Chapter 6
Findings, Implications, Contributions & Conclusions

6.1 Overview
In this chapter the findings, implications, contributions, and conclusions of this study are listed. The research findings are based on the exploratory research on TQM implementation, hypothesis building and testing, and field visits. The implications drawn through the research analysis have also been presented in this chapter. Contributions made by this research have been recorded. The chapter ends with the conclusions of the entire research, giving in brief the various aspects of this research and the possible direction for future work.

6.2 Research Findings
6.2.1 Descriptive Statistics – General Findings

Even though descriptive statistics do not lead to major finding in research, it reveals some important general issues in connection to the area of study. In this exploratory research, the first objective was to identify the critical factor responsible for TQM implementation in Indian construction industries from a myriad of factors which have been already listed in the research literature in this area.

The first and foremost result of descriptive statistics was on the sample distribution. It gives a general idea of who were the respondents of this study and what type of companies in the construction industry they come from. In terms of their turnover, it was found that a vast majority of the companies had an annual turnover less that Rs. 500 Crores (68%), a sizable number were in the range of Rs. 500 to 750 Crores (25%) and a small number (7%) were having an annual turnover of above Rs. 750 Crore. Majority of the companies (66%) had less than 500 permanent staff. Major contributors for the survey are from highway projects (37.5%) followed by residential buildings (24.5%), rest were distributed almost equally in commercial buildings, industrial projects and dams. Majority of the respondents were having about 2 to 5 years of experience in the construction
industry. In quite a good number of companies (80%) quality initiatives are already in place and the respondents have reasonably good exposure to the jargons of quality. Indian construction industry, as expressed by the respondents, gives priority (ranking) to Customer management, Process management, Top management leadership, Supplier management, Organizational learning, People management & Continuous improvement, and Quality information management in this order.

The confirmatory factor analysis has revealed that the variables selected for representing the CSFs have adequate factor loading and can be used for the collection of data as they measure what is expected to be measured from them.

6.2.2 Issues Hindering TQM Implementation in Construction Industry

In addition to the questionnaire method of data collection, semi-structured interviews with knowledge workers (Project managers, Engineers, Architects, Draftsmen, and Supervisors) were also undertaken. The purpose here was to get some idea about the general conditions of working and identifying the problems faced by the construction industry employees which would have a direct or indirect effect on quality issues in the industry. Some of the major problems faced by the employees irrespective of their position of working are listed below:

1. Top management was all for quality initiatives and in almost every meeting they were speaking about their quality philosophies. But when it came to implementation, there were shortcomings in terms of support through manpower and technical support. Some of the measurement tools were old and out-dated and were due for replacement.

2. There was no adequate quality inspection and testing on incoming material used for construction. This was creating problems at later stages of the project.

3. Most of the operations involving fabrication were outsourced to third party and their quality was not properly supervised.

4. Delays in supply were not monitored properly and project managers were always busy on resource smoothing operation than quality as they had to meet the deadlines.
5. Organizational structure was not congenial for modern methods of information sharing.

6. Due to the employment of people from different geographic locations, communication barriers were in abundance and it was causing misunderstandings, delays and serious lapses in the execution of orders from the superiors.

7. Risk management was not to the international standards.

8. Construction automation was at infant stage and dependence on manual labour was a major hurdle in producing quality work.

9. Groups such as quality circles in use in manufacturing industry have never been tried in the construction industry.

10. The biggest gap was seen in some industries at the middle and lower levels of the organization structure. Senior management’s view of a warm, friendly and stimulating working environment was far different to the reality suggested by the lower levels, of an unhappy mixture of isolation, shallow friendliness between management, staff, engineers and administration.

11. Also expressed was a distinct lack of a group identity of everyone working together as one single team, and a cultural absence of ‘do it right first time, every time’ was not practiced at all levels.

12. Modern methods of getting higher employee commitment through stock option, reward systems, etc. were not evidently practiced in all the industries.

13. The company vision, mission, objectives, strategies, quality etc., were not realized by the employees. In fact, it was surprising to note that many employees were not aware of the company vision statement.

14. Employee opinions were not seen as important, so the employees do not have the habit of expressing themselves during the meetings.

