CHAPTER 3

RESEARCH METHODOLOGY

Research methodology is a way to systematically solve the problems. The research plan and design are the important steps in the research process because of the fact that, a well-defined problem is easy to solve by the researcher. A good research plan gives a clear picture about what to do. Research methodology deals with the different steps included for solving the research problem. Research is a process through which an attempt is to make achieve a systematic resolution of the problem or a greater understanding of a phenomenon. This process is called research methodology.

3.1  EMPIRICAL SIGNIFICANCE OF THE STUDY

Hospitality has emerged as a serious business in Coimbatore, even though the real estate developers have thus far not been looked at this segment as seriously as the residential or commercial establishments. Many analysts believe the growth of hospitality in this country now onwards is actually in the tier-two cities like Coimbatore. A number of international visitors come here and several major and even small scale companies in this region have overseas contacts. Many of the foreign visitors who come to Tirupur, Karur and Erode, stay in Bangalore and Chennai. Given the quality hotel stay, they would prefer to stay in the city while on their business trip. This raises a fundamental question as to why the developers have not forayed into hospitality sector in this market even though Coimbatore has shaped up well as a business destination. The developers cite their own reasons ranging
from the policies of the state government, to opportunity cost and hurdles in the clearances as compared to the residential projects.

Coimbatore has major infrastructure shortcomings like lack of power, proper roads and scarcity of water makes it unattractive for major developments. The fallout and decline of the textile and hosiery business (closure of dyeing units) have resulted in the negative growth of this city. Most of the existing hospitality start-ups have failed. Hence, Coimbatore is a strict no-no destination for hospitality. Despite being the second largest city in Tamil Nadu, lack of political will and political impetus on the part of successive governments has left Coimbatore lagging behind on several fronts making it almost impossible for any developer to foray into hospitality. Participation of national and international hotel chains is the only option that could prove beneficial to the hospitality sector as the industry itself has proven that stand-alone hotels are not successful business options.

Beyond these teething issues lies the fact that Coimbatore is poised to grow on the hospitality map of India. The way the city is growing with its vibrant economy, it is quite natural that the big hospital chains would like to tap the potential of the Coimbatore economy. A few years back, hotels with facilities like a ball room, an exclusive spa and health club, multi cuisine restaurants, imported chandeliers from Italy etc were unheard of in this part of the world. Today, some of the upcoming hospitality groups are clubbing entertainment centers with the hotel itself.

Analysts maintain the very economy of Coimbatore is such that MICE (Meetings, Incentives, Conferences and Exhibition) segment can be catalysed with the policy incentives which will further ignite the economy of the city. They suggest it is the time Coimbatore should be promoted as tourism destination, something that will attract developers from other big
cities to invest in the city. After all, the land cost and overall opportunity cost is pretty low when compared with the other markets.

It is true that the developers have thus far resisted investing into high capital intensive hotel projects. But many of the big developers are also realising that there lies a big market in the segment of urban resort. They are hence in talks with the big chain of hospitality brands for a possible tie-up. Of course, there is a cost-benefit analysis that prohibits the developers to jump into a new segment. Striving to be more environmentally friendly through the efficient use of energy, water, and materials can help to eliminate some of this waste while also providing cost benefits for your business. Green hotels have seen benefits such as increased profits and reduced costs and liabilities.

3.2 RESEARCH METHODOLOGY

The current study is both explorative and descriptive in nature.

Stage 1: This stage of the research was exploratory in nature. This was done in two phase. The initial phase was to undertake detailed secondary search literature survey on natures of service offered at hotel industry, overview on customer satisfaction, customers’ perception and satisfaction towards service quality dimensions in general and studies pertaining to hospitality industry. This exploratory search was also form basis for preparing the questionnaire for the next stage.

Stage 2: A descriptive research was carried out at the second stage by applying a survey method. The nature of this study demands survey method. The study is focused on the star hotels function across Coimbatore District. The data collection tool used is a questionnaire.
3.2.1 Significance of the Study Area

Coimbatore, situated along the western extremity of Tamil Nadu and surrounded by the Western Ghats, is one of the fastest growing Tier II cities in India. The city is a municipal corporation as well as headquarters of the Coimbatore district. Coimbatore is one of the most industrialised cities in Tamil Nadu and is known for textiles, auto mobile, information technology, education and healthcare. It is increasingly well-known for its high quality affordable healthcare. The medical and education facilities in Coimbatore generate demand from neighboring towns in Tamil Nadu and Kerala as well as from overseas locations like Sri Lanka, Malaysia, and Singapore. Coimbatore also has more than 25,000 small to large-scale industries, and major SEZs such as Coimbatore Hi-Tech Infrastructure and IT SEZ by Electronics Corporation of Tamil Nadu (ELCOT) near Peelamedu.

