Chapter 1

Introduction

1.1 Construction Management: An Overview

In the prevailing globalized scenario, infrastructure remains the top priority for addressing developmental gaps, as it is considered to have the ability of lifting economies' out of the financial turmoil and giving ample scope for both service as well as production sectors. Owing to this fact, the governments around the world are pumping money to generate demands for goods and services by creating jobs through higher spending into physical and social infrastructure. Likewise, the Indian government is also actively participating in this global trend, and accordingly, has taken concrete steps to revive the sector to gain momentum and attain sustainable growth.

Modern construction includes high rise buildings, dams, irrigation network, energy conversion, and industrial plants, environmental protection works, infrastructure facilities like roads, bridges, airports and seaports, satellite launching station, onshore and offshore oil terminals etc. Considering the ever increasing competition in this sector, a construction organization may outperform competition by being able to anticipate and respond quickly to the customers demand with new ideas and technologies and to produce structured facilities that satisfy or exceed customer's expectations. Construction firms need to embrace time based strategies in order to withstand the ever increasing competition in the industry.

1.2 Construction Management Scenario in India

The government has initiated innumerable initiatives to lift the construction sector from its current dormant conditions. The measures include authorizing the Indian Infrastructure Finance Company Limited (IIFCL) to raise Rs. 100 billion by issuing of tax free bonds to make highways and port projects funding worth Rs. 250 billion available to the sector. In order to finance projects worth Rs. 750 billion, the IIFCL has been given permission to raise additional funds worth Rs. 300 billion (NBMCW, 2009)( New Building Materials and Construction World -Magazine).
India being the second fastest growing economy in the world, construction industry has been integral part of its economy as in case of its global counterparts. Industrialization, urbanization, economic development and the rising expectations for improved quality of living by Indian citizens has today made construction industry the second largest economic activity after agriculture. Construction accounts for nearly 65 per cent of the total investment in infrastructure and is expected to be the biggest beneficiary of the surge in infrastructure investment over the next five years (IICCI, 2008) (IICCI-Indo Italian Chamber of Commerce). Investment in construction accounts for nearly 11 per cent of India’s Gross Domestic Product (GDP). Rs. 16,500 billion is likely to be invested in the infrastructure sector over the next five to 10 years - in power, roads, bridges, city infrastructure, ports, airports, telecommunications, which would provide a huge boost to the construction industry as a whole. With such bullish prospects in infrastructure, affiliated industries such as cement are on a high. Cement consumption, for the first time, is set to exceed the 150-million tonne mark. Reflecting the demand for the commodity, capacity utilisation rose to over 100 per cent to touch 102 per cent in January 2007 with production touching of 14 million tonnes. As opportunities in the construction sector continue to come to the fore, foreign direct investment has been moving upwards.

The Planning Commission has estimated that an investment of about Rs. 27,200 billion will be required for the infrastructure sector during the Eleventh Five Year Plan. Whereas private investment seems difficult to come by in the current scenario, public investment can be expected to materialize or even increase. While it is essential that the government plays a vital role in improving the pace of implementation of key projects, construction companies need to upgrade their project management expertise and ensure that there is adequate capacity to undertake and execute projects on time.

Along with the above bright side of construction scenario in India, there are many challenges to be faced, and the failure to meet them may be detrimental to sustainability of the whole industry. First and foremost, the construction industry in India suffers from many weaknesses in the quality of the finished building, methods of construction, standard of construction specifications used in the industry, number of conflicts and disputes resulting every year from construction sites, level of organizations’ management available in the industry, level of workmanship, and
constant search for better modes of procuring services within the construction industry.

Time and cost related issues are the second among the challenges to be faced. These two are the major elements in project management, apart from quality and scope. These two elements have become the major concern to most of the customers and have become subject of continuous discussion. One of the biggest challenges in the management of construction project is to ensure that the project is completed on time and within estimated cost with the promised quality. Most of the Indian construction companies are struggling with these two critical elements of construction.

As pointed out by many, one of the interesting aspects of construction that makes it more challenging and sometimes full of surprises is that it is a very fragmented industry. It involves myriads of interrelated activities that are carried out by many separate individuals and organizations with different sizes and expertise that may come from different parts of the country. So, this causes another challenge concerned with supply chain management. Unless the supply chain management is efficient as well as effective, results are farfetched dreams.

So, despite the fact that the prospects for construction industries in India are bright, sustainability of the construction industry is very much a function of the quality of the projects being commissioned. The onus is on the quality management systems used in the construction industry in par with the international standards. Hence, a dedicated study on Total Quality Management (TQM) is not only timely, but also, a compelling necessity to ensure the sustainability of the construction industry.

1.3 Areas and Scope of Research
This research is basically an exploratory research oriented towards TQM and its implementation issues, with specific reference to Indian construction industry. As it is basically an 'ex post facto' (Kothari, 2000) kind of a research newer areas keep adding as the research moves from the unknown towards the known. The study is partly descriptive and partly analytical in nature and the descriptive study takes an exploratory approach to identify the issues and perspectives as perceived by the employees of construction industry and adopts statistical hypothesis testing approach for the quantitative
analysis. The research includes areas of research methodology such as empirical research, meta-analysis of literature, descriptive statistics, correlation and structural equation modelling.