15. In general, the employees particularly those on daily wages, had low esteem about the nature of the work they were doing and the conditions under which they were working. This had repercussions on the quality of work they produced.
6.2.3 Hypothesis Testing – Specific Findings

The structural equation modelling using partial least square method has enabled the finding of those indicators of CSFs, among the variables selected through confirmatory factor analysis, which could be eliminated from the study during the path modelling and hypotheses testing. Through pilot run analysis the original number of variables was reduced to the given number of indicators based on the factor loadings as indicated in the respective models (Chapter 5, section 5.5).

Hypothesis testing revealed that among the eight CSFs which were chosen for TQM implantation, five were actually contributing to the business success as measured through Operational performance and Organizational performance. These five CSFs were: Customer management, Quality information management, Top management leadership, Process management, and Supplier management. The remaining three CSFs chosen did not contribute to the business success as measured through Operational and Organizational performance measures. These three factors: People management, Organizational learning, and Continual improvement are yet to prove their significance of influence on business success and have not yet been practiced seriously by the construction industry. This revelation has led to the following implications based on the hypothesis testing.

6.2.3.1 People Management

The Indian construction process has traditionally been characterised by bureaucracy, red tape and erratically enforced regulations. This explains why People management as a CSF has not contributed much to the business success either though Operational performance or Organizational performance.

People Management issues were discussed in semi-structured interviews with the knowledge workers in the construction industry at various locations in India. Interviewees were reflecting their experiences and knowledge in connection to various issues related to TQM and following are the excerpts of the key issues which could have been responsible for the failure of effectiveness of People management in TQM in the construction industry. They have been categorized into the following.

1. Working environment: People management as a dimension fails if working environment is not congenial to creativity, productivity and performance. This was expressed by most of the knowledge workers during the interviews. The interacting
factors in the working environment can cause cascading effect and hinder the progress. It was observed that in the construction industry People management issues such as job satisfaction, commitment, motivation, and organizational citizenship, were totally neglected dimensions. As rightly pointed by Delbridge (2005) in similar study in manufacturing sector this severely affects work intensification. So, when work intensification suffers, it affects both the Operational as well as Organizational performance. So, the construction industry should initiate job satisfaction surveys and introduce the proven methods of employee training on commitment and motivation enhancement.

Organizational citizenship behaviour (OCB) which enhances organizational performance is also an important aspect of People management, which seems to be completely missing in construction industry. During the interviews it was found that there were no OCB related activities in the construction industries such as there is a connection between employee engagement and business results (Harter et al., 2002). Kahn (1992) proposed that employee engagement leads to both individual outcomes (i.e. quality of people's work and their own experiences of doing that work), as well as organizational-level outcomes (i.e. the growth and productivity of organizations). Furthermore, the Maslach et al. (2001) model treats employee engagement as a mediating variable for the relationship between job satisfaction and commitment and performance.

2. Employee safety: Employees labelled the construction industry as heavy work and accident prone and safety measures were not adequate. The safety issue has always been a worry among people to be involved in the construction industry (Construction Industry Development Board-CIDB, 2007; Toolle, 2002). Accidents on construction sites are very common in Indian construction sites and everybody accepts it as an unavoidable feature of the industry (Kaur, 2006). Besides that, work at construction sites is difficult because of the need to provide heavy work in most of the activities. Prevention strategies must be worked out by the safety department by collecting information during fatality investigations.

3. Wages and employment status: Employers mentioned that the low wages cause local workforces to be uninterested with the construction industry and it has repercussions on their performance. The wage level is not applied properly according to the skilled labourer but it depends on the competency of the employer to pay off the labourer (Salleh, 2008). So, construction industry being skill based in
its very nature, manual work cannot be avoided fully and the wages and the working conditions need to be seriously considered. Employers, when inquired, stated that labour force in the construction industry is on temporary work. As they move to different geographical locations they hire employees locally on a temporary basis and again this has bearing on their output as they lack motivation. In addition, not all the staff enjoy benefits like Insurance, Provident fund, Gratuity etc.

