CHAPTER - 4
RESEARCH METHODOLOGY

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CHAPTER-4

Research Methodology

4.1: Introduction

This chapter outlines the research methodology used in this study. The chapter brings the conceptual clarity of research methods and operational clarity of research methodology that have been used in the research covering the research design, unit of analysis, population, sampling method and sample size, as well as the research instruments. The process used to collect and analyses of the data is also described. Finally the assumptions and limitations of the study are discussed.

Each section starts with a section definition. Nextly, the details of the methodology chosen for each section are described.

4.2: Research design

4.2.1: Definition of Research design

Business research is defined as “the systematic and objective process of gathering, recording, and analysing data for aid in making business decisions” (Zikmund, 2003, p. 6). Applied research is defined as “research undertaken to answer questions about specific problems or to make decisions about a particular course of action” (Zikmund, 2003, p. 7). Inductive reasoning is defined as “the logical process of establishing a general proposition on the basis of observation of particular facts” (Zikmund, 2003, p. 47).

Business research may be classified into exploratory research that is “conducted to clarify and define the nature of a problem” (Zikmund, 2003, p. 54), descriptive research that is conducted “to describe characteristics of a population or phenomenon” (Zikmund, 2003, p. 55) or causal research that is
“conducted to identify cause-and-effect relationships among variables when the research problem has already been narrowly defined” (Zikmund, 2003, p. 56).

**4.2.2: Details of Research Design**

This study took the form of applied research and is descriptive and exploratory in nature. The study uses inductive reasoning to test the theory which states the need for Developing Human Resources for TQM.

Descriptive research was chosen as the research methodology because the problem was fairly well defined and much of the theory has been written the significance of HRD for TQM and its vital role.

Causal research could not be used, because a study inferring causality is required to establish the sequence of events, measure associated variations and recognize the presence of other factors (Zikmund, 2003).

**4.3: Research Methodology**

**4.3.1: Details of Research Methodology**

In the qualitative research methodology part, two interviews have been conducted. The first interview was conducted with Master Black Belt (MBB) having more than 22 years of experience handled around 700 Six Sigma projects and 450 projects were successfully completed in both manufacturing and service sectors and conducts training programme in quality improvements and process improvement in various companies across Bangalore city.

Regarding question list, it was generated after studying TQM approach and company background learning (question list is presented in Appendix-A) which was used to in software companies for process improvement. And modified as per IT-ITeS companies with aligning TQM concepts. The motivation behind the interview was firstly to understand how IT-ITeS employees are trained in TQM,
what are the TQM tools used and how far trainees are able to understand TQM concepts to adopted them practically.

The second interview was conducted with HR manager of IT-ITeS company, having 10 years of experience, and trained as “Six Sigma Black Belt”, before facing the American Society for Quality (ASQ) examination. Regarding question list, it was prepared with sufficient review of HRD concepts, TQM concepts, TQM application in service sectors, hurdles, benefits and consequences (question list is presented in Appendix-B). The intention of this interview was to find the training and development methods used for TQM. An IT-ITeS employees interviewee were informed well in advance and the interview was conducted for 20 minutes.

The second type of secondary data are the data that originated outside the organization and are accessed by the researcher through books and websites such as computerized databases, published materials and syndicated services.

4.3.2: Details of secondary data collection

Secondary data were collected to identify IT-ITeS company lists from the NASSCOM database. As NASSCOM is the regulatory body for IT-ITeS companies and a premier trade body as well as the Chamber of Commerce of IT-BPO sector in India. It is a not-for-profit organization and has emerged as an authentic voice of this industry in India. It publishes an annual edition of its strategic review to disseminate the latest status of the industry based on the survey of large companies of this sector. The details will be discussed later in this chapter in unit 4.6.2.
4.3.3: Primary data

Primary data can be identified, according to Malhotra and Birks (2007, p.733), as “data originated by the researcher specifically to address the research problems”. Hence, it is original material which has not been interpreted by anyone other than the researcher. These data are collected by the researcher to solve a specific problem at hand, giving the researcher the control over data collection.