Hospitality sector in Coimbatore is dynamic due to the business climate prevailing, given the rapid IT development and growth in the textile and automobile industry. The hotels have seen more than 60per cent occupancy rate during the off peak season and it goes up to 90per cent in peak season due to the presence of major textiles mills, foundry units and pumps and auto components manufacturing base. The city continues to see the entry of new IT parks and is next only to Chennai in IT software production in the state. Coimbatore also has a large manufacturing industry producing automotive components, pumps and wet grinders. It is served well by road, rail and an international airport making the city easily accessible. Traditionally, the city has supported a small base of hotel rooms, predominantly in the mid-market and budget segments catering to demand emanating from the Commercial and MICE segments. However, in the last few years, the city has seen the entry of international and branded players such as Le Meridien, Aloft, Park Plaza, and Vivanta by Taj. Based on its
contribution to growth of hotel industry the researcher has been motivated to select Coimbatore District for the conduct of empirical study.

### 3.2.2 Sampling Framework

According to Anthony Onwueguzie & Kathleen Collins (2007) sampling, which is the process of selecting “a portion, piece, or segment that is representative of a whole” is an important step in the research process because it helps to inform the quality of inferences made by the researcher that stem from the underlying findings. In both quantitative and qualitative studies, which is very popular in social science disciplines, researchers must decide the number of participants to select (i.e. Sample size) and how to select these sample respondents (i.e., sampling scheme).

Based on this theoretical understanding this research has adopted both quantitative (identification of research problem, conduct of review the literature, clearly specify the purpose of the study, collection of data, conduct of analyse and interpretation of data and report evaluation through findings, suggestions and conclusion) and qualitative (The qualitative method investigates the why and how of decision making, not just what, where, when). Hence, smaller but focused samples are more often used than large samples through descriptive validity (factual accuracy), interpretive validity, evaluative validity and generalisability research techniques.

The process of sampling is important to both quantitative and qualitative research. The size of a population is a critical factor in making sampling choices. One should have knowledge of the size of the population before making sampling choices. Sampling, which is the process of selecting “a portion, piece, or segment that is representative of a whole” is an important step in the research process because it helps to inform the quality of inferences made by the researcher that stem from the underlying findings.
The current research work is based on the multi-stage random sampling technique. In the first stage of the research adopted cluster based random sampling technique. According to Anthony Onwuegbuzie & Kathleen Collins (2007) before deciding on the sampling scheme, mixed methods researchers (Qualitative & Quantitative) must decide what the objective of the study is. For example, if the objective of the study is to generalise the quantitative and/or qualitative findings to the population from which the sample was drawn (i.e., make inferences), then the researcher should attempt to select a sample for that component that is random. In this situation, the mixed method researcher can select one of five random (i.e., probability) sampling schemes at one or more stages of the research process: simple random sampling, stratified random sampling, cluster random sampling, systematic random sampling, and multi-stage random sampling. Drawing justification to the above discussed concept this study has adopted cluster based random sampling in the first stage of research i.e., identification of study region and in the classification of sample colleges.

In the first stage of the sampling the researcher had identified that Coimbatore city has more than 80 hotels of budget class, one, two, three, four and five star hotels. The population of the study was restricted to the customers of three star, four-star and five-star hotels located in Coimbatore district. In Coimbatore city there are 12, Three, Four and Five Star rated hotels are currently in operations.
Table 3.1  Population Size of Hotels in Coimbatore District

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Star Category</th>
<th>Number</th>
<th>Name of Hotels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>5 Star</td>
<td>2</td>
<td>Le Meridien, Vivanta By Taj-Surya</td>
</tr>
<tr>
<td>2.</td>
<td>4 Star</td>
<td>3</td>
<td>The Residency, Aloft, Jenney’s Residency</td>
</tr>
<tr>
<td>3.</td>
<td>3 Star Hotel</td>
<td>7</td>
<td>Alankar Grande, Heritage Inn, Grand Regent, Park Plaza, CAG Pride, Hotel City Tower, Metro Park Inn</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>12</td>
<td>-</td>
</tr>
</tbody>
</table>