4. Organizations strategies: Weakness on organizations strategies was very evident during the discussions. In ideal situation, the employer needs to study and analyse their Human Resource Planning processes to retain and attract more local employees in the construction organization. Some organizations had no concrete HR planning causing major problems in People management issues such as employee retention. The following ten determinant factors of HR planning (Dom et al., 2012) need to be considered by the construction industries internal factors- (1) organization strategy; (2) organization change; (3) organization culture; (4) nature of work; (5) leadership style and experiences; (6) empowerment and external factors; (7) legislation; (8) economic changes; (9) technological changes; and (10) demographic changes. These determinant factors influence employee performance in an organization and are the essentials of People Management as identified by a group of researchers (Loosemore et al., 2003; Keel, 2006; Cotten, 2007; Deborah et al., 2003; E-CORE, 2005; Zahidi and Afzaniizam, 2009).

6.2.3.2 Organizational Learning

Strictly speaking, Organizational learning was not one of the CSFs among the 20 dimensions that were identified through meta-analysis of the literature. However, based on the initial interaction with the knowledge workers and based on the advancement of TQM as a concept this dimension was taken as a CSF as in today’s competitive world of business almost all the fortune 500 companies have imbibed it. After a thorough interaction with the knowledge workers and skimming through the research literature following concepts have been identified which need to be implemented by the construction industries if Organizational learning has to take place and if it has to produce a significant influence on the business performance. These dimensions have been tried in various SMEs and manufacturing industries successfully, and it is now the time for the construction industries to formalize these.
These dimensions include: Defining organizational vision (Allen, 1995), Relating future impacts to organizational competence (Richardson and Thompson, 1995), Implementing and updating organizational vision (Benbow, 1995), Future planning and organizational direction (Bell & Tunnicliff, 1996), Interrelating complexity, information, Organizational structure and learning (Gault & Jaccaci, 1996), Establishing an evolutionary organization (Smith and Saint-Onge, 1996), Intelligent relationship management strategy (McDermott and Chan, 1996). These dimensions are in use since a long time and time tested by various successful organizations.

Following are the implications for organizational learning in construction industries in India:

1. **Organizational structure:** The construction industries are still following the old hierarchical form of organization structure. This may not be congenial to organizational learning, so the time has come to move from multi-level hierarchical structure to networking kind of organizational structure. This would facilitate faster flow of information both ways and promote organizational learning. With self-organized learning networks budgets, resources, targets and goals for learning are released to groups of employees, each one of them managing the construction activities.

2. **Knowledge management:** There is a need in today’s business world to update very individual with the latest knowledge in his or her field of expertise. So, the construction industry should develop mechanisms and build the technology to identify, assimilate, store, validate, disseminate, and apply knowledge in the form of Knowledge Management System (KMS), which has been successfully used in manufacturing sector. The whole idea would be to provide the right kind of information to the right person at the right time.

3. **Adapting to the changing market:** As mentioned before, construction industry is a highly creative field. The industry has to equip itself to detect and respond appropriately to the changing market trends. It should have mechanisms, processes and procedures which are needed to isolate any given pattern of external events, devise suitable responses, and ensure that the implications for realigning resources and competences are addressed.

4. **Moving towards learning organization:** The construction industry must make a deliberate attempt to interrelate complex dynamic internal and external environments to planned organizational cultures for promoting learning and creativity. The entire
philosophy need to be developed or the five disciplines of learning organization viz., Shared vision, Self-mastery, Mental models, Team learning and Systems thinking (Senge, 1993).

6.2.3.3 Continual Improvement

It was surprising to find that continual improvement has not been practiced in its true sense in construction industry and TQM remained just a slogan as far as this CSF is concerned. In fact, this is one of the first CSF that should have yielded result in the visible form of Operational and Organizational performance. But unfortunately it has failed to produce results. The reasons could be many. Project managers had expressed very clearly that, time was a major constraint and the urgency to finish the project and save the organization from paying compensation gave little scope to think too much about continual learning and improvement.

Continual improvement should provide the industry with the transition from the old methods of quality control, standards, inspection, surveillance, blame and incentives to the new methods, teams, systematic investigation of processes, experimentation, customer/supplier relationships, dialogue and communication. Continual improvement would yield excellence in design, ensure communication in contracts and create a teamwork spirit in construction. Basically quality comes to promote development. But unless it has been systematised, it can fail to give performance results as indicated through hypothesis testing in this research.

