A STUDY ON COMPETENCY MAPPING FOR CIVIL ENGINEERING
CONTRACTORS AT SALEM DISTRICT

CHAPTER I
1.1 INTRODUCTION TO THE STUDY

At the heart of any successful activity lies a competence or skill. In today’s competitive world it is becoming particularly important to build on the competitive activities of business. The competency approach to human resources management is not new. The early Romans practiced a form of competency profiling that attempts to detail the attributes of a “good Roman soldier”. The introduction of competency based approaches within the corporate environment initiated around 1970 and their development and use since then has been rapid. The distinguished Harvard’s psychologist, David McClelland is credited with introducing the idea of “competency” into the human resource literature; in his efforts to assist the United States Information Agency, to improve its selection procedures. The latter argued that traditional intelligence tests, as well as proxies such as scholastic grades, failed to predict job performance. McClelland’s counter argument to the growing dissatisfaction with the intelligence testing and the traditional job analytic approaches to personnel selection, was the proposal to test for competency.

Throughout the years competency based approaches have proved to be a critical tool in many organizational functions, such as workforce and succession planning and performance appraisal. The main reasons for selecting these approaches are as follows:
* They can provide identification of the skills, knowledge, behaviors and capabilities needed to meet current and future personnel selection needs, in alignment with the differentiations in strategies and organizational priorities.

* They can focus the individual and group development plans to eliminate the gap between the competencies requested by a project, job role, or enterprise strategy and those available.

**Definition of competency:**

A specific, identifiable, definable, measurable knowledge, skill, ability and/or other deployment-related characteristic (e.g. attitude, behaviour, physical ability) which a human resource may possess and which is necessary for or material to, the performance of an activity within a specific business context.

Construction industry makes a significant contribution to the national economy and provides employment to large a number of people. The use of various new technologies and deployment of project management strategies have made it possible to undertake projects of mega scale. In its path of advancement, the industry has to overcome a number of challenges.

The construction industry sets in motion the process of economical growth in the country; investment in this sector contributes to 6.5% of Gross Domestic Product (GDP). Every Re.1 investment in the construction industry causes an Rs.0.80 increment in GDP as against Rs.0.20 and Rs.0.14 in the fields of agriculture and manufacturing industry, respectively. Statistics over the period have shown that compared to the other sectors, this sector of economic activity generally creates 4.7 times increase in incomes and 7.76 times
increase in employment generation potentiality. Sustained efforts by the Indian construction industry and the Planning Commission have led to assigning the industry status to construction today. This means formal planning and financial planning will be the obvious destination of the construction sector in the country, with over 3.1 crore persons employed in it.

This study contributes to the competencies required for superior performance in the construction industry.

1.2. Need for the study

Construction sector contributes a huge chunk to the world GDP amounting to 1/10th of the same. More than 7% of the total workforce of the country is employed and this is the second largest sector in India after the agricultural sector. India has a large growing middle class population of 300 million people, out of which a large section is in need of new houses. It is estimated that there is a national housing storage of 41 million units. The construction sector is undergoing dramatic changes- with 60 storeyed sky scrapers being built in the cities like Mumbai, and thousands of kilometers of expressways and highways being laid across the sub continent. This sector paves the way for an exciting future.

The success of every civil engineering contractor depends upon the individual skill possessed by him. This study tries to find out what are the competencies ruled for an individual to be a successful Civil Engineering contractor and identify the gap between the present skill and the required future skills. The key to achieving business growth and success is having a workforce with the capacity to continually learn, update their knowledge, and hone their skills in today’s rapidly changing environment."
1.3 Statement of problem

The construction industry is the second largest industry of the country after agriculture. With the present emphasis on creating physical infrastructure, massive investment is planned in this sector. The Planning Commission has estimated that investment requirement in infrastructure to the tune of about ₹14,50,000 crore or US$320 billion during the 11th Five Year Plan period. However, the industry is still faced with some major challenges, including housing, disaster resistant construction, water management and mass transportation. Recent experiences of several new mega-projects are clear indicators that the industry is poised for a bright future. It is the second homecoming of the Civil Engineering contractors to the forefront amongst all the professions in the country. The construction industry everywhere faces problems and challenges. However, in developing countries like India, these difficulties and challenges are present alongside a general situation of socio-economic stress, chronic resource shortages, institutional weaknesses and a general inability to deal with the key issues. There is also evidence that the problems have become greater in extent and severity in the recent years.