Total Quality Management is basically an integrated process, which involves all the departments of the organization to achieve continuous improvement of the quality of product or services. It is a strategy for continuously improving performance at every level, and in all areas of responsibility, so the study includes the areas related to TQM such as: continuous quality improvement, leadership through quality, managing total quality, customer management, people management, organizational learning, process management, quality information management, operational performance, organizational performance, and total quality control.

The scope of this research is limited to the domain of the Indian construction industry. The exogenous (independent) variable of this study would be the critical factors of TQM implementation which could be further categorises into tactical, strategic and operational factors, and endogenous variable would be organizational performance which would be studied both in terms of financial as well as non-financial performance. There would be another variable which may either be mediating variable or even intervening variable in the form of operational performance. Market conditions, influence of climatic conditions, influence due to calamities such as earth quake or other forms of disasters, currency fluctuations, GDP variations, governmental policies etc., are extraneous to the study even though they may lead to confounded relationships. While the formulation of the research model is based on meta-analysis, hypothesis testing is based on statistical procedures.

1.4 Problem Statement
Having identified through the literature review that for the Indian construction industry there is no dedicated exploratory study with empirical approach, the problem identified in this research is to bridge this gap by a dedicated study and seek relationship between the critical factors of TQM implementation. Khanna and Sharma (2011) clearly state that despite the benefits of TQM, Indian organizations face implementation problems and prioritization of critical success factors (CSFs) of TQM remains a problem for decision makers in these organizations. Khanna et al., (2011) have claimed that there is a dearth of research with regard to some CSFs of
TQM implementation in India. So, essentially, this exploratory research attempts to examine the influence of the critical factors of TQM implementation on organizational performance, by considering the operational performance as intervening as well as mediating variable.

The sustainability of construction industry being a function of the performance of the industry as measured by its organizational performance measures as well as financial performance measures, the above research problem definition would provide answer to the following research questions in the specific context of Indian construction industry.

a) Would better customer management contribute to the operational performance?

b) Would top management leadership contribute to the operational performance?

c) Would better people management contribute to the operational performance?

d) Would better organizational learning contribute to the operational performance?

e) Would better process management contribute to the operational performance?

f) Would continuous improvement contribute to the operational performance?

g) Would quality information management contribute to the operational performance?

h) Would better supplier management contribute to the operational performance?

i) Would the strategic factors contribute to the operational/organizational performance?

j) Would the tactical factors contribute to the operational/organizational performance?

k) Would the operational factors contribute to the operational/organizational performance?

The answers to the above questions would lead to some key revelations on the performance of the Indian construction industry, and also, provide inputs on which are the issues critical for its success.
1.5 Objectives of Research
The cardinal objective of this research is to explore the critical factors, which influence the Indian construction industry’s performance. To accomplish this following specific objectives have been developed:

i. To identify critical factors responsible for TQM implementation in Indian construction industries.

ii. To investigate the relationship between the above factors and the organizational performance of construction industry and identify the mediating or intervening variables, if any.

iii. Develop and validate a metric to suit to the Indian construction industry requirements, so as to explore and measure the variables of research interest leading to organizational performance.

iv. To formulate and test hypotheses to identify the significance of relationship between variables of study using the metric.

v. Develop TQM implementation strategy framework and make suggestions to enhance the effectiveness of existing quality policies.

1.6 Motivation, Need and Rationale for the Exploratory Research in Construction Industry
The main motivation to this research is despite the fact that construction industry is the second largest economic activity in India (after agriculture), there are no strict measures to ensure its sustainability. Quality being the prime driver of business growth, TQM principles has been in use in the construction industry since the past decade round the globe, but there is little evidence on focussed research leading to the identification of the relationships between the critical factors of TQM implementation and business performance in connection to Indian construction industry. Even though the dimensions of study may not differ significantly from country to country, the cultural, ethnic, and communicational issues may lead to variances. Unless, empirical evidence is established, the influence of critical factors on TQM implementation is not justifiable and there is a felt need to undertake a systematic research in this direction. TQM has invaded into almost all the service as well as production sectors owing to the fact that it results in lesser or practically no
defects which improves operational performance, which in turn, enhances business performance that is quintessential for sustainability of the business.

The rationale for this study is that, there is dearth of empirical evidence to support the influence of critical factors of TQM implementation on business performance and exploratory approach with empirical method would lead to the revelation of the significance of relationship between variables of research interest. Metric development is one of the most critical issues concerning the measurement of critical factors affecting TQM implementation or operational and business performance. So, a reliable and validated metric would facilitate the quantification of several indicators of measurement. As this research would adopt the rationale of quantifying the qualitative variables through appropriate scales so that they can be measured and subject to further statistical analysis, and the results could be generalized to a great extent depending upon how well the response of the sample population through the metric would respond to various statistical significance tests.