Out the identified 12 hotels, it has been observed that only 11 hotels had applied for reaccreditation of star stated under the Ministry of Tourism and also rated under the HRACC (Hotel & Restaurant Approval and Classification Committee) rating. Thus, the study was confined to these 11 hotels. Out of the selected 11 hotels 65 percent of were considered as sample i.e., seven hotels. The lists of the seven hotels are: Vivanta by Taj, Le Meridien, The Residency, Aloft, Alankar Grande, Heritage Inn and Park Plaza. All these seven hotels are considered as the sample population.

Based on the above stated Random (Probability) Sampling of the Anthony Onwuegbuzie & Kathleen Collins (2007). A researcher can adopt convenience sampling, when the study demands cluster based random sampling while selection of study region or area. Based on this concept the researcher has adopted convenience sampling in the second stage of data collection process for conducting descriptive analysis (Qualitative research). Thus, the second stage of sampling technique used based convenience sampling and data collection was carried through well-structured questionnaire. As per the James McMillian (1996) a convenience sample is a group of subjects selected because of availability, often this is the only type of sampling possible especially in geographical area based study, where the
target group of population is only available for study, and the primary purpose of the research may not be to generalise but to better understand relationships that may exist. Similarly Roscoe (1975) proposed that a sample size of >30 and <500 are appropriate for most research. Based on this concept the sampling framework of the study was constructed. According to Orme (2010) sample size for conjoint studies generally ranges from about 150 to 1,200 respondents and it largely depends on the purpose of research. Conjoint analysis is a statistical technique used in Social Science (marketing, management and others) research to determine how people value different attributes (feature, function, benefits) that make up an individual product or service. The researcher adopted convenience sampling techniques in this stage of the study.

A sample of 150 guests from each star graded hotel was selected for the effective conduct of the study i.e., 1050 respondents in total. A well-structured questionnaire was framed for collection of primary data from the sample population. Since hotel industry is greatly influenced by the various seasons, its room occupant rates varies from 40 per cent in non-seasonal period to 80-90 percent during the peak seasons. Thus, data were collected from seasonal tourist, seminars and conferences participations and business executives those who had either visited the city or stayed in these hotels for want of services. Research took at most care in collection of all the questionnaires distributed in completely filled by the sample populations.

Totally 1225 questionnaires were distributed. Many respondents have not filled all the details. After scrutinising the questionnaire, 1050 questionnaires were taken into account for the study. So under convenience sampling method, 1050 questionnaires were considered as sample size.
3.2.3 Parameters Considered for Research Instrument Design

Star hotel guests’ satisfaction levels were measured with a self-administered questionnaire. The questionnaire was developed on the basis of a literature review. Understanding the fact that the customer satisfaction is a motivation factor that leads to loyalty of customer to a product or service. Satisfaction regarding the hospitality industry has to do with both tangible and non-tangible products and service which guarantee satisfaction in the following areas, Food and Beverages, level of services, level of cleanliness and hygiene, value for money and atmosphere. A total quality customersatisfaction is a participative process that empowers all levels of operators to work in groups to establish guest expectation and determine the best way of meeting or exceeding those expectations (Fornell & Anderson, 1996). Based on this concept this research work has framed. The questionnaire focused to gather information of customers’ perception and satisfaction towards various basic and additional services rendered by the sample star hotels functioning in Coimbatore district.

From the detailed literature reviews it has been understood that many studies have investigated the controversial topic of service quality and they had fixed tools for the assessment of service quality in hotels. Through comprehensive survey of the published studies in the field of assessing the quality of hospitality services indicates that all of the models have many dimensions. Based on this conceptual understanding the questionnaire also focused to measure the customers’ perception and expectation towards service quality dimensions of star hotels.

