for retrieving investment.
Lease-Renovate-Operate-Transfer (LROT)	Used facilities requiring renovation or up gradation can be taken under this type of BOT arrangement. The developer invests for the renovation of the facility and pays a leasing fee to government. The developer is authorized to operate the facility for a determined time period and also to collect charges by the user.

2.9 Potential Advantages to the Host Government

The BOT approach to financing infrastructure has many potential rewards and is a feasible alternative in developing countries to the more traditional approach using sovereign borrowing or budgetary resources (UNIDO 1996).

a. Capability to step up the development of projects that would otherwise have to wait for and compete for limited sovereign funds.
b. Allocation to the private sector of project risk and burden that would otherwise have to be borne by the public sector. The private sector is responsible for the operation, maintenance and output of the project for an extended period (normally the government would receive protection only for the normal construction and equipment warranty period).
c. In contrast to full privatization, government retention of strategic control over the project, this is transferred to the public at the end of the contract period.
d. Technology transfer, the training of local personnel and the development of national capital markets.
e. The involvement of private sponsors and experienced commercial lenders, which ensures an in-depth review and is an additional sign of project feasibility.
f. The opportunity to establish a private benchmark against which the efficiency of similar public sector projects can be measured and the associated opportunity to enhance public management of infrastructure facilities.
g. Use of private division capital, initiative and expertise to reduce project construction costs, shorten schedules and better operating competence.
h. Use of private sector investment to provide new sources of capital, which reduces public borrowing and direct spending and which may develop the host government's credit rating.

2.10 Attitudes of the Key Players

The attitudes and motivations of the following contributors make us understand the interests in BOT atmosphere and it is also important to understand the concern and interest of each stakeholder (ADB 2004).

- **Governments**
  - Politicians want the bodily result: an expressway (and are often little concerned with its traffic/benefits).
  - A ‘cargo cult’ mentality: BOT projects - a cost-less result which happen without major government input.
  - Expressways can be constructed without acquiring land.
  - Infrastructure makes money - the uncomplicated solution.
  - All BOT projects are a fine thing.
  - BOT a replacement for transport policy (capacity development is the core policy goal).
  - Reluctance to consider tolling existing free roads.

- **Project Sponsors/Developers**
  - Belief that a blend of purposeful action, good connections and some technical/financial work can: (i) secure government endorsement for a new project and (ii) result in efficient execution.
  - Primary intention for contractor members is short-term construction benefits and an adequate exit strategy once the project is ready.
  - Interest in future business scenario in the country and focus on expanding returns collection from tolls.

- **Financial Institutions**

  Their concerns are:
  - The negative risk - bankers have no upside;
  - To put a floor beneath the risk - and get others to take the risk under this.

Their requirements are:

- Strong government pledge to private sector policy.
- An satisfactory legal framework, as a prerequisite.
- Sound business plan.
- Government to have contact to world-class consultants, contractors, operators.

- **Community Groups**
  - Influence of the anti-toll and anti-car lobby.
  - Apprehension that the alignment protects sensitive areas.
  - Apprehension that environmental and social policies are not circumvented - land acquisition, compensation/relocation.

2.11 Failures and Successes of BOT Roads

Although the term BOT is relatively new, the practice of permitting private concerns to develop and operate infrastructure projects has been around for several centuries. Concessionised infrastructural development was employed for projects such as a 1782 water system in Paris and the Suez Canal which opened in 1869. Since the early 1980s the concept has been applied to power generation, telecommunications, sewage and water, bridges and toll roads, and other facilities in the United States of America, England, and Latin America. The Anglo-French channel tunnel, the Eurotunnel, built in the early 1990s, became probably the largest ever BOT project. This experience demonstrates the feasibility of the concept. But the Eurotunnel project also reflects the complexity and dangers inherent in the BOT approach: the project has been a financial disaster for investors, sponsors, and bankers, requiring long and costly restructuring. In 1970 it was proposed in Thailand for a new airport, with American sponsors, until allegations of corruption led to the project's cancellation (Paul Handley, 2002). Similarly the BOT environment in Pakistan is not that conducive for attracting private investors to put the capital in the road industry. Few examples of success and failures of road infrastructure development through BOT project delivery method in various regions of the world are given in the succeeding section.

2.12 Successful BOT Projects

2.12.1 Thailand's Second Stage Expressway (SSE) Project

Bangkok Expressway Company Ltd. (BECL)'s carried SSE project and ended reasonably successful, however the elements of success are indisputable. The SSE is a US$1.1 billion, thirty-two kilometer inner-city toll road. The thirty-year BOT concession was awarded to a Japanese construction company, Kumagai Gumi, in 1988, in a detailed concession contract with the state agency, the Expressway and Rapid Transit Agency of Thailand (ETA), that explicitly declared the principles of the sponsor undertaking the costs of building the road in exchange for earning revenues on predetermined user tariffs. With a bidding process set on clear goals and an apparent general support for the BOT approach, it took only twelve months for the final concession contract to be concluded. Financing was successfully arranged within another year. In 1993, BECL completed the main portion of the road on schedule, and when the SSE opened, income flows from users more than validated the projections made at the beginning: the road was profitable and self-funding. The company proved that the private sector could far outperform in construction time and costs, without recourse to government financing or equity. In 1995 BECL was successfully floated on the stock exchange of Thailand (Handley1997).

2.12.2 Manila North Tollways-North Luzon Expressway, Philippines

This Expressway is also called North Diversion Road, it is a limited-access toll expressway linking Metro Manila to the Central Luzon district in the Philippines. North Luzon Expressway (NLEx) was previously under the management of Philippine National Construction Corporation or PNCC, later in 2005 the management of operation and was shifted to the Manila North Tollways Corporation, a secondary of the Lopez Group of Companies. A partnering with the Philippine National Construction Corporation (PNCC) was formed in order to build up and improve the NLEx, PNCC is a government-owned and managed corporation. The joint venture created, in order to provide financing, rehabilitate, operate and maintain the NLEX until 2030. Another construction company Egis Projects S.A. of France, Leighton Asia Limited of Australia, was allowed to join in

the venture along PNCC to partner with it through equity funding and construction of the expressway facility. Therefore this rehabilitation of the North Luzon Expressway became a joint venture between the government and the private sector, for which the Manila North Tollways Corporation was allowed the concession to investment, restore, expand, operate and maintain the NLEx under a Supplemental Toll Operation Agreement (STOA). This agreement provided all functionary rights, interests and rights of PNCC to be used by MNTC. Now MNTC got the right to collect toll fees during the concession period of 30 years for the purpose of maintenance, recovering its investment and resolving the long-term loans used for financing the project. In 2001, this project was named as the "Asia Pacific Transport Deal of the Year" by the Project Finance magazine publication (Llanto 2008).

2.12.3 The Dulles Greenway Project, USA

Dulles Greenway is a major example of a BOT project in the United States of America, built in Virginia and was completed in 1995. The BOT concept has been applied for the construction of Dulles Greenway which is a toll road. This road joins Dulles International Airport to Leesburg through a 14 Km stretch of pavement and later joins the existing Dulles Toll Road. This road is a 4 lane limited-access Highway, having a right of way of 250-foot.Being a BOT project, a private consortium sponsored, built, and operated this infrastructure. In order to allow a private company for construction and operation of a toll road, the prerequisites were obtained by enabling legislation in the Virginia Assembly. An Italian Construction company Autostrade International S.p.A. became the concessionaire and took the responsibility of constructor as well as operator. This construction company became general partner in the Greenway corporate entity and also became an operator of the Greenway. For collection of tolls automated toll collection techniques along with traditional manned toll collection booths are employed together. US $326 million was anticipated as the total cost of the project. $22 million was kept for equity financing and $46 million was provided by the concessionaire to various lines of credit that would serve as guarantees against project risks, against total investment of $68 million by the consortium partners. A US $202 million was provided as a long-term loans by a consortium of 10

financing institutions. The Dulles Greenway Project came into effect when no government resources were available for the project and it was not possible to devote other public fund for the purpose. An investment of private division funding, made the project possible to be completed. The other advantage is that the project is self-supporting and government agencies does not have to allocate budget resources for its maintenance. The road users are charged fees for the use of the facility only (Levy 2006).

2.12.4 Riverside Freeway in California, USA

The median strip is basically converted to an all-electronic-toll four-lane express highway with two lanes in each direction. The median "express" lanes can be chosen by vehicles by paying pay up to $3.50 or they can take the stop and go lanes. This median road infrastructure is the world's first fully electronic toll road, with differing toll demands (Poole, 2000). US $126 million was expanded for the construction of 10- mile lanes by a team under contributory of the general contractor Peter Kiewit Sons, Inc and completed in 1995 with a 35-year franchise period. The construction team in 1988 tried to pull out from the project after operating it only for few years and made plans to trade the freeway to a nonprofit corporation which they themselves had created. However it could not happen due to public resistance that that stopped the planned $244 million deal, this amount would have been used to refinance the project with tax exempt bonds, thus minimizing interest rates on the loan of $100 million also this would facilitate car pools to resume using the toll lane free of charge. Critics charged that this deal was not easy to achieve as the price asked was too high and if it would happened it would result in extreme debt service and higher toll rates. The construction team would be making profit in double digits on the investment made by them, although a slight profit might be achieved by the project. This gives business lesson that BOT is not always reasonable to be adopted by the governments however more attractive it seems. The constructor is still reluctant to continue on the agreed-upon concession conditions, although the road project is going successful. In this environment the government is dealing with a less-than-willing partner. The other issue was that the provisions for the exit of a developer was not catered while enabling the legislation enacted by the state of California. Clarity is foremost to

protect public safeguards before private investment projects of this type can be awarded (Williams 2003).

2.12.5 Tate's Cairn Tunnel, Hong Kong

In February 1988, a private division consortium headed by the Japanese construction company named Nishimatsu was awarded a 30-year contract by the Hong Kong government through a special order. The project costing HK$2.15 billion (U.S.$276.5 million) consisted of a 4-kilometer twin tube tunnel with four lanes and approach road, being the longest road in Hong Kong, Pre completion was achieved two months earlier in June 1991 (Pyle, 1996). A conventional distribution of fund was followed i.e. debt-to-equity ratio of 2.6:1 between the developers and the financers. An equity of HK$600 million was provide by the private sector for the tunnel construction. All the major risks were satisfactorily addressed by following efficient financing arrangement.

- A relatively short 18-month construction time was covered by pre-completion risks.
- The tunneling method used was well known therefore the construction risk was low.
- The good reputation of the contractor and a delay penalty of HK$400,000 per day reduced the contractor risk.
- Several guarantees from the shareholders overcome the cost overrun risk.
- A 10-year performance bond by the contractor catered the performance risk.
- Purchase of an interest rate cap reduced the shareholders interest rate risk.
- Preapprovals from the Hong Kong government to increase tolls over time addressed the cash flow risk.

Lesson learnt is that risk transfers must be undertaken within each BOT contract for future satisfaction and success. Expertise and collaboration are essentially required for a large project for an early and profitable completion (Williams 2003).

2.13 Unsuccessful BOT Projects

2.13.1 Malaysia's North-South Highway Project

One of Malaysia's first BOT privatization programmes, the 1,000 kilometer, North-South Highway (the operating company is known as PLUS) is widely lauded as a success. What should be pointed out, however, is that although the road was indeed completed, the government ended up absorbing much of the financial costs. The BOT sponsor was to take over and complete the road, nearly half of which had already been built by a state-owned enterprise at a cost of three billion ringgit. Despite an open tender for the project in 1985, it was awarded to the third-runner among the bidders, a company attached to the ruling political party. The outcome was a legal challenge which delayed final contract signing for more than two years, until March 1988. (In that period the state itself could have made substantial progress in completing the road). Financing PLUS took more time because international bankers found it too risky as a limited-recourse BOT company. As a result the government provided a 1,650 million ringgit subsidized loan, nearly half of the projected costs. In the event, the road was completed in 1993, at a cost of more than 6,000 million ringgit for the section built by PLUS, which was far above projection. In the process the government had found it necessary to continue its intervention in the form of support and subsidy for PLUS, including unscheduled toll increases to help the project's cash flow (Handley 1997).

2.13.2 Thailand's Don Muang Tollway Project

Don Muang Tollway was a 20 kilometer BOT toll road connecting inner Bangkok with its main airport. It was awarded in 1988 to a consortium of well-known Thai businesses on a hurried, negotiated basis. It was opposed by significant sectors of the bureaucracy, and plans for its connection with other major road arteries in Bangkok were unresolved when the concession was granted. 40 financial and traffic projections undertaken by the sponsors were highly flawed, and the sponsors' own capital base was weak. Financing was only completed two years after the concession was awarded, and only when the government ordered the state-owned Krung Thai Bank to become the core lender. Krung Thai’s management argued that the project was not viable. In the event, construction delays and rising costs left the road more than two years behind schedule. It was also constructed at a cost which was about 50 per cent above the estimate when it

partially opened in late 1995. Connections with other roads had become a serious political problem and original traffic projections proved overoptimistic by a factor of two. As a result of these considerations, the tollway's sponsors could hold little hope for capital recovery. In early 1996, banks froze further disbursements. The sponsors then demanded that the government intervene to save the project (and their equity). In response to this, the government ordered in mid-1996 another state bank to refinance the road with subsidized loans (Handley 1997).

2.13.3 Hungary - M1/M15 Motorway

M1/M15 project was the first motorway concession in Eastern Europe, it involved 43 km on M1 (the last missing link of the 260 km motorway between the Hungarian and the Austrian capitals) and 14 km on M15 (a branch toward Bratislava). The advertisement was published in September 1991, a 35-year concession contract was finalized in April 1993 and become effective in January 1994, and the project reached financial closure in December 1993. The Concession Company, ÉLMKA, involved French, Austrian, and Hungarian operators, contractors, oil companies, and banks. The Concessionaire Equity formed 20 % against a Debt of 80 %. There was no state guarantee for traffic or cash-flow levels and 15 % of the profits were to be paid to the Government's Road Fund. According to the concession agreement the initial toll rates were based on distinct vehicle categories and will automatically increase without any prior approval of the Government on the basis of the domestic consumer price index and/or the exchange rate differential in percentage of the currencies of the loans (USD and DEM). The M1 section opened in January 1996 (on schedule and within budget) and the M15 section was to be finished by mid-1998. On M1, traffic growth during the first three years was significantly below expectations, resulting in the impracticality to service debt. Level of toll rates turned out to be politically unacceptable and a court case made financial situation indefensible. Attempts to restructure company finances, preliminary with the issue of letters of credit by Government and shareholders, remained unproductive. Government and lenders agreed however on a replacement process after three years of operation. Of the ambitious motorway program outlined in 1991, only few were realized by the end

of the century and the early achievement of other parts remains doubtful (Tahir 2005).

The reasons for poor outturn were:

- Project design: Short tolled section of motorway linking two untolled sections can easily be avoided.
- Traffic prediction errors.
- Over-optimistic forecasts - of Hungarian revenue growth, Austrian export traffic, Western tourism traffic.
- Adverse reaction of truck and coach operators to tolls and to Concession Company.
- Strict pricing policy, unsuccessful marketing, poor image of Concession Company.
- Shifting of all traffic linked commercial risks to private sector a major error.
- Substantial government input not provided to make toll motorway projects bankable.

2.13.4 Indonesia's Toll Road Project

In Indonesia, several urban BOT toll roads have been constructed in Jakarta and in 1995 the government undertook to offer nineteen segments of proposed toll roads across Java as BOT projects. But the government had avoided redressing the following two core issues which made the deals and the environment commercially unsuitable (Handley 1997):

- As per laws of setting and increasing of toll, it was the authority of the Indonesian President and the government had taken the position that while increases can be promised in principle, they cannot be contractually guaranteed. This has not been a problem for the private Jakarta toll roads, which have been built by companies owned and managed by the children of President Suharto. This issue was the main reason why the British company Trafalgar House spent six years (from 1988 to 1994) trying to negotiate a concession contract for a rural Java toll road. In the end Trafalgar accepted the Record of the President's support for existing concessions and was able to

finance their project. However, the six years spent on negotiating the project were much more than it would have taken to build the road.

- The second issue challenging the government's ability to create commercially viable concessions was that, for the cross-Java highway sections, the government insisted that land acquisition be pre-funded by the sponsors and that the land will remain in state hands. Because land acquisition is a lengthy and unpredictable process, potential investors in Jakarta consider this requirement as putting project expenses and risks at an unacceptable level.

2.13.5 Eurotunnel

The Channel Tunnel is a 31 mile tunnel running underneath the English Channel to carry Eurostar trains and goods trains between the UK and France. Construction of the tunnel started in 1988, the project extended around 20% longer than planned (at 6 years vs. 5 years) and came in 80% over budget (at 4.6 billion pounds vs. a 2.6 billion pound forecast). In fact, the Channel Tunnel has been planned as one of the engineering wonders of the world, which emphasizes its distinctiveness. The issues that caused delay resulted from three factors:

- A altered specification for the tunnel, there was a need for air conditioning systems to improve safety that were not incorporated initially.
- The understanding between the British and French teams who were essentially tunneling from the either sides and meeting in the middle could have been improved. These sorts of communication issues are fairly common in delayed projects when tensions persist.
- The contract was bid on by contending firms, this framework will necessarily promote the ‘winner’s curse’ of the successful bidders having the lowest and most optimistic price estimates.

Another remarkable aspect of the Channel Tunnel’s forecasts was that a lot of revenue was projected to come from driving the existing ferry operators out of business. Of course, these ferry operators were the main way to cross the English Channel before the Channel Tunnel was constructed. However, this analysis overlooked the possibility that the ferries would counter to the Channel Tunnel

with better pricing and service, leading to them retaining market share. In addition the creation of budget airlines providing cheap air travel between UK and France was not catered. It is a good reminder that in making strategic forecasts of benefits or results, one should bear in mind how other stakeholders can react to the project that is being planned.

Whilst it is not a project administration issue, it should also be noted that a great deal of the financial troubles with the Channel Tunnel were caused by extremely optimistic revenue projections, on top of the construction cost overruns and those projections failed to predict that the set of options for getting from Paris to London might change, both in reaction to the tunnel and because of innovation in other areas such as the development of the budget airline business model. (http://strategicppm.wordpress.com/2010/11/16/project-failure-channel-tunnel/)

2.14 BOT Road Projects in Pakistan

2.14.1 General Statistics

Presently, Pakistan Road density is of 0.32 km per sq. km as shown in figure 2.3. The total road network is nearly 2,580,000 km. Transport sector has accounted 20-25% of Federal Public Service Development Projects (PSDP) in the recent years. As per NHA data, the growth rate of inland freight per year is 10.6 percent and the growth rate of passenger on road is 4.4 percent for the last ten year period between 1991 and 2001. An annual increase of 8 percent has been observed in Pakistan where about 4.2 million vehicles are plying on the road. Around 250,000 commercial vehicles are accounted within the given quantity (NHA 2007).