4.3.4: Details of primary data collection

To identify the HRD practices in IT-ITeS companies, a focus group discussion was conducted for one hour with “one Six Sigma master black belt” as a moderator with ten IT-ITeS company’s HR-managers. From the focus group discussion, the researcher was able to identify the most important HRD practices for TQM such as Organizational Support, Quality Culture, Training and Education, Employee Involvement, Employee Encouragement, Teamwork, Communication and Information & Analysis. Moreover, the critical success factors (CSF) of HRD for TQM were identified which in turn review of were hinted through literature. For the purpose primary data collection, a set of questionnaires were designed and administered on IT-ITeS employees. The 175 responses were collected personally, the 80 questionnaires were posted in which 28 were received and 373 questionnaires were e-mailed in which 117 were received. Total of 320 responses were received.
4.4: Unit of Analysis

4.4.1: Definition of Unit of Analysis

The unit of analysis specifies “whether the level of investigation will focus on the collection of data about the entire organization, departments, work groups, individuals, or objects” (Zikmund, 2003, p. 96).

4.4.2: Details of Unit of Analysis

In this research the NASSCOM member IT-ITeS (www.nasscom.in) companies are considered as the units of the study.

4.5: Population of Relevance

4.5.1: Definition of population of relevance

A population is “a complete group of entities sharing some common set of characteristics” (Zikmund, 2003, p. 369) and the population of relevance or target population is “the specific, complete group relevant to the research project” (Zikmund, 2003, p. 373).

4.5.2: Details of population relevance

NASSCOM database was used for identifying listed companies. This population was further divided into top, middle and moderate performing IT-ITeS companies based on the transaction at the end of December 2011 (NASSCOM report). The whole population is further divided based on the segment of operation as given below in the tables. In Bangalore 21% of member IT-ITeS companies are operating. The following Table-4.5.2.1 and Graph-4.5.2.1 show percentage of IT-ITeS member companies operating in different segments.
Table-4.5.2.1: Profile of Member Companies

<table>
<thead>
<tr>
<th>Operation Segment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Service</td>
<td>62</td>
</tr>
<tr>
<td>BPO</td>
<td>30</td>
</tr>
<tr>
<td>Product Development</td>
<td>36</td>
</tr>
<tr>
<td>Engineering R&amp;D, Embedded</td>
<td>13</td>
</tr>
<tr>
<td>Others</td>
<td>23</td>
</tr>
</tbody>
</table>

(Source: NASSCOM Report, 2012)

The above IT-ITeS companies are classified based on gross revenue as

- Large company – Companies with gross revenue of over Rs.200 Cr
- Medium company – Companies with gross revenues between Rs. 50 Cr and Rs. 200 Cr
- Small company – Companies with gross revenues of less than Rs. 50 Cr
- Institutional company – Companies that provide support services to the IT-BPO sector

The following table-4.5.2.2 and Graph: 4.5.2.2, show the IT-ITes member companies distribution by size.
Table-4.5.2.2: Member Distribution by Size

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>69</td>
</tr>
<tr>
<td>Medium</td>
<td>12</td>
</tr>
<tr>
<td>Small</td>
<td>10</td>
</tr>
<tr>
<td>Institutional company</td>
<td>9</td>
</tr>
</tbody>
</table>

(Source: NASSCOM Report, 2012)

Graph-4.5.2.2: Member Distribution by Size

(Source: NASSCOM Report, 2012)
The following Table-4.5.2.3 & Graph: 4.5.2.3, gives city-wise spread of IT-ITeS member companies.

**Table-4.5.2.3: City-wise spread of Member Companies**

<table>
<thead>
<tr>
<th>City</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>21</td>
</tr>
<tr>
<td>Chennai</td>
<td>12</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>9</td>
</tr>
<tr>
<td>Mumbai</td>
<td>15</td>
</tr>
<tr>
<td>Pune</td>
<td>6</td>
</tr>
<tr>
<td>Kolkata</td>
<td>4</td>
</tr>
<tr>
<td>NCR</td>
<td>21</td>
</tr>
<tr>
<td>Others</td>
<td>12</td>
</tr>
</tbody>
</table>

*(Source: NASSCOM Report 2012)*

**Graph-4.5.2.3: City-wise spread of Member Companies**

*Citywise spread of IT-ITeS companies in %*

- Bangalore
- Chennai
- Hyderabad
- Mumbai
- Pune
- Kolkata

*(Source: NASSCOM Report 2012)*
4.6: Sampling and Sampling Technique

4.6.1: Definition of Sampling

Sampling is “the process of using a small number of items or parts of a larger population to make conclusions about the whole population” (Zikmund, 2003, p. 369).