The questionnaire was classified into six sections. First section of the questionnaires was framed to gather information on the demographic profile of the hotel guests. The second section of the questionnaire aimed to gather information on the star hotel guests’ level of awareness to hotel
services. The third and fourth section of the questionnaire focused to assess customers’ preferences for hotel selection, their preferred services and satisfaction towards service offered. Fifth part of the questionnaire was framed with aim to measure the customers’ perception and expectation towards service quality dimensions of star hotels. This section aimed to measure whether the customers expectation of services were met at the time of visit (i.e.,) their perceptions. The last part of the questionnaire raised queries on nature of problems faced by the star hotel guests.

3.2.4 Data Source

In the present study, both primary and secondary data are used but largely based on the primary data. Required primary data have been collected through the survey method, well-structured and non-disguised questionnaire. The required secondary data for the present study have been collected from various research articles published in various journals, periodicals and also through web sites. To measure the validity of the study, pilot study was conducted. 175 respondents were selected from the seven selected hotels, reliability and validity test was conducted.

3.2.5 Reliability and Validation Measures

The reliability of an indicator can be defined as its overall quality, i.e. its consistency and its ability to give the same results in repeated measurement. The most outstanding feature of reliability is the test-retest correlation of the specific measure under scrutiny. It is well-known that minor differences in circumstances and technical features of the specific questionnaire used, affect the reported causes for stress, its level of occurrence and coping strategies. Correspondingly, the test-retest correlation for most single-item measures is presented in the following table.
Table 3.2  Data Validity and Reliability Test

<table>
<thead>
<tr>
<th>General Variables</th>
<th>Number of Items</th>
<th>Range</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion Considered by the Customers for Selection of Hotels</td>
<td>10</td>
<td>1-10</td>
<td>.905</td>
</tr>
<tr>
<td>Customers Preferences for Basic Service</td>
<td>11</td>
<td>1-11</td>
<td>.884</td>
</tr>
<tr>
<td>Customers Preferences for Additional Services</td>
<td>13</td>
<td>1-13</td>
<td>.810</td>
</tr>
<tr>
<td>Customers’ Level of Perception towards Service Quality</td>
<td>29</td>
<td>1-5</td>
<td>.773</td>
</tr>
<tr>
<td>Customers’ Level of Expectation towards Service Quality Enhancement</td>
<td>29</td>
<td>1-5</td>
<td>.928</td>
</tr>
<tr>
<td>Customers’ Level of Satisfaction</td>
<td>24</td>
<td>1-5</td>
<td>.807</td>
</tr>
<tr>
<td>Overall Data Validation</td>
<td></td>
<td></td>
<td>0.890</td>
</tr>
</tbody>
</table>

Source: Computed from Primary Data

The most widely used measure to assess the internal consistency of constructs is Cronbach’s alpha. The generally agreed upon value of Cronbach’s alpha is 0.70, although it may decrease to 0.60 in case of exploratory research (Hair et al 2006). In this research the reliability measure for the whole scale is 0.890 which is acceptable. Again the reliability for all the constructs is shown in Table 3.2; the values for all the constructs range between 0.773 - 0.928, which is acceptable. Hence, the construct reliability in this research is satisfactory. The result of Cronbach’s alpha draws a significant amount of correlation between the variables tested. The validity of a test is the extent to which differences in scores reflect differences in the measured characteristic. Predictive validity is a measure of the usefulness of a measuring instrument as a predictor. Proof of predictive validity is determined by the correlation between results and actual behaviour. Construct validity is the extent to which a measuring instrument measures what it intends to measure.
Similarly in the present study, Kaiser-Meyer-Olkin (KMO), Measure of Sampling Adequacy (MSA) and Bartlett’s test of Sphericity were applied to verify the adequacy or appropriateness of data for factor analysis at 0.922, which again drawn a statistical relevance to the data adequacy.

3.3 STATISTICAL TOOLS APPLIED

The data collected through the questionnaire were classified and tabulated for analysis in accordance with the outline laid down for the purpose of justifying the objective and the hypotheses framed at the time of developing research design. The following statistical tools were applied in this study like: Frequency Distribution, Garrett’s Ranking Technique, Weighted Arithmetic Mean, Chi-Square test, paired ’Z’ test, Multiple Regression, Reliability Analysis, Rotation Factor Analysis and SEM (Structural Equation Model).

- The Frequency Distribution of the variables has helped the researcher to calculate distribution value of variables tested.

- Garrett’s Ranking Technique was applied to measures criterion considered by the star hotel customers while selection of hotels and their preferred basic and additional services.