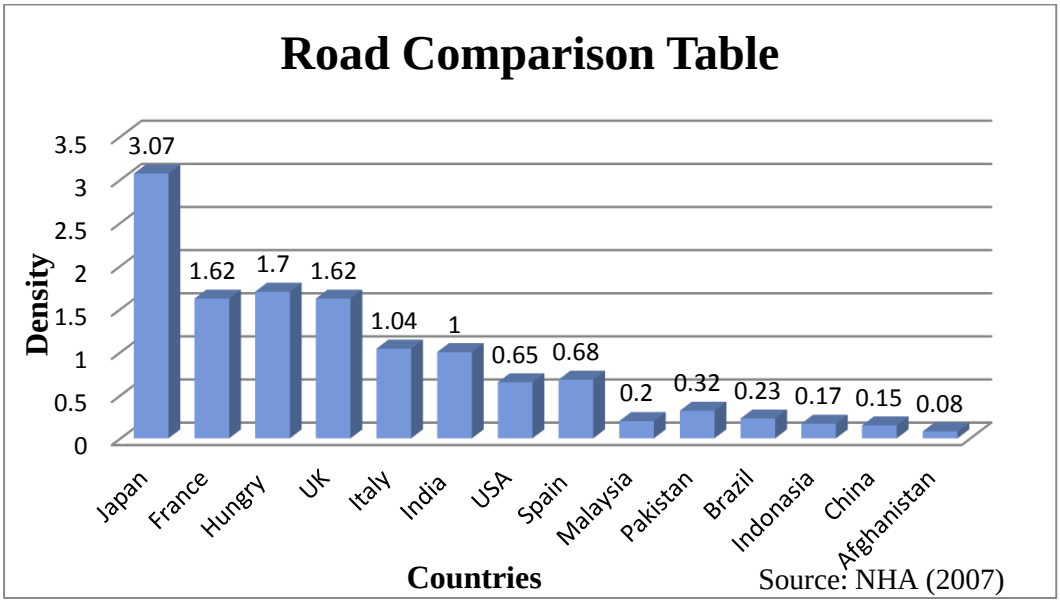


Figure 2.3: Road Density Chart

2.14.2 National Highway Network

In Pakistan all the important roads like National Highways, Motorways and Strategic Roads falls under the jurisdiction of National Highway Authority (NHA). Around 9,000 km of road network is being looked after by NHA and these consists mainly of strategic and foremost routes that serve among provincial long distance traffic, including vital commercial cities and major cargo terminals. It is a surprising fact that total weight of National Highways is only 3.3% of the whole road network of the country but they bear more than 80% of the country's traffic. The north-south links in Pakistan's national road transportation system are the main streams, for the reason that goods transaction whether being imported or exported, has to pass from southern ports while maximum population of Punjab and KPK lives in the north. The two main links of Pakistan are N-5, which is generally called G.T. Road runs along eastern bank whereas N-55 or Indus Highway runs on the western bank of the River Indus. The bulk of Pakistan's commercial and industrial activity is concentrated along the N-5 corridor.

2.14.3 Guarantees to Road Public Private Partnerships

Pakistan's existing road BOT do not include Government guarantees but it is likely that future road concessions may require Government

guarantees. They do, however, include contractual obligations through which the implementing institution (NHA) agrees to bear some of the project risks. The Lakpass Tunnel, Shahdara Flyover, and M-9 concession contracts include the following obligations that transfer risk to NHA (World Bank 2007).

- **Demand.** NHA compensates concessionaire if alternate route is build and traffic falls below certain level. There is no minimum traffic guarantee.

- **Regulatory.** NHA compensates concessionaire if tolls are not adjusted per contract terms.

- **Change in Law.** NHA compensates concessionaire if change in law has an adverse financial effect.

- **Convertibility and Remitability.** NHA compensates concessionaire if concessionaire is unable to convert and remit funds.

- **Contract Default leading to Termination.** Concession contract specifies a buyout payment depending on who defaulted.

- **Force Majeure leading to Termination.** Concession contract specifies a buyout payment.

2.14.4 Public Agencies Undertaking BOT Roads

Pakistan's program of PPPs in roads is less developed than its program for PPPs in power generation. The majority of BOT roads are planned at National Highway Authority (NHA), which is a Government office under Ministry of Communication. The BOT cell within the NHA is responsible for procuring BOT for road projects (including tunnels). There are other provincial and regional development authorities for facilitating and implementing BOT projects in their respective regions, e.g. Infrastructure Project Development Facility, PPP Unit Sindh, PPP Unit Punjab, CDA, RDA, Provincial C&W Departments, etc. At present there are numerous BOT roads under consideration or at development stages under these authorities, some may be at conception stage or some may be at

approval stage i.e. PC-1 stage. Many of the approved projects have gone under review feasibility study and forwarded for 'Request for Proposals'. In short the BOT road projects at implementation stage are very few when compared to the projects that have been under evolution or waiting for right proposals. A summary of BOT road projects at various stages is given as under:

2.14.4.1 National Highway Authority

The maximum number of roads on BOT modality are under National Highway Authority; the road projects are divided under three stages of performance i.e. implementation, procurement and preparation, stages. Details are given in tables 2.2 to 2.4.

Projects Not Available for Investment

Table 2.2: BOT Roads under Implementation Stage

No	Location	Length (KM)	Approx Cost (Mn)	Project Details	Status
1	Service Areas 10 Nos (M-2)	-	1,125	10 Service compounds to be constructed within 15 years Concession phase - on BOT terms	Operational (13th Year)
2	Lakpass Tunnel (N-25)	0.18	679	Tunnel of 180 M length is functional for 15 years Concession phase - on BOT terms.	Operational (5th Year)
3	Khi-Hyderabad Motorway (M-9)	136	13,000	Renovation of present four-lane road into six-lane Motorway - on BOT terms	Financial Close Stage
4	Shahadara Flyover (N-5)	5.20	3,560	Erection of six-Lane Raised Flyover within 15 years Concession phase - on BOT -Annuity basis	Financial Close Stage
5	Two Main-Service Areas at (M-1)	-	689	Construction of 2Main-Service compounds on M-1, Concession awarded for fifteen Years - on BOT terms	Financial Close Stage
6	Two Mini-Service Areas at River Haro (M-1)	-	260	Construction of 2 Main Service compounds on M-1 - on BOT terms	Concession Negotiation Stage

Projects Available for Investment

Table 2.3: BOT Roads Under Procurement Stage

No	Location	Length (KM)	Approx Cost (Mn)	Project Details	Status
1	Karachi Northern Bypass (M-10) & Karachi - Hub Bypass (N-25)	63	5,500	Renovation of existing 2-Lane highway into 4-Lane divided facility	Bid submission date was February 3, 2012
2	Leftover Works of Liyari Expressway'		8,372	Completion of Leftover Works	Bid submission date was March 05, 2012
3	Connecting Road Network for New Benazir Bhutto International Airport, Islamabad	21	4,098	Construction of Connecting Road Network of Benazir Bhutto International Airport	Advertised. Last date for submission of bids was March 01, 2012
4	Multan Muzaffargarh D.G Khan (N-70)	80	3,500	Renovation of present two-lane road into four-lane splitted structure with Bridge at Ghazi Ghat	Bid submission date was February 20, 2012
5	Overlay and Modernization of Lahore-Islamabad Motorway (M-2)	357		Overlay and Intelligent Transportation System (ITS) on 350 km long existing Motorway.	Bid submission date was March 22, 2012

Projects Available for Investment

Table 2.4: BOT Roads Under Development Stage

No	Location	Length (KM)	Approx Cost (Rs in Mn)	Project Details	Status
1	D.I Khan-Balkasar Interchange	235	11,750	Upgradation of Existing Road	Yet to be Federalized
2	Jhang-Chund Bridge-Sargodha-Salam MB Din-Kharian	280	14,000	Renovation of existing road into two lane Highway	Yet to be processed for Federalization
3	Redirection of Lahore-Islamabad Motorway (M-2) at Salt Range	15	12,730	Redirection of present six-Lane facility at salt range.	Preparation Stage
4	Link Road Rawat to Thullian (link between N-5 and M-2)	29	5,150	New 4-lane divided access controlled Expressway.	Preparation Stage
5	Kandhkot-Ghotki Bridge at River Indus	1.04	6,271	Erection of two-lane RCC Bridge on River Indus joining N-5 and N-55	Preparation Stage
6	Malakand Tunnel (N-45)	4.25	9,043		PC-I Prepared
7	Hasanabdal Abbottabad Expressway (E-35)	110	47,000	Construction of Expressway on new alignment	PC-I Prepared
8	Two Mini Service Areas on M-4			On Section-1 of Faisalabad - Multan Motorway (M-4) - on BOT terms	
9	Rawalpindi Flyover (N-5)	13	28,000	Erection of four-lane Flyover Expressway on present Rawalpindi urban area of N-5	Commercial Feasibility Study completed.
10	Habibabad Bridge (N-5)	-	562	Renovation of present four-lane flyover for north bound traffic and erection of new flyover for south bound traffic	Commercial Feasibility Study completed.
11	Multan Northern Bypass and Qadirpur Ran to Muhammad Wala Bridge	22.75	-	-	Yet to be Federalized
12	Muhammad Wala Bridge to Multan-Mianwali Road	13.00	-	-	Yet to be Federalized

2.14.4.2 Infrastructure Project Development Facility (IPDF)

- **Lahore Southern Bypass Motorway to Ferozepur Road**

  At present the technical feasibility study is completed and financial feasibility is being undertaken. The total approximate cost of the project is US$ 25 million. Proposed length of the project is 16 KMs. The design of the project includes six lanes divided highway with controlled access having two lanes service roads with the proposed right of way of 200 ft including interchanges, flyovers and crossover structures. wherever required.

2.14.4.3 PPP Unit Sindh

- **Hyderabad MirpurKhas Dual Carriage Way**

  At present, 75% construction of the road has been completed and the work is in progress in healthy manner. The road is being constructed under PPP mode (DFBOT) by Korean firm namely M/s Deokjae Construction Company. The Project road is 60 km long with 8 bridges and 62 culverts. Construction period is 24 months. The Developer will operate and maintain the road for 30 years after construction, before returning it to Government of Sindh.

- **Hyderabad Badin Dual Carriage Way**

  At present, the performance of the project is at evaluation of bids. This project is a design, build, finance, operate and transfer variant of BOT. The concessionaire period for Hyderabad – Badin Road (the "Project") is for a term of 32 years. The road facility is 98.5km in length of which the portion from Hyderabad to Matli (approx. 51.2km) is to be dualized while the remaining portion from Matli to Badin (approx. 47.3km) is to be rehabilitated.

2.14.4.4 PPP Unit Punjab

- **Lahore Ring Road (Southern Loop)**

  Total length of the ring road is about 90-Kms out of which 40-Kms (Northern Loop) has been completed from provincial government sources. Lahore Ring Road Authority is now soliciting EOI from National and International Firms/builders to undertake the remaining length of 50-Kms (Southern Loop), costing about Rs. 50 billion.

2.14.4.5 C&W Punjab

- **Lahore Sheikhupura Faisalabad Dual Carriageway**

  It was the first BOT project in Pakistan, completed by BOT Company M/S LAFCO (Pvt) Ltd, a consortium of M/S FWO a lead partner with M/S KRC, M/S HRL (Pvt) Ltd and M/S Sachal Engineering Works (Pvt) Ltd. The cost of the project was Rs. 6.20 Billion and the total length of project was 115.5 Km. Construction period was 36 months while concession period was 25 years. The project started in Mar 2004 and completed on Sep 2006. The project proved successful and the concessionaire has earned its investment and also started servicing of debts within three years of tolling.

- **Lahore Nankana Sahib Dual Carriageway**

  This project was initially taken by NHA but later shifted to C&W Punjab. The project is at conception stage.

2.14.5.6 Rawalpindi Development Authority (RDA)

- **Rawalpindi Ring Road-II (City Boulevard)**

  PC-II of the project is in the process of approval in Housing, Urban Development & PHE Department, Govt. of Punjab. It originates from Rewat via Adiyala Road, Dhamial Road, Girja Road, Chakri Road, Misrial Road upto I-15 Islamabad, GT Road and new Islamabad International Airport. Total length is

48 Km and expected completion time is 4 years. Designing of the project is in progress.

- **Elevated Expressway over Murree Road, Rawalpindi**

  PC-II has already been prepared by RDA and submitted for approval of the concerned authorities in the Govt. of Punjab. Total length is 9 km approximately; having base line as flyover from Marrier Chowk and then establishing the radial link through Doubled road, I.J. Principal Road, Khayaban-e-Sir Syed, Shah Allah Ditta Road and along with Nallah Lai up to Marrier Chowk and its approaching links covering the backlog of traffic and its maximum area of influence. Detailed design is in progress. Estimated cost of the project is Rs.8 billion.

2.15 Summary

The chapter of literature review, enables a reader to understand the purpose and utilization of BOT road projects in global construction industry and in particular of Pakistan road construction industry. This chapter has given a broad picture of understanding the BOT approach and its application in road construction, with examples of global BOT delivered road projects and their causes of failures and success.

Chapter 3

MECHANICS OF BOT PROJECT DELIVERY METHOD

3.1 Introduction

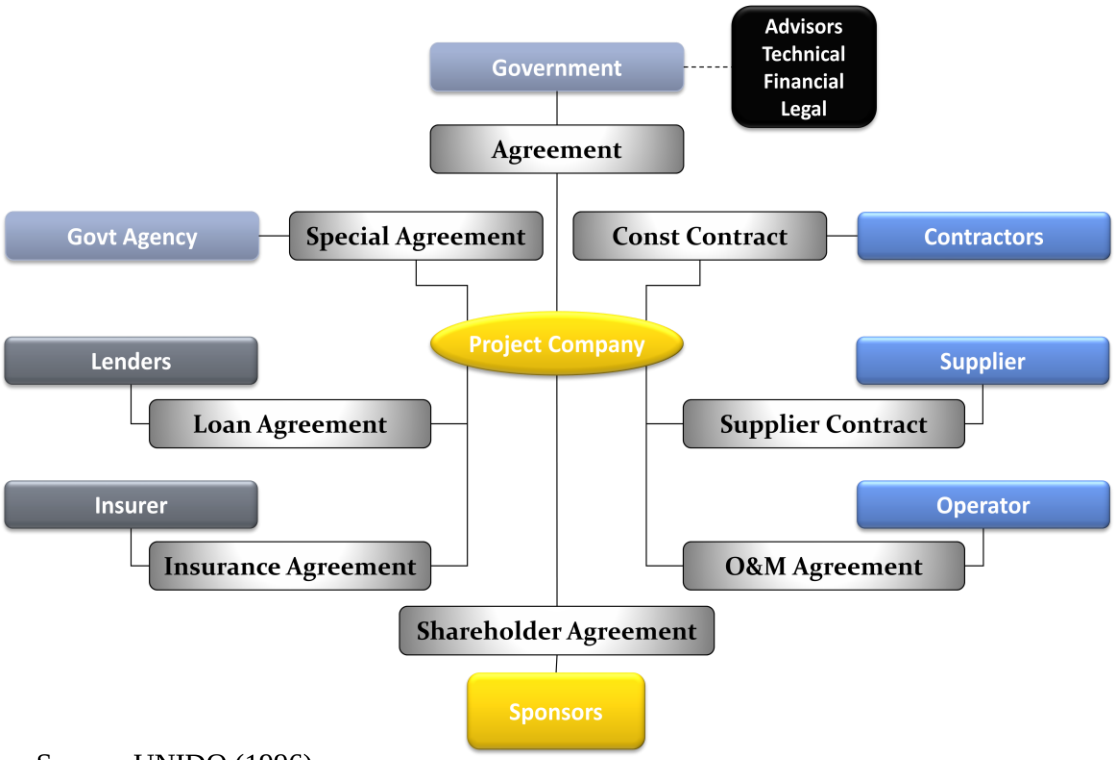
A critical challenge for developing countries is to identify the factors that make projects finance-able in the private sector. Understanding the mechanics of BOT project delivery method actually aims at helping public and private sectors to identify those factors and specifically those issues which require maturity and understanding in the development of infrastructure projects. Since BOT entails the financing of infrastructure projects by the private sector, there is a common misconception that the "public" nature of the project can be largely overlooked and the host government often assumes that it has minimal involvement in BOT projects.

3.2 Financing Techniques

The BOT theory, it is worth noting at the outset, does not involve a new or novel system for obtaining financing for a project or for structuring it. It uses the well-established approach and legal instruments of a technique known as "project finance". In simple manner, a BOT project involves a private sector who borrows finance on either a limited recourse basis or a non-recourse basis. In theory, the lender in a non-recourse financing arrangement can only make claim on the project's assets and revenue stream for repayment, not to additional sources of security, such as the other assets or balance financial strength of the project sponsors. Presently, almost all BOT projects are financed on a limited recourse basis, as opposed to a purely non-recourse basis. The criticality of financing can be understood by comparing the sources of revenue from a power plant to that from a toll road; since the revenue from a toll road depends on the individual travelling decisions of tens of thousands of potential users, the terms of project agreement for toll road are based primarily on travel forecast by experts. A power plant has greater credit worth utility due to detailed terms in agreement as compared to unpredicted forecast of travelers on a toll road (UNIDO 1996).

3.3 Structure of a BOT Project

The structure of the construction categories related to each other in BOT contracts and agreements is shown in Figure 3.1



Source: UNIDO (1996)

Figure 3.1: Structure of a BOT Project

3.4 The Project Company

The private project company is the concessionaire of the BOT projects; it means that the company had been sanctioned on the basis of its rights and obligations as given in the concession or project agreement with the related government. A consortium (or consortia) of private sector sponsors is created before the establishment of the project company, its function is to review the request for proposals, prepare a feasibility study and propose a bid. The selected sponsor or sponsors usually produce a special purpose, limited liability company known as the "project company" or the "joint venture company". Each sponsor will place some form of finance in the Project Company in the form of limited equity, so as to develop responsibilities within the company partners.

The project company is also known as Special Purpose Vehicle, which is responsible for borrowing the funds to finance the project other than the equity contributions of the sponsors. This same company is also responsible to enter into the essential contractual arrangements with the concerned government, with the construction contractor, the operator (often a specialized operating company), equipment and raw material suppliers, and so on (UNIDO 1996).

3.5 The Project Agreement

The project agreement is at the hub of the web of contractual arrangements which, taken together, defines the BOT project. The project agreement which is also called a concession agreement in some countries, is at the heart of all BOT projects. This agreement also defines the rights, privileges and obligations of the project company and the concerned government for the development and operation of the project. It provides the project sponsors the right and responsibility to finance, construct and operate the project for a particular period. The agreement distributes the project risks initially between the private sponsors and the government. In later stages of the project construction, this agreement also involves the obligations and risks of operation and maintenance (O&M) and for supply as well. These agreements are prepared with mature vision of handling future contingencies so that the primary contractor, the operator and various suppliers of equipment, fuel and other goods and services to the project must remain harmonized and in accord with the basic economics of the project (UNIDO 1996).

3.6 Project Finance

The BOT approach is a particular form of project finance for infrastructure development. The return on investment of a BOT project for the concessionaire must be sufficient enough not only to reimburse the lenders but also to benefit the sponsors for providing their equity and realistic involvement and for assuming the risks involved in such projects. The main objective of structuring the project finance is to launch or arrange a mix of debt, equity and mezzanine financing that makes the optimal usage of financial sources so that a sound security base can be developed.

The project company is responsible to arrange the necessary debt financing or lending for the project from lenders of private sector and from export credit agencies and bilateral and multilateral financial institutions. Generally the lending is on a non-recourse basis, because the lenders do not have any direct financial alternative to the sponsors who own the project company or to the host government that guarantees the entire debt.

More often, BOT project financing is on a limited-recourse basis; in case of default, the recourse can be claimed in opposition to the project company and its possessions, including real estate, plant and equipment, contractual rights, performance bonds, insurance, government guarantees and other commitments the project company has obtained.

The hallmarks of project financing are:

- The credit assessment of the project company for getting loan is based on the project, not on the credit value of the borrowing entity, therefore the lenders to the project look mainly at the income of the construction project as the source from which loan repayments will be made.
- In BOT finances, the project financing is often called as “limited recourse” financing because in case of non-payment of the construction contract, the lenders are given only a limited recourse against the borrower, thereby it is defined that the security taken by the lenders is limited to the project assets.

3.7 Financial Requirements for a BOT Project

The financial feasibility of a BOT project must be clearly understandable to potential equity investors and lenders for better and smooth provision of finances. Independent viability studies carried by the technical experts or consultants in the form of ground and geological studies, demand studies, demographic projections and so forth provides confirmation for the understanding of the lenders.

The project must have a reliable supply of revenue that will be sufficient to service principal and interest payments on the project debt over the term of the various loans and to provide a return on equity proportionate with whatever development and long-term project risk the equity investors are being asked to take. In the case of a power plant, the revenue will normally be contract-based: that

is, based on a long-term off-take contract with a government power agency. In the case of roads, tunnels and bridges, the revenue will normally be market based: that is, based on the tolls to be collected, with the traffic risk borne entirely by the project company (UNIDO 1996).

3.8 Equity Investment

Only equity provided by the sponsors is not sufficient to go on with the construction project, the BOT projects also require a major support in the shape of debt provided by commercial banks, international financial institutions and bilateral government lenders. Generally the share of equity is lesser to the debt arranged, i.e..between 20 and 30 percent of the total project cost, although in some projects it has been outside this range. It is difficult to estimate the returns earned by equity investors in BOT projects. Greater the degree of risk taken by the investor, the more reasonable is the return and the additional benefits the project brings to the host government, such as timeliness, efficiencies and new technology. The projected rate of return for the base case assumptions is often set forth in government requests for proposals and in offering memoranda circulated by investment banking firms. If the project performs at better than base case, the rate of return to the equity investors can improve substantially. The public office performing as client should remain vigilant to avoid supporting such cases that would generate additional “pay” for the project in the concessionaire’s share of revenue (UNIDO 1996).