Construction projects are of high risk. They present enormous fiscal requirements and unusual logistical challenges for the companies constructing new office buildings, plants or production facilities.

Construction contractors are under constant pressure to improve margins, reduce costs and improve predictability. Developing long-term relationships with the strategic suppliers is the key part of delivering this strategy. This involves construction companies motivating their contractors to be pro-active, develop new approaches, solutions and work
with them to reduce risk. Based on the above issues the following questions are probed in the present study.

1. What are the competencies required for the people in construction industry?
2. Is there any relationship between socio-economic characteristics of Civil Engineering contractors and the competencies possessed by them?
3. To what extent the Civil Engineering contractors and their competencies are correlated?
4. In what way the educational backgrounds help the Civil Engineering contractors to perform well?
5. Which is the competency map that can be used to excel in the industry?
6. What are all the factors that highly differentiate the outstanding performer and the average performer?

1.4 Objectives of the study

1. To identify the core competencies required for the Civil Engineering contractors.
2. To measure the relationship existing between the socio economic characteristics of the Civil Engineering contractors and the competencies possessed by them.
3. To measure the relationship existing between the competencies possessed by the Civil Engineering contractors and their performance.
4. To know the impact of educational background in their performance.
5. To suggest a suitable competency map for better ways and means to excel in the construction industry.
6. To identify the gap exists between the average and the outstanding performers prevailing in construction the industry.
1.5 METHODOLOGY

The validity of any research depends on the systematic method of collecting the data, and analyzing the same in a sequential order. In the present study, both the primary and secondary data are used extensively.

Population and Sample:

The population for this study includes the contractors, the promoters, the architects and the builders. Current interest in behavioral competencies can be traced back to Mcclands influential paper, “Testing for competence rather than intelligent”. In this tradition, a competency has been defined as “An underlying characteristic of a person which results in effective and a superior performance in a job.”

The research typically aims to identify specific behavior exhibited by more effective and less effective individuals. The research mainly identified these behaviors through a detailed interviewing process, known as the behavioral event interview (BEI) which is based on Flanagans critical incident technique. In the interviews, detailed examples are gathered of how contractors have behaved in certain situations, what they have said, what they have done, what they have thought and how they had felt? The interviews are then coded and key competencies common to a number of successful situations are identified.

Often the list of competencies produced by this method is along one and for obvious operational reasons it is customary to group them into logical clusters. These groups are given names that indicate the common theme in the competencies. In each BEI interview the respondents were asked to rate the level of importance of each competency tested on the survey using a five point scale ranging from vital important to just relevant.
The respondents were chosen from the entire Salem district. The selection of respondents is made by taking in the members titled in Salem Civil Engineers’ Association and Federation of Civil Engineering Contractors’ Association Tamil Nadu (FACEAT). The respondents are selected on a simple random basis from the above specific source.

1.6 SAMPLING DESIGN

For collecting the primary data, field survey technique is employed in the study. First-hand information pertaining to get different skills relating to today’s construction industry trends, problems encountered in the construction, behavior and attitude towards the problematic area, interpersonal skills and other problems faced by the Civil Engineering contractors are collected from three hundred sample respondents. The respondents are selected on a simple random basis from the above specified source.

The geographical distribution of the sample respondents is exhibited in Table No. 1.

