Chapter 3
Theoretical Models & Hypotheses

3.1 Models of Critical Success Factors (CSFs) of TQM

A literature review on CSFs has been carried out in Chapter 2 and the basic elements of TQM implementation have been discussed in detail. Drawing from those review results, in this chapter various theoretical models will be discussed so as to construct the research model for the exploratory study on the influence of the CSFs of TQM on performance. Also, though the literature review conducted, 20 CSFs have been identified in the previous chapter. So, only the newer dimensions in the individual model which have not been discussed before will be explained in this chapter, as the focus of this chapter is to construct a theoretical model for Indian construction industry for TQM implementation.

Some CSFs are the same in their content but authors give different titles to these dimensions based on their convenience e.g. Human resources management, and people management both are same in their content. In the evolutionary stages of TQM, the factors affecting TQM were identified and were called under different names like TQM implementation criteria, enablers, success factors, indicators of TQM performance etc., and over a period of time the word CSF came into existence as these factors decided the success or failure of TQM.

Khanna et al., (2011) state that CSFs are different from other management tools due to following reasons:

(1) These look at a company as a totality.

(2) These require careful consideration of priorities in order to identify what is critical. Those involving new development normally demand higher priority than those monitoring existing situations.

(3) These define assumptions that are implied when goals are set and plans are drawn.

(4) These are constantly evolving, providing greater flexibility in decision making.
Hence, there are several models on CSFs of TQM implementation and they are context based to some extent and also situation based to a great extent. Some of the models on CSFs relevant to this research are discussed in the following sections. A group of researchers have shown that TQM implementation programs have failed because the then success factors were not in-laid into the system (Curry and Kadasah, 2002; Jones and Seraphim, 2008). Successful TQM implementation requires a thorough understanding of CSFs and their ordered implementation (Salahedin, 2009). The importance of ranking CSFs for implementation of TQM is to increase success rate, reduce costs, and mainly prevent failure. Following are some of the models which have been widely used worldwide in defining the CSFs for TQM implementation.

3.1.1 Malcolm Baldrige National Quality Award (MBNQA) Model

Lam et al., (2012) have taken the six CSFs of TQM as considered by MBNQA, which is one of the most prestigious quality awards worldwide. The six CSFs include: Leadership, Customer focus, Strategic planning, Human resource focus, Information and analysis, and process management (figure 3.1). This model gives emphasis to strategic planning in comparison to other models of CSFs as this group of researchers opine that “market-led strategic change” (Piercy, 1992), better known as “market focus” (Brown, 1993), where companies align their internal processes to fit with the characteristics of the marketplace, can help companies achieve sustainable competitive advantage. The study by Lam and his group was to find the empirical evidence for the influence of TQM on market orientation and service quality they found the MBNQA was very relevant.

![Figure 3.1: Critical Success Factors of TQM Implementation (Lam et al., 2012)](image-url)
3.1.2 Deming Award Model

Deming award had six CSFs which included (Metri, 2005): Process quality management, Design quality management, Education and Training, Supplier quality management, Employee empowerment and involvement, and Culture (figure 3.2).

![Diagram of Deming's Critical Success Factors of TQM Implementation](image)

Metri (2005) used this model as one of the criterion for selecting the appropriate CSFs in a construction company. The Deming prize, established in December 1950 in honour of W. Edwards Deming, was originally designed to reward Japanese companies for major advances in quality improvement. Over the years it has grown, under the guidance of Japanese Union of Scientists and Engineers (JUSE) to where it is now also available to non-Japanese companies, albeit usually operating in Japan, and also to individuals recognized as having made major contributions to the advancement of quality.

3.1.3 European Foundation for Quality Management (EFQM) Award Model

Metri (2005) considered the EFQM award criterion as one of the models which had eleven CSFs which include: Strategic quality management, Process quality management, Design quality management, Supplier quality management, Customer satisfaction, Employee empowerment, Business results, Information and analysis,
Benchmarking, Impact on society and environment, and Statistical process control (figure 3.3).

This is a widely used model in entire Europe (formerly known as European Quality Award) as a quality standard and includes even business results as one of the factors. The model was used to help determine where an organization is on their journey towards excellence, to provide a common language to enable the exchange of ideas and information, both within and outside the organization, to integrate existing & planned activities, improving organizational efficiency and effectiveness, and to provide a basic structure for the organization's management system.

3.1.4 Pheng and Ke-Wei (1996) Model

Pheng and Ke-Wei (1996) developed a CSF model for successful implementation of TQM on construction projects. They endorsed their view that success in construction industry can be achieved through persistence, positive hands-on leadership, upfront preparation and continuous maintenance of a sensible plan. The dimensions included in this model are: Client commitment, Awareness & training, Documentation,
Planning, Leadership, Continuous improvement, Quality circles and measurement (figure 3.4). While other dimensions are common, the emphasis of the model is on quality circles.