3.9 Security for Lenders

It is but natural that Lenders who are financing the BOT project at some prescribes rate of return, will surely insist for a range of security measures and these measures are collectively referred to as the security package. The security packages are not simple ones, they are beyond a simple mortgage or deed of trust covering the project assets. Since the lenders recognize that if the project company defaults, there will be no ready market available for a partly built toll road or a power plant that has been left in incomplete stages. Various term and conditions are devised in the agreements with the financiers that helps to protect the lenders

are usually found in BOT projects. To the degree that these security measures ensure that the project remains financially viable and performs as intended, they are also in the overall interest of the host government (UNIDO 1996).

3.10 Risk Identification and Management

Project risks are the most critical and concerning to the success of each BOT project, therefore it is absolutely important that the identification, allocation and management of these project risks to be done at earlier stages. The examples of project risks are inflation and currency risk.

The inflation risk is brought to lesser degree by bringing in some mechanism for the protection of lenders and equity investors, for which they normally keep insisting on. This protection may be provided by price escalation clauses in the off-take agreement (in the case of a power project) or by clauses in the project agreement allowing the project company to increase tolls (in a toll road project). Such price escalation clauses are planned to take account of increased costs due to inflation. For the maintenance of the purchasing power of the project's net income and equity in general, such clauses are drafted to provide protection against inflation risk (UNIDO 1996).

The sponsor must allocate these risks in a manner that these risks should first be identified, then the likelihood of their occurrence is assessed and their impact on the project is determined. In short, the purpose is to take up the risk, lay off the risk with third parties, such as insurers, or apportion the risk among contractors and lenders. The sponsor will be acting, more often than not, on behalf of a sponsor at a time when the equity participants are unknown. However, all the equity partners must be conscious and contented with the risk allocation, the creditworthiness of the risk taker and the return of reward that party earns by taking the risk. In this respect, each party takes a quasi equity risk in the project (UNIDO 1996).

3.11 Guarantees

Generally the host governments do not afford a direct government guarantee for loans made to a BOT project company, however the parties involved in the BOT system may ask the government to provide such guarantees, or parallel assurances, for certain aspects of the project. In some cases, a government-owned corporation can enter into the contract with the project company (an example is when the public related offices enters into a long-term off-take contract or contracts the long-term supply of fuel or energy to the BOT project), then in such cases the government itself have to provide guarantee for the utility's performance. In case of foreign exchange and exchange rate fluctuations, the host government is under obligation to give certain guarantees on the availability of foreign exchange, either directly to the project company or indirectly to foreign export credit guarantee agencies. The government may also be required to guarantee the provision of vital services at the construction site e.g. access roads or transmission lines, or force majeure on clauses where financial readjustments deems necessary even in clear circumstances. The host government or the executing agency involved will normally support the project company by obliging them along with the basic agreement terms (UNIDO1996).

3.12 Complexity of the BOT Process

BOT projects are not that simpler as those of conventional construction methods, it may be highly complicated, time-consuming and from the point of view of the sponsors, very expensive. For large projects, closing of the financing or financial clousure may take several years, even the signature of the project agreement takes unpredictable time. During this phase, the sponsors may spend considerable amounts for feasibility studies, professional fees to advisers and consultants, and other out-of-pocket expenses, to say nothing of the cost of their own management time. The host government also carries obligations for the potential project companies in a manner that the government should do everything possible to ensure an orderly, fair and efficient process, from bid solicitation, selection, contracting and permitting, through to project implementation or in other words the public executing agency must understand the complexity of the process

and be willing to provide the timely support required for success. Fortunately, valuable experience has been gained over the last decade in a number of countries by commercial banks, export credit agencies and multilateral financial institutions. All have come to understand the BOT process better, and standard solutions to recurring problems have been developed (UNIDO 1996).

3.13 Factors Affecting the Structure of the Contract

In order to achieve positive net present value and validate payback time, various dynamic factors require the contract and particularly the time duration for the concessionaire to achieve a break-even on the capital investment. In offering a BOT concession to an existing owner, the factors outlined in Table 3.1 must be considered and allowed for:

Table 3.1: Factors to be considered for Applying BOT Method

Factor	Consideration
Capital Requirement	Longer contracting periods should be formulated against upgrading of facilities or purchase of assets, either of which are being heavily funded or provided huge finances.
Profit Sharing Formula	A general distribution at the start of profit earning among the partners should be followed as 50:50 formula. However this will not remain the final distribution as other upcoming factors will definitely affect the distribution formula.
Business Operating Risk	The duration of the return from the facility depends upon the type of the investment contract as well as the associated risks present in the construction industry. The operating risk for the concessionaire can be reduced by bringing it down through guarantees as well as increasing the duration of operating the facility.
Cost of Capital	The minimum the premium or interest on the capital borrowed, the earlier the concessionaire will achieve a break-even point if all other issues remain stable.
Nature of revenue stream	Revenue streams of different facilities differ from each other depending upon the security of users input. A greater risk will be involved and will remain threat to other factors if the facility users have open choice of selecting other facility offered by some competitor or other options available to the user that provide alternate to facility utilization.

3.14 Stages in BOT Process

The different stages in BOT process are shown in Figure 3.2

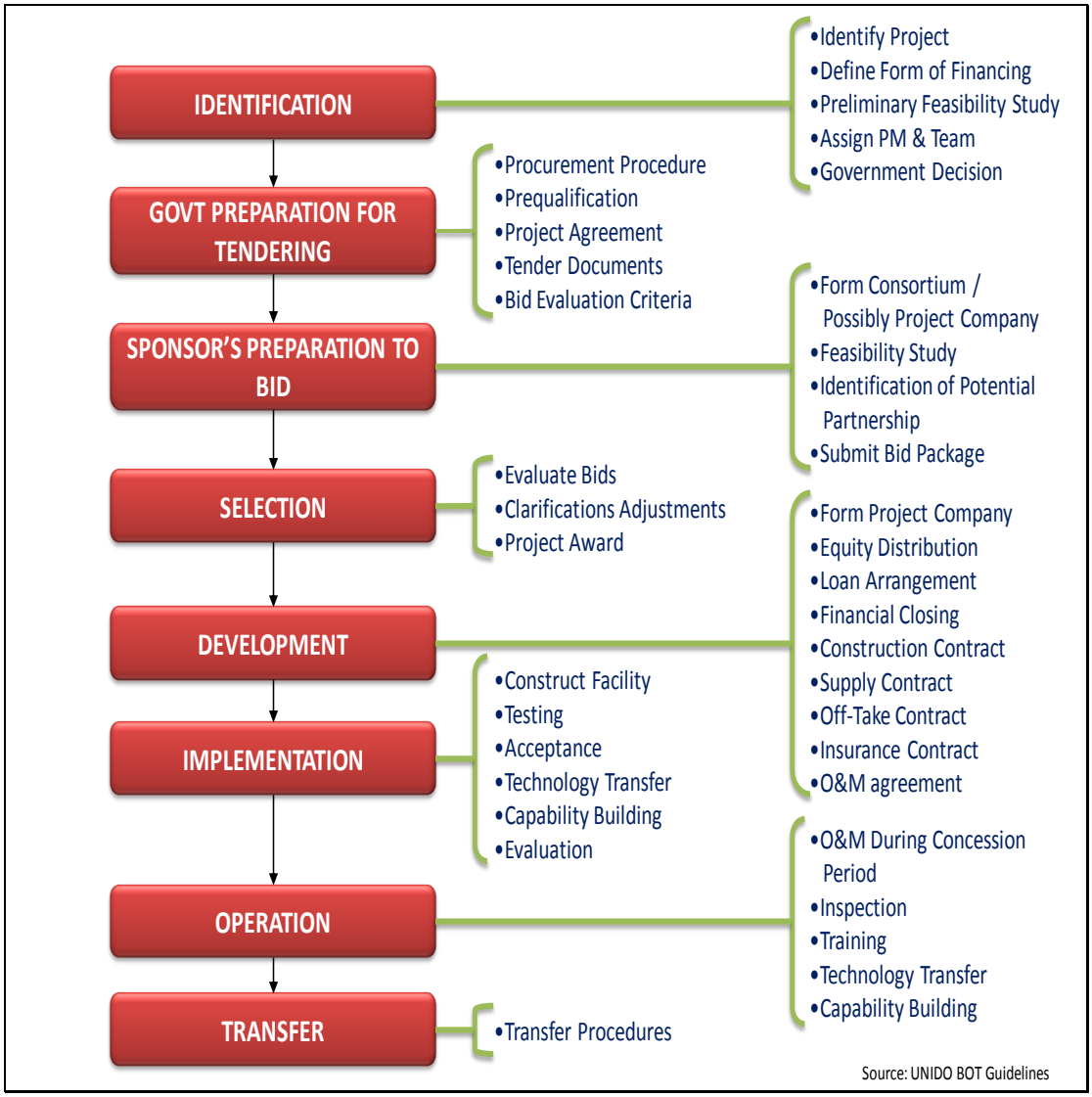


Figure 3.2: Different Stages in BOT Process

3.14.1 Preliminary Study

Infrastructure priorities for their development and construction are prepared by the government agencies. In Pakistan, Ministry of Finance under the existing policies prepares target requirement of infrastructure and formulates the precedence list in which infrastructure projects likely to be ventured through Public

Private Partnership. These target projects are forwarded to Public Development Infrastructure Facility (PDIF) or Private Power and Infrastructure Board (PPIB) to further investigate and prepare feasibilities for designing, financing and construction. Many of the projects will be earmarked for implementation through BOT terms. These agencies may themselves or invite or contract private consultants to conduct feasibility studies to verify the possible viability and attractiveness of BOT projected infrastructure. Projections of income streams are calculated here to decide the viability of private sector participation. In certain cases private construction enterprises or financers themselves proposes government for undertaking a project infrastructure along with feasibility study so that the government can stay relief from financial shortage and same time a public project can be structured (Llanto 2008).

3.14.2 Selection Process

Solicited and unsolicited are two methods for carrying out BOT construction. In solicited method, conventional manner of selection is done through bidding process among numerous bidders called through advertisement by road authority of the state or city. In some cases proposals are also collected from pre-qualified contractors. All these proposals are then analyzed through two-envelope system. The first is the analysis of technical proposal in which the structural and contractual details are checked against the bidding documents provided. This is followed by analysis of financial proposal in which financial feasibility and economic benefits of the project are considered. The bidder who's financial as well as technical bids both gets through the analysis is then awarded. The other method of BOT construction is unsolicited method, where a private builder or enterprise proposes directly to the government for undertaking construction of a special project. The unsolicited method is the one in which an autonomous uninvited party offers its own services for submitting a project proposal, as against the solicited method in which the public agency takes the scheme in asking private companies to submit proposals. If the offered proposal weighs beneficial, than proposal is thrown for competition (e.g. Swiss challenge) to establish who would be awarded the project (Llanto 2008).

3.14.3 Project Implementation

After awarding of the project, the project company will then develop a precise work plan that includes representation or making of project designs and detailed engineering, obtaining essential legal permits to facilitate the project, etc. The issues of environment and the worries of affected communities are addressed and evenly handled so that less of hindrances and more of support is generated to achieve early completion (Llanto 2008).

3.14.4 Construction

Llanto (2008) stated that "construction phase gets started after addressing all the previously stated procedures so that the facility once developed should be challenged at later stage. The constructor in this phase is the key player as he implements the execution phase through employing crew, technical / managerial staff, suppliers and safety staff.

3.14.5 Operation

The operation of the facility starts, once the construction is completed or become partially function able, at this time the concessionaire appoints an agency to run and sustain the project structure and collect the generated revenue, if the case implies. The operation period stands valid until the termination of the concession period (Llanto 2008).

3.14.6 Transfer

Llanto (2008) stated that "at the end of project agreement period, the client becomes the final owner of the project facility along with its assets present on the sire. In a manner to reward the construction enterprise for the investment made and running of the facility, generally prior transfer of the project facility is not carried.

However at after termination of contract, the authority might run the facility itself or may select an independent operator".

3.15 Risks involved in BOT Process

3.15.1 Completion Risk

Generally in any classic BOT project, the possibilities of delay in project completion or increase in the agreed price are present and known as completion risk. Following are the answer to this risk;

- Construction enterprise to present a fixed price.
- Rigid timeline.
- Design Build contract with associated penalties.
- Pre agreed by delaying damages.

Llanto (2008) stated that this clause makes the construction contractor responsible for the monetary damages for any delay of time against achievement of the facility or failure to achieve the required specifications. In other words the overall responsibility of hidden defects, cost overruns and other related problems lies with the construction contractor. Consequently the builder enterprise has to raise the price of the turnkey contract in order to pay compensation for the risks that he has to bear. A solution to this heavy risk and increase in price lies in a way that the consortium may allow the construction contractor to be included as a partner or participant in the consortium. In this way, the information mismanagement between the two parties, which may lead to moral hazard problem, will eradicate.

3.15.2 Performance and Operating Risk

The performance and operating risks are always present and that is the likelihood that a project will not execute according to what is anticipated from it. These hindrances may be caused due to technological failures, disruption and administration or manual labor ineffectiveness. This may be resolved by undertakings from the enterprise and gear suppliers (Llanto 2008).

3.15.3 Cash Flow Risks

The negative trends in market claim conditions: for instance, sudden turmoil of tariff revenue brought about by a slump in purchasing power of the consumers causes grave disruptions of cash flow that may put at risk the repayment of debt to the project's lenders. Normally following two measures are adopted to avoid such risks (Llanto 2008).

- Spell out in the contract the opening of an escrow account.
- The concerned government to guarantee a segment of the revenues generated by the facility, for instance, a least amount off-take agreement.

3.15.4 Inflation and Foreign Exchange Risks

The profit returns to both lenders and equity investors are greatly damaged by rapid inflation and exchange rate variations. These issues are outside the control of lenders and equity investors and cause extreme damages. However government policies can provide relief by following certain actions as given below (Llanto 2008);

- Indexation of user-fees and revenues from off-take contracts to deal with the risk of inflation.
- Government to afford sufficient foreign currency in case of supply disruptions or index.

3.15.5 Insurable Risks

Llanto (2008) stated that insurable risks, e.g., manpower casualty, can be adequately covered by various type of insurance. The insurance may be provided through commercial sources or from government guarantees.

3.15.6 Force Majeure

Llanto (2008) explained that these risks are occasionally uninsurable or can be insured at a very excessive cost. The government may be asked to cover or seek

cover for force majeure risks that are uninsurable. For international group of investors/developers, force majeure risks are frequently insured by entities such as the Overseas Private Investment Corporation (OPIC) and the Multilateral Investment Guarantee Agency (MIGA).

3.15.7 Political Risks

Whenever during the currency of the project , the host government backs out from any definite undertakings or agreement provided in the project, the construction contractor becomes victim to political intervention. Other political risks are;

- political violence—war
- insurrection
- sabotage
- law and order situation
- risk of expropriation or nationalization by the host government
- transformation in political leadership, which questions the legality or suitability of a BOT project approved by the predecessor government.

Foreign commercial lenders and equity investors always looks for political risk insurance from sources such as the government itself (through sovereign guarantees), export credit agencies or other multilateral agencies (Llanto 2008).

3.15.8 Regulatory Risks

In BOT agreements the validity and true application of rules and clauses are necessary otherwise regulatory risks are prone to affect the progress of projects. Poorly drafted rules may lead to changes in tariff rates, volume or quality of services. Political interference, which put at risk the practicality of the BOT project, e.g., fixing or controlling charges/fees, unclear formulas for rate or fee adjustment, and others. The establishment of reliable and independent regulatory bodies is seen as the first step to mitigate such regulatory risks (Llanto 2008).

3.16 Risk Mitigation Instruments

Llanto (2008) identified that there may be some risks that cannot be insured due to high cost involved in its application. To bring attraction for private

investors, the government usually generates guarantees, subsidies and similar support for the investors. At present only private investors are performing as BOT sponsors in developing countries with very rare support from host government. The reluctance for private investment is due to underdeveloped capital markets, political instability, regulatory uncertainty in infrastructure development, hence the government steps in to eradicate or reduce such risks to the project. The following are the some of the frequent support given by governments for the development and execution of BOT projects:

- Political and Bureaucratic Support
- Assured Supplies e.g. land, right of way, raw materials, energy etc
- Assured Revenues
- Loans/Equity Contributions
- Earning Assets i.e. toll earning for payment of debt service, operating expenses
- Regulatory, Fiscal and Other Support i.e. conducive regulatory and legal environment
- Project Risk Support
- Inflation and Foreign Exchange Cover
- Sovereign Guarantees
- Protection from Competition

3.17 Summary

In Chapter 3, an effort has been put to bring the mechanics of BOT project delivery method on paper for better and easier understanding of the reader. The structure of BOT including the types of contracts and agreements has been amply covered along with understanding of financial matters involved in the delivery method. Types of risks involved and the methods of mitigating them has also been highlighted for better understanding.

Chapter 4

KARACHI – HYDERABAD MOTORWAY (M-9)

4.1 Introduction

The Karachi-Hyderabad section of N-5 (popularly known as super highway) connects the port city of Karachi to the North of Pakistan. This section of the highway is amongst the most densely trafficked in the entire country, the existing highway is serving a traffic volume of over 20,000 VPD (Vehicles Per Day) with over 60% of truck traffic. The average traffic growth rate of this section is about 5% annually. The route is also the shortest possible distance between the two cities i.e Karachi and Hyderabad and feeds into the main North – South Links i.e. National Highway N-55 (Indus Highway) and the National Highway N-5 (Grand Trunk Road) (Figure 4.1). The Karachi-Hyderabad section was constructed as a part of the First Highway Project with the assistance of World Bank during 1964-1968 and dualizied in 1991as part of the fourth IBRD (International Bank for Reconstruction and Development) Highway project. Toll is being collected from Highway users by the NHA.

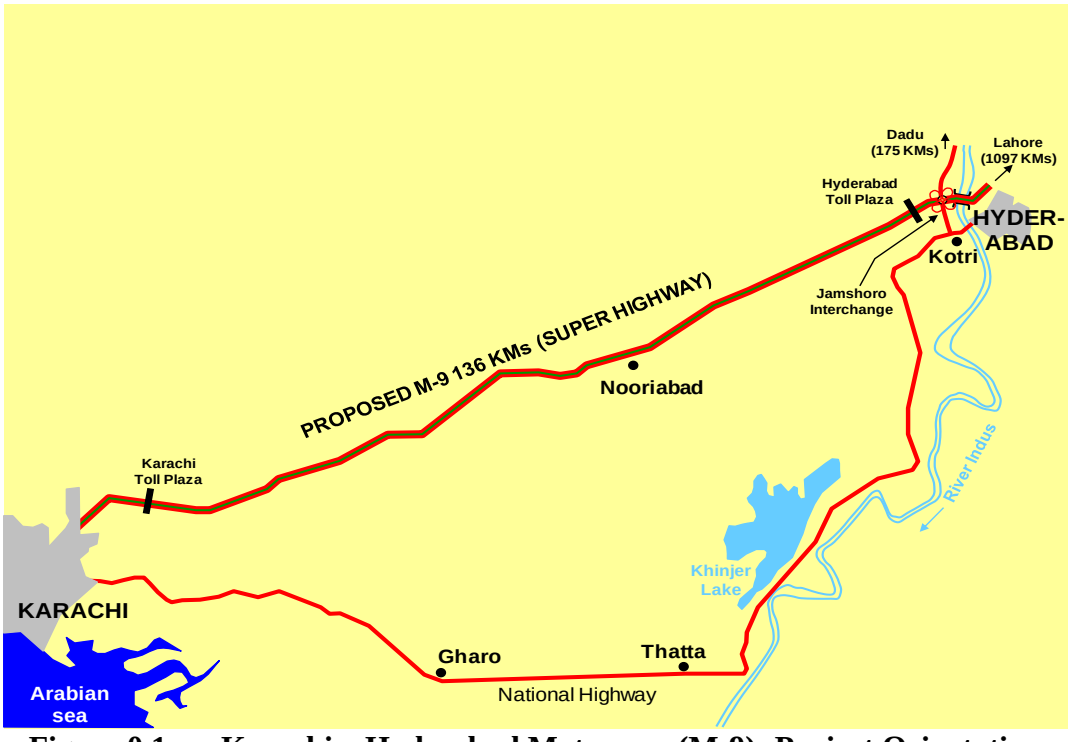


Figure 0.1: Karachi – Hyderabad Motorway (M-9); Project Orientation

4.2 Proposal and Award

Standard Construction Company, a subsidiary of Saadullah Khan and Brothers (a renowned Civil Construction Company) in 2005, offered a proposal of BOT Project delivery method for complete new construction of Karachi – Hyderabad Motorway (M-9), same was encouraged and followed by Chairman NHA Major General Farrukh Javed till the positive outcome of its initial feasibility and financial analysis. Standard Construction Company won the bid for the BOT Project delivery method and after negotiations the concession was awarded on Sep 2006, but was terminated by the Government in July 2007 as a result of "political" pressure. EOBI (Employees Old-Age Benefits Institution), in 2010 started taking interest in M-9 on BOT delivery method and even the offer of construction was approved by President, but Transparency International Pakistan pointed the inability of EOBI to undertake infrastructures being out of mandate. Recently in Jan 2012, the National Highway Authority (NHA) has signed a contract with Malaysian Company Binapuri Holdings for the construction of Karachi-Hyderabad Motorway (M-9) costing Rs 24.93 billion.

