CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

In India, Construction Industry plays a key role in both economic growth and poverty reduction. The industry consumes about 40 to 50% of the national five year plan outlay and contributes to nearly 20% of GDP. Construction industry is the second largest industry next only to agriculture in terms of providing employment in India (Construction Industry Development Council). Government is targeting an economic growth of around eight percent during the Eleventh five year Plan (2008-12). Construction projects entail high risk, long gestation period, high costs and budget constraints. India is the second most populous country in the world with over one billion people accounting for around 16% of the world’s population. It is estimated that the population living in urban areas will increase from 29 percent in 2000 to 40 percent by 2030. Therefore the escalating demand requires adequate building infrastructure facilities at reasonable cost (The India Infrastructure Report 1996).

Indian government has attached high priority to the building sector (UK Trade and Investment). Rapid growth in the country over the past few years has considerably strained its infrastructure. India needs significant investment in the infrastructure sector as many corporate leaders feel that the current infrastructure is inadequate to support their business needs and long-
term growth. India has been a little slow in creating building infrastructure ahead of demand, and has typically swung into action when bottlenecks become apparent (Survey report of KPMG International and Economist Intelligence Unit). Investment requirement for housing in urban areas has been estimated at Rs.526000 million (US$ 12.5 billion) in the 9th five year plan (1997-2002). Market size, market potential, labour force skills are the most important factors for considering Foreign Direct Investment in Construction and Engineering in India. Foreign investors in India expect high rates of return on their investments (FDI Confidence Audit: India 2001). In India, the performance record of successful implementation of infrastructure projects has not been encouraging. Cost overrun and cost escalation are part and parcel of the construction projects.

1.2 NEED FOR RESEARCH IN THE AREA

The lack of research on cost escalation in building construction industry in India brought about the need for this study. Internationally a few scientific and systematic studies have been carried out on cost escalation in building construction projects. Poor site management and supervision, unforeseen ground conditions, low speed of decision making involving all project teams, client-initiated variations and necessary variations of works have been identified as causes of time overruns in Hong Kong construction project (Chan et al 1997). In Nigeria, shortage of materials, methods of financing and payments for completed works and poor contract management are the three major reasons for high construction costs. Price fluctuation and improper planning were identified as the most important factors responsible for the escalation of project costs (Okpala et al 1988; Elinwa et al 1993). In Indonesia, inflationary increases in material cost, inaccurate material estimating and project complexity are the main causes of cost overruns. The
predominant causes for delay are design changes, poor labour productivity and inadequate planning (Kaming et al 1997). Akinci et al (1998) identified that cost overruns creates a significant financial risk to both contractors and owners. Uncontrollable risk sources that affect the cost estimate and the final cost of a project include factors specific to the cost estimator, the project design, construction, and the project environment. Frimpong et al (2001) concluded that poor contractor management, monthly payment difficulties from agencies, material procurement, poor technical performances, escalation of material prices were the important causes of delay and cost overruns in construction of groundwater project in Ghana. Knight et al (2002) developed a risk assessment model using fuzzy logic for predicting potential cost overrun in engineering design building projects. Lo et al (2006) studied construction delays in Hong Kong civil engineering projects. Zou et al (2007) have researched on key risks in construction projects in China to achieve objects in terms of time, cost, quality, safety and environmental sustainability. Managing risks in construction projects has been recognized as a very important process in order to achieve project objectives in terms of time, cost, quality, safety and environmental sustainability.

Blair et al (1993) have highlighted that forecasting construction cost escalation is important as escalation accounts for a substantial part of the costs of construction projects. With forecasting software, many complex statistical forecasting techniques can now be used to forecast construction cost escalation. Univariate time series method, cannot predict turning points. It follows the existing pattern of the data. Multivariate forecast methods are dependent on the accuracy of the explanatory variables used in the forecasts. One of the main difficulties in using the multivariate forecast method is the identification of statistically significant explanatory variables. The accuracy of the multivariate forecasts depend on the accuracy of the explanatory
variables used to make the forecasts. The analytical forecasting techniques are only valid for short-term forecasting in stable condition, generally less than one year. No analytical forecasting technique is capable of long-term forecasting of cost escalation. Hastak et al (1996) have carried out a study on cost management planning support system for project cost control strategy and planning (COMPASS). It was presented as a new paradigm and a management tool for formulating effective strategies for project cost control. The study found that through the life cycle of a project COMPASS methodology assists management in evaluating the potential degree of cost escalation. The study identified attributes such as management errors, regulatory approvals, and error/rework, that might be the cause for project cost escalation.