Through their model they propagated the following are the keys to continuous improvement in the construction process:

- Learn to work smoothly in teams, i.e. respect the principle of internal supplier to internal customer chains.

- Be proactive to sense reasonable future change and be prepared. Do not wait until you are pressured into change or to act.

- Aim process improvement at the singular goal of meeting clients’ expectations.

- Set benchmark at above average incremental process improvement to systems or subsystems and implement/monitor programmes.

- Look for root causes when diagnosing the system malfunction or project process bottlenecks.
• Recognize the integrated and interdependent nature of project system and its parts.

3.1.5 Whiteman and Haupt (2004) Model

Whiteman and Haupt (2004) through their research identified nine factors which influenced TQM implementation (figure 3.5).

![Figure 3.5: Critical Success Factors of TQM Implementation (Whiteman and Haupt, 2004)](image)

The model has nine dimensions including: Top management commitment, Top management involvement, Primary customer focus, Planning, Training, Participative management, Continuous improvement measurements, Rewards, and TQM application (figure 3.5). Top management commitment and top management involvement have been considered as separate dimensions by Whiteman and Haupt owing to their individual importance. According to them, top management is one of several major critical factors or organizational requirements for effective quality management and successful quality performance requires top management to be dedicated to that goal. Almost all of the 109 valid responses to the questionnaire survey regarded as important, the commitment and involvement of their top or senior management in the TQM process for its successful implementation and they claim that this conclusion was in accordance to the findings of other researchers (Anderson...
et al., 1994; Douglas and Judge, 2001; Kathuria and Davis, 1999; Miller, 1996; Rahman, 2001; Reed et al., 2000; Saraph et al., 1988; and Tata & Prasad, 1998).

In this study again, top management commitment, top management involvement, and customer focus emerged as the top three dimensions which support TQM implementation. They used coefficient of variation in percent as a tool to measure variance and observed that the least variation was on customer focus and this shows the general perception about this factor.

According to the study of Whiteman and Haupt (2004) participative management was an important criterion to the respondents in the implementation of TQM. They also claim that this finding is well-supported in the literature (Ho et al., 2000; Kathuria and Davis, 1999; Stashevsky and Elizur, 2000; Yong and Wilkinson, 2001). The importance of participative management is suggested by other factors such as the notions of relationship oriented practices (Kathuria and Davis, 1999), employee fulfilment (Anderson et al., 1994), teamwork (Black and Porter, 1996; Shammas-Toma et al., 1998), employee involvement, empowerment and teamwork (Kols and Sherman, 1998; Tata and Prasad, 1998), employee relations (Saraph et al., 1989), and people (Rahman, 2001; Yusof and Aspinwall, 2000). Their observation also included the fact that the lack of integration between TQM and human resource practices has been cited as a major barrier to achieving full-blown TQM (Glover, 2000).

3.1.6 Salaheldin (2009) Model

Salaheldin (2009) identified seven CSFs for TQM implementation for his research on Small and Medium-sized Enterprises (SMEs) which included: Top management commitment, Organizational culture, Leadership, Continuous improvement, Quality, goals and policy, Resources value addition process, and Benchmarking. He had conducted an extensive meta-analysis to arrive at these CSFs (Table 3.1). The study was influenced by the research of a wide range of researchers from a period of 1999 to 2006 in the SMEs. He had also identified those CSFs not observed by these researchers and conducted an extensive research to include those factors which would really matter in SMEs and came out with a model with seven dimensions including: Top management commitment, Organizational culture, Leadership,
Quality goals and policy, Resources value addition process, and Benchmarking (Figure 3.6).

Table 3.1
(Critical Success Factors for TQM Implementation (Salaheldin, 2009))

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<th>Sl. No.</th>
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<th>Critical Success Factors for TQM Implementation</th>
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Even though he had a wide choice of factors to choose from, Salaheldin (2009) as given by the principle of long-term effectiveness of the company (Davis et al., 2003), and significant change in the manner in which the business is conducted (Turban et al., 1999). Among the seven factors chosen by Salaheldin (2009), Benchmarking is the dimension added by him, which combines several features of the missed factors.
into one. As benchmarking is always against the best in the trade all the features of the top performer industry comes to the industry which implements TQM.