4.3 Important Financial Aspects of Standard Construction Company

Following were the financial conditions offered by Standard Construction Company for technical/financial proposal to NHA.

- Revenue generated during construction will be utilized in project.
- Traffic growth after 2007-2008 incremented @ 5% per year.
- Toll escalation @ 10% per year after every 3 years.
- Inflation rate @ 3.5% approx.
- Toll revenue in 2005-2006 i.e. Rs 226 M per year (Actual count).
- Estimated toll revenue in 2007-2008 will be Rs 973 M per year.
- NHA share in toll revenue in Motorway operation upto loan payment is shown as below:

Years	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
NHA Share	10 M	15 M	15 M	15 M	25 M	25 M	30 M

- In 25 years NHA will receive Rs 20 Billions which is more than the concessionaire earnings.
- Payback period is 6 years that starts after two years of construction.

A comparison of project salients is drawn in Table 4.1 between Standard Construction Company and Binapuri Holdings.

Table 0.1: Comparison of Project Salients

Ser No	**Parameters**	**Standard Construction Company (2006)**	**Binapuri Holdings (2012)**
1	Length of Road	136 Km	134.95 Km
2	Length of Service Road	130 Km	71.05 Km
3	Proposed Lane	6 Nos	6 Nos
4	Weigh Stations	3 No existing, RBOC will construct upto 2	7 No
5	Pedestrian Underpass	10 No	10 Nos
6	Main Service Areas	2	2
7	No of Interchanges	11	7
8	No of Toll Plazas	24	16
9	Likely Cost	7 Billion Rs	24.93 Billion Rs
10	Bid Security	170 M Rs	170 M Rs
11	Construction Period	24 Months of Construction along Financial Close	36 Months of Construction along Financial Close
12	Concession Period Including Construction Period	25 Yrs (Max)	28 Years (Max)
13	Type of Motorway	Controlled accessed	Controlled accessed
14	Financial Close Period	180 days after signing of concession agreement	180 days after signing of concession agreement
15	Toll Escalation	10% after every 3 years	10% every year
16	Equity : Debt	30:70	30:70
17	NHA Revenue Sharing	20% after Loan Repayment	5% after Payment of Cost

Source: NHA (2009) and http://en.wikipedia.org/wiki/Super_Highway

4.4 Scope of Work

The National Highway Authority (NHA) has brought some changes in the previously planned specifications of the project, however the fundamental scope of up-gradation of the existing 4-lane Super Highway to a 6-lane controlled access motorway on BOT basis remains the same. The objective is to facilitate intercity and freight traffic thru-and fro from up country to the ports in the south and back. Following is the summary of the fresh scope of work:

- Rehabilitation & up gradation of 134.5 Km highway into 6 lane controlled access motorway.
- Seven (7) new interchanges to support towns, population and industrial zones.
- Two kinds of service road i;e urban and semi urban cum rural.
- Two main service areas
- Seven (7) Weigh station to strategically cover movement of heavy traffic and minimize over loading.
- Two new 16 lane Toll plazas with electronic toll and traffic management (ETTM) on each entrance & exists.
- The Concessionaire will also undertake Ancillary Development relevant to the Motorway Project. Such development encompasses approach roads, interchanges/flyovers, lighting, administrative and operation buildings/centers, controlling systems and environment-friendly development of areas located in the project jurisdiction and where the Motorway links with the city or other connecting points.

4.5 Commercial Feasibility Report

NHA has undertaken an independent commercial feasibility of the Project, completed in 2009, which includes detail traffic, cost, revenue and financial analysis in order to assess the viability of Karachi-Hyderabad Motorway (M-9) on BOT basis with various combinations and its financial modeling. Important aspects of this feasibility study are mentioned in the succeeding sub-sections.

4.5.1 Willingness to Pay Survey

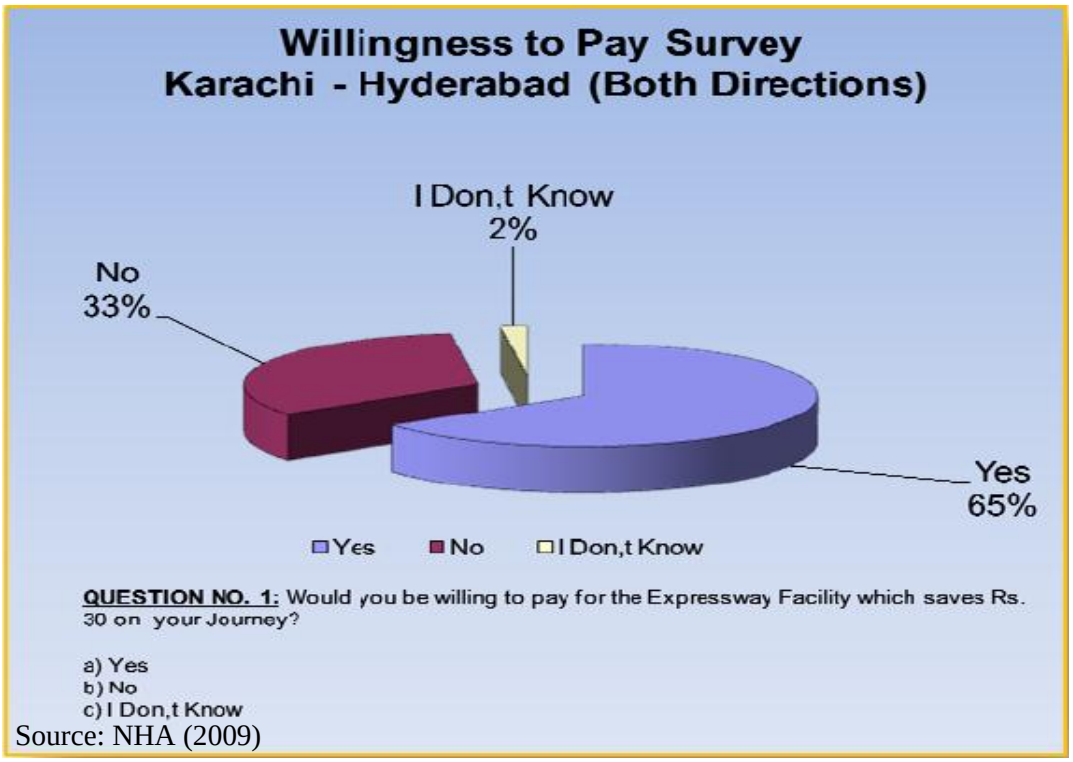
Present and expected future travel patterns and driver behavior towards utilization of proposed toll rates have been derived from Willingness to pay survey data. Willingness to pay survey was conducted at Hyderabad and Karachi toll stations by NHA Staff in 2009 and carried out randomly with the assistance of the local police. It has been very important to establish the willingness of various road user groups about the additional toll levying in case of road improvement.. The three questions which make up the Willingness to pay survey are as follows:

Question No. 1: Would you be willing to pay for the Expressway which saves Rs. 30 on your journey?

a. Yes

b. No

c. I Don,t Know



Source: NHA (2009)

Figure 0.2: Willingness to Pay for Saving Rs 30 on the Motorway

Figure 4.2 shows the positive attitude of commuters towards tolling facility, this result was collected by interviewing 21,305 commuters in 3 days. The results depict that 65% of the road users would be willing to pay for the said journey. 30%

of the users (willing to pay) would pay an extra amount of upto Rs. 30 while 23% would be willing to pay more than Rs. 30 over the existing Toll Rates.

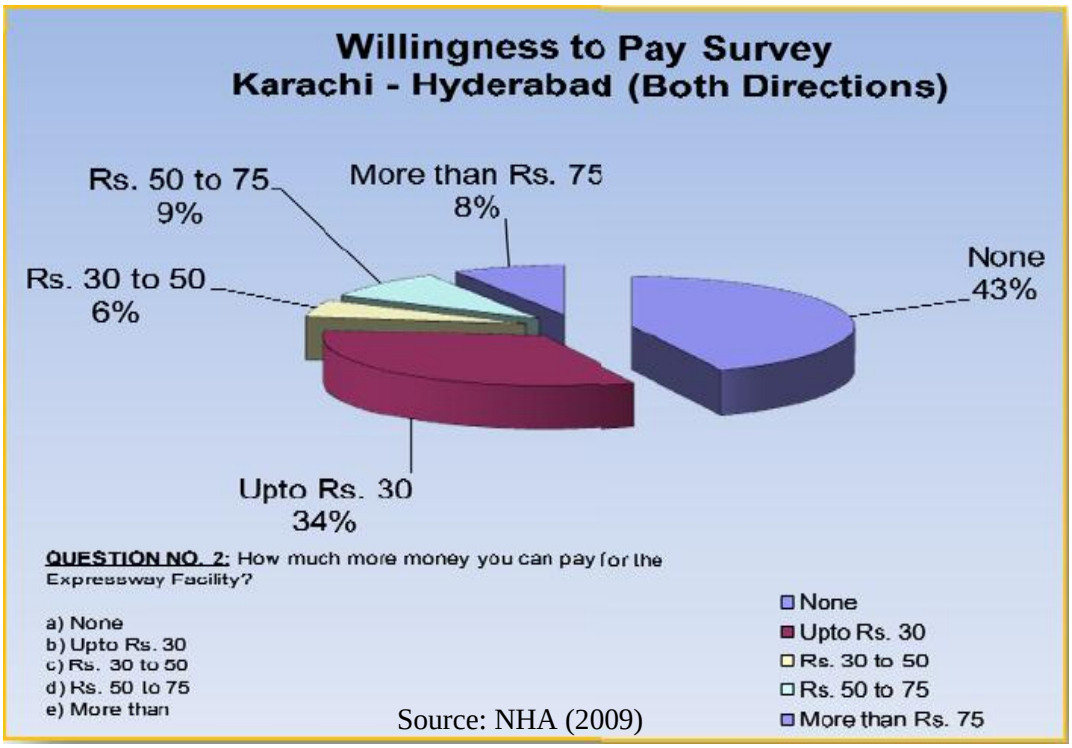


Figure 0.3: Willingness to Pay More Money for the Facility

Question No. 2: How much more money can you pay for the Expressway facility?

a. None

b. Upto Rs. 30

c. Rs. 30 to 50

d. Rs. 50 to 75

e. More than Rs. 75

Figure 4.3 indicates different strengths of commuter categories that are willing to pay more for availing the motorway facility.

Question No. 3: Will you prefer to use Expressway facility? If Yes:

a. For Regular Use

b. For Occasional Trips

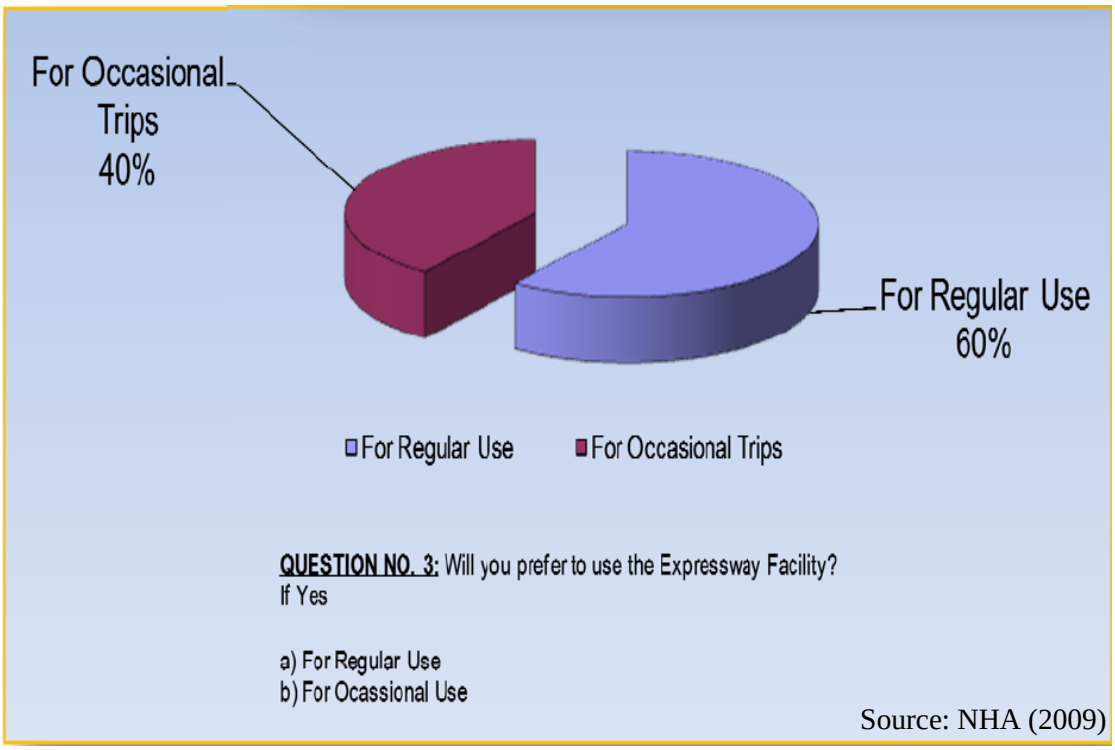


Figure 0.4: Preference to use Motorway Facility

Figure 4.4 is another good indicator for the utilization perspective of the motorway facility, as 60% of general commuter is willing to use this facility on regular basis.

4.6 Traffic Data and Analysis.

Future travel demand was estimated based on the traffic growth trend for the past years plus the anticipated growth in future and thus the traffic volume forecast was made for the next 25 years. The data was collected from the following three locations

- 3 day 24 Hrs Traffic Count at Karachi Toll Plaza (Both Directions)
- 3 day 24 Hrs Traffic Count Between Kathore Interchange and Nooriabad Industrial Area (Both Directions)
- 3 day 24 Hrs Traffic Count at Hyderabad Toll Plaza (Both Directions)

Summary of the traffic volume along distribution of vehicles is given in Table 4.2:

Table 0.2: Traffic Volume at Three Different Locations on M-9

Type of Vehicle	Karachi-Kathor	Kathor-Noriabad	Hyderabad-Noriabad
Cars/Jeeps	28.26%	29.48%	29.31%
Wagons/Pick ups	9.47%	5.93%	5.85%
Coasters/Mini Trucks	3.53%	3.63%	3.69%
Buses and Trucks (Rigid) 2 and 3 Axles	40.51%	41.94%	42.21%
Articulated 4, 5 & 6 Axles	18.23%	19.02%	18.94%
Total Vehicles	21235	20232	19980

Source: NHA (2009)

The range of the 3 distinct zones reflects consistency over the zone and variation from zone to zone.

4.7 Traffic Growth and Forecast

A careful analysis of historical data suggests that the traffic had been growing with variable growth rates in the past. This may be due to political, economic and administrative changes taking place in the country. Therefore, a wider period was analyzed to arrive at a relatively comfortable level of confidence about the traffic growth rate in the region. Reference is also made to the JICA study-PNTP (Pakistan National Transport Plan) 2005, which suggested the future growth rate of 5% based on the prevailing trend of traffic increase in the past years. The growth rates have been shown in Table 4.3 for analysis:

Table 0.3: Traffic Growth Rate for Different Type of Vehicles

Sr. No	**Traffic Class**	**Assumed Growth rate**
1	Cars	5.0
2	Wagons	5.0
3	Coasters	5.0
4	Buses	5.0
5	Trucks	4.0
6	Trailer (5x)	4.0
7	Trailer (6x)	4.0

Source: NHA (2009)

For the feasibility purpose the project construction period is assumed to be 3 years. The base year for traffic has been taken as 2009 and then forecasted for each distinct traffic zone for eventual revenue analysis. The forecast tables for next thirty years indicating the anticipated growth of vehicles are given in Appendix I:

4.8 Revenue Forecasting

In course of developing the Revenue Model the following factors are considered as key factors.

4.8.1 Traffic Demand Forecasting

The Traffic Demand is expressed in terms of Annual Average Daily Traffic (AADT), and the traffic is projected for the future years using the formula

AADT projected = AADT present × (1+Growth Rate) ^ no. of years 4.1

4.8.2 Tolling Systems and Efficiency

The tolling systems affect the efficiency of the toll revenue collected. The electronic toll and traffic management (ETTM) for the project is categorized as closed toll system with entry exit points at either end i.e Karachi Toll Plaza or Hyderabad Toll Plaza and at intermediate interchanges. The Toll Efficiency factor is assumed to be 99% efficient by the NHA officials.

4.8.3 Base Toll Rates

The NHA decided that the schedule of present NHA's toll rates for open system during construction and base toll rates per kilometer basis under closed toll system, shall be applicable upon completion of construction and commissioning of the Motorway. The toll rates both for open and closed system is given in table 4.4.

Table 0.4: Toll Rate for Different Type of Vehicles

Vehicle Category	Toll Rate (Rs)	Toll Rate (Rs/ Km)
Car	25	0.64
Wagon	40	0.89
Buses	65	1.42
2-Axle Trucks	80	2.02
3-Axle Trucks	80	2.48
Articulated Trucks	155	3.19

Source: NHA (2009)

4.8.4 Toll Escalation

Tariffs are usually increased, on the basis of an established formula. These formulae have a great impact upon the anticipated return of concessionaire, and may normally take many months and iterations before agreement is reached. The yearly toll escalation is usually linked with the domestic consumer price index to escalate it for the future years. The option proposed for the escalating the Base Tolls for the future year's rates is:

- Through Constant Escalation Per Year @ 5%

4.8.5 Toll Revenue Forecasting

The traffic numbers combined with the toll rates are used to forecast the toll revenues: The three distinct traffic bands (these bands are converted to weighted average lengths as per 134.35 Km against the Toll to Toll distance of 115 Km for revenue calculation have been considered in Table 4.5.