**Table No. 1. GEOGRAPHICAL DISTRIBUTION OF RESPONDENTS IN THE STUDY AREA**

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>NAME OF THE AREA (BLOCK)</th>
<th>TOTAL</th>
<th>REGION</th>
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<tbody>
<tr>
<td>1</td>
<td>Attur</td>
<td>75</td>
<td>I</td>
</tr>
<tr>
<td>2</td>
<td>Mettur</td>
<td>75</td>
<td>II</td>
</tr>
<tr>
<td>3</td>
<td>Salem</td>
<td>75</td>
<td>III</td>
</tr>
<tr>
<td>4</td>
<td>Sankari</td>
<td>75</td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>300</strong></td>
<td></td>
</tr>
</tbody>
</table>
1.7 DATA COLLECTION

Primary Data

In order to fulfill the objectives set, a sample study is undertaken by using a well-structured questionnaire, duly filled by the respondents. Respondents with varying background are selected based on the important aspects of their education, age, area etc. They are all situated throughout the Salem district. The specimen of the questionnaire given to the selected sample respondents is shown in the Appendix section of this thesis.

Secondary Data

The primary data are supplemented by a spate of secondary sources of data. The secondary data pertaining to the study is gathered from the records of Salem Civil Engineer’s Association (SCEA) and Federation of all Civil Engineers Association Tamil Nadu, (FACEAT). The contractor’s who do not have any educational qualification related to Civil engineering are also included in the study. Latest information about this industry is gathered from well equipped libraries of Bangalore, Coimbatore and Chennai. Internet Web resources are also used.

Discussions and Informal Interviews

In order to know the general working pattern of the contractors, several rounds of discussion are held with the contractors in this field, specifically with the President of Salem Civil Engineers’ Association, Salem, and The president of Federation of all Civil Engineers’ Association Tamil Nadu, (FACEAT). The discussion is presented and streamlined with the help of the Research Supervisor.

Tools of Data Collection

By virtue of a mass of data obtained from the research survey, as well as the data collected from the secondary sources, descriptive and analytical research is considered the most appropriate one for the study. The research problems and the questionnaire are all framed accordingly. The suggestion offered in the final chapter of the present research report has emerged from the inferences drawn from the study of the sample respondents (Civil Engineering contractors). The researcher has used both open-ended and closed-ended questions in the questionnaire to collect primary data.

Construction of Questionnaire

The researcher typically aimed to identify specific competency exhibited by more effective and less effective individuals. The Researcher has mainly identified these competencies through a detailed interviewing process, known as the Behavioral Event Interview (BEI). In the interview detailed examples are gathered regarding how the contractors have behaved in certain situations. The interviews are coded and key competencies common to successful situations are identified.
Often the list of competencies produced by this method is a long one and for operational reasons it is customized to group them into logical clusters.

Using the cluster, the questionnaire is framed and a pilot study is conducted among the leading Civil Engineering contractors. The questionnaire so drafted is checked by the research supervisor. Then, it is issued to a few large-scale builders, medium and petty contractors for a critical view with regard to wording, format, sequence and the like. The questionnaire is re-drafted in the light of their comments.

Pre-test

The questionnaire meant for the respondents is pre-tested with twenty-five respondents who included both registered and unregistered Civil Engineering contractors. After pre-testing, necessary modifications are made in the questionnaire to fit in the same on the track of the present study.

Frame Work of Analysis

The core of the study being “Competency Mapping for the Civil Engineering contractors”, the study centers around the dependent variables viz., the level of contractors performance in the industry and their relationship with the related independent variables.

Approach to the Extent of competency

The difference in the competency among the different types of contractors is based on their age, educational qualifications, experience, total number of employees, generation, number of hours they spent on work. These factors are studied by means of Two-Way tables, Percentages, Averages, Ranges and Standard Deviation.
Chi-Square Test

The degree of influence of the independent variables pertaining to the superior performance in the industry is listed.