The sampling frame is “the list of elements from which a sample may be drawn; also called a working population” (Zikmund, 2003, p. 373). A sample is “a subset, or some part, of a larger population” (Zikmund, 2003, p. 369).

4.6.2: Details of Sampling Technique adopted

The researcher has identified 264 member of IT-ITeS companies operating in Bangalore from the NASSCOM report. It represents 21% of 1256 companies. The researcher has identified the companies’ addresses and phone numbers by using website www.bangalrecircle.com. The questionnaires were mailed or posted to every second IT-ITeS company from the list. Hence, a systematic probability sampling technique is adopted.

4.7: Measurement Instrument

4.7.1: Definition of Measurement

The measurement instrument is the instrument used to collect the data, such as structured questionnaires, interviews and focus discussions.
4.7.2: Details of Measurement

Instruments used questionnaires were designed using 5 point Likerts scale and were administered on the employees at top level, middle level and lower levels in companies in Bangalore.

The 5 point Likert rating scale range shows: 1= Strongly Disagree, 2= Disagree, 3 = Moderately Agree, 4= Agree, 5= Strongly Agree.

The questionnaire had four sections. Section- A, consisted of demographic data. During the pilot study, the respondents showed concern about disclosing information with regard to their names and the name of the organization, age, marital status, mail IDs. Keeping in view this concern, this information was kept optional and left it to the discretion of the respondents. It has been stated that no identifying information should be recorded for individuals who do not consent to this (Marezyk et al., 2005).

In section- B, consisted of Employees Development (HRD) for TQM in IT-sector, Training & Development Policy, Training Programme on TQM – concepts, type of TQM principles used in training and regularly and frequency of training. These information identify the proper formal practices and TQM concept practices as suggested by Jain & Gupta (2012).

In section -C, consists eight factors of HRD for TQM The factor-1, i.e., organizational support has 5-constructs for basic organizational support such as ISO-9000 Standards, quality management or quality assurance, Initiation in total quality management program and quality management training and updating quality standards developed as suggested by Douglas & Fredendall (2004) and Jain & Gupta (2012).
The factor-2, i.e., Quality Culture has 7-constructs such as degree of management and employees quality as strategic weapon, degree to which the employees at all levels accept the motto “service to customers”, organization believes in extent to which the employees believe in doing things, “right the first time and every time”, organization believes in level of prevalence among employees, feeling such as “my company” or “my organization” and “we work together to achieve common goals”, organization believes in level of appearance of employees having a pleasant and professional look, organization believes in degree to which physical layout of premises, facilities and other furnishings are comfortable for the employees to work, organization believes in extent to which house-keeping is kept as a priority and of the highest order in the company through seven items (Arumugam et al., 2008; Brah et al., 2002; Prajogo, 2005; Prajogo and Brown, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-3, i.e., Training and Education has 5-constructs such as organization provides specific level of work-skills training, organization provides specific level of quality-related continuous training, organization provides training in interactive skills, Training programme for problem identification and solving skills and quality improvement skills and organization management and employees are trained in advanced/special tools and software through five items (Arumugam et al., 2008; Brah et al., 2002; Prajogo, 2005; Prajogo and Brown, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-4, i.e., Employee Involvement has 6-constructs such as Extent to which employees are encouraged for suggestions and Innovation, Extent to which employees are actively involved in TQM related activities, Extent to which employee are involved in type programs like quality circles, cross-
functional and so on, Degree of coordination among employees of various departments to achieve overall improvement in service quality, Extent to which employee’s suggestions are evaluated and implemented, if accepted and Extent to which management encourages employees to participate in achieving organization’s objectives through six items (Arumugam et al., 2008; Brah et al., 2002; Prajogo, 2005; Prajogo and Brown, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-5, i.e., Employee Encouragement has 6-constructs such as Degree to which the management provides ample recognition, rewards and encouragement to the employees for quality improvement/performance, Extent to which the innovative ideas and suggestions of employees are encouraged and rewarded, Effectiveness of grievance redressal of employees, Extent to which non-financial incentives systems are used to reward quality contributions and achievements, Extent to which financial incentive schemes for quality performance are used to motivate employees and Extent to which career advancement opportunities are designed and implemented through six items (Arumugam et al., 2008; Brah et al., 2002; Prajogo, 2005; Prajogo and Brown, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-6, i.e., Teamwork has 4-constructs such as Extent to which the employees trust each other and work as a team, Extent to which team members routinely engaged in solving the problems, Extent to which team members appreciate constructive criticisms, and Existence of communication within the team members to generate good ideas about potential changes and solutions to problems through four items (Arumugam et al., 2008; Brah et al., 2002; Prajogo, 2005; Prajogo and Brown, 2004, Jain & Gupta, 2012, Siam et al., 2012).
The factor-7, i.e., Communication has 5-constructs such as Extent to which quality goals, strategies and plan of action are perceived in the same way by both management and employees, Overall effectiveness of communication process in the company in terms of quickness and completeness, Effective top-down, bottom-up and horizontal communication in the company, Extent to which reports on the effectiveness of QM program are communicated to the employees and Extent to which duties and responsibilities of each employee are made clear to him or her through five items (Arumugam et al., 2008; Brah et al., 2002; Prajogo, 2005; Prajogo & Brown, 2004, Jain & Gupta, 2012, Siam et al. 2012).