- (Traffic 1) Karachi Toll Plaza to Kathore Interchange

  i.e 16+000 to 30+100 – (14.100 Km) weighted average (16.34 Km)
- (Traffic 2) Kathore Interchange to Nooria*b*ad Int.

  i.e 30+100 to 66+953 – (36.853 Km) weighted average (42.72 Km)
- (Traffic 3) Nooriabad Int. to Hyderabad Toll Plaza

  i.e 66+953 to 131+000 – (64.947 Km) weighted average (75.89 Km)

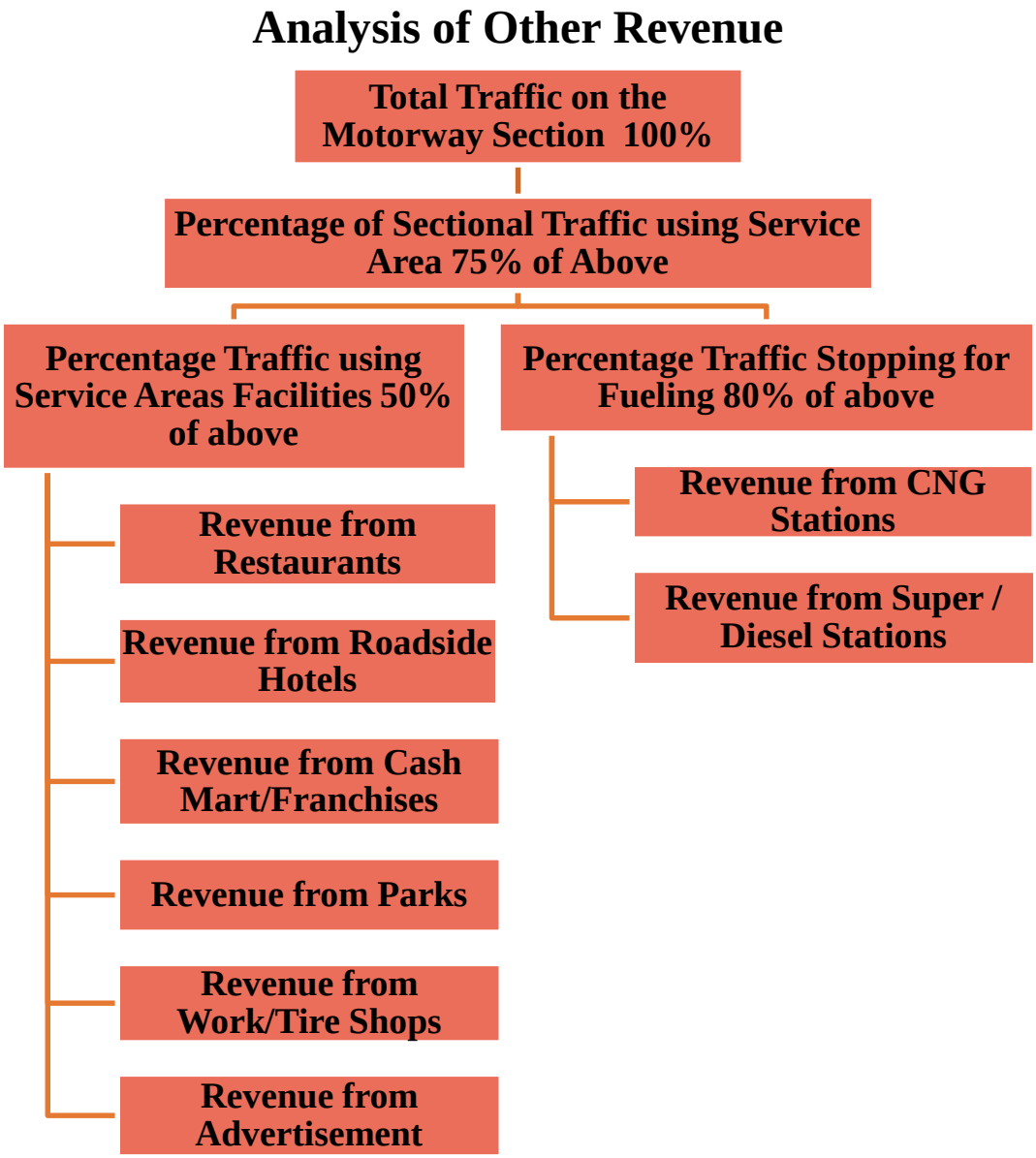
Table 0.5: Revenue Analysis for 30 years at three distinct Traffic bands

Sr. No	Year	Traffic 1	Traffic 2	Traffic 3	Total Traffic
1	2009	203.31	516.59	907.86	1,627.75
2	2010	222.37	564.95	996.2	1,783.52
3	2011	243.23	617.84	1,089.47	1,950.54
4	2012	266.04	675.7	1,191.49	2,133.22
5	2013	305.18	774.45	1,365.63	2,445.26
6	2014	333.81	846.99	1,493.54	2,674.34
7	2015	365.13	926.33	1,633.9	2,925.36
8	2016	399.39	1,013.12	1,786.99	3,199.5
9	2017	436.87	1,108.06	1,954.45	3,499.38
10	2018	477.88	1,211.91	2,137.63	3,827.41
11	2019	522.74	1,325.5	2,338.01	4,186.25
12	2020	571.83	1,449.76	2,557.2	4,578.79
13	2021	625.53	1,585.69	2,796.97	5,008.19
14	2022	684.28	1,734.39	3,059.27	5,477.94
15	2023	748.56	1,897.06	3,346.21	5,991.83
16	2024	818.89	2,075.01	3,660.11	6,554.02
17	2025	895.85	2,269.69	4,003.51	7,169.04
18	2026	980.05	2,482.66	4,379.19	7,841.89
19	2027	1,072.17	2,715.65	4,790.18	8,578.00
20	2028	1,172.98	2,970.54	5,239.81	9,383.33
21	2029	1,283.27	3,249.4	5,731.73	10,264.41
22	2030	1,403.97	3,554.49	6,269.91	11,228.37
23	2031	1,536.03	3,888.28	6,858.72	12,283.04
24	2032	1,680.54	4,253.47	7,502.93	13,436.95
25	2033	1,838.68	4,653.03	8,207.76	14,699.46
26	2034	2,011.72	5,090.18	8,978.93	16,080.83
27	2035	2,201.08	5,568.49	9,822.68	17,592.25
28	2036	2,408.31	6,091.82	10,745.88	19,246.01
29	2037	2,635.08	6,664.44	11,756.01	21,055.52
30	2038	2,883.24	7,290.98	12,861.28	23,035.5

Source: NHA (2009)

4.9.6 Other Revenue

Other revenue can be collected from a number of sources like hoarding boards, renting of land for service stations etc. An additional 10 % of toll revenue is assumed to be collected through other sources; an analysis of likely revenue is given in figure 4.5. Further an Interest Income shall also be generated and is assumed to be @ 5% of the cash balance after dividend payment. Additional Rs. 400 million are generated annually from two major service areas provided in the opening year.



Source: NHA (2009)

Figure 0.5: Distribution of Other Revenue

4.9 Capital Costing

The construction cost of the project is based on the design conducted by NHA and rates used for the estimate are the NHA Composite Schedule of Rates (CSR) 2009 issued in March 2009. Summary of the cost is given in Table 4.6.

Table 0.6: Construction Cost Based on NHA Composite Schedule of Rates (2009)

Grand Summary (Civil Works)	
Description	**Amount (Rs)**
Main Carriage Way (North & South Bound)	7,633,735,234
Interchanges (07 nos.)	892302502
Service Road	641855526
Service Areas (North & South)	400421120
Main Toll Plaza	224000000
Weigh Bridges & Allied Works	140000000
Sub Total	9,932,314,382
Contingences 3%	297969431
Construction Cost (A)	10,230,283,813
Consultancy, design & project management 3 % of (A)	306908514
Escalation @ 6.5% p.a (2nd year) for 70% of the project cost	398981069
Escalation @ 6.5% p.a (3rd year) for 30% of the project cost	199490534
Grand total	11,135,663,931

Source: NHA (2009)

The construction time is fixed as 30 months. It is understood that 30% of the project cost shall be expended in the first year, 40% in the second year and 30% in the third year.

4.10 Routine Maintenance Costs and Projections

Routine maintenance works need to be undertaken each year and constitute cyclic as well as reactive works. The need of these works is dependent on environmental as well as traffic effects. These will generally involve:

- Repair of cracks/potholes
- Edge Repair
- Road furniture maintenance
- Vegetation control
- Clearing drains and culverts
- Toll plaza and Operations Office maintenance
- Utility infrastructure/ communications maintenance

For our analysis, the assumed cost is taken as Rs. 450,000 per 3- lane Km (including service areas, operation offices, service and main carriageway) Routine maintenance cost shall also keep on rising each year by 5%.

4.11 Periodic Maintenance.

Periodic maintenance is planned to be undertaken at intervals of several years. These works can take the form of preventive, resurfacing or overlay works. These will generally involve:

- Overlays on Roads/ Bridge Decks
- Replacement of Road furniture where required
- Replacement of expansion joints/ bearing pads where required
- Up gradation of Toll plaza i.e. canopy/ generators etc. where required
- Utility infrastructure/ communications up gradation where required

The cost of Periodic Maintenance is worked out as Rs. 8.50 Million per 3-lane Km according to CSR 2009 prices

4.12 Operation.

The Operations Cost encompasses all such costs that are required to keep the expressway operational. These include cost of tolling equipment, tolling personnel, electricity, water, cleanliness etc. It is assumed that the Operations cost shall be 10% of the toll revenues collected each year.

4.13 Financial Analysis

The objective of the financial feasibility study is to determine the parameters under which the M-9 Project can be structured as a viable commercial enterprise. The financial analysis makes use of a financial model based on operating conditions under which the Project is assumed to be structured as a tolled motorway. These conditions are reflected in the commercial and economic assumptions underlying the financial model. For the purposes of the financial evaluation the broad indicator for the project viability is:

- Pay Back Period
- Project Financial Internal Rate of Return

The three main indicators of financial feasibility from client, sponsors and lenders perspective that need to be considered are:

- Positive annual net cash flows
- Maintenance of adequate debt service coverage
- Achievement of the required rate of return to equity holders

4.14 Financial Analysis and Sensitivity

The financial modeling is subject to multiple assumptions which can cause major impacts on the model output. The key factors are:

- Construction Cost
- Traffic Volume
- Toll Rates
- Financing Terms

Changes in any one of these primary input factors will cause varied effects in the model outcome and results. A base case has been developed before sensitivity was performed on the following possible variables from the base case:

- NHA share 30% of toll revenues (after debt servicing)
- NHA share 50% of toll revenues (after debt servicing)
- NHA share 70% of toll revenues (after debt servicing)
- Commercial Bank interest rate at 11%
- Commercial. Bank interest rate at 13%
- Revenues 20% (minus)
- Cost 20%(plus)
- Revenues 30% (plus)
- Revenues 20% (minus) & cost 20% (plus)

4.15 Parameters for Base Case

A base case has been considered which will simply show the final return on investment after deduction of expenditures and taxes from the revenue generated in the concessionaire period. Only the project company will own the benefit, this case was further evaluated by NHA under financial sensitivity analysis.

4.16.1 Revenue Sources

Two Sources of Revenue are considered

- **Toll Revenues.** The base toll rates of M-2 are assumed to be the base toll rates for M-9 for year 2009. The annual increase on toll rates is assumed to be 5% annually. There is potential of toll collection of about Rs. 1.25 Billion resource during the construction. Details of traffic forecast already discussed
- **Service Areas and Other Revenues.** An additional 10 % of toll revenue and an Interest income @ 5% of the cash balance after dividend payment is assumed.

4.16.2 Expenditure Sources

Details of expenditures and the related rate of escalation with depreciation has already been mentioned in previous paragraphs, however the main expenditures are:

- Construction Cost
- Periodic Maintenance
- Operation
- Debt servicing
- Other Factors
    - Corporate Tax 35%
    - Concession Period 25 Years
    - Construction Completion 30 Months
    - Provision made of Maintenance Reserve Account (MRA) @ 100% of O&M Expenditures
    - Provision made of Debt Servicing Reserve Account (DSRA) @ 50% of Loan Repayment
    - All values were taken in Rs. in Million

Table 4.7 summarizes the results of the financial analysis:

- Serial 9 indicates maximum of return on investment i.e. 34%, due to increase of 30% of revenue.
- Serial 4 indicates maximum of return on investment i.e. 17.7%, due to additional share of 70% for NHA from the concessionaire share.

Table 0.7: Financial Analysis Summary

S No	Case Description		Capital Cost	Equity	Loan	Debt Servicing	1st Year Toll revenue	Total Revenues	Pay Back Period	Total O&M	Tax	NHA Share		Concessionaire Share		
												Total	NPV @12%	Total	ROI (%)	NPV @12%
1	Base Case		11,436	3,431	8,005	15,417	2,445	196,048	7	32,094	51,184	-	-	97,354	26.2%	12,627
2	Base Case With	NHA share 30% of toll revenues (aft debt srv)	11,436	3,431	8,005	15,417	2,445	196,048	7	32,094	36,499	41,956	5,086	70,082	23.4%	9,321
3		NHA share 50% of toll revenues (aft debt srv)	11,436	3,431	8,005	15,417	2,445	196,048	7	32,094	26,709	69,927	8,477	51,902	21.0%	7,117
4		NHA SHARE 70% OF TOLL REVENUES (Aft Debt Srv)	11,436	3,431	8,005	15,417	2,445	196,048	7	32,094	16,919	97,897	11,868	33,721	17.7%	4,913
5		COMM. BANK INTEREST RATE 11%	11,436	3,431	8,005	13,315	2,445	196,072	7	32,094	51,928	-	-	98,736	28.4%	13,367
6		COMM. BANK INTEREST RATE 13%	11,436	3,431	8,005	14,353	2,445	196,066	7	32,094	51,562	-	-	98,057	27.3%	13,004
7		REVENUES 10% (minus)	11,436	3,431	8,005	15,417	2,200	176,575	7	30,467	44,937	-	-	85,754	23.5%	10,678
8		COST 10% (plus)	12,580	3,774	8,806	16,958	2,445	196,027	7	32,094	50,917	-	-	96,058	23.8%	12,014
9		REVENUES 30% (plus)	11,436	3,431	8,005	15,417	3,178	254,383	6	36,973	69,893	-	-	132,100	34.0%	18,448
10		REVENUES 10% (minus) & COST 10% (plus)	12,580	3,774	8,806	16,958	2,200	176,430	7	30,467	44,627	-	-	84,377	21.3%	10,030

Source: NHA (2009)

4.16 Summary

The feasibility of Karachi-Hyderabad Motorway (M-9) prepared by NHA, was analyzed in this chapter for its commercial and financial validity, which has come out to be tremendously positive. The important aspect emerged from this feasibility report is the attitude of the users for their willingness to pay for the toll on the section of Karachi-Hyderabad, secondly the traffic volume that has been taken into account is expected to grow with positive rate due to the presence of trade hub at Karachi port as well as centre of financial activities.

Chapter 5

RESEARCH METHODOLOGY

5.1 Introduction

In this chapter, the research methodology adopted for judging the BOT suitability will be discussed and presented. The main methods for collecting and developing research data are the questionnaire survey and the interview with the respondents. This data is used to analyze BOT environment and its practices in Pakistan and to suggest measures to encourage the private and public sector and financial institutions in infrastructure development sector. The given sections provide the details of the research method employed in this research thesis.

5.2 Research Design

The objectives for this research have already been indicated in the introduction chapter. The methods for achieving these objectives were addressed by crafting the research in an appropriate manner. The research methods generally used in scientific studies are experiments, surveys, archival analysis, interviews, case studies and histories. It is also to be highlighted that the method adopted for a particular research also depends on the degree of research already carried, type of the research operation (what, how, why) etc, the research focus, the geographical scenarios and control over variables. In order to select an appropriate method for research, it is compulsory to consider the links between data collection and the required issues to be addressed through analysis, as well as the major questions to be addressed and also the results. Therefore, when starting a research, it is very important that the link among research questions, the kind of data acquired and the method of data analysis approach should be well thought-out.

A questionnaire is mostly used as an instrument in scientific subjects and it is also used as the main research method in this study. For the development of the questionnaire, an already designed template by Dr. Bing Li (School of Built and Natural Environment Glasgow Caledonian University) has been referred and same template had also been applied by Dr. Esther Cheung and Albert P. C. Chan in 2007, during BOT analysis of Hong Kong Zhuhai Macau Bridge, a project costing 37.4 billion (RMB) in Hong Kong. For grading of factors, use of a distinct 5-point Likert Scale was made, in order to discover the

complete range of possible replies between "Yes" and "No". This technique also permits relative judgment of multiple responses to the same question (e.g. reasons for privatization).

5.3 Survey Sample

The use of statistics is to have summary assessment about some characteristics of the population through sampling and for good results from sampling, there should be a good representative of population. There are numerous ways of sampling depending on the characteristics of the population. These are judgmental, random and non-random samplings (Francis and Hoban 2002). In judgmental sampling, the researcher's judgment is used for selection of sample, without using statistical sampling techniques. Judgmental sampling is prone to injustice, so reason for its use should be clearly mentioned in the study. Random sampling method is used when population structure have no major variation. Methods used in non random sampling are:

- Systematic sampling
- Stratified sampling
- Cluster sampling.

The sample for this research is chosen from a population of projects which are delivered through BOT construction method in the Pakistan construction industry. The BOT form of delivery method is unfamiliar and limited at this stage, therefore there are few road projects actually been implemented. It is fairly a small population of BOT population; however the sample collection will represent various construction experts including clients, financers, consultants and contractors with different categories and backgrounds. In this research, the judgmental sampling method is applied to acquire samples from various categories of construction industry in Pakistan. The BOT projects for road construction are mostly under taken by National Highway Authority, but there are certain federal and provincial authorities who are also facilitating the Privatization Investment in their respective areas of responsibilities like IPDF, PPIB, PPP Unit Sindh and PPP Cell Punjab. Obviously, surveying all these organizations in the privatization sector would give way the most representative results though hardly realistic due to amount of work and time involved. The questionnaire was therefore circulated and dispatched to 60 randomly selected possible respondents. Majority of the

respondents were physically visited for interview and discussion purpose as well. These respondents included clients, consultants, developers, financers and academic scholars. Table 5.1 shows the distribution of all the BOT projects among the public agencies with their stage of execution.

Table 4.1: Distribution of BOT Projects in Pakistan 2011

Public Agency	No of BOT Projects	BOT Roads	Status of BOT Roads		
			Implementation	Development	Preparation
IPDF	16	1	-	-	1
NHA	23	23	6	5	12
PPP Sindh	7	2	1	1	-
PPP Punjab	6	1	-	-	1
CDA	3	-	-	-	-
RDA	4	2	-	-	2
C&W Punjab	2	2	1	-	1
C&W KPK	1	-	-	-	-
C&W Sindh	2	-	-	-	-
		Total	8	6	17

Total Road Projects = 31

Source: NHA (2009)

The administrative appointments of the public agencies were addressed as the research informants, since they are believed to possess the maximum knowledge regarding the BOT project companies. The project companies and their dependent consultants and financers presently working on the BOT road execution were also given the priority as the valuable survey.

5.4 Sample Size

As per Dillman (2007), the major factors which should be taken into

account in shaping an appropriate sample size are:

- Sampling error
- Population size
- Variation in answers
- Confidence level

From a statistical viewpoint, 30 is the minimum sample size to carry out a statistical analysis (Economists 2003). It will be difficult to obtain a noteworthy statistic test if the sample size is lesser than 30 (Saunders et al. 2009). In short, the reason why most of researchers view 30 (or a little bigger) as the smallest sample size is because according to these researchers, a sample size of 30 (or bigger) usually could consequence in a sampling distribution for the mean that is very close to a normal distribution. Therefore considering the above arguments, at least 30 respondents are to be taken in account to be the minimum number for this research. The choice of sample size depends on:

- The confidence required to have the data, i.e., the level of firmness that the characteristics of the data collected will represent the characteristics of the total population.
- The margin of error that can be tolerated, i.e., the accuracy required for the estimates made from the sample.

  The empirical formula used here for calculating the sample size is as given below (Wilson 2010):

$$\boldsymbol{n = \frac{N}{[1 + N(e)^2]}} \qquad \textbf{5.1}$$

Where,

n = Sample Size

N = Population Size

e = Precision

The number of BOT projects that are presently being implemented on ground should be considered to determine the population size, as remaining projects have

no certainty of getting shortlisted from feasibility point of view or approval from authorities or getting favorable investor. However, BOT projects at implementation and development stages have been considered (See Table 5.1).

For each BOT project, four types of categories have been taken i.e. client, consultant, financer and developers, hence value of N comes to 56 (14 x 4 = 56). The value of *n* from Wilson's formula comes to 50 respondents as calculated in equation 5.2. In order to maintain uniformity for getting equal no of responses from each category, 60 questionnaire forms were circulated or dispatched (Table 5.2)

$$\boldsymbol{n = \frac{56}{[1+56(0.05)^2]}} \qquad \textbf{5.2}$$

$$\boldsymbol{n = 50}$$

Table 4.2: Response Rate of Respondents

Respondents Type	No. of questionnaires sent/interviewed	No. of questionnaires returned	Response rate
Clients	15	15	100%
Consultants	15	15	100%
Developers	15	15	100%
Financers	15	10	67%
Total	60	55	92%

Owen and Jones (1994) emphasized that an average of 20% of questionnaires returned should be considered satisfactory. And in the construction industry, a good response rate is around 30% (Black *et al.* 2000). Therefore, the response rate in this research was highly suitable.