- Weighted arithmetic means and Rensis Likert’s Summated scales helped in interpreting the averages of the variable used in this study like: service quality dimension of star hotels (both perception and expectations) and customers’ level of satisfactions towards various services of star graded hotels.

- Chi-square test was applied to measure whether the association between socio-economic status of the star hotel
customers’, their purpose of tour and stay in star hotels and their nationality and level of satisfaction derived by them.

- Multiple regression analysis was performed to evaluate whether there exists close association between customers’ preference toward star hotel services and their purpose of trip.

- Rotation Factor Analysis with Kaiser-Meyer-Olkin (KMO) test were performed to measure the service quality dimension of star hotels (both perception and expectations) and customers’ level of satisfactions towards various services of star graded hotels.

- The existence of gap between the consumer’s perception and expectation service quality dimensions of star hotel services were measured with the support of paired ‘Z’ test.

a. Frequency Distribution

The frequency distribution of the variables were calculated with help of simple percentage, by writing the formula \( FD = \frac{F}{N} \times 100 \). Where \( F \) denotes the number of respondents, and \( N \) denotes the total number of sample population.

b. Weighted arithmetic mean

One of the most important objectives of statistical analysis is to get one single value that describes the characteristic of the entire mass of an widely data. Such a value is called the central value or an “average” means or the expected value of the variable, what the statisticians call the arithmetic mean. The process of computing mean in case of individual observation (i.e). Where frequencies are not given is very simple. Add together the various
values of the variable and divide the total by the number of items. The researcher has applied weighted mean, instead of calculating the simple mean to obtain a realistic average.

\[ \bar{X} = \frac{\sum WiXj}{\sum Wi} \]

where \( \bar{X} \) = Weighted mean

\( Wi = \) Weight of ith item X

\( Xj = \) value of the jth item of X

c. Garrett’s ranking technique

Garrett’s Ranking Technique is used to identify the reason for choosing the particular type of hotel. This method was suggested by Garrett’s for converting the ranks into scores where the number of items ranked differed from respondent to respondent by using the following formula

\[ \text{Present position} = \frac{100 \ (Rij - 0.5)}{Nj} \]

\( Rij = \) Rank given for the item by the \( J^{th} \) individual

\( Nj = \) Total rank given by the \( J^{th} \) individual
d. Summated scales (Likert’s-scales)

Summated scales (or Likert-type scales) are developed by utilising the item analysis approach where in a particular item is evaluated on the basis of how well it discriminates between those persons whose total score is high
and those whose score is low. Those items or statements that best meet this sort of discrimination test are included in the final instrument. In a Likert Scale, the respondent is asked to respond to each statement in terms of several degrees, usually five degree of agreement (or) disagreement. Each point on the scale carries a score of 5, 4, 3, 2, and 1. Scaling describes the procedure of assigning numbers to various degrees of opinion, attitude and other concepts.

e. Chi-square test

The chi-square test is an important test amongst the several tests of significance developed by statisticians. Chi-square, symbolically written as $\chi^2$ (pronounced as ki-square). As a non-parametric test, it can be used to determine if categorical data shows dependency or the two classifications are independent.

Chi-square as a test of independence enables a researcher to explain whether or not two attributes are associated.

$\chi^2$ are calculated as follows:

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

where $O_{ij}$=observed frequency of the cell in ith row and jth column

$E_{ij}$=expected frequency of the cell in ith row and jth column

The $\chi^2$ values obtained as such should be compared with relevant table value of $\chi^2$ and the inference can be drawn. If the calculated value is greater than the table value the hypothesis framed will be rejected, otherwise accepted.
f. Independent ‘Z’ test

The independent Z-test, also called the two sample Z-test or student's Z-test, is an inferential statistical test that determines whether there is a statistically significant difference between the means in two unrelated groups.

\[ Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \]

g. Reliability analysis

Reliability analysis may be used to construct reliable measurement scales, to improve existing scales, and to evaluate the reliability of scales already in use. Specifically, Reliability & Item Analysis will aid in the design and evaluation of sum scales, that is, scales that are made up of multiple individual measurements (e.g., different items, repeated measurements, different measurement devices, etc.). It can be compute numerous statistics that allows researcher to build and evaluate scales following the so-called classical testing theory model.