Following are the implications for the construction industries to strengthen the continual improvement component of TQM:

1. Teamwork: As per the observations made during the semi-structured interviews, it was observed that the construction industry has not been very successful in working smoothly in teams, i.e. respect the principle of internal supplier to internal customer chains. The concept of internal customer is not fully exercised in the construction industry. Suppliers of material, engineers, architects, contractors, project managers, plumbers, electricians, carpenters, painters etc., are all internal customers to each other and they need to satisfy both the stated and implied needs of each other as customers. But this practice is observed to be flawed and several cases of rejection of the material, delay in material procurement, rejection etc., are found to be common features in the construction industry. If continuous improvement has
to produce results, mechanism will have to be developed to collect feedback from internal customers and identify the non-compliance. Measures may have to be designed to mitigate the non-compliance issues on a continual basis so that this CSF contributes to the performance of the industry.

2. Change management: The industry will have to be proactive to sense reasonable future change and be prepared to use it for its advantage. In most of the cases it was told by the project managers that change was implemented only when unavoidable. Construction industry automation was quoted as an example by the managers. As manual labour was relatively cheaper the industry had not considered automation for quite some time until competition became stiffer and things were imposed. Anticipation and preparation in advance would have provided the industry a competitive advantage.

3. Process improvement: As an individual CSF, Process management has been contributing towards performance, however, small process improvements on a continual basis have not been a regular feature in the industry. Aiming at process improvement at the singular goal of meeting clients’ expectations is not observed in the industry. System’s concept with an input and output must be introduced into all the processes in the construction industry so that there is ample scope for systematic process improvement based on real-life situations and experience.

4. Benchmarking: The construction industry needs to set benchmark at above average incremental process improvement to systems or subsystems and implement/monitor programmes. Benchmarking should always be against the best in the trade. Learning from the competitor has been very successfully practiced in manufacturing industry and the time is now ripe for the construction industry to try the same.

5. Root cause analysis (RCA): Among several quality tools, RCA has been successful in eliminating defects in SMEs and manufacturing and even in service sectors, while attempting for Continual improvement. RCA refers to both a philosophy and a set of specific techniques used to find the basic reason(s) for the occurrence of unwanted situations, problems, or accidents (Dorsch et al., 1997). If RCA is correctly understood and applied, errors can be eliminated from the source itself. So, this has to be tried in the construction industry. Looking for root causes when diagnosing the system malfunction or project process bottlenecks must be exercised.
6.3 The TQM Framework for Indian Construction Industry

The ultimate objective of this research was to develop a TQM implementation strategy framework considering the critical success factors in Indian construction industry, which would contribute to the Operational and Organizational performance of the industry.

The literature review has emphasized the importance of having a system’s perspective into TQM, and hence, the framework is developed considering the entire construction industry as a system with the following three basic components.

1. **Input:** The construction industry has men, machine, material and money as the basic inputs to the system. Building material can be any material which is used for construction purposes. Many naturally occurring substances, such as clay, rocks, sand, wood etc., have been used to construct buildings. Many man-made products are in use, which are the synthetic materials. The manufacture of building materials is an established industry in many countries and the use of these materials is typically segmented into specific specialty trades, such as carpentry, plumbing, roofing etc., In addition binding material such as cement will be used. Concrete is a composite building material made from the combination of aggregate and a binder such as cement. Apart from these several others such as paints, glue, glass, different metals, composite materials etc., form the input materials for building residential and commercial buildings, highways, dams etc.

There need to be a well-planned and selected human resource at different levels to do specific jobs which could be highly skilled, semi-skilled or unskilled manual labour. There are also knowledge workers who provide the technical know-how to carry out entire construction work. Finance is required to procure both human and physical resources, at every stage of the project. In addition, for transport, lifting and moving operations a large number of equipment, machinery and vehicles are required. There are many more items such as those for illumination, cooling, storage etc. All these become the input for the construction process.

2. **Processes:** There are a large number of processes, which need to be carried out from start to finish of the buildings, dams, or other infrastructure. Planning forms the starting phase of the building and a group of engineers, architects, and draftsmen prepare the complete design and drawing of the building, highway, dam etc. There are various standards and codes followed during this stage. There are also legislative
issues, environmental and ecological issues to be considered during this stage. Financial issues, costing, billing etc., will be carried out systematically and the final plan for the infrastructure to be built will be ready with material specifications and bill of material.