5.5 Design of Surveys

The importance of questionnaire design for an impelling survey has been highlighted by many researchers (Giritli, *et al.* 1990, Kim 2010, Lingard *et al.*

2010). Accordingly, a well tailored questionnaire should have such uniqueness that respondents can easily tackle and can answer without putting in much of the effort and taking curiosity simultaneously and at the same time does not use much of their time. The rate of response by respondents is subjective by numerous factors, such as the size of questionnaire and size, color and type of paper used, transcript or designs cover pages, questions order, as well as the stamps and envelope used to mail the questionnaire (Memili *et al.* 2011). In this study a mixed mode survey has been adopted as researchers are in favor of mixed- mode survey in order to obtain a better response rate. Maximum of the respondents were interviewed and others were surveyed via mailed questionnaire. To achieve a high response rate there is collective survey method which is highly suggested (Mbachu 2008). Developments in technology have also given rise to self-administering surveys such as web, electronic mails, and touch-tone data entry methods (Dillman 2000). There are many ways to create judgment of increased rewards, decrease social costs for being a survey respondent, and build respondent trust (Dillman 2000). Provision of rewards to respondents can be made by financial or material incentives, ask for guidance, make the questionnaire interesting, inform respondents that opportunities to respond are restricted and offer a result summary for the better consumption of the subject matter by the respondent. Postal stamps and addressed return envelopes if sent to the respondent along the questionnaire, can reduce the cost by respondent, also by assuring privacy or anonymity and making questionnaires appear short and easy, the respondent feels contented. Specimen of the covering letter and questionnaire used in this thesis are exhibited in the Appendix II.

The research process and the method of approach followed in the present study is outlined in figure 5.1.

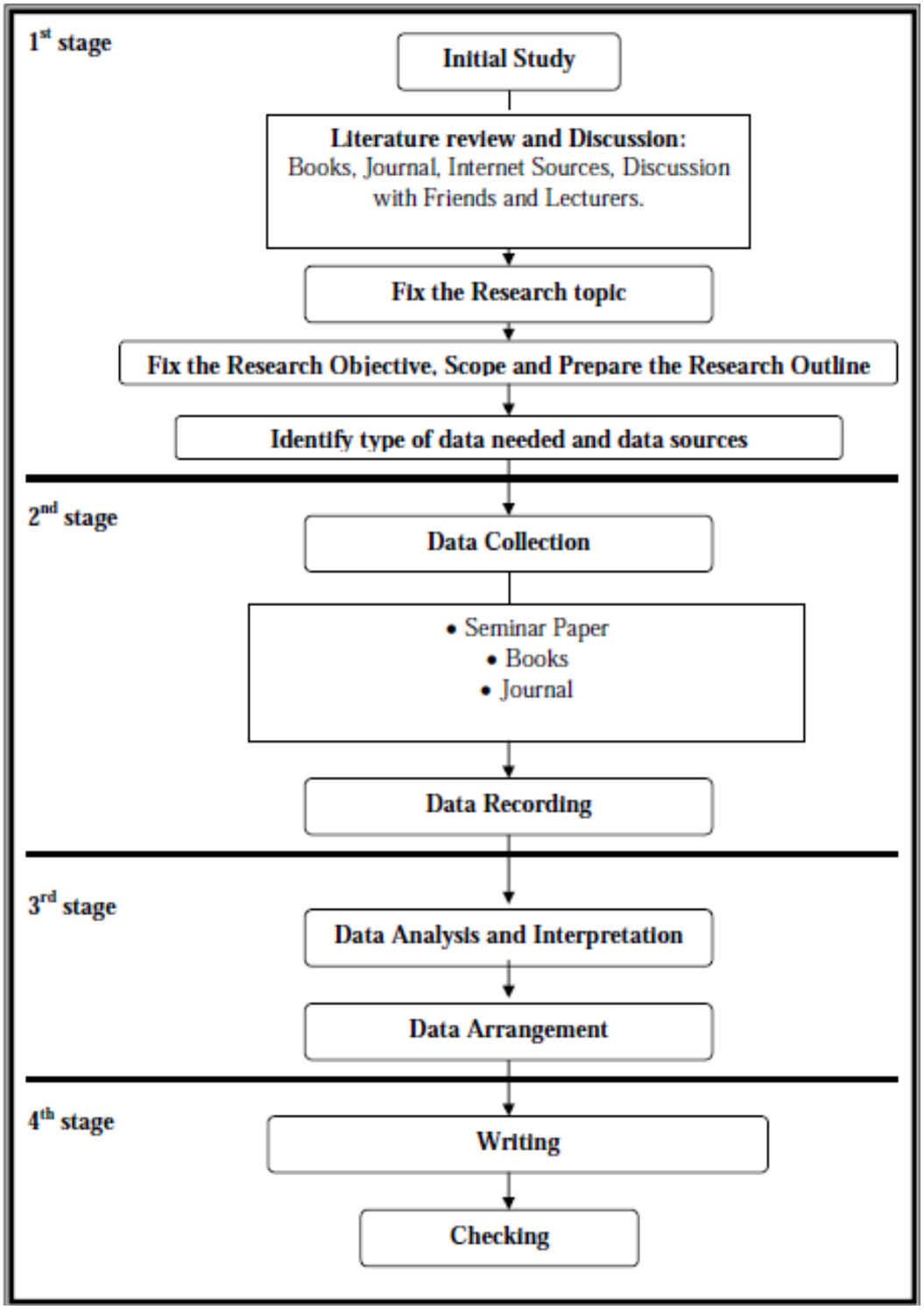


Figure 5.1: Research Process and Methods of approach

5.6 Development of Suitability Model

5.6.1 Step 1: Calculate the rating of Positive and Negative Factors

5.6.1.1 Design of Questionnaire

The questionnaire template designed by Li (2003) during his fellowship of post doctorate in the United Kingdom has been adopted. Although a new research questionnaire could be developed, but Li's template of questions are generally common and it seemed more rewarding to adopt Li's (2003) survey questionnaire rather than designing a new template. One of the advantages of adopting such template is that the value of Li's (2003) questionnaire was already recognized by the construction industry in general. His publications as a result of the doctorate research findings derived from the questionnaire were proof of its merit. Secondly, there was no added advantage to reformulate the work previously done by other researchers. Thirdly, administering Li's (2003) questionnaire in different administrative systems made it of interest for future evaluation purposes. In addition, the construction industry of Pakistan is generally similar to English norms and practices and no problems in adopting this questionnaire were anticipated. Therefore, Li's (2003) questionnaire was adopted for this survey.

5.6.1.2 Type of Respondents for Data Collection

The respondents from whom the questionnaire forms were filled belonged to different sectors including the public, private, finance, consulting and academics. Target respondents were selected on any of the two criterions:

- they must possess adequate knowledge in the area of PPP/BOT

or

- they must have hands-on experience with BOT projects, experience in conducting BOT research, or have followed very closely with the development of BOT.

Maximum of the survey questionnaires were filled by the respondents during personal visit, with intent of getting personal experiences and information on BOT. Sixty survey questionnaires have been floated for response, out of which fifteen were forwarded via e-mail or postal mail. A total of 55 filled questionnaires from complete Pakistan including Azad Jammu Kashmir have been included in the collected sample, however no response could be arranged from Baluchistan.

5.6.1.3 Background of Questionnaire Respondents.

The questionnaire respondents comprised experienced practitioners from the construction industry and Figure 5.2 shows that approximately 30% of the respondents in Pakistan possess 21 years or more of construction experience. Figure 5.3 provides a breakdown of the experience of questionnaire respondents who have been involved with BOT projects. Given the few BOT/PPP projects conducted in Pakistan, it was a surprise to find that 33% or one third of the respondents had no previous experience. Some of these may have had experience with local BOT projects or PPP projects overseas, but still the experience of these respondents confirmed the quality of the responses from the survey. Therefore the data provided by these professionals was taken to be authentic and reliable.

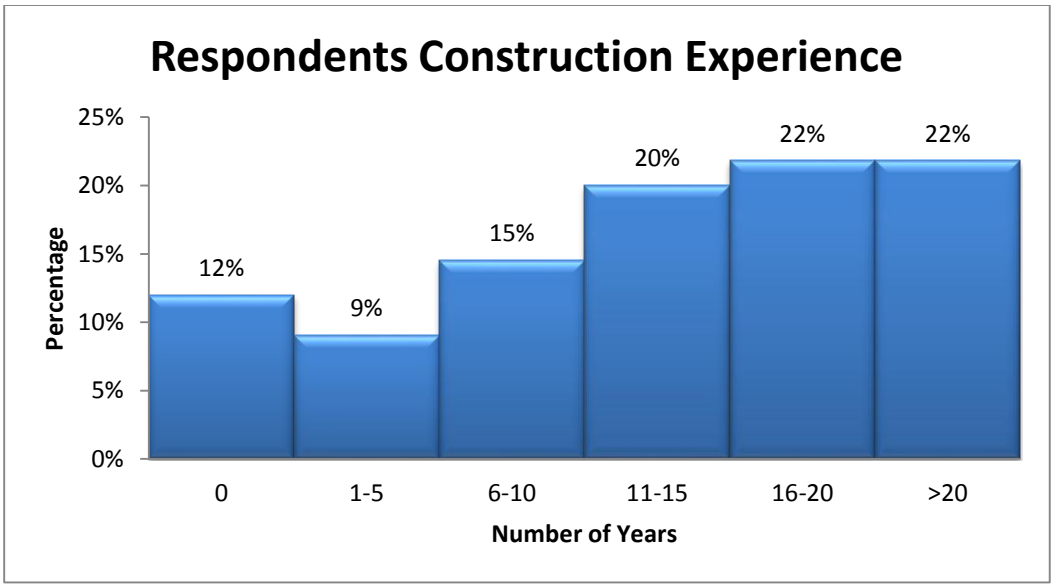


Figure 4.1: Respondents Construction Experience in Years

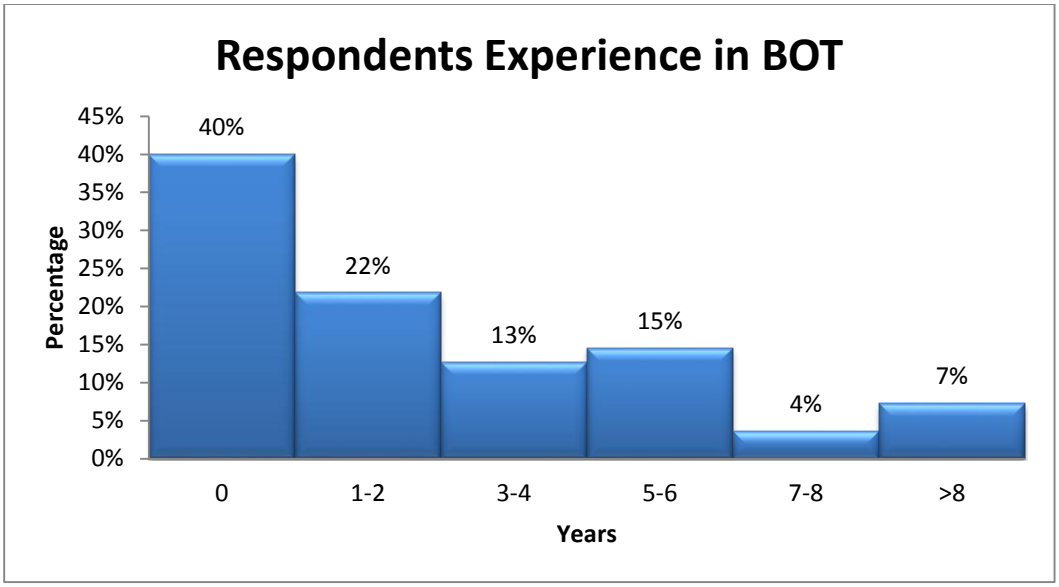


Figure 4.2: Respondents BOT Experience in Years

5.6.1.4 Assessment of Attractive and Negative Factors by Questionnaire Respondents.

The respondents rated their degree of agreement and disagreement against each of the identified attractive and negative factors of Dr Bing Li's designed template, as per five-point Likert scale (1 = Strongly not agreed and 5 = Highly agreed). The mean score of each factor was used as the relative weight to develop the assessment model. In addition to the already written factors, the survey respondents were given the opportunity to suggest additional factors to ensure that the ones already derived were not only representative for BOT projects, but additional factors can be considered because of the uniqueness involved in each project. Nevertheless, the questionnaire surveys sought opinions on BOT projects in general and not for particular projects the respondents were asked to rate, they were also given the chance to add others of importance, but they did not do so.

5.6.2 Step 2: Analyze the Potential BOT Project

Before the project to be undertaken, a thorough analysis of the potential BOT project should be carried out by the public agency. Project information is as necessary as to the knowledge of medical history of a patient before being prescribed medicine by the doctor. In BOT infrastructure, a comprehensive study of the project is very important, which should include the history, development, future, parties involved,

impediments, general public tendency, preference of public and private sector, normal practice, financial health, advantages and disadvantages, political situation, level of corruption, bureaucratic attitude, time frame, opportunities, obstacles, and traditions. Information can be sourced from newspapers, magazines, governmental reports and web sites, studies conducted by researchers, private sector publications, interviews with parties involved or parties that would be affected, discussions with experts, and a questionnaire survey with the general public. In order to use the suitability model, the user of the model should be fully conversant with the project study and then he could match the project information available him with the list of attractive and negative factors. For each factor, the user marks a score for the likelihood it would occur in the project being considered. The scoring done by the model user is same as Likert scale used by the questionnaire respondents.

5.6.3 Step 3: Evaluate the Decision for Adopting Potential BOT Project

TS in equation **5.3** is the total score for the values of attractive and negative factor groups separately. The TS value of each factor group is derived by multiplying the relative weight of the factor (mean score of the different values given by the questionnaire respondents) with the weight of the factor (score given by the user of the suitability model). The total score by the following formula:

$$TS = \sum W \times S \qquad 5.3$$

Where TS = total score of factor group (attractive or negative factor group)

W = weight of the individual factor within the factor group

S = score assigned by user for the individual factor within the factor group

Each total score of the groups (attractive factors group and negative factors group was compared; the group of factors scoring the highest indicated the suitability or unsuitability of adopting BOT for the considered project. For example, if the total score of the attractive factors is higher, then BOT is the referred option. If the total score of the negative factors is more dominant, then BOT is not recommended.

5.7 Summary

This chapter covers the development of questionnaire and the deriving of number of respondents for making a reliable data for analysis by using William's formula of calculating the number of respondents. Also the validity of respondents have been measured by getting data of the respondents' construction experience and also their particular experience in BOT project delivery method. The last paragraphs gives the method of development of development of suitability model for a particular BOT potential project.

Chapter 6

RESULTS ANALYSIS AND DISCUSSION

6.1 Introduction

A great care has been taken while collecting data that the qualification standard of the respondents should be highly educative because of very raw and unskilled BOT atmosphere in road infrastructure development. More than 50% respondents were found to have Masters Degree in respective fields (see Figure No 6.1), same as the construction experience of respondents (see Figure 6.2) which is also found to be very rich. At the same time it has been also considered that the data collection should be invariably equally distributed to represent all types of construction related categories from the BOT construction industry. Figure 6.2 shows the category of each respondent related with the BOT project delivery method. Keeping the quality of survey, the higher qualification of the respondents and the main objective of determining the suitability for the considered project, it had been kept in mind that all the result analyzing process to be carried with extreme measures and precise methodology so that all the sincere efforts put in can be verified and reformed into desired results for the benefit of BOT Industry of Pakistan.

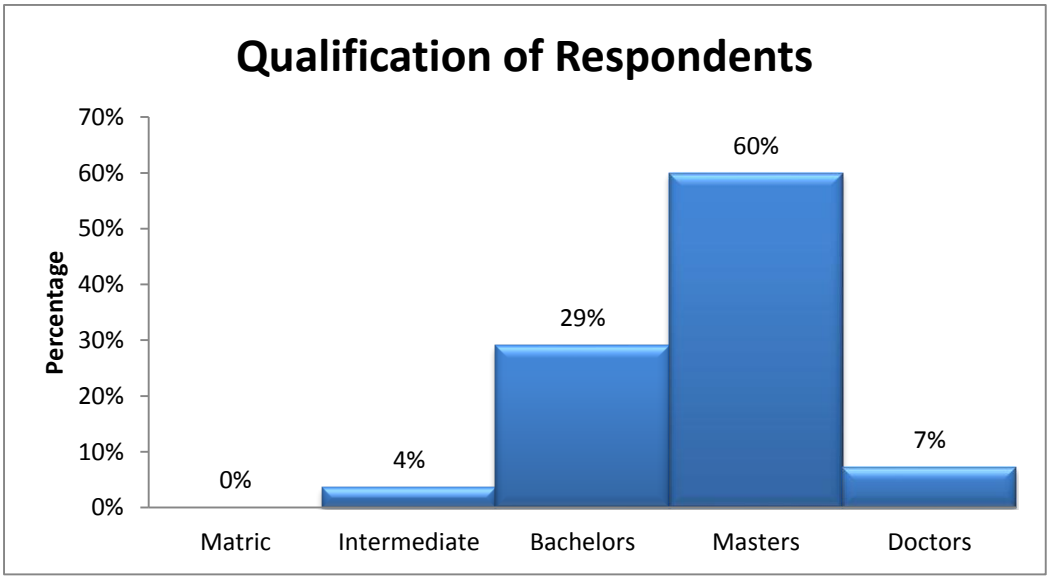


Figure 5.1: Academic Qualification of Respondents

Figure 6.3.and 6.4 shows the distribution of BOT experienced respondents and countrywide distribution of respondents respectively.