From the above discussion, one can easily infer a measure or statistic to describe the reliability of an item or scale. Specifically, we may define an index of reliability in terms of the proportion of true score variability that is captured across subjects or respondents, relative to the total observed variability. In equation form, we can say:

\[ \text{Reliability} = \frac{\sigma^2_{\text{true score}}}{\sigma^2_{\text{total observed}}} \]
Cronbach's Alpha: The proportion of true score variance that is captured by the items by comparing the sum of item variances with the variance of the sum scale. Specifically, can be computed: 

$$\alpha = \frac{k}{(k-1)} \times \left[1 - \frac{\sum(s_i^2)}{s_{sum}^2}\right]$$

If the sum scale is perfectly reliable, it would expect that the two halves are perfectly correlated (i.e., \( r = 1.0 \)). Less than perfect reliability will lead to less than perfect correlations

h. Rotation factor analysis

The factor analysis is another multivariate technique. It is an extremely powerful and useful analytic approach to psychological, behavioral, financial and other types of data. It is a statistical technique for determining the underlying factors or forces among a large number of interdependent variables of measures. It is a method for extracting common factor variances from a set of observations. It groups the number of variables of smaller set of uncorrelated factors potentially conveying a great deal of information.

A factor analysis was concluded to develop constructs that will help analyse the questionnaire responses and to evaluate factors that influence customers’ actual usage of the internet bank. Factor analysis assists in condensing a large set of variables into a smaller number of basic components, which include some connected variables.

The factor analysis made use of eight questions concerning the customer usage of the hotels. The eight questions were subjected to principal component analysis (PCA) using as software statistical package for social sciences (SPSS). According to the PCA the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. The Kaiser-Meyer-Olkin-value reached 0.716, which is more than the recommended minimum of 0.6.
Barlett’s test of Sphericity reached statistical significance (0.000), supporting the factorability of the correlation matrix.

- **Factor**: A factor is an underlying dimension that accounts for several observed variables. There can be one or more factors, depending upon the nature of the study and the number of variables involved in it.

- **Factor –loading**: Factor-loading is those values which explain how closely the variables are related to each one of the factors discovered. They are also known as factors-variable correlations. In fact, factor-loadings work as a key to the understanding what the factors mean. It is the absolute size (rather than the signs, plus or minus) of the loading that is important in the interpretation of a factor.

- **Communality (h^2)**: Communality, symbolised as h^2, shows how much of each variable is accounted for by the underlying factors taken together. A high value of communality means that not much of the variable is left over after whatever the factors represent is taken into consideration. It is worked out in respect of each variable as under:

  \[ H^2 \text{ of the } i\text{th variable} = (\text{ith factor loading of factor A})^2 = (\text{ith factor loading of factor B})^2 \]

- **Eigen Value**: Eigen value (or Latent Root) is the sum of squared values of factor loadings relating to a factor. It indicates the relative importance of each in accounting for the particular set of variables under study.

- **Total sum of squares**: When Eigen values of all factors are totaled, the resulting value is called the total of squares.
Rotations reveal different structures in the data. If the factors are independent, orthogonal rotation is done, and if they are corrected, an oblique rotation is made. Factor score represents the degree to which each respondent gets high scores on the group of item that load high on each factor. Factor scores are used in several other multivariate analyses.

i. **Multiple regressions**

Multiple Linear Regression Analysis is a technique for modeling the linear relationship between two or more variables. It is one of the most widely used of all statistical methods. The regression model was performed to evaluate whether there exists close association between customers’ preference toward star hotel services and their purpose of trip.

The general linear regression model, with normal error terms, simply of X variables is shown in equation 1.

\[ Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_{p-1} X_{ip-1} + \epsilon_i \]

where \( \beta_0, \beta_1, \ldots, \beta_{p-1} \) are parameters, \( X_{i1}, X_{i2}, \ldots, X_{ip-1} \) are known constants, \( \epsilon_i \) are independent \( N(0,\sigma^2) \), \( i=1, 2, 3, \ldots, N \).