The factor-8, i.e., Information and analysis has 5-constructs such as Extent to which important information is presented and transmitted to employee, Extent to which quality data are used as tools to manage quality, Degree to which departmental meetings are conducted at regular intervals to plan, implement and monitor the effectiveness of quality improvement programs and Extent to which quality data are used by top and middle management in decision making, planning and controlling through five items (Arumugam et al., 2008; Brah et al., 2002; Prajogo, 2005; Prajogo and Brown, 2004, Jain & Gupta, 2012, Siam et al., 2012).

In section -D, to identify the critical success factors are used of HRD for TQM, 7 factors, starting from factor-9 to 17.

The factor-9, i.e., Leadership and Commitment is covered with 5-constructs to measure the dimensions of Visionary Leadership that focuses on the involvement of top management in providing personal leadership, envisioning the goals, objectives and strategies of quality and its communication to all. In this respect, following five items have been used: Top
management in the organization assumes responsibility for quality performance, The major department heads participation in quality improvement processes, The organization’s top management objectives for quality performance, Goal setting process for quality within the organization is comprehensive and Importance is attached to quality by organization’s top management in relation to cost objectives (Douglas & Fredendall, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-10 i.e., Project Planning and Management has 5-constructs such as TQM concepts require close project monitoring and management, Project management requires quality conceptual training, To track project effectively different tools & techniques are required, Stage of project must be clearly defined and Project requires strict adherence to schedules (Douglas & Fredendall, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor -11, i.e., Understanding the TQM Methodology has 5-constructs such as To understand TQM conceptual knowledge is mandatory, To understand TQM concepts skills are required, TQM concepts require good aptitude, TQM concepts involve complex statistical tools & techniques and To practice TQM concepts, ability is must (Douglas & Fredendall, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-12, i.e., Project Prioritization and Selection has 4-constructs such as A decision process to identify and plan projects to utilize TQM methods and systems is well-defined, documented, and followed, Project management procedures and tools for projects utilizing TQM methods and systems are well-defined, documented, and utilized, Project tracking and oversight for projects utilizing TQM methods and systems is well-defined, documented, and utilized and Project evaluation metrics for projects utilizing TQM methods and
systems is well-defined, documented, and utilized (Douglas & Fredendall, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-13, i.e., Organizational Infrastructure has 5-constructs such organizations develop a TQM infrastructure, organizations identify, train, divisional and regional TQM infrastructure, organizations align the TQM infrastructure with the organizational infrastructure, organizations enable teams to implement improvements and organizations use customer data when implementing or changing infrastructure (Douglas & Fredendall, 2004, Jain & Gupta, 2012).

The factor-14, i.e., Customers Involvement has 5-constructs such Involving customers on projects, Identifying customer requirements, Selecting projects that impact favorably on customer satisfaction, Degree to which customer feedback is used as the basis of quality Improvement and Extent to which products and service information and details are provided by the company (Arumugam et al., 2008; Brah et al., 2002; Prajogo, 2005; Prajogo and Brown, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-15, i.e., Cultural Change has 5-constructs such TQM concepts bring organization culture shift, TQM practices brings attitudinal changes, TQM practices enhance individual performance, TQM practices improve business performance and TQM practices enhance company’s performance (Douglas & Fredendall, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-16, i.e., Linking TQM Process Improvement has 5-constructs such Establishing clear responsibility and accountability for managing key activities, Controlling the quality and operational performance of key processes, Strictly analyzing significant variations in process and output to make corrections, Measuring the capability of key activities and Focusing on
resources, methods and materials that will improve key activities (Douglas & Fredendall, 2004, Jain & Gupta, 2012, Siam et al., 2012).