Based on the planning, the materials will be procured and the construction process will begin. Starting from marking of the land to the erection of the building the entire operation is a process in one form or the other. So, all these processes need to be monitored and controlled to check their conformance to the specified standards and if there is deviation it need to be corrected, or else, it will lead to defective parts. Even though the inputs and processes are not explained in detail in the thesis, as it is beyond the scope of this research, the emphasis here is that the TQM implementation is to control the variance in the process so that defects may be under control and standardization of the process is the key. Also, there are soft and hard aspects of quality and both need to be intact.

So, the framework of TQM is for the processes which are central to the construction industry. The strategic framework should consider the CSFs for TQM implementation such that they contribute to the performance of the business as measured through the Operational and Organizational performance.

3. Output: The last and the most important component of the construction in the systems view is the output in the form of the building, highway, dam or any other project that is completed and commissioned. It should conform to the required standards and satisfy the stated and implied customer needs.
4. **Critical success factors:** In this research, as explained before, there are eight critical factors which have been identified through the exploratory research and five of them were proved to have significant influence on the performance of the construction industry. The performance included both Operational and Organizational aspects. Further, these eight CSFs were grouped under the three well
accepted management factors namely, Strategic factors, Tactical factors and Operational factors. In response to the customer expectations, needs, external and internal operating factors these factors should be adjusted by the construction industry such that the eight CSFs adopted for TQM implementation successfully control quality of the product. Quality does not refer only to the quality of the final product, but quality at each component of the system shown.

6.4 Implications for TQM Implementation in Indian Construction Industry

While there are several implications that can be drawn from this research, by combining the results of empirical study based quantitative study and semi-structured interview based qualitative study, the most important ones have been grouped under the following headings.

1. Communication: Communication is the key to quality. A clear vision has to be developed not for the sake of ISO certification but for having a clear roadmap for travel. A bottom to top approach on developing a vision has been successfully tried in many manufacturing industries and it can pave the way for success in construction industry too. When this vision is shared among all the employees it can be realized in its true sense. Based on the imbibing of this vision, all the rest of the mission, objectives, strategies, policies, procedures, systems and practices will follow.

2. Training programmes: Training programmes need to be arranged to make clear many of the quality statements. This can be in the form of awareness programs. Concept such as Continuous improvement has to be discussed at length and the very essence of it has to be made known to the employees so that they can practice it in their day to day operations. Training programmes on customer is the key, and this may include: basic definitions of TQM, house of quality, quality function deployment, Deming’s cycle, quality circles, communication systems, concepts of internal customers, quality control tools and techniques, statistical methods, TQM philosophy, team work etc., have to be regularly conducted in the industry.

3. Feedback systems: Process as such is incomplete without “feedback”. The mind-set of the employees that feedback is criticism was prevailing throughout the industry. The purpose of feedback as a tool to improve performance was not understood by the employees. There were comments that even appraisal system was
biased and favouritism, nepotism and lack of recognition were prevailing in it. So, the time is ripe for the construction industry to come out with objective feedback systems so as to make the process run in such a way that variances are maintained at the minimum.

4. **Organization structure:** As discussed before, organization structure plays a very important role in the success of TQM policies as there should be a structure to support the philosophy. The absence of clear organizational structure was also apparent from respondents describing lack of job descriptions, unclear promotion and routes, and the problems experienced by the researchers in obtaining up-to-date divisional and corporate structures. Most of the industries still have the hierarchical management structure and it needs to be changed to networking type of organizational structure which is now commonly used in manufacturing and IT sectors. This gives free flow of ideas and minimizes the time spent in bringing the ideas to fruition.

5. **Corporate quality policy:** Through interviews it was felt that there is a need to critically appraise and possibly revise the corporate policy on quality, following the new quality awareness. The success or failure of TQM initiative is also a function of the corporate policy and quality policy should be a part of corporate policy. Rules may be subject to change based on requirements which may be different from time to time, but the policies of the organization should be robust and stable. It is to be understood by the employees that it is the policy of the company to strive at all times for the satisfaction of its customers, its shareholders and its employees.