j. **Confirmatory factory analysis (CFA)**

Factor analysis is a collection of methods used to examine the underlying constructs which influence the responses on a number of measured variables. The methods employed so far make an attempt to repackage all of the variance in the \( p \) variables into principal components. The researcher has to restrict the analysis to variance that is common among variables. Basically two types of factor analyse: exploratory and confirmatory. Exploratory factor analysis (EFA) attempts to discover the nature of the constructs
influencing a set of responses. Confirmatory factor analysis (CFA) tests whether a specified set of constructs is influencing responses in a predicted way. SPSS 20.0 has applied to perform EFA. The AMOS 20.0 was used to perform structural equation model like CFA which have been used to analyse the level of satisfaction towards star hotel services in Coimbatore District.

k. Structural equation model (SEM)

Structural Equation Models (SEMs) report findings in three different ways. Understanding the way statistical significance is reported requires understanding the terminology of the model itself. Within the graphical display of the model there are boxes and arrows. Boxes represent observed data and the arrows represent assumed causation. Within the model a variable that receives a one-way directional influence from some other variable in the system is termed "endogenous", or is dependent. A variable that does not receive a directional influence from any other variable in the system is termed as "exogenous" or is independent.

Besides regression coefficients and correlations, SEMs also test the overall fit of the model. The narrative analyses use three measures of model fit to determine the overall quality of fit of the model. Another way of thinking about model fit is to view this as the test of model significance, thus, when the values of significance are met for the tests all relationships within the model are significant, and it is then their relative strengths which decides if there is a relationship or not. Besides testing for model fit, SEMs also provide a measure of multi co linearity. In some cases, the model fits the data well, even though none of the independent variables has a statistically significant impact on the dependent variables.

When interpreting SEMs the values attached to one-way arrows (or directional effects) are regression coefficients, whereas two-way arrows (non
(directional relationships) are correlation coefficients; regression coefficients and correlations comprise the “parameters” of the model. The regression coefficients and correlations measure the strength of the relations between the variables. A regression coefficient of 0.70 or higher indicates a very strong relationship; 0.50 to 0.69 indicates a substantial relationship; 0.30 to 0.49 indicates a moderate relationship; 0.10 to 0.29 indicates a low relationship; 0.01 to 0.09 indicates a negligible relationship; and a value of 0 indicates no relationship.

Structural Equation Model has been used for analysing the level of satisfaction towards star hotel services in Coimbatore District with specified latent and manifest variables. The indices were given below.

i. **Comparative fit index (CFI)**

In examining baseline comparisons, the CFI depends in large part on the average size of the correlations in the data. If the average correlation between variables is not high, then the CFI will not be very high. A CFI value of .90 or higher is desirable. The comparative fit index (CFI) analyses the model fit by examining the discrepancy between the data and the hypothesised model, while adjusting for the issues of sample size inherent in the chi-squared test of model fit, and the normed fit index. CFI values range from 0 to 1, with larger values indicating better fit; a CFI value of .90 or larger is generally considered indicating acceptable model fit.

The comparative fit index (Bentler 1990) is given by.

\[
\text{CFI} = 1 - \frac{\max(\hat{c} - d, 0)}{\max(\hat{C}_b - d_b, 0)} = 1 - \frac{\text{NCP}}{\text{NCP}_b}
\]
where $\hat{C}$ and $NCP$ are the discrepancy, the degrees of freedom and the non-centrality parameter estimate for the model being evaluated, and $C_b - d_b$ and $NCP_b$ are the discrepancy, the degrees of freedom and the non-centrality parameter estimate for the baseline model.

**ii. Normed Fit Index (NFI)**

Normed and non-normed fit indexes are frequently used as adjuncts to chi-square statistics for evaluating the fit of a structural model. A drawback of existing indexes is that they estimate no known population parameters. A new coefficient is proposed to summarise the relative reduction in the non-centrality parameters of two nested models. Two estimators of the coefficient yield new normed (CFI) and non-normed (FI) fit indexes. CFI avoids the underestimation of fit often noted in small samples for Bentler and Bonett's (1980) normed fit index (NFI). FI is a linear function of Bentler and Bonett's non-normed fit index (NNFI) that avoids the extreme underestimation and overestimation often found in NNFI. Asymptotically, CFI, FI, NFI, and a new index developed by Bollen are equivalent measures of comparative fit, whereas NNFI measures relative fit by comparing non-centrality per degree of freedom.