The factor-17, i.e., Benchmarking has 5-constructs such as Emphasis on benchmarking the services and processes with those of direct competitors, Emphasis on benchmarking the training and development programs with those of direct competitors, Emphasis on benchmarking servicescapes (i.e. the cleanliness, appeal, physical facilities, physical layout, ambient condition, etc.) with those of other companies, Emphasis on benchmarking the level of quality culture with those of direct competitors and Emphasis on benchmarking the best practices and performance of direct competitors (Sajjad F. and Amjad S., 2011, Jain & Gupta, 2012, Siam et al., 2012).

4.7.3: Pilot Study

The pilot testing of the instrument was carried out. Respondents from IT-Sector were selected. The questionnaires were distributed to 60 respondents. The questionnaires included all 17-factors: the factors Organization Support (4 items), Quality Culture (7 items), Training & Education (5 items), Employee Involvement (6 items), Employee Encouragement (6 items), Teamwork (4 items), Communication (5 items) & Information Analysis (5 items). The critical success factors viz, Visionary Leadership & Commitment (5 items), Project Planning & Management (5 items), Understanding TQM Methodology (5 items), Project Prioritization & Selection (4 items), Organization Infrastructure (5 items), Customer Involvement (5 items), Cultural Change (5 items), Linking TQM Process Improvement (5 items) & Benchmarking (5 items). A five point Likert scale ranging from Strongly Agree
having a score of five (maximum score) to Strongly Disagree having one point (minimum score) was used to measure response for all constructs. The data collected was subject to SPSS (Version 16) analysis and a Cronbach Alpha was commuted in order to evaluate internal consistency and reliability for the set of measurement of each construct. The Cronbach alpha values for all factors, which ranged from 0.715 to 0.99, which are acceptable and presented in Table-5.5.1 of the next chapter.

**4.8: Process of Data Analysis**

The information collected are analyzed by using SPSS-16 Version and MS-excel. The statistical techniques like factor analysis to test validity and reliability of the data, Multiple regression, correlation, and $\chi^2$-test are also used.

**4.8.1: Definition of data analysis**

“Analysis is the application of reasoning to understand and interpret the data that have been collected.” Descriptive statistics is “statistics used to describe or summarise information about a population or sample” (Zikmund, 2003, p. 402). Inferential statistics is “statistics used to make inferences or judgements about a population on the basis of a sample” (Zikmund, 2003, p. 402).

**4.8.2: Details of Data Analyses**

The data has been analyzed using SPSS (Version 16). Following tests have been conducted to analyze the data for the study:

1. Reliability and validity of Instrument has been made using Cronbach alpha.
2. Descriptive statistics has been used to identify the phenomenon of interest such as, mean, minimum, maximum and standard deviation. To understand the normality of the data skewness and kurtosis are calculated.

3. The $\chi^2$-test is used to bring the association between the attributes and to test the significance.

4. Correlation has been calculated to identify any preliminary relationship among the variables being examined and to identify the multicollinearity.

5. Confirmatory factor analysis has been done to validate the factors.

6. Statistical tests have been made to measure the underlying assumptions through multiple regression analysis. Salient tests include independence of observations, checking of outliers, normality, linearity, homoscedasticity, multicollinerarity and singularity.

7. Linear regression and multiple regression analysis have been done for hypothesis validation.

8. To validate the proposed model (path), Training and Education is assumed as an independent variable and Understanding TQM Methodologies as a dependent variable in the first step. In the second step, Understanding TQM Methodologies is assumed as an independent variable and Project Planning and Management is assumed as independent variable. And so on, the Cultural Change as independent variable and Quality Culture as dependent variable as sown in the figure 2.13.1.

With this detailed explanation of Research Methodology used for the study, thus the, data collected are analyzed and presented in the next chapter.
References:


Information Systems in Implementing Total Quality Management”,