Figure 3.6: Critical Success Factors of TQM Implementation (Salaheldin, 2009)

3.1.7 Singh (2011) Model

Singh (2011) has come out with 11 factor CSF model for TQM implementation in SMEs (Fig 3.7). He takes the view of Gotzamani et al. (2006), and claims that TQM elements are directly related to final product quality and customer satisfaction. So, based on the literature and expert opinion he has identified those factors (Table 3.2).

Table 3.2
(Critical Success Factors for TQM Implementation (Singh, 2011)

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<th>Sl. No.</th>
<th>Critical Success Factors for TQM Implementation</th>
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<td>2.</td>
<td>Employee training</td>
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<td>4.</td>
<td>Coordination between Departments</td>
<td>Coyle-Shapiro (1997)</td>
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Singh (2011) initially conducted a meta-analysis of literature to identify the CSFs and used Interpretive Structural Modelling (ISM) technique to develop the structural framework. This method is particularly useful to determine the levels for different factors in the framework. ISM is basically an interactive learning process. ISM
helps to identify levels for variables and structural relationships among elements of the system (Sage, 1977).

Through ISM, Singh (2011) could arrive at a relationship between all the 11 CSF and depicted the nature of flow between different factors of quality management that leads to improved product quality and finally satisfied customers (figure 3.8).

![Interpretive Structural Modeling-based Model for Total Quality Management (Singh, 2011)](image)

3.1.8 Khanna et al., (2011) Model

Khanna et al., (2011) used the following three bases for defining the CSFs in their exploratory research:
1. CSFs are the limited number of areas in which satisfactory results will ensure competitive performance for the organization Rockart (1979).

2. CSFs are those few things that must go well to ensure success Boynton and Zmud (1984), and

3. CSFs are the essential things that must be achieved by the company or which areas will produce the greatest "competitive leverage" Brotherton and Shaw (1996).

In accordance to the above, Khanna et al., (2011) have arrived at 10 CSFs which include: Top management leadership, Role of quality department, Training, Quality information system and use of IT, Product design, Quality citizenship, Customer focus, Process management, Supplier’s quality management, Human resources management (Figure 3.9). The model was based on the meta-analysis of literature on TQM implementation frameworks.

![Critical Success Factors of TQM Implementation (Khanna et al., 2011)]](image)

3.2 The proposed structural CSFs of TQM implementation Model

Most of the models discussed above are the models of CSFs of manufacturing and cannot be applied directly for construction industry. There are a few models developed for construction industry, but again, as discussed earlier in this chapter
each one is unique. So, it is very much essential to consider the most relevant CSFs in this exploratory research and identifying the CSFs in Indian construction industry is one of the objectives set for this research.

The focus is to rank order the CSFs after the identification of the most critical factors using the technique called TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) (Khanna et al., 2011), which is widely used in ranking the dimensions in management studies. Multiple criteria decision making (MCDM) is a very powerful tool widely used for dealing with unstructured problems containing multiple and potentially conflicting objectives (Lee and Eom, 1990) and one of the methods adopted in MCDM is TOPSIS. Analytic Hierarchy Process (AHP) has been used to prioritize the relative importance of these CSFs.

Among the eight models, TOPSIS and AHP indicate that the dimensions: Customer management, Top management leadership, People management, Organizational learning, and Process management clearly emerge out as the acceptable dimensions of study (Table 3.3). So, among the remaining dimensions namely: Continual improvement, Quality information management, Supplier management, Strategic planning, Role of quality department, Product/service design a further analysis of CSFs based on their relevance to construction industry was undertaken.

During the meta-analysis of literature the CSF ‘continuous improvement’ or also called ‘continual improvement’ cannot be eliminated as one of the primary tools of TQM as recommended by a group of researchers is this dimension. Pheng and Wei (1996) state in the construction project implementation guidelines that one among the eight key criteria is continuous improvement. According to Spires (1996), there is a clear trend towards customers demanding industry specialised systems, further, the pressures and influences on suppliers to accommodate this demand are vast, but unless a supplier is of sufficient size to afford the ‘continual improvement’ required for product development, they will struggle to achieve profitability and long-term stability becomes less likely. In the Whiteman and Haupt (2004) (section 3.1.5) model developed for construction industry, again continuous improvement
## Table 3.3
(Critical Success Factors of TQM Implementation by TOPSIS)

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<tr>
<th>Author</th>
<th>*Critical success factors</th>
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<td><strong>1. MBNQA Lam et al., (2012)</strong></td>
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<td><strong>2. Deming award Metri, (2005)</strong></td>
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<td><strong>3. EFQM, Metri, (2005)</strong></td>
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<td><strong>5. Whiteman and Haupt (2004)</strong></td>
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<td><strong>6. Salaheldin (2009)</strong></td>
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<td><strong>7. Singh (2011)</strong></td>
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*CSFs