6. **Quality circles:** The construction industry should introduce the concept of quality circles which is used successfully in manufacturing world. A quality circle is a volunteer group composed of workers, usually under the leadership of their supervisor, who are trained to identify, analyse and solve work-related problems and present their solutions to management in order to improve the performance of the organization, and motivate and enrich the work of employees. When matured, true quality circles become self-managing, having gained the confidence of management. Quality circles have the advantage of continuity and the circle remains intact from project to project. So, this would be worth a try in the construction industry.

7. **Roles and responsibilities:** In many cases the employees expressed that there was no role clarity and sometimes had to do multiple tasks as and when they were assigned to them. It would be fine in terms of optimum utilization of manpower, but
accountability and responsibility will be an issue in such cases. Construction industry has a myriad of processes and each of them has to pass through a set of highly skilled and specialized jobs and there is a need for having a clear set of roles and responsibilities defined in the beginning itself. It can be circulated among the employees so that there will be no scope for role conflict and nobody can shun responsibility.

In order to effectively manage the staff at all levels it is important to provide them with a clear definition and understanding of their role, function, and responsibilities in the workplace. This will provide them with a good understanding of the job and tasks they are to perform as an individual and within any teams they are a part of it. It also provides information on where they fit within the organisation and who they report to, helping to avoid disputes and misunderstandings over authority.

As the process of defining roles and responsibilities has not been systematized in the construction industry it has created tension, miscommunication and inefficiency within the organization. Mistakes and omissions can also occur where people are unsure of what is required of them, thus affecting quality.

8. **Statistical techniques:** There are several statistical techniques which aid quality and the upper and middle class of knowledge workers are supposed to have an exposure to these tools. The general observation during the interviews was that there was no formal training in most of the companies in these techniques. The most popular and useful techniques are Control charts, Capability analysis, and Six sigma. In-house on the job training can be given to the employees specifically on issues where the statistical techniques can be applied to control variance.

9. **Benchmarking:** Interview with the knowledge workers revealed that this one area which is yet to be explored by the Indian construction industry. Benchmarking is an important means of gradually, continually and permanently improving performance in the construction industry (Pheng, Ke-Wei, 1996). A company must embrace strong acceptance and maintenance of a Total Quality Management and benchmarking plan (Motwani, 2001). Benchmarking is always against the best and it involves the emulation of the processes from the best in the trade and some researchers call it as learning from the competitors. It basically starts with the gathering and assessing the information on competitors and other similar process-based businesses, beyond construction industries. Benchmarking is a systematic and
continuous process that enables organizations to identify world-class performance and measure themselves against that.

6.5 Contributions of this Research
This research is a systematic approach to explore into the issues and perspectives of Indian construction industry. This research has resulted in a framework for TQM implementation in construction industry in general, and Indian construction industry in particular in terms of eight CSFs which are considered to be the main contributors for Operational and Organisational performance of the industry. The meta-analysis has resulted in the identification of a group of critical factors which need to be satisfied for TQM implementation and this can be used by the future researchers as guidelines for undertaking research in the TQM implementation. The research has contributed a validated and tested metric for measurement of CSFs of TQM implementation in construction industry, which could be used by the future researchers not only in construction industry, but also, in other related industries with little modification, if required.

The hypothesis testing undertaken in this research has revealed the most significant factors among the eight CSFs chosen from a myriad of critical factors which influence TQM implementation. The implications of the study can be made use by the policy makers of the Indian construction industry to enhance the performance of their industries through effective TQM implementation. Also the problems identified in the construction industry in India could be a guiding path in resolving the issues hindering growth of the industry. Finally, the outcome of this research adds immensely to the body of knowledge of TQM literature in construction industry.

6.6 Conclusions
Construction industry in India is one of the largest businesses in terms of turnover as well as employment. Owing to the stiff competition and requirement of competitive advantage in terms of business quality management has been an area of concern in this field. TQM has become a well-established system for improving both the performance of industries and the overall satisfaction of customers due to the main reason that it improves the quality of the product.
In this context, this study has tried to develop a framework for analyzing the CSFs for success of TQM in Indian construction industry. Based on a literature review and expert opinion, a total of eight factors are identified in this study. For establishing a relationship between these critical factors, Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) methodology has been applied. It has also helped in determining dependence relation between different components of the framework. Customer management, Top management leadership, People management, Organizational learning, Process management, Continual improvement, Quality information management, and Supplier management have emerged as the eight CSFs. These eight CSFs were grouped into Strategic factors, Tactical factors and Operational factors. Operational performance and Organizational performance were the dependent variables.