(i) Respondents’ Age
(ii) Respondents’ Education
(iii) Respondents’ Experience
(iv) Respondents’ Generation in this field
(v) Number of Employees working under the contractor
(vi) Competency possessed by the Civil Engineering contractors
(vii) Meta qualities

In order to identify the competencies required by a successful performer, Chi-square (χ²) test is used and the formula applied is given below.

\[ \chi^2 = \sum \frac{(O-E)^2}{E} \]

with Degree of Freedom (D.F.) = (c-1) (r-1) where,

\( O = \) Observed frequency,
\( E = \) Expected frequency,
\( c = \) Number of Columns,
\( r = \) Number of Rows.
**Friedman’s Non parametric Test** : The Friedman test is a non-parametric alternative to the repeated measures analysis of variance. To identify the factor which is more influencing the respondent towards attitude the Friedman’s test analysis is used

\[
G = \frac{12}{nK(K+1)} \sum R_j^2 - 3n(K+1)
\]

**Multiple Regression Analysis**

The regression is a statistical relationship between two or more variables. When there are two or more independent variables, the analysis that describes such relationship is the multiple regression. This analysis is adopted where there is one dependent variable that is presumed to be a functionary of two or more independent variables. The linear multiple regression problem is to estimate coefficients \( \beta_1, \beta_2, \ldots, \beta_j \) and \( \beta_0 \) such that the expression,

\[
Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_j X_K
\]

provides a good estimate of an individual \( Y \) score based on the \( X \) scores,

Where,

\[
Y = \text{Competencies required for the superior performer}
\]

\[
X_1 = \text{Vision and Purpose}
\]

\[
X_2 = \text{Developing workers}
\]

\[
X_3 = \text{Values and ethics}
\]

\[
X_4 = \text{Commitment}
\]

\[
X_5 = \text{Performance}
\]
\[ X_6 = \text{Basic knowledge and information} \]
\[ X_7 = \text{Skills and attributes} \]
\[ X_8 = \text{Meta Qualities} \]
\[ X_9 = \text{Communication and interpersonal competencies} \]
\[ X_{10} = \text{Hours Spent on Working} \]
\[ X_{11} = \text{Employees Working} \]

and \( \beta_0 + \beta_1 + \beta_2 + \ldots + \beta_j \) are the parameters to be estimated.

**Multi Discriminant Analysis**

The objective of Multi Discriminant Analysis is to predict an object’s likelihood of belonging to a particular group based on several independent variables. The multi discriminant analysis reveals the specific variables to account for the largest proportion of inter-group differences. It is a simple scoring system that assigns a score to each individual or object. This score is a weighted average of the individual’s numerical value of the independent variables. The individual is assigned the ‘most likely’ category on the basis of this score. The model is represented as:

\[ Z_i = \beta_0 + \beta_1 X_{i1} + \ldots + \beta_j X_{ik} \]

Where \( X_{ik} \) is the \( i^{th} \) individual’s value of the \( k^{th} \) independent variable, \( \beta_j \) is the multiple discriminant coefficient of the \( k^{th} \) variable. \( Z_i \) is the \( i^{th} \) individual’s multiple discriminant score.
Garrett Ranking Technique

This technique is used to rank the various competencies necessary to excel in this industry. The order of merit given by the respondents is converted into ranks by using the following formula.

\[
\text{Percentage Position} = \frac{100 (R_{ij} - 0.5)}{N_j}
\]

The percentage position of each rank thus obtained is converted into scores by referring to the table given by Henry Garrett. Then for each factor the scores of the individual respondent are added and divided by the total number of the respondents for whom the scores are added. These mean scores for all the factors are arranged in the order of their ranks and the inferences are drawn.

Independent-Samples T Test

The Independent-Samples t test procedure is used to compare mean scores of the two groups. The procedure assumes that the variances of the two groups are equal and it is tested with Levene’s test statistics. The significant difference between the mean scores is tested with respect to the various factors.

\[
t = \frac{|X_1 - X_2|}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \sim t_{n_1 + n_2 - 2 \text{ df}}
\]

where 
\[
S = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}
\]
**Analysis of Variance**

After converting the qualitative information into a quantitative one using a five point scale, the average score is obtained from the respondents on various issues to determine the level of satisfaction.