1. Customer management
2. Top management leadership
3. People management
4. Organizational learning
5. Process management
6. Continual improvement
7. Quality information management
8. Supplier management
9. Strategic planning
10. Role of quality department
(11) Product/service design

(12) Business/quality results

(13) Benchmarking;

(14) Quality citizenship; and

(15) Quality culture.

is one of the nine CSFs. In construction industry there are numerous operation management processes and (Fassoula, 2006), through their research have found that firms seek to adopt and implement a set of operations management practices that have been successful elsewhere and that will help them to identify changes in their environment and to respond proactively through continuous improvement. According to Yang (2005), TQM is an integrated management philosophy and a set of practices that emphasizes ‘continuous improvement’, meeting customers’ requirements, reducing rework, long-range thinking, increased employee involvement and teamwork, process redesign, competitive benchmarking, team-based problem solving, constant measurement of results and closer relationships with suppliers. According to Rampersad (2001), to realize customer satisfaction, everyone within the organization should consider ‘continuous improvement’ as something normal. Fryer et al., (2007) through their thorough literature review conducted on the critical success factors (CSFs) for ‘continuous improvement’ suggested that it is different among manufacturing, service and public organizations but important. Khanna et al., (2011) claim that the focus of HRM is on enabling employees to contribute meaningfully to the quality of processes and their ‘continuous improvement’. So, as this is relatively an important dimension contributing to the success of TQM implementation this is included in the current study.

Among the remaining contenders for CSFs: quality information management, supplier management, strategic planning, sole of quality department, product/service design the law of optimum utilization and importance was adopted. The quality management philosophy was in existence even before IT revolution and quality information management was not a very popular CSF those days. Wilkinson (1992), declared strategic planning, process management and information analysis as ‘hard’ elements of TQM in the MBNQA context. Lam et al., (2012) opine that in the implementation of both TQM practices and marketing orientation activities require
close co-ordination among departments in the company in collecting data or 'information' for the purpose of satisfying customer values and expectations. Furthermore, information analysis and customer focus were identified to have direct effect on quality (Lam et al., 2012; Ooi et al., 2011, and Samat et al., 2006). Lakhe and Mohanty (1994) discussed a case of a TQM implementation in India and the analysis of their case study demonstrated the major obstacles in implementing TQM, specifically in developing nations was inadequate 'knowledge and information' about TQM. So, Quality information management also needs to be added in Indian construction industry context.

Finally, supplier forms the important link in the construction industry as it comprises a number of disintegrated suppliers connected to each other in a sequential manner. Today, supply chain management has emerged as one of the key driver of quality goods and services in the globalized market. Harrington et al., (2012) through their extensive research on TQM implementation in construction industry claim that regarding TQM as an internal process if fails to involve suppliers, subcontractors, and others in the process chain, then it creates a major difficulty in implementing TQM. TQM recognizes that the quality of any stage in a process is dependent on the quality of the previous stage. For example, carpenters frequently complain that they must adapt to work done by electricians or plumbers. There must be careful identification of requirements and respect for each other's valid needs. Thus, TQM pays attention to the suppliers or vendors of both labour and materials. Maintaining close and long-term relationships with supplier's results in achieving the best economy and quality. Having close working relationships with a small number of supplier's means that each supplier can be given larger orders, which helps win their loyalty. Conducting frequent and routine visits and other communications can help to enhance the relationship between the supplier and the organization. Maintaining a close relationship and open communication with the suppliers help them to have a good understanding and a feel for their customers' requirements. This can result in better products satisfying the needs of the organization. Deming has emphasized the importance of maintaining special relations with suppliers (Harrington et al., 2012).

Hence, the proposed research structural model that emerges out at the end of the analysis has eight CSFs which are called 'critical factors' for TQM implementation in Indian construction industry in this research comprise: Customer
management, Top management leadership, People management, Organizational learning, Process management, Continual improvement, Quality information management, and Supplier management (figure 3.10).

![Diagram of TQM Implementation Model](image)

**Figure 3.10: The Proposed Critical Success Factors of TQM Implementation Model**

### 3.3 Performance Measurement Model of TQM

In most general terms, performance is defined as the degree to which an operation fulfils the performance objectives – primary measures – in order to meet the needs of the customers – secondary measures (Slack et al., 2001). Performance measurement is a critical factor for the effective management. This may stem back from the fact that without measuring something, it is difficult to improve it. Therefore, improving the organizational performance requires identifying and measuring the impact of TQM practices on it (Demirbag et al., 2006; Koh et al., 2007).