Knight et al (2000) have carried out a preliminary study of the factors affecting the cost escalation in construction projects. The study indicates factors that cause unanticipated project cost escalation during construction, from the contractor’s perspective. It is found that impact of labor productivity factor is the major source of cost overrun. A combination of subjective, objective, and secondary indicators are used to measure these factors and to assess their impact on project performance. The main outcome of the study is that many of the factors affecting the cost of construction are evaluated in subjective and imprecise terms and are difficult to quantify. Dawood (2001) did an analysis of cost escalation and risk assessment of infrastructure projects using Japanese civil engineering projects. The study focused on the development of a forecasting methodology for cost indices: An application to the Greek construction industry was carried out to predict the future costs that will assist management in making accurate decisions. There are two forms of approach to forecasting: Subjective in which judgement of 'experts' (persons who work closely with the industry or product) are taken and set objective, which apply a scientific process to the analysis of previous
data using a statistic 'a fit' to the historic data and then applies the 'model' to predict future occurrences.

Dawood et al (2002) have carried out research in a decision support system for cost escalation in heavy engineering industry in the United Kingdom. They have developed a structured cost escalation methodology for improving estimation management and control in the heavy engineering industry. The cost escalation is made up of three key elements namely market variations – dealt with by cost indices, Risk/contingency – dealt with by a risk engineering strategy, Bias – dealt with as part of company addition through the monitoring of previous projects. Each of the elements mentioned are cost sciences in their own right and should be dealt with independently. All components should be brought together to form the cost escalation for the project. This study does not focus on giving a definitive answer to the problem of cost escalation but aims at suggesting possible answers based on the information fed to the model at a specified time, rather than an expert solution. The developed model is useful by the personnel within the heavy engineering industry. Touran et al (2005) studied modelling cost escalation as a risk factor in construction projects. The study identified a computer model designed to incorporate the effect of cost escalation on large projects spanning several years. Based on precedence relationship projects and modelling the effect of escalation probabilistically, a distribution is calculated for the cost. There are two main contributors to cost variation in projects i.e. delays for each individual that may have an impact on total program finish time, and the uncertainty in the value especially in multi-year projects.

Touran et al (2006) have studied the importance of cost escalation in large long-term construction projects in the United States. In the United States Engineering News Records (ENR)’s are most important and commonly used in the construction industry. The cost overrun in large infrastructure
projects occurs very often. Budgeting for cost escalation is a major issue in planning phase of the projects. They have reviewed various methods of forecasting escalation factor and studied the changes in cost of 25 years by analyzing the movement of cost indices. A computer model has been designed to incorporate the effect of cost escalation on large construction programs consisting of several projects spanning over a period of several years. This computer model takes into consideration the uncertainty and variability of both schedule (delays) and escalation factor in an integrated probabilistic approach. The modelling of cost escalation factor is done by considering its variability and its correlation with subsequent periods. The proposed model provides a powerful tool to assess the impact of this factor.

The performance of the road construction projects in Zambia are not found satisfactory due to major causes of cost escalation and schedule delays on many projects. The study found that inclement weather due to heavy rains and the resulting floods to be the primary cause for cost escalation. It was followed by scope change, environmental protection and mitigation costs. Schedule delays, strikes, local government pressures, technical challenges and inflation were also found to be major contributors to cost escalation. Studies have also found that delayed payments by the client organisations, contract modifications, and economic hardships. Materials procurement, changes in drawings, staffing problems, equipments unavailability, poor supervision, construction mistakes, poor coordination on site, changes in specifications and labour disputes were among the major causes of schedule delays (Kaliba et al 2008).