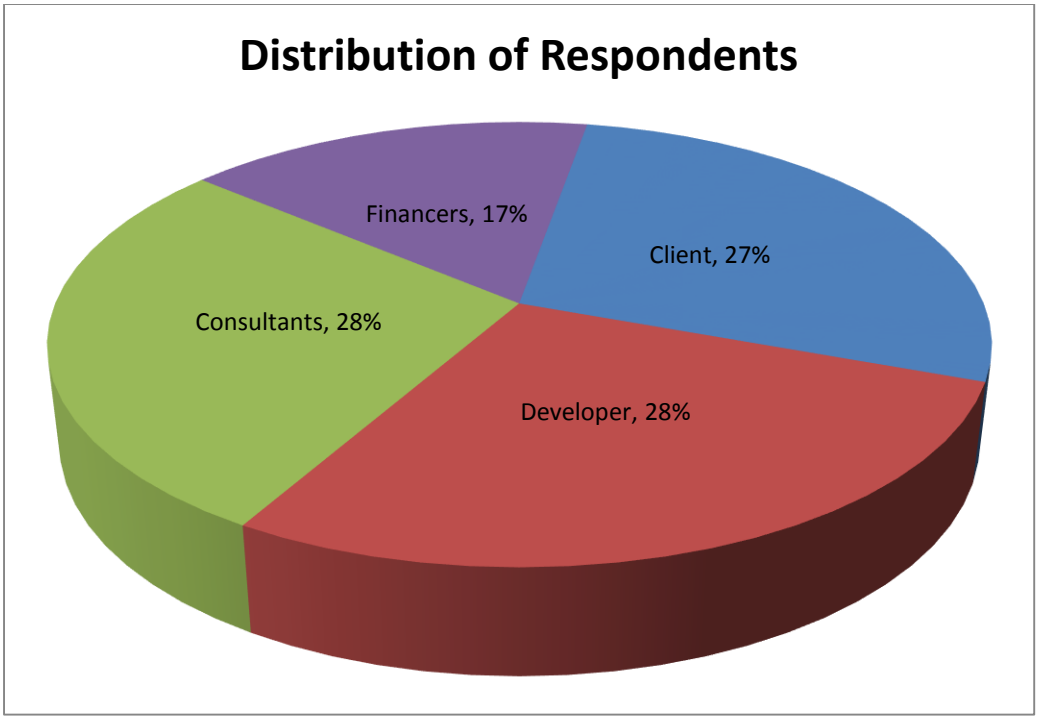


Figure 5.2: Distribution of Respondents

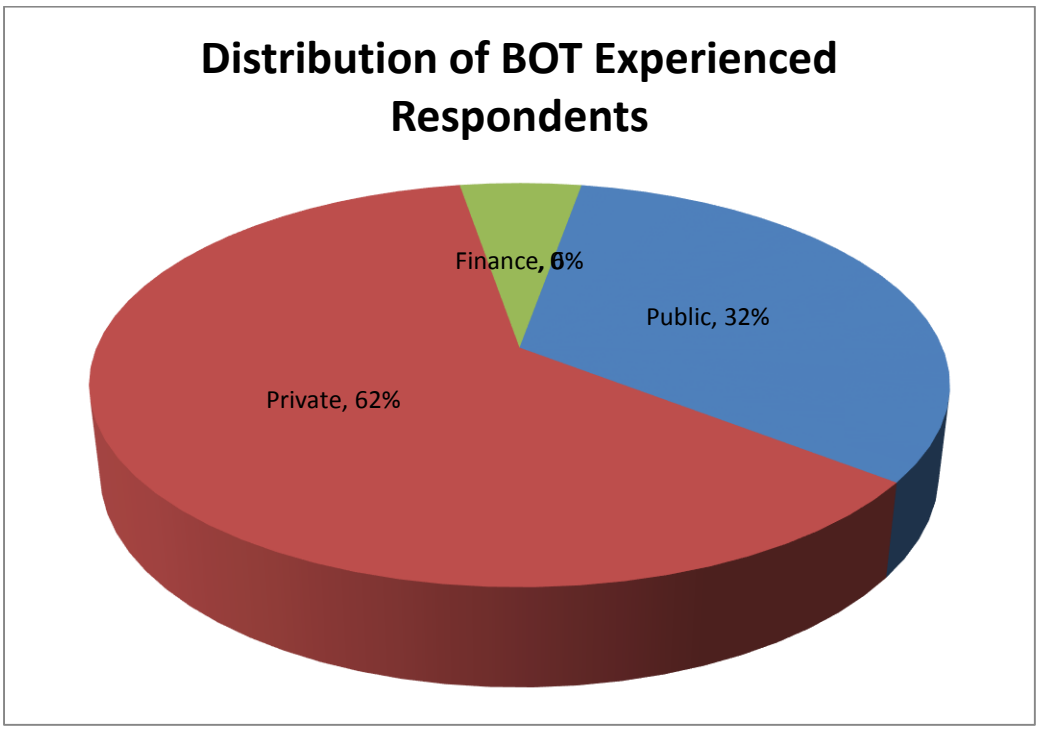


Figure 5.3: Distribution of BOT Experienced Respondents

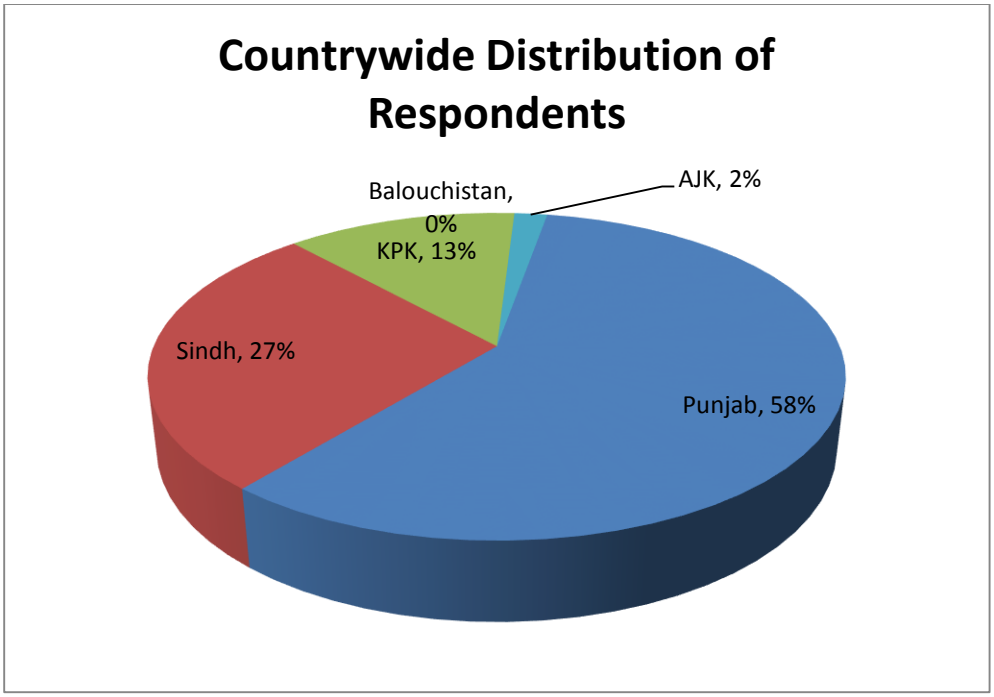


Figure 5.4: Countrywide Distribution of Respondents

In this study the data was divided in two groups, each of positive factors and other of negative factors, therefore all the statistical tests were applied on both groups in same manner and frequency for equal analysis opportunity. There were no omitted values. Table 6.1 shows the descriptive statistics of positive factors.*Skewness* and *kurtosis* illustrate the shape of the curve formed. The skewness value provides an indication of the symmetry of the distribution. Kurtosis on the other hand, provides information about the 'Peakedness' of the distribution. If the distribution is perfectly normal, one would obtain a Skewness and Kurtosis value of 0. Here the analysis showed that there was no regularity in the data of skewness, whereas Kurtosis showed the Peakedness of the data. The values of Skewness and Kurtosis were not equal to zero representing the lack of normality in the data (Kanji 2006; Pallant 2007). Large differences in original mean and 5% trimmed mean showed that the outlier scores were having strong influence on the original mean. In the obtained data, there were no significant differences between both means; hence the outliers were not highly effective on the original mean. Descriptive analysis of negative factors in Table 6.2 also showed similar statistics.

Table 5.1: Descriptive Statistics of Positive Factors

Factors	Mean	5% Trimmed Mean	Skewness	Kurtosis
Positive 1	4.47	4.52	-.703	-.420
Positive 2	4.29	4.35	-.845	.944
Positive 3	4.33	4.39	-.938	.618
Positive 4	3.86	3.92	-.766	.960
Positive 5	4.20	4.24	-.618	-.416
Positive 6	2.88	2.87	.168	-.944
Positive 7	4.04	4.09	-.561	.013
Positive 8	3.98	4.03	-.816	.549
Positive 9	4.04	4.12	-1.082	.831
Positive 10	4.27	4.33	-.803	.594
Positive 11	3.65	3.66	-.374	-.563
Positive 12	4.06	4.11	-.579	-.060
Positive 13	3.76	3.79	-.437	-.539
Positive 14	3.78	3.82	-.220	-.463
Positive 15	4.24	4.28	-.727	1.064

Table 5.2: Descriptive Statistics of Negative Factors

Factors	Mean	5% Trimmed Mean	Skewness	Kurtosis
Negative 1	2.76	2.75	.019	-1.183
Negative 2	3.20	3.20	3.20	3.20
Negative 3	3.73	3.77	-.523	-.380
Negative 4	3.45	3.50	-.343	-.687
Negative 5	3.78	3.84	-.623	-.613
Negative 6	3.16	3.14	.204	-1.396
Negative 7	3.41	3.46	-.502	-.701
Negative 8	3.22	3.24	-.089	-.974
Negative 9	3.73	3.77	-.466	.146
Negative 10	3.92	3.99	-.847	-.071
Negative 11	3.90	3.95	-.610	.430
Negative 12	3.49	3.54	-.513	-.102
Negative 13	3.75	3.77	-.340	-.884
Negative 14	2.76	2.74	.563	-.451
Negative 15	3.08	3.03	.240	-1.234

6.2 Test for Normality

An assessment of the data normality is a prerequisite for the use of numerous statistical tests. Shapiro-Wilk test is normally practiced as test of normality suitable for data sets of about two thousand elements or less. To tally as sufficiently normal, the Significant value should be non significant (that is, it should be larger than .05). For the data set more than 2,000 values Kolmogorov-Smirnov test, also known as K-S Lilliefors, is more appropriate. Shapiro-Wilk test was used in this study to check the normality due to limit of sample size.

As given in the column of Significance (Table 6.3), all the values in both tables are less than .05, that indicates that the data does not follow the normal distribution; it will go through the non-parametric statistics. Therefore, only non-parametric tests were used for the data analysis in this research study.

Table 5.3: Shapiro-Wilk Test

Positive Factors	Shapiro-Wilk		
	Statistic	df	Sig.
Positive 1	.726	54	.000
Positive 2	.775	54	.000
Positive 3	.774	54	.000
Positive 4	.854	54	.000
Positive 5	.813	54	.000
Positive 6	.910	54	.001
Positive 7	.836	54	.000
Positive 8	.809	54	.000
Positive 9	.815	54	.000
Positive 10	.788	54	.000
Positive 11	.861	54	.000
Positive 12	.836	54	.000
Positive 13	.862	54	.000
Positive 14	.865	54	.000
Positive 15	.776	54	.000

Negative Factors	Shapiro-Wilk		
	Statistic	df	Sig.
Negative 1	.885	54	.000
Negative 2	.865	54	.000
Negative 3	.883	54	.000
Negative 4	.903	54	.001
Negative 5	.858	54	.000
Negative 6	.838	54	.000
Negative 7	.885	54	.000
Negative 8	.910	54	.001
Negative 9	.880	54	.000
Negative 10	.838	54	.000
Negative 11	.825	54	.000
Negative 12	.895	54	.000
Negative 13	.868	54	.000
Negative 14	.881	54	.000
Negative 15	.830	54	.000

6.3 The Kruskal-Wallis Test

The Kruskal-Wallis one-way analysis-of-variance is a non parametric test and is applied to determine whether three or more independent groups i.e. client, consultant and developer are matching or diverse on some variable of interest when an ordinal level of data or an interval or ratio level of data is existing. Scores are converted into ranks and the mean rank for each group is compared. It is more appropriate for finding statistical evidence of *inconsistency* or dissimilarity across the means of the various groups. The Kruskal-Wallis test is used for non parametric data while one way ANOVA is used for parametric data.

In Table 6.4, the three outputs of Kruskal-Wallis Test test are Chi-Square value, the degree of freedom (df) and the significance level (Asymp.Sig). If the significance level is less than .05, then the continuous variables across the five groups are having statistically significant difference. The result indicated that there were no significant differences among the opinions of the clients, contractors, developers, academics and the financers on both of the factor group. Here we can say that generally the categories of respondents were having similarity of ranking on the factors about BOT behavior.

Table 5.4: Kruskal-Wallis Test

Positive Factors	Chi-Square	df	Asymp. Sig.
Positive 1	4.403	3	.354
Positive 2	3.470	3	.482
Positive 3	4.631	3	.327
Positive 4	3.590	3	.464
Positive 5	6.958	3	.138
Positive 6	1.230	3	.873
Positive 7	1.224	3	.874
Positive 8	3.368	3	.498
Positive 9	7.372	3	.117
Positive 10	1.784	3	.775
Positive 11	8.936	3	.063
Positive 12	1.166	3	.884
Positive 13	3.915	3	.418
Positive 14	3.856	3	.426
Positive 15	4.857	3	.302

Negative Factors	Chi-Square	df	Asymp. Sig.
Negative 1	3.357	3	.500
Negative 2	1.185	3	.881
Negative 3	3.120	3	.538
Negative 4	8.144	3	.086
Negative 5	.618	3	.961
Negative 6	5.865	3	.209
Negative 7	9.042	3	.060
Negative 8	5.419	3	.247
Negative 9	4.308	3	.366
Negative 10	7.499	3	.112
Negative 11	5.608	3	.230
Negative 12	3.076	3	.545
Negative 13	2.632	3	.621
Negative 14	4.970	3	.290
Negative 15	2.776	3	.596

6.4 Kendall's Coefficient of Concordance W

Kendall's coefficient of concordance or Kendall's W is a non-parametric statistic. It is a normalization of the statistic of the Friedman test, and can be used for assessing agreement among raters. If W is 0, then there is no overall trend of agreement among the respondents, and their responses may be regarded as essentially random. Intermediate values of W indicate a greater or lesser degree of unanimity among the various responses. However in this case, the Kendall's coefficients is not indicating greater degree of unanimity among the agreement responses as nonparametric tests are less powerful than parametric tests and they are less likely to reject the null hypothesis when it is false. The Null Hypothesis states that there is no significant difference between the expected and observed result.

According to Siegel and Castellan (1988), W is only suitable when the number of variables is less than or equal to 7. If the number of variables is greater than 7, chi-square distribution is used as a near approximation instead. The critical value of chi-square was obtained by referring to the table of critical values of chi-square distribution exhibited at Appendix III. Table 6.5 shows fifteen attractive and fifteen negative factors have been considered in this study, therefore the chi-square value was referred to rather than the Kendall's Concordance Coefficient (W) value. According to the degree of freedom $\mathcal{V}$ the critical value of chi-square was 23.680 for both the attractive and negative factors and the computed chi-square value was above the critical value of chi-square Therefore, the assessment of rankings of attractive and negative factors by the respondents within the group proved to be dependable. This investigation confirmed the validity of the completed questionnaires for further analysis.

Table 5.5: Result of Kendall's Concordance Analysis

	Test Statistics of Positive Factors	Test Statistics of Positive Factors
No of Survey Respondents	60	60
Kendall's Coefficient of Concordance (W)	.167	.116
Value of Chi-Square	119.240	82.620
Critical Value of Chi-Square	23.68	23.68
Degree of Freedom (df)	14	14
Asymptotic Significance	.000	.000

6.5 Final Assessment of Karachi-Hyderabad Motorway (M-9)

The final assessment of the data collected through the survey questionnaire was carried out by the suitability model which has been discussed in detail in chapter 5. The groups of positive factors and negative factors were placed in the given model equation 5.2 and the results are shown in Table 6.6 and 6.7. The tables indicates the weights of positive and negative factors of BOT by giving them ranks with respect to the mean values of the total responses. The weight of each factor is the relative percentage value of the particular factor to all of the fifteen factors in the group. The weighted values of both the groups have been multiplied by the assessment ranking given by user of this particularly considered project i.e. M-9. For Karachi-Hyderabad Motorway (M-9), the user selected is the head of BOT Cell at National Highway Authority as he is the one who has all the knowledge and knowhow of the considered project and is the pivotal instrument in application of BOT BOT in Karachi-Hyderabad

Motorway (M-9). If attractive factors are prevailing in a given project scenario then the use of BOT will be more positive. On the contrary, if negative factors are dominant then BOT can be considered unsuitable. Tables 6.6 and 6.7 summarize the assessment of the Karachi-Hyderabad Motorway (M-9) according to their calculated scores. The score of the positive factors ranges in between 0.38 and 0.23 and the score of the negative factors ranges between 0.31 and .15 thus indicating approximately equal range of response among both groups of positive and negative factors. Total scores for the attractive and negative factors in respect of the Karachi-Hyderabad Motorway (M-9) are 4.86 and 2.74, respectively. This result shows that positive factors are much more dominant than attractive factors by 56%.

Table 5.6: Mean Scores and Ranking for Positive Factors

					Assessment of M-9	
No	**Positive Factors**	**Mean**	**Rank**	**Weight in %age**	**Likert Scale Assessment**	**Score**
1	Solves the problem of public sector budget restraint	4.49	1	7.51%	5	0.38
2	Provides an integrated solution for public infrastructure and services	4.40	2	7.36%	5	0.37
3	Reduces public money tied up in capital investment	4.29	3	7.18%	5	0.36
4	Caps the final service costs	3.76	12	6.29%	5	0.31
5	Facilitates creative and innovative approaches	4.05	8	6.78%	5	0.20
6	Reduces the total project cost	2.80	15	4.68%	3	0.23
7	Saves time in delivering the project	4.07	7	6.81%	5	0.34
8	Transfers risk to the private partner	4.22	5	7.05%	5	0.35
9	Reduces public sector administration costs	4.02	9	6.72%	5	0.34
10	Benefits to local economic development	4.24	4	7.08%	5	0.35
11	Improves buildability	3.69	14	6.17%	5	0.31
12	Improves maintainability	4.00	10	6.69%	5	0.33
13	Technology transfer to local enterprise	3.71	13	6.20%	5	0.31
14	No recourse or limited recourse to public funding	3.96	11	6.63%	5	0.33
15	Accelerates project development	4.09	6	6.84%	5	0.34
	TOTAL	**59.80**		**100.00**		**4.86**

Table 5.7: Mean Scores and Ranking for Negative Factors

					Assessment of M-9	
No	**Negative Factors**	**Mean**	**Rank**	**Weight in %age**	**Likert Scale Assessment**	**Score**
1	Reduces the project accountability	2.67	15	5.13%	3	0.15
2	High risk relying on private sector	3.44	9	6.60%	5	0.33
3	Very few schemes have actually reached the contract stage (aborted before contract)	3.84	3	7.37%	1	0.07
4	Lengthy delays because of political debate	3.71	7	7.13%	1	0.07
5	Higher charge to the direct users	3.82	4	7.34%	5	0.37
6	Fewer employment positions	3.16	12	6.08%	1	0.06
7	High participation costs	3.47	8	6.67%	5	0.33
8	High project costs	3.42	10	6.57%	2	0.13
9	A great deal of management time spent in contract transaction	3.82	5	7.34%	5	0.37
10	Lack of experience and appropriate skills	4.07	1	7.82%	4	0.31
11	Confusion over government objectives and evaluation criteria	3.95	2	7.58%	4	0.30
12	Excessive restrictions on participation	3.38	11	6.50%	1	0.06
13	Lengthy delays in negotiation	3.78	6	7.27%	1	0.07
14	Staffing issues	2.73	14	5.24%	1	0.05
15	Suspected public-private collusion	2.80	13	5.38%	1	0.05
	TOTAL	**52.05**		**100.01**		**2.75**

6.6 Summary

The validity and consistency of the data collected through survey had been verified by making use of SPSS software. The results of three different tests of SPSS and the quality of personnel information and experiences of the respondents helped in making decision for adopting BOT method of project delivery or to carry the project in conventional way of project delivery. After carrying out the final assessment, the user can embark on with greater degree of confidence that build, operate and transfer (BOT) method of procurement is highly reliable for the construction of Karachi-Hyderabad Motorway (M-9).

Chapter7

CONCLUSIONS AND RECOMMENDATIONS

7.1 Review of Research Objectives

The objectives of this study were;

a. Understanding mechanics of Build, Operate and Transfer (BOT) project delivery method.

b. Commercial Feasibility of Karachi – Hyderabad Motorway (M-9).

c. Development and grading of attractive and negative group of factors for BOT project delivery method through survey questionnaire.

d. Statistical analysis of attractive and negative group of factors by using SPSS software and determine the suitability for the considered project.

e. To recommend modalities to improve BOT project delivery method in Pakistan.

The 1st objective was met by understanding the structure and organization of BOT method of project delivery which depends on different types of contracts and agreements and on the relationship of financial details among the stake holders. 2nd objective was achieved by studying the financial feasibility of Karachi – Hyderabad Motorway (M-9), carried out through financial modeling, under various conditions of revenues and cost. 3rd and 4th objectives were met by collecting data from 55 respondents of four different categories of road construction industry and then analyzing the data using SPSS-17 and later applying the feasibility model equation for assessing the suitability of Karachi – Hyderabad Motorway (M-9). Finally the 5th objective was attained by suggesting measures to support and enhance the Build, Operate and Transfer culture in the road construction industry of Pakistan.

7.2 Potential for BOT

The conclusion to the study carried out for finding the suitability of Karachi-Hyderabad Motorway (M-9) through a questionnaire survey, arrived at higher degree of recommendations that this project was very much viable under all conditions of the

sensitivity and social analysis and should be undertaken as BOT project delivery method. The project has the potential for the sponsors to recoup their investment along with reasonable profit in a short time. Beside this NHA can also entail a reasonable share of revenue after the debt retirement without affecting the project profitability. The significant difference between the total weights of positive and negative factors is very confirming for the success of the project under BOT delivery method, i.e. 4.86 (Positive score) and 2.74 (Negative score). The payback period varies between 6-7 years after effective date, which means almost 4 years after construction is a clear positive sign of project viability. It may be mentioned here that the traffic survey was conducted in Dec 2008 precisely in times of unconventional economic crunch resulting in relatively less trade and hence less freight movement, however the situation is easing out and has returned to normalcy, thus a positive financial indicator for early closure of payback period.