Several empirical studies have been conducted to establish the link between TQM practices and organizational performance (e.g. Sterman et al., 1997; Choi and Eboch, 1998; Easton and Jarrell, 1998; Samson and Terziovski, 1999; Brah et al., 2002; Brah and Lim, 2006; Demirbag et al., 2006; Feng et al., 2006). The results of these studies indicated that there are various measures, i.e. Organizational performance, Corporate performance, Business performance, Operational performance, Financial and non-financial performance, Innovation performance, and Quality performance. Ramamurthy (1995); Beaumont et al. (2002); Brah et al.

Nutt and McLennan (2000) claim that the first step towards improvement is performance measurement since it will give direction or evidence of the improvement progress. The Office of Government Commerce (2011) of the UK suggested that measuring efficiency, effectiveness and performance allows organisations to benchmark property against industry best practice, informing strategic decisions about buildings and their impact on delivery. Several frameworks have been developed for measuring performance over the years. Until 1980, the performance measurement was based on mostly financial measures (Parida and Kumar, 2006). According to Kaplan and Norton (1992), the approach at that time looks at the four perspectives that focus on financial aspects, customers, internal processes and innovation, and learning. Subsequently, various researchers have developed frameworks considering non-financial measurements and intangible assets to achieve competitive advantages.

Major issues related to this field concerns what to measure and how to measure it in and cost-effective way (Neely et al., 1995). The measurement of performance has also become an essential requirement for the industry today (Parida and Kumar, 2006). An important objective of the measurement system is also to bridge the gap and establish the relationship between the internal measures that may be seen as the causes and the external measures as the effects (Jonsson and Lesshammar, 1999). The efficiency, effectiveness and performance measurement systems play a pivotal role in the organisations’ success and business sustainability (Myeda, 2011). Therefore, the system’s performance needs to be measured using a well thought out performance measurement system.

Atkinson et al. (1997) state that performance measurement serves three basic functions: to co-ordinate, to monitor and to diagnose and these functions, if implemented and used properly, performance measurement can actually change the lives of people and effectiveness of organisations. Similarly, Cupello (1994) looks at performance hierarchies for different performance measures and provides four reasons why organisations need to conduct measurement; for planning, screening, control and diagnosing. In keeping with this, Rummler and Brache (1995) affirm that three significant levels of performance are the organisation, process and
job/performer. However, Pintelon et al. (2006) argue that maintenance performance will depend on the perspective applied. In the case of construction industries, accountants will think of operations in terms of costs, top management is often only interested in budget performance, engineers will focus on techniques, and builders will see performance in terms of equipment availability and support responsiveness. Tucker and Pitt (2010) show that performance management and measurement systems should balance the quantitative and the qualitative methods in order to gain an idea of customer satisfaction. The performance measurement needs to be aligned to organisational strategy (Kaplan and Norton, 2001; Eccles, 1991; Murty et al., 2002; Parida and Kumar, 2006). The important aspects in designing the framework of a performance measurement system in construction industry are the goals, design and management.

Organisations need such a framework of performance acting in line with TQM to align system with the corporate strategic goals of the company by setting objectives and defining key performance at each level. White (1996) points out that performance measurement system should include subjective measures as well as objective measures whereby objective measures are addressed to have the advantage of not being biased by whoever is providing the opinion. Conversely, subjective measures provide a wealth and variety, which is not obtainable from objective measures alone. Sinclair and Zairi (1996) highlight the need to involve employees in the development of performance measurement. Employees are the individuals who operate the processes and who know the task best and thus, getting them involved will not only result in commitment toward efficient performance measurement but also influence the actual performance too. The literature suggests that an effective performance measurement system should be able to recognise different performance hierarchies and multiple dimensions of performance measures, relate the measures to the relevant goals and link them to strategy, address cross-functional issues, involve subjective measures as well as objective ones, involve employees to ensure that it gets their support and finally, it presents a balanced view of the system.

**Performance indicators**

An indicator is a product of several metrics or measures. A performance indicator is a measure capable of generating a quantified value to indicate the level of
performance taking into account single or multiple aspects (Parida and Kumar, 2006). Performance indicators are utilised to evaluate the efficiency and effectiveness of any process carried out (Wireman, 1998). Performance indicators could be used for financial reports, for monitoring the performance of employees, customer satisfaction, the health safety environment rating and overall equipment effectiveness as well as many other applications. If performance indicators are identified properly then it can provide or identify resource allocation and control, problem areas, the contribution, benchmarking, personnel performance and the contribution to maintenance and overall business objectives (Kumar and Ellingsen, 2000).