The research methodology adopted for this research included exploratory research followed by empirical study. Meta-analysis of literature was used for the identification of CSFs for TQM implementation. Questionnaire method & Semi-structured interviews were used for data collection, and Structural Equation Modelling was the tool used for statistical analysis. Hypothesis testing revealed that out of the eight factors chosen as CSFs only five had significant influence on business performance of the industry as measured through Operational and Organizational performance. It also revealed that in terms of planning all the three viz., Strategic, Tactical and Operational factors had significant influence on performance in one form or the other. Based on the hypothesis testing results and the information collected during interviews and filed study, implications were drawn to improve upon the performance of the TQM in construction industry. An integrated framework for TQM implementation was developed. Problems faced by the employees were also listed.

Although the findings of this study will be very helpful in the success of TQM in Indian construction scenario, this study has got some limitations due to the limited number of variables and chances of biasing while developing the relationship between the variables. Therefore as a future scope of study, the framework developed in this study could be refined, newer variables may be added if found necessary and research may be carried forward.

This research has been an experience to delve into the problems, challenges, issues and perspectives of knowledge workers in the Indian construction industry and
the outcome could be of immense use for the construction industries in India which is growing exponentially and demands improvement in its processes.

6.7 Limitations and Future Scope of Research

This research is an exploratory research which is extended as an empirical study through hypothesis testing. Due to the very ‘ex post facto’ kind of its nature even though the study was to explore the factors which would affect the most in TQM implementation, the extensive literature review that was carried out in this research revealed certain facts which were not evident at the beginning of this research. So, first of all this research is limited by its research methods being confined to exploration, meta-analysis and empirical study. Many more research methodologies such as action research, quasi-experimental research or non-experimental research methodologies with Taguchi method of design of experiments could have been carried out. So this is the limitation of this research in terms of research methodology. However, as the research has converged into specific framework that was to be designed through this research, this limitation can be overruled and may be considered to as the future scope for this research.

The qualitative data has been collected through Semi-structured interviews, as it was considered by many researchers to be the most appropriate method for this kind of research. However, there are other methods which are also equally effective such as Internet survey, Delphi technique, Group discussions, Panel discussion etc. which have not been tried in this research.

There are limitations in the very hypothesis testing research. They include,

1. The tests are only useful aids for decision-making. Hence, “proper interpretation of statistical evidence” is important to intelligent decisions.
2. Tests do not explain the reasons as to why does the difference exist, say between the means of the two samples.
3. Results of significance tests are based on probabilities and as such cannot be expressed with full certainty.
4. Statistical inferences based on the significance tests cannot be said to be entirely correct evidences concerning the truth of the hypotheses, especially in small samples. For greater reliability, the size of samples be sufficiently
enlarged. In this research, the sample size is larger than the recommended minimum size.

Further all the limitations of statistical methods are applicable for this research too. Nevertheless, in problems of statistical significance, the inference techniques (or the tests) have been combined with adequate knowledge of the subject-matter through literature review and discussions with the knowledge workers in the construction industry and combined with the ability of good judgement. Moreover, the entire framework is based on the construction industry in India so generalization of the framework into a universal model may not be recommendable as such. Nevertheless, as the sample size is adequate for this kind of research, implications are based on the empirical evidence combined with the facts expressed by the knowledge workers the framework can still be generalized to a considerable extent.

This research opens up ample scope for future researchers in the field of TQM in construction industry. Firstly, they can combine these CSFs with the rest of the factors discussed in this research and extend the study. Secondly, this research is in connection to the general construction industry which includes all the major construction projects from houses to dams and highways. It can be narrowed down to a single industry and an in-depth research may be undertaken. Thirdly, other methods of research can be used which have not been tried in this research and it can be checked whether the results still concur or diverge from those obtained in this research. Finally, there is also ample scope for using modelling and simulation such as System Dynamics to simulate the entire TQM implementation processes and the influence of each of the CSF can be individually studied.