1.7 Methods
Chapter 4 provides a full explanation of the various methods used and the detailed research methodology. The aim here is to provide only a brief overview of the main research methods and strategies. The metric used is in the form of a self-administered questionnaire. Frameworks and models are studied in depth to identify the critical factors of TQM implementation and a structural research model is prosed for analysis. Hypotheses are built by rationalizing on the inter-relationships, so as to answer the research questions of interest proposed earlier (section 1.4). Metric development is through relation seeking between the model parameters and developing the variables so that they can be rated on the Likert scale. Primary data is through the employees who are involved as the project managers, engineers, quality managers, suppliers, quality inspectors. Secondary data is though journals, manuals, construction company annual reports, statistical bureau reports, internet archives etc. Descriptive statistics, reliability, validity tests including factor analysis are for testing the construct for its content and criterion and the degree of variance through mean and standard deviations. Structural equation modelling through partial least square method has been used to seek the significance of
relationship through t-test and path coefficients. Inter-item correlation is also carried out to study the relationships between these items.

1.8 Significance of the Research
There are many empirical studies which examine TQM practices-performance relationships in a group of small, medium and micro scale industries (Powell, 1995; Ahire and Golhar, 1996; Motwani, 2001; Montes et al., 2003; Brah and Lim, 2006; Kapuge and Smith, 2007; Khanna et al., 2007; Salaheldin, 2009; Kumar et al., 2009; Koh and Low, 2010; and Khanna, 2011). In contrast to most previous studies found in the literature, this research examined these relationships in a different way through a different approach. Specifically, this study adopted a more comprehensive and exploratory approach than previous studies which have tried to mainly investigate the effects of TQM. In other words, this study has a wider coverage of the eight key TQM critical factors than categories as strategic, tactical and operational factors. It also adopted the primary measures as expressed by the operational performance as the mediating as well as intervening factor and studied the influence on performance and contributes to the body of knowledge with a different dimension, and provides the future researchers ample scope to extend the study further by considering the factors in the framework which have been made extraneous.

The significance of this research lies in its timeliness in addressing a key question about TQM success in Indian construction industry, the question being, is there a significant positive influence of the critical factors of TQM implementation on business performance as a huge amount of money, time, and other resources are spent on these factors. This research becomes significant in the Indian construction industrial context as it identifies the main factors which significantly contribute to the business success as well as identify pitfalls, which need attention and suitable strategies to be proposed for improvement for ensuring sustainable growth. Further, this research would significantly contribute to the body of knowledge in TQM in construction management in the form of a valid metric, a framework for TQM implementation and suggestions to enhance TQM performance.
1.9 Outline of the Thesis

Chapter 1 provides the background to the research, general scenario of construction management in India and addresses the challenges faced by the construction industries, presents the problem statement, gives objectives of the research, lists the motivation, rationale of the research, need for the study and briefly explains the methods used in this research. This chapter also gives the basic definitions of various terms used in this research. The significance of this research has also been mentioned. Finally, the chapter outlines the thesis chapter-wise. Chapter 2 gives general introduction to TQM, discusses the relevance of TQM to construction industry, and identifies the basic elements of TQM which form the building blocks of TQM implementation. The felt benefits of TQM in general and construction industry in particular are discussed. The general issues of implementation of TQM in construction industry and the contemporary research in the field is discussed in this chapter so as to form the basis for the next chapter.

Chapter 3 focuses on the theoretical models and frameworks of TQM in general, and TQM as applicable to construction industry in particular. Critical success factors are essential elements to be considered for obtaining results through TQM and hence are discussed in detail. The relationship between the TQM, CSFs and operational performance is then discussed. On the basis of this analysis, the proposed model development process for TQM implementation in construction industry is explained. Deriving from the inter-relationships in proposed model, the hypotheses to be tested are developed.

Chapter 4 discusses the nature of research and the variables involved. The methods used have been briefly explained. A fully detailed account of the research methodology, such as, the reasons for which various research strategies were selected and the rationale for the sample selection has been narrated. It also deals with the issue of how the survey questionnaire was developed from the standard questionnaire to suite to Indian construction industry. The statistical procedures adopted have been listed.

Chapter 5 deals with the statistical analysis. The overall and descriptive statistics have been explained. Reliability & validity and frequency distribution has been undertaken. Hypothesis testing using structural equation modelling, the multi-variate
analysis, path coefficients, and significance values are obtained and analysed. The results are presented in pictorial and tabular forms whenever necessary for easier understanding. Chapter 6 reports the findings of the study. Details regarding the various results obtained during the research process are listed in the form of tables. Interpretation derived out of hypotheses testing is also reported in this chapter. The framework for implementation of TQM is explained. The contributions of the study have been explained. Based on the findings, suggestions and implications have been made to improve the performance of TQM process in Indian construction industry. The chapter culminates with the general conclusions, limitations and future scope of this research.