Campbell (1995) states that there are three performance measurement indicators suitable to be applied as equipment, cost and process. Coetzee (1998) also agrees that machine or facility maintenance is among other factors like task, organisational and profit or cost that should be measured with focus on the efficiency level of each subject. He also suggests the use of performance ratios that are parallel to the performance parameters defined which include availability, mean time to failure, manpower utilisation and overall maintenance cost effectiveness. Although the measures form a balanced view of the maintenance system, they are yet limited to operational and tactical aspects. The measures appeal to different performance hierarchies but it is very difficult to identify the specific hierarchies to which they belong. They are also numeric and hard measures with no clear connections to the corporate strategy. Kutucuoglu et al. (2001) and Wordsworth (2001) agree on the indicator for performance which comprises of the performance of aspects which are related to equipment, task, cost, immediate customer impact and also learning and growth. However, Cupello (1994) states that the indicators divided into two aspects that are the satisfaction factors from customer and employee and also the performance of project and suppliers. Brown et al. (1994) suggests three similar factors with Cupello (1994) while adding that financial, product/service quality and public responsibility are also significant measures to assess the performance level of maintenance management.

While Kaplan and Norton (1992) advocate different perspective on measuring performance level in which they classify the properties into tangible aspect as financial and intangible aspects like customers, internal processes and innovation and
learning. Baharum et al. (2006) from his service quality framework differently proposes three different aspects for instance functional which focuses on the service quality, technical aspect on the property quality and also image aspect also from property quality. So, ultimately all the above indicators of performance can be broadly categorised in to Operational performance and Organizational performance factors in the context of construction industry (figure 3.11). Performance measures that have been suggested by (Ramamurthy, 1995; Beaumont et al., 2002; Brah et al., 2002; Demirbag et al., 2006; Sila, 2007) are used to develop the structural model of performance in this research.

Figure 3.11: Indicators of the Construction Industry Performance
3.3.1 Operational Performance
Operational performance reflects the performance of internal operation of the company in terms of cost and waste reduction, improving the quality of products, improving flexibility, improving delivery performance and productivity improvement (Salaheldin, 2009). They are considered as primary measures because they follow directly from the actions taken during the implementation of TQM. In the context of construction industry operational measures will be primary measure of performance. It is primary measure because, all the operations involved in construction industry say building construction, such as: foundation laying, brickwork, roofing, windows and frames creation/erection, plumbing, plaster and electrics, painting, aesthetics, cleanout, etc. are the basic necessities for the performance of the project. So, they come under primary operations, which are basically operational activities. After the meta-analysis of the literature and discussion with the knowledge workers in the construction industries in India, following indicators are selected for the measurement of Operational performance: Cost reduction, Waste reduction, Improving the quality of products, Improving flexibility, and Improving delivery performance.

3.3.2 Organizational Performance
This forms the secondary measure of performance because they are a consequence of TQM implementations.

3.3.2.1. Financial Performance
This measure of performance is directly in terms of financial measures. It basically gives the financial health of the organization. Organizational performance is measured by financial measures are: Revenue growth, Net profits, Profit to revenue ratio, and Return on assets (Salaheldin, 2009).

3.3.2.2. Non-financial Performance
These measures are not directly in terms of financial figures but are still results of TQM implementation. They will add value to the construction industry and ensure growth and success of the industry. Non-financial measures are: Investments in
3.4 The relationship between the TQM CSFs and Performance in Construction Industry

TQM practices and performance have been positively related though empirical evidence in many manufacturing firms. But there has been no much of study exploring the relationship between CSFs, Operational performance and Organizational performance which are very much required in construction industry as operational performance can be intervening or mediating variable between CSF and organizational performance. Even though ultimate goal is to achieve organizational performance, it may not be able to obtain this without operational efficiency as construction industry is operation intensive. So, this research focuses on studying the influence of CSFs on organizational performance in the first stage. In the second stage the CSFs are divided into Strategic, Tactical and Operational factors and the relationship of each of these on organizational performance is studied with operational variable as both intervening and mediating variable.