The test for mean score analysis (ANOVA) test procedure is used to compare mean scores of more than two groups. The procedure assumes that the variances of the groups are equal and it is tested with Levene’s test statistics.

\[ F = \frac{S_1^2}{S_2^2} \sim F_{(n_1-1),(n_2-2)} \text{ df} \]

**1.8 HYPOTHESIS**

1. **H0**: There is no association between the age and the performance.

   **H1**: There is an association between the age and the performance.

2. **H0**: There is no association between the educational qualification of the respondents and their performance.

   **H1**: There is an association between the educational qualification of the respondents and their performance.

3. **H0**: There is no association between the experience of the respondents and their performance.

   **H1**: There is an association between the experience of the respondents and their performance.

4. **H0**: There is no association between the creativity and their performance.
H1: There is an association between the creativity and their performance.

5. H0: There is no association between the workers development skills and their performance.

H1: There is an association between the workers development skills and their performance.

6. H0: There is no association between the values and ethics followed by the Civil Engineering contractors and their performance.

H1: There is an association between the values and ethics followed by the Civil Engineering contractors and their performance.

7. H0: There is no association between the commitment towards their job and their performance.

H1: There is an association between the commitment towards their job and their performance.

8. H0: There is no association between the Meta qualities possessed by the Civil Engineering contractors and their performance.

H1: There is an association between the Meta qualities possessed by the Civil Engineering contractors and their performance.

9. H0: There is no association between the communication and the interpersonal competencies of the Civil Engineering contractors and their performance.
H1: There is an association between the communication and the interpersonal competencies of the Civil Engineering contractors and their performance.

**SCOPE OF THE STUDY**

The success of construction industry people depends upon the individual skill possessed by them. This study will help the construction industry people to excel in this field, and the new entrants in to the industry to develop the required skills. The study points out to the educational institutions, the need to create competent civil engineering professionals, and to higher education ministry, it highlights the changes needed in the civil engineering curriculum as the second largest industry this will help the country as a whole.

**1.9 PERIOD COVERED BY THE STUDY**

The research is conducted over a period of three years. The first two years were spent on collecting the review of literature and primary data. The secondary data is collected for a period of five years from the records maintained by the Salem Civil Engineers Association. Web resources are also referred to collect the latest information about the construction industry.

**1.10 LIMITATIONS OF THE STUDY**

The study suffers from the following limitations:

The market survey is conducted only in the Salem District of Tamilnadu. Further, the survey method which is adopted for collecting the data in this study has its own limitations.
Only 300 respondents are selected for eliciting first-hand information. In view of the time and monetary constraints involved, it is not possible to contact more than the selected number of respondents.

Certain respondents gave information about their economic backgrounds like annual turnover from their memory as they have no recorded account of them. Some of the respondents were hesitant to reveal these details. Hence, the generalization of the findings of the study is subjected to these limitations.

1.11 CHAPTER SCHEME

The present empirical study has been divided into Seven Chapters.

The First Chapter gives the intense and clear picture of the Indian Civil industry, which includes Introduction, Need for the Study, Statement of the Problem, Objectives of the Study, Research Methodology adopted, Frame Work of Analysis, Scope of the Study, Period covered by the Study and Limitations of the Study.

The Second Chapter reviews the concept and the literature of the previous studies relevant to the present research.

The Third Chapter covers the overview of competency mapping. It also highlights the competencies required by the civil industry people to excel in this industry. This chapter also includes the competency dictionary, competency clusters to be a successful performer in the industry.
The **Fourth Chapter** focuses on the overview of the civil industry, which includes the Origin and Development of the civil industry, Civil industry in India, Major players in the Indian civil industry, reasons for increasing trend in the Indian civil industry, the existing scenario of the Indian civil industry, Challenges of the Indian civil industry, and the future of the Indian civil industry. It also highlights the competencies required by civil industry people to excel in this industry.

The **Fifth Chapter** gives the general profile of the study area.

The **Sixth Chapter** gives the data analysis and interpretation.

**Seventh Chapter** recapitulates the key findings and conclusions of the study. At the end of this chapter certain suggestions have been made for the superior performer in the industry.