Keller et al (1982) initiated the early research in the area of optimal polices for claiming payment under price escalation clause types of contracts. The study examined the overall effect of these factors on the policy for claiming payments under the type of contracts with clauses for price
escalation. A mathematical model to describe Contract Price Adjustment (CPA) claim by a contractor was developed together with methods for obtaining optimal claiming policies. Williams et al (1994) focused on predicting changes in construction cost indexes using neural networks. Construction cost indexes provide a comparison of cost changes from period to period for a fixed quantity of goods or services. Akpan et al (2001) have carried out research in the area of methodology for determining price variation in project execution.

In India, the performance record of successful implementation of infrastructure projects has not been encouraging. Cost overruns and cost escalation are part and parcel of the construction projects. According to the Ministry of Statistics and Programme Implementation (MOS&PI) under Government of India, out of 909 projects costing over Rs.200 million, 346 projects had a delay in completion as of March 2008. The Cost escalation in 346 delayed projects accounted for Rs.246, 890 million which is 13.33 percent of the approved cost of Rs.1,850,890 million. Out of 515 projects costing over Rs.1000 million, 224 projects underwent a delay in completion. The total cost of implementation of 515 projects when sanctioned, was around Rs.3,534,830 million but this was subsequently revised to Rs.3,906,400 million implying a cost overrun of 10.5 per cent. It was found that central and state government’s mega projects on an average annually face a cost escalation of about Rs.400,000 to 500,000 million. Hence, identification and evaluation of factors affecting cost escalation in building construction projects in India becomes necessary for undertaking a systematic study on cost escalation. The studies carried out in the developed countries like USA, UK, Canada provide a rich source of information. However, there is a fundamental difference in the operating environment of these economies and a developing country like India. In India, there has been very limited to no
systematic study on cost escalation in building construction industry. The level of investment requirement in the Indian building construction industry, the poor response in successful implementation of government infrastructure projects due to the high degree of perceived cost escalation problems and the lack of adequate research in the area of cost escalation management have been the motivation for the present research.

1.3 RESEARCH OBJECTIVES AND SCOPE

The present study was carried out with the following objectives:

1. To identify and evaluate the factors affecting cost overrun in building construction projects in India
2. To identify and evaluate the factors affecting cost escalation in building construction projects in India
3. To study the trend in price of building materials and cost indices in India and
4. To study how the cost escalation issue is presently addressed in the building construction contracts in India.

The scope of the present study is limited to building construction projects in India. However, the concept and methodology are generic in nature and can be extended for other sectors or countries. Cost overrun is defined as amount by which the actual cost exceeds the original cost of the project. The term “Cost overrun” used in the context of this study, is the difference between the original cost and final cost of the project due to factors affecting such as site conditions, change in design and number of changes order by the client.
The term “Cost escalation” used in the context of this study, is the increase in the cost of any construction elements of the original contract or base cost of the project due to passage of time. The term ‘Building construction projects’ includes all the Government building construction projects and specifically to Central Public Works Department (CPWD), dealing with public works, Military Engineer Services (MES), dealing with defence construction works in the country and Tamil Nadu Public Works Department (TNPWD), dealing with public works in the state of Tamil Nadu.

The reasons for selecting these Departments are:

CPWD and MES departments are major construction departments of Government of India, TNPWD department is pioneering construction department in the state of Tamil Nadu. They have immense experience in executing large building construction projects, both in value and size.

1.4 ORGANISATION OF THE THESIS

The thesis is organised into seven chapters. First chapter focuses on the introduction and the motivation of the study. The other six chapters are organised as follows:

Chapter 2 - Literature review with reference to the present study is presented

Chapter 3 - The research methodology is discussed. The necessity of adopting questionnaire survey approach for the study is described.

Chapter 4 - Identification and evaluation of factors affecting cost overrun in building construction projects in India. World experiences in the causes of cost overrun of construction projects are also reviewed.
Chapter 5 - Identification and evaluation of factors affecting cost escalation in building construction projects in India. World experiences in the cost escalation of construction projects are also reviewed.

Chapter 6 - A study of the trends in prices of materials and cost indices in building construction contracts in India.

Chapter 7 - Study of price escalation clause in building construction contracts in India.

The summary of the present research work and the conclusions drawn are given in Chapter 8. Scope for further work in continuation to the present study is also presented.