3.4.1 Structural Model A: Influence of individual TQM CSFs on Organizational Performance in Construction Industry

Researchers have been always interested in finding the relation between TQM and Performance (Motwani, 2001; Montes et al., 2003; Brah and Lim, 2006; Demirbag et al., 2006; Kapuge and Smith, 2007; Sila, 2007). So, in the context of Indian construction industries a similar study would bring out a clear outcome on whether TQM is bringing the expected results. In the first stage the research model for this study is shown in figure 3.12. The eight CSFs which influence the TQM implementation have been identified as: Customer management, Top management leadership, People management, Organizational learning, Process management, Continual improvement, Quality information management, and Supplier management.
Figure 3.12: Research Model for Studying the Influence of CSFs on Organizational Performance (Model A)
3.4.2 Structural Model B: Influence of CSFs on Operational and Organizational Performance in Construction Industry

Critical Factors

- Customer management
- Top management leadership
- People management
- Organizational learning
- Process management
- Continual improvement
- Quality information management
- Supplier management

Operational Performance

- HB17 to 24

Organizational Performance

- HB25, HB26

- Financial Performance
- Non-financial Performance

Figure 3.13: Research Model for Studying the Influence of CSFs on Operational and Organizational Performance (Model B)
In the second stage of research model (Figure 3.13), the influence of CSFs on Operational and Organizational performance is studied. Hypotheses HB1 to HB16 test significance of relationship between CSFs to Financial and Non-financial performance (Organizational performance), HB17 to HB24 test the significance of relationship between CSFs to Operational performance and HB25 and HB26 test significance of relationship between Operational performance and Financial and Non-financial performance (Organizational performance).

3.4.3 Structural Model C: Influence of Strategic, Tactical, and Operational factors on Operational and Organisational Performance in Construction Industry

In the third stage of research CSFs are categorised into Strategic, Tactical, and Operational factors which would be a better measures in the component form of CSFs Salaheldin (2009). Salaheldin had reduced 24 CSFs into three fundamental factors through Principal Component Analysis with Varimax rotation. These three factors had about 20 to 30% variance on his analysis. The influence of each of CSFs these three factors on Operational and Organizational performance would be of interest in this exploratory research as it would lead to some key revelations regarding performance of the construction industry.

The current study makes an attempt to operationalize the CSFs, not only in terms of the importance of each factor (structural model A), but also in terms of relative importance that is given to each factor (structural model B). In this way, those factors can be classified as Strategic factors. They are broad in nature and impact the long-term effectiveness of the company (Davis et al., 2003), and also they require a significant change in the manner in which the business is conducted (Turban et al., 1999). Moreover, they are dominant factors which play a significant role in the successful implementation of TQM practices. Those factors include; Top management commitment, Organizational culture, Leadership, Continuous improvement, Quality goals and policy, Resources value addition process and Benchmarking. After the meta-analysis of literature and structured discussion with the knowledge workers in the industries Top management leadership and Continual improvement were taken as the indicators of Strategic factor in this research.
The second group of factors are classified as Tactical factors. They are of less criticality than strategic factors of TQM implementation. However, these factors are significant to support the latter. More importantly, they impact the methods and actions that help accomplish the expected benefits of TQM implementation. In other words, they affect the decisions that are made by middle management (Turban et al., 1999). Those factors include employee empowerment, employee involvement, employee training, team building and problem solving, use of information technology to collect and analyze quality data, supplier quality, supplier relationships, integration with other systems and assessment of performance of suppliers. After the meta-analysis of literature and structured discussion with the knowledge workers in the industries, People management, Organizational learning, and Quality information management were taken as the indicators of Tactical factor in this research.

At the other end of the list, i.e. the least important or less critical factors are classified as Operational factors. They reflect those factors which produce consequences that will be visible in a short term period. Those factors include product and Service design, Process control, Management of customer relationships, Customer orientation, Customer and market knowledge, Realistic TQM implementation schedule, Resources conservation and utilization, Inspection and checking work and enterprise performance metrics for TQM. After the meta-analysis of literature and structured discussion with the knowledge workers in the industries Supplier management, Customer management, and Process management were taken as the indicators of Operational factors in this research. The research structural model is given in figure 3.14.

Figure 3.14: Research Model for Studying the Influence of CSFs on Operational & Organizational Performance (Model C)
3.5 Hypothesis Formulation

The model tests basically five types of hypotheses, in an attempt to answer the research questions (Chapter 1):

1. The effect of each TQM CSFs on Organizational performance.

2. The effects of the TQM CSFs on the Operational performance (primary measures) & Organizational performance (Secondary measures) and Primary to Secondary measures.

3. The effects of the TQM CSFs on the Operational performance (primary measures).

4. The relationship between the TQM CSFs and the Organizational performance (secondary measures).

5. The impact of the primary measures (as expressed by the Operational performance) on the secondary measures (as expressed by the Organizational performance).

3.5.1 The effect of each TQM CSFs on Organizational performance

Financial aspects of organizational performance:

HA_{1a}: Customer management has significant influence on Financial performance.

HA_{10}: Customer management has no significant influence on Financial performance.

HA_{2a}: Top management leadership has significant influence on Financial performance.

HA_{20}: Top management leadership has no significant influence on Financial performance.