7.3 Relief on Public Funds

Particularly in developing countries, the availability of public funds for development of larger infrastructure has always remained an issue because of the scarcity of public funds. The National economy does not have financial strength to invest in capital business and wait for the profit to mature after a certain timeline; other social sectors would be left with no probable funding, thus leading to critical social stage. However, in case of privately financed projects, the government may not have to make available the limited financial sources for infrastructure development. In this way, desirable projects can be constructed without recourse to government funding. In other words the government gets these funds available for other social sectors like education, healthcare and community services. No budget cuts or increase in taxes for building much needed infrastructure projects. Those using BOT facilities will only pay pay tolls, thus other taxpayers cannot complain that the facility being used by others, has been borne from their pockets

7.4 Effective Project Delivery Method

In traditional method of project delivery, project though competitive bidding is often labeled by adversarial relations among the owner, the designer and the constructor. Disputes are common in traditional method because no every situation

has been indicated in the contract documents or the party makes an interpretation of a clause other than that of the second party. In BOT method, complete functions of designing, construction, operation, maintenance and financing lies with one company, thus rejecting any possibility of dispute. Competitive bidding also has the considerable drawback that construction cannot begin until after the design is entirely finished.

7.5 Life Line for National Economy

The major component of this promising project is its geographical and economical nature, the road provide the shortest possible route from the coastal city of Karachi which is the hub of economical activities of Pakistan. The clearance and operation ability of this road is a guarantee to the cycling process of all the lifestyles in Pakistan, may it be economical, agriculture, industrial, scientific, educational, political, environmental, religious, medical, social, cultural or any form of society. This road serves as the main artery for all transit goods or passenger due to the strategic location of countries two of the major sea ports and countries biggest financial market.

7.6 Political Interests

Unfortunately the policymakers and executioners of this country have failed to deliver the right job by falling prey to the incompetency, corruption and personal or foreign vested interests, a job that was in the hand six years earlier could not be delivered and was left due to political non willingness. Now again the same project has come into limelight and we strongly hope that this time the project will take a smooth takeoff and will make an early touchdown for the benefit of end-user and strong infrastructural network of this country. This concludes that how lucrative and financially viable a private partnership project may be, but the will of political government is necessary to make the project useable by the end product user.

7.7 Win –Win Situation

Another important part of the analysis for conclusion is the satisfactory financial results based upon rational assumptions and meets the general expectations of the private sector. Karachi-Hyderabad Motorway (M-9) satisfies the basic theme of

PPP; that is based upon creating win-win situation for the partnering parties and ensures quality of service for the end users. The project provides excellent opportunity for the private sector to show its true potential as stakeholder of national economy.

7.8 Recommendations

a. Development of a conducive environment for private investment is the essence of privatization; this requires the bureaucratic support, political will, public acceptance and acceptable profit.

b. Privatization Acts including legal framework should provide security to all stakeholders for effective participation in BOT projects, to prevent devaluation of Pakistani rupee, scarce energy sources, elevated banking interest rates and increased oil prices.

c. There are numerous attractive projects being floated by public agencies for privatization but unable to get the required attention, a research is required to be carried out to find hitches in the pre-qualification mechanism of BOT projects.

d. Awareness of BOT mechanism and BOT culture is very essentially required for the public agency employers before or during launching BOT projects.

e. In order to attract the foreign investors and to keep the reputation of construction management; the guarantees, bonds, surety considerations should be relieved in time and in compliance with running international criteria.

f. Successful BOT projects to be exploited on social forums by highlighting through media to add the attention of local and foreign investors.

g. Competitive bidding is the essence of public procurement policy and also ensures execution of the infrastructure project at the minimum possible cost. Direct negotiation and unsolicited proposals should be discouraged.

h. A detailed survey to be carried out to identify those potential contractors within Pakistan who carries the strength to delivery road construction projects through BOT method of construction, their further categorization will further help the public agencies in selecting the contractors for variable budgeted road projects.

7.9 Recommendations for Future Research

a. An independent suitability analysis for all potential BOT projects be carried out at regular intervals by the government in order to assess whether BOT delivery method be adopted or not.

b. A research can be initiated on remaining length of Grand Trunk Road (N-50), in order to indentify the particular sections that can be rehabilitated and improved through BOT delivery method and the concessionary period, during which the toll road remains under the operation of Project Company.

c. There are numerous attractive projects being floated by public agencies for privatization but unable to get the required attention, a research is required to be carried out to find hitches in the pre-qualification mechanism of BOT projects.

7.10 Summary

It is anticipated that further research with in Pakistan could disclose more potential information to benefit process for selecting suitable BOT projects in transportation industry and also new ways for achieving required maturity and creating an attractive atmosphere of private investment to bring success for the benefits of stakeholders of road sector specially the general public.

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APPENDIX-I

Traffic Forecast

TRAFFIC FORECAST

Direction: **Karachi - Kathore (Both Directions)**

Location: **Karachi Toll Plaza**

SR. NO.	Year	Cars/ Jeeps	Wagons/ Pick ups	Coasters/ Mini Trucks	Buses	Trucks (Rigid)		Articulated			Total
						2-Axles	3-Axles	4-Axles	5-Axles	6-Axles	
1	2009	6001	2010	750	1162	3331	4110	2615	465	791	21235
2	2010	6301	2111	788	1208	3464	4274	2720	484	823	22172
3	2011	6616	2216	827	1257	3603	4445	2828	503	856	23151
4	2012	6947	2327	868	1307	3747	4623	2942	523	890	24174
5	2013	7642	2560	912	1425	4084	5039	3206	570	970	26407
6	2014	8024	2687	957	1482	4248	5241	3335	593	1009	27575
7	2015	8425	2822	1005	1541	4417	5450	3468	617	1049	28794
8	2016	8846	2963	1055	1603	4594	5669	3607	641	1091	30068
9	2017	9288	3111	1108	1667	4778	5895	3751	667	1135	31400
10	2018	9753	3267	1163	1733	4969	6131	3901	694	1180	32791
11	2019	10240	3430	1222	1803	5168	6376	4057	721	1227	34244
12	2020	10752	3601	1283	1875	5374	6631	4219	750	1276	35763
13	2021	11290	3782	1347	1950	5589	6897	4388	780	1327	37350
14	2022	11855	3971	1414	2028	5813	7172	4564	811	1380	39008
15	2023	12447	4169	1485	2109	6046	7459	4746	844	1436	40741
16	2024	13070	4378	1559	2193	6287	7758	4936	878	1493	42552
17	2025	13723	4597	1637	2281	6539	8068	5133	913	1553	44444
18	2026	14409	4826	1719	2372	6800	8391	5339	949	1615	46421
19	2027	15130	5068	1805	2467	7072	8726	5552	987	1679	48487
20	2028	15886	5321	1895	2566	7355	9075	5774	1027	1747	50647
21	2029	16681	5587	1990	2668	7650	9438	6005	1068	1817	52904
22	2030	17515	5866	2089	2775	7956	9816	6245	1111	1889	55263
23	2031	18390	6160	2194	2886	8274	10209	6495	1155	1965	57728
24	2032	19310	6468	2304	3002	8605	10617	6755	1201	2043	60304
25	2032	20275	6791	2419	3122	8949	11042	7025	1249	2125	62997
26	2032	21289	7131	2540	3247	9307	11483	7306	1299	2210	65812
27	2032	22354	7487	2667	3376	9679	11943	7599	1351	2298	68754
28	2032	23471	7862	2800	3512	10066	12420	7903	1405	2390	71829
29	2032	24645	8255	2940	3652	10469	12917	8219	1461	2486	75044
30	2032	25877	8667	3087	3798	10888	13434	8547	1520	2585	78404

TRAFFIC FORECAST

Direction: **Kathore - Noriabad (Both Directions)**

Location: **Between Kathore Interchange and Nooriabad**

SR. NO.	Year	Cars/ Jeeps	Wagons/ Pick ups	Coasters/ Mini Trucks	Buses	Trucks (Rigid)		Articulated			Total
						2-Axles	3-Axles	4-Axles	5-Axles	6-Axles	
1	2009	5965	1199	735	1159	3272	4054	2611	452	785	20232
2	2010	6263	1259	772	1205	3403	4216	2715	470	816	21120
3	2011	6576	1322	810	1254	3539	4385	2824	489	849	22048
4	2012	6905	1388	851	1304	3681	4560	2937	508	883	23017
5	2013	7596	1527	936	1421	4012	4971	3201	554	962	25180
6	2014	7976	1603	983	1478	4172	5169	3329	576	1001	26288
7	2015	8374	1683	1032	1537	4339	5376	3463	599	1041	27445
8	2016	8793	1767	1083	1598	4513	5591	3601	623	1083	28654
9	2017	9233	1856	1138	1662	4693	5815	3745	648	1126	29916
10	2018	9694	1949	1195	1729	4881	6048	3895	674	1171	31235
11	2019	10179	2046	1254	1798	5076	6289	4051	701	1218	32613
12	2020	10688	2148	1317	1870	5279	6541	4213	729	1267	34052
13	2021	11222	2256	1383	1945	5490	6803	4381	758	1317	35556
14	2022	11784	2369	1452	2023	5710	7075	4557	789	1370	37127
15	2023	12373	2487	1525	2104	5938	7358	4739	820	1425	38768
16	2024	12991	2611	1601	2188	6176	7652	4928	853	1482	40482
17	2025	13641	2742	1681	2275	6423	7958	5125	887	1541	42274
18	2026	14323	2879	1765	2366	6680	8276	5330	923	1603	44145
19	2027	15039	3023	1853	2461	6947	8607	5544	960	1667	46101
20	2028	15791	3174	1946	2559	7225	8952	5765	998	1733	48144
21	2029	16581	3333	2043	2662	7514	9310	5996	1038	1803	50279
22	2030	17410	3499	2145	2768	7815	9682	6236	1080	1875	52509
23	2031	18280	3674	2252	2879	8127	10070	6485	1123	1950	54840
24	2032	19194	3858	2365	2994	8452	10472	6745	1168	2028	57276
25	2033	20154	4051	2483	3114	8790	10891	7015	1214	2109	59821
26	2034	21161	4254	2607	3238	9142	11327	7295	1263	2193	62481
27	2035	22220	4466	2738	3368	9508	11780	7587	1313	2281	65260
28	2036	23331	4690	2875	3502	9888	12251	7890	1366	2372	68165
29	2037	24497	4924	3018	3643	10283	12741	8206	1421	2467	71201
30	2038	25722	5170	3169	3788	10695	13251	8534	1477	2566	74373

TRAFFIC FORECAST

Direction: **Hyderabad - Noriabad (Both Directions)**

Location: **Hyderabad Toll Plaza**

SR. NO.	Year	Cars/ Jeeps	Wagons/ Pick ups	Coasters/ Mini Trucks	Buses	Trucks (Rigid)			Articulated		Total
						2-Axles	3-Axles	4-Axles	5-Axles	6-Axles	
1	2009	5856	1169	737	1140	3329	3964	2527	467	791	19980
2	2010	6149	1227	774	1186	3462	4123	2628	486	823	20857
3	2011	6456	1289	813	1233	3601	4287	2733	505	856	21773
4	2012	6779	1353	853	1282	3745	4459	2843	525	890	22729
5	2013	7457	1489	938	1398	4082	4860	3098	573	970	24865
6	2014	7830	1563	985	1454	4245	5055	3222	595	1009	25958
7	2015	8221	1641	1035	1512	4415	5257	3351	619	1049	27100
8	2016	8632	1723	1086	1572	4591	5467	3485	644	1091	28293
9	2017	9064	1809	1141	1635	4775	5686	3625	670	1135	29539
10	2018	9517	1900	1198	1701	4966	5913	3770	697	1180	30841
11	2019	9993	1995	1258	1769	5165	6150	3920	725	1227	32201
12	2020	10493	2095	1321	1839	5371	6396	4077	753	1276	33621
13	2021	11017	2199	1387	1913	5586	6652	4240	784	1327	35105
14	2022	11568	2309	1456	1989	5810	6918	4410	815	1380	36655
15	2023	12147	2425	1529	2069	6042	7194	4586	848	1436	38275
16	2024	12754	2546	1605	2152	6284	7482	4770	881	1493	39967
17	2025	13392	2673	1685	2238	6535	7781	4961	917	1553	41735
18	2026	14061	2807	1770	2327	6796	8093	5159	953	1615	43581
19	2027	14764	2947	1858	2420	7068	8416	5365	992	1679	45511
20	2028	15502	3095	1951	2517	7351	8753	5580	1031	1747	47527
21	2029	16278	3249	2049	2618	7645	9103	5803	1072	1817	49634
22	2030	17091	3412	2151	2723	7951	9467	6035	1115	1889	51835
23	2031	17946	3582	2259	2832	8269	9846	6277	1160	1965	54135
24	2032	18843	3762	2372	2945	8600	10240	6528	1206	2043	56538
25	2033	19786	3950	2490	3063	8943	10649	6789	1255	2125	59049
26	2034	20775	4147	2615	3185	9301	11075	7060	1305	2210	61674
27	2035	21814	4355	2745	3313	9673	11518	7343	1357	2298	64416
28	2036	22904	4572	2883	3445	10060	11979	7637	1411	2390	67282
29	2037	24049	4801	3027	3583	10463	12458	7942	1468	2486	70277
30	2038	25252	5041	3178	3726	10881	12957	8260	1526	2585	73406

APPENDIX-II

Covering Letter and Questionnaire

NATIONAL UNIVERSITY OF SCIENCES AND TECHNOLOGY
ISLAMABAD

QUESTIONNAIRE SURVEY FORM

Survey on the

SUITABILITY OF BUILD OPERATE TRANSFER (BOT) DELIVERY METHOD FOR ROAD INFRASTRUCTURE IN PAKISTAN

Prepared by
Ahmar Jamal
MS Construction Engineering and Management

Department of Construction Engineering and Management

School of Civil and Environmental Engineering

National University of Sciences and Technology

H-12,Islamabad,Pakistan

Contact :- 051 2300027, 0334 8980806

Dear Sir / Madam,

Subject: **- Suitability for Construction of BOT Projects in Pakistan by Developing Evolution Model**

The above topic is under study for Master's Thesis at Construction Engineering and Management Department at NUST by undersigned and the research involves the input of all the agencies/stakeholders involved in the construction industry i.e. government/public authorities, consultants, contractors, sub contractors, joint ventures, financers or private owners.

The research study is to determine the suitability of BOT projects at the stage of planning or at its initial stage for its successfulness or survivability by carrying out survey through BOT relevant attractive and negative factors. My research study would indicate or give decision making ability for adapting BOT or alternate construction method for all the stakeholders involved in the project.

Your kind interest for sharing your deep practical experiences of construction industry through filling the attached questionnaire would put me wise for taking a right step in the benefit of BOT environment and also for the construction industry.

Please note to return filled questionnaire within a week through return envelope already attached at the end and it is informed that ***all the information would be used for academic purposes only by concerned department at NUST and would be kept confidential.***

In advance, I wish to thank you for your kind favor, guidance and cooperation on the subject.

Thanks,

Yours sincerely

(Ahmar Jamal) (Dr. Hamza Farooq Gabriel)

Researcher ***Supervisor***

Part (I) GENERAL INFORMATION	
Respondent Name	
Occupation/Appointment	
Organization/Department/Firm	
Qualification	
Place/Province	
Experience in Construction (In years)	
Experience in BOT (In years)	
E- Mail address	
Contact No.	
Field of Major Experience	– Client/Authority – Construction / Management – Contracting / Consultancy – Financing – Others
Category related with Build Operate Transfer (BOT)	– Government/Public – Private – Financer/Banker – Academics

Part (II) FACTORS AFFECTED BY BOT METHOD						
Attractive Factors		Please first go through all mentioned statement and mark **(√)** in the box under one of the five categories which applies.				
		Strongly not agreed	**Not agreed**	**Average**	**Agreed**	**Highly agreed**
		(1)	(2)	(3)	(4)	(5)
1.	Solves the problem of public sector budget restraint					
2.	Provides an integrated solution for public infrastructure and services					
3.	Reduces public money tied up in capital investment					
4.	Caps the final service costs					
5.	Facilitates creative and innovative approaches					
6.	Reduces the total project cost					
7.	Saves time in delivering the project					
8.	Transfers risk to the private partner					
9.	Reduces public sector administration costs					
10.	Benefits to local economic development					
11.	Improves buildability					
12.	Improves maintainability					
13.	Technology transfer to local enterprise					
14.	No recourse or limited recourse to public funding					
15.	Accelerates project development					

Part (III) FACTORS AFFECTED BY BOT METHOD						
Negative Factors		Please first go through all mentioned statementsand mark **(√)** in the box under one of the five categories which applies.				
		Strongly not agreed	**Not agreed**	**Average**	**Agreed**	**Highly agreed**
		(1)	(2)	(3)	(4)	(5)
1.	Reduces the project accountability					
2.	High risk relying on private sector					
3.	Very few schemes have actually reached the contract stage (aborted before contract)					
4.	Lengthy delays because of political debate					
5.	Higher charge to the direct users					
6.	Fewer employment positions					
7.	High participation costs					
8.	High project costs					
9.	A great deal of management time spent in contract transaction					
10.	Lack of experience and appropriate skills					
11.	Confusion over government objectives and evaluation criteria					
12.	Excessive restrictions on participation					
13.	Lengthy delays in negotiation					
14.	Staffing issues					
15.	Suspected public-private collusion					

APPENDIX-III

Chi-Square Distribution

Chi-Square Distribution Table

Level of Significance								
df	0.2	0.1	0.075	0.05	0.025	0.01	0.005	0.0005
1	1.642	2.706	3.17	3.841	5.024	6.635	7.879	12.116
2	3.219	4.605	5.181	5.991	7.378	9.21	10.597	15.202
3	4.642	6.251	6.905	7.815	9.348	11.345	12.838	17.731
4	5.989	7.779	8.496	9.488	11.143	13.277	14.86	19.998
5	7.289	9.236	10.008	11.07	12.833	15.086	16.75	22.106
6	8.558	10.645	11.466	12.592	14.449	16.812	18.548	24.104
7	9.803	12.017	12.883	14.067	16.013	18.475	20.278	26.019
8	11.03	13.362	14.27	15.507	17.535	20.09	21.955	27.869
9	12.242	14.684	15.631	16.919	19.023	21.666	23.589	29.667
10	13.442	15.987	16.971	18.307	20.483	23.209	25.188	31.421
11	14.631	17.275	18.294	19.675	21.92	24.725	26.757	33.138
12	15.812	18.549	19.602	21.026	23.337	26.217	28.3	34.822
13	16.985	19.812	20.897	22.362	24.736	27.688	29.82	36.479
14	18.151	21.064	22.18	23.685	26.119	29.141	31.319	38.111
15	19.311	22.307	23.452	24.996	27.488	30.578	32.801	39.72
16	20.465	23.542	24.716	26.296	28.845	32.	34.267	41.309
17	21.615	24.769	25.97	27.587	30.191	33.409	35.719	42.881
18	22.76	25.989	27.218	28.869	31.526	34.805	37.157	44.435
19	23.9	27.204	28.458	30.144	32.852	36.191	38.582	45.974
20	25.038	28.412	29.692	31.41	34.17	37.566	39.997	47.501
21	26.171	29.615	30.92	32.671	35.479	38.932	41.401	49.013
22	27.301	30.813	32.142	33.924	36.781	40.289	42.796	50.512
23	28.429	32.007	33.36	35.172	38.076	41.639	44.182	52.002
24	29.553	33.196	34.572	36.415	39.364	42.98	45.559	53.48
25	30.675	34.382	35.78	37.653	40.646	44.314	46.928	54.95
26	31.795	35.563	36.984	38.885	41.923	45.642	48.29	56.409
27	32.912	36.741	38.184	40.113	43.195	46.963	49.645	57.86
28	34.027	37.916	39.38	41.337	44.461	48.278	50.994	59.302
29	35.139	39.087	40.573	42.557	45.722	49.588	52.336	60.738
30	36.25	40.256	41.762	43.773	46.979	50.892	53.672	62.164
40	47.269	51.805	53.501	55.759	59.342	63.691	66.766	76.097
50	58.164	63.167	65.03	67.505	71.42	76.154	79.49	89.564
60	68.972	74.397	76.411	79.082	83.298	88.38	91.952	102.698
70	79.715	85.527	87.68	90.531	95.023	100.425	104.215	115.582
80	90.405	96.578	98.861	101.88	106.629	112.329	116.321	128.267
90	101.054	107.565	109.969	113.145	118.136	124.117	128.3	140.789
100	111.667	118.498	121.017	124.342	129.561	135.807	140.17	153.174