HA_{3a}: People management has significant influence on Financial performance.

HA_{30}: People management has no significant influence on Financial performance.

HA_{4a}: Organizational learning has significant influence on Financial performance.

HA_{40}: Organizational learning has no significant influence on Financial performance.

HA_{5a}: Process management has significant influence on Financial performance.

HA_{50}: Process management has no significant influence on Financial performance.

HA_{6a}: Continual improvement has significant influence on Financial performance.
HA60: Continual improvement has no significant influence on Financial performance.

HA7a: Quality information management has significant influence on Financial performance.

HA7b: Quality information management has no significant influence on Financial performance.

HA8a: Supplier management has significant influence on Financial performance.

HA8b: Supplier management has no significant influence on Financial performance.

Non-financial aspects of organizational performance:

HB1a: Customer management has significant influence on Non-financial performance.

HB1b: Customer management has no significant influence on Non-financial performance.

HB2a: Top management leadership has significant influence on Non-financial performance.

HB2b: Top management leadership has no significant influence on Non-financial performance.

HB3a: People management has significant influence on Non-financial performance.

HB3b: People management has no significant influence on Non-financial performance.

HB4a: Organizational learning has significant influence on Non-financial performance.

HB4b: Organizational learning has no significant influence on Non-financial performance.

HB5a: Process management has significant influence on Non-financial performance.

HB5b: Process management has no significant influence on Non-financial performance.

HB6a: Continual improvement has significant influence on Non-financial performance.

HB6b: Continual improvement has no significant influence on Non-financial performance.
HB_7a: Quality information management has significant influence on Non-financial performance.
HB_7b: Quality information management has no significant influence on Non-financial performance.
HB_8a: Supplier management has significant influence on Non-financial performance.
HB_8b: Supplier management has no significant influence on Non-financial performance.

3.5.2 The effects of the TQM CSFs on the Operational performance (primary measures) & Organizational performance (secondary measures) and Primary to Secondary Measures

Same as above with an additional set of two hypotheses to test relationship between Primary and Secondary measures (HB1 to HB26).

3.5.3 The effects of the TQM CSFs on the Operational performance (primary measures)

HC_1a: Strategic factor has significant influence on Operational performance.
HC_1b: Strategic factor has no significant influence on Operational performance.
HC_2a: Tactical factor has significant influence on Operational performance.
HC_2b: Tactical factor has no significant influence on Operational performance.
HC_3a: Operational factor has significant influence on Operational performance.
HC_3b: Operational factor has no significant influence on Operational performance.

3.5.4 The relationship between the TQM CSFs and the Organizational performance (secondary measures).

HC_4a: Strategic factor has significant influence on Financial performance.
HC_4b: Strategic factor has no significant influence on Financial performance.
HC_5a: Strategic factor has significant influence on Non-financial performance.
HC_5b: Strategic factor has no significant influence on Non-financial performance.
HC_6a: Tactical factor has significant influence on Financial performance.
HC60: Tactical factor has no significant influence on Financial performance.
HC74: Tactical factor has significant influence on Non-financial performance.
HC79: Tactical factor has no significant influence on Non-financial performance.
HC86: Operational factor has significant influence on Financial performance.
HC86: Operational factor has no significant influence on Financial performance.
HC98: Operational factor has significant influence on Non-financial performance.
HC98: Operational factor has no significant influence on Non-financial performance.

3.5.5 The impact of the primary measures (as expressed by the operational performance) on the secondary measures (as expressed by the organizational performance)

HC10a: Operational performance has significant influence on Financial performance.
HC10a: Operational performance has no significant influence on Financial performance.
HC11a: Operational performance has significant influence on Non-financial performance.
HC11a: Operational performance has no significant influence on Non-financial performance.

3.6 Summary
In this chapter all the important models of CSFs of TQM implementation as applicable to construction industry are discussed in detail. The conceptual background of each of the model and the indicators of CSFs as defined by the respective researcher are highlighted and depicted in the form of structural model. Rationalising on these models and applying the theory of TOPSIS and AHP the most appropriate CSFs for TQM implementation in Indian construction industries are identified and the structural model is developed. The meta-analysis of literature necessitates the testing of hypotheses in three stages, and accordingly, three separate structural models named A, B and C are developed. The structural model A tests the relationship of each of the CSFs on Organizational performance. The structural model B Tests the relationships between the eight CSFs and Organizational
performance when Operational performance is introduced to be the intermediate or intervening variable. In the structural model C the eight CSFs identified in this research are categorized into Strategic, Tactical and Operational factors so that their individual influence can be determined on Operational and Organizational performance.