Bentler & Bonett (1980) normed fit index, or $\Delta_i$ in the notation of Bollen (1989b) can be written

$$NFI = \Delta_i = 1 - \left( \frac{\hat{C}}{C_b} \right) = 1 - \left( \frac{\hat{F}}{F_b} \right)$$

Where $\hat{C} = n\hat{F}$ is the minimum discrepancy of the model being evaluated and $\hat{C}_b = n\hat{F}_b$ is the minimum discrepancy of the baseline model.
iii. Rule of Thumb

“Since the scale of the fit indices is not necessarily easy to interpret (e.g., the indices are not squared multiple correlations), experience will be required to establish values of the indices that are associated with various degrees of meaningfulness of results. In experience, the models with overall fit indices of less than .9 can usually be improved substantially. These indices, and the general hierarchical comparisons described previously, are best understood by examples” (Bentler & Bonett 1980, Referring to both the NFI and the TLI).

iv. Relative Fit Index (RFI)

Relative fit indices (also called “incremental fit indices” and “comparative fit indices”) compare the chi-square for the hypothesised model to one from a “null”, or “baseline” model. This null model almost always contains a model in which all of the variables are uncorrelated, and as a result, has a very large chi-square (indicating poor fit). Relative fit indices include the normed fit index and comparative fit index.

Bollen's (1986) relative fit index is given by

$$RFI = \rho_1 = 1 - \frac{\hat{c}}{\hat{c}_b} = 1 - \frac{\hat{F}}{\hat{F}_b}$$

where \(\hat{c}\) and \(d\) are the discrepancy and the degrees of freedom for the model being evaluated, and \(\hat{c}_b\) and \(d_b\)are the discrepancy and the degrees of freedom for the baseline model. The RFI is obtained from the NFI by substituting \(F/d\) for \(F\). RFI values close to 1 indicate a very good fit.
v. **Incremental Fit Index (IFI)**

Bollen's (1989b) incremental fit index is given by

\[ IFI = \Delta_2 = \frac{(\hat{C}_b - \hat{C})}{\hat{C}_b - d_b} \]

where \( \hat{C} \) and \( d \) are the discrepancy and the degrees of freedom for the model being evaluated, and \( \hat{C}_b \) and \( d_b \) the discrepancy and the degrees of freedom for the baseline model. IFI values close to 1 indicate a very good fit.

vi. **Parsimonious Normed Fit Index (PNFI))**

The PNFI is the result of applying the James, Mulaik and Brett, 1982 parsimony adjustment to the NFI:

\[ PNFI = (NFI)(PRATIO) = NFI \frac{d}{d_b} \]

Where \( d \) is the degrees of freedom for the model being evaluated, and \( d_b \) is the degrees of freedom for the baseline model.

vii. **Parsimony Comparative Fit Index (PCFI)**

The PCFI is the result of applying the James, Mulaik and Brett, 1982 parsimony adjustment to the CFI:

\[ PCFI = (CFI)(PRATIO) = CFI \frac{d}{d_b} \]

Where \( d \) is the degrees of freedom for the model being evaluated, and \( d_b \) is the degrees of freedom for the baseline model.
viii. **Tucker Lewis Index (TLI)**

The Tucker-Lewis coefficient ($\rho_2$) in the notation of Bollen (significance 1989) was discussed by Bentler & Bonett (1980) in the context of analysis of moment structures, and is also known as the Bentler-Bonett Non-Normed Fit Index (NNFI).

$$TLI = \rho_2 = \frac{\tilde{c}_b - \tilde{c}}{\tilde{d} - \tilde{d}}$$

where $\tilde{c}$ and $\tilde{d}$ are the discrepancy and the degrees of freedom for the model being evaluated, and $\tilde{c}_b$ and $\tilde{d}_b$ are the discrepancy and the degrees of freedom for the baseline model. The typical range for TLI lies between zero and one, but it is not limited to that range. TLI values close to 1 indicate a very good fit.

ix. **Root Mean Squared Error of Approximation (RMSEA)**

The root mean square error of approximation (RMSEA) avoids issues of sample size by analysing the discrepancy between the hypothesised model, with optimally chosen parameter estimates, and the population covariance matrix. The RMSEA ranges from 0 to 1, with smaller values indicating better model fit. A value of .06 or less is indicative of acceptable model fit.

$F_0$ incorporates no penalty for model complexity and will tend to favour models with many parameters. In comparing two nested models, $F_0$ will never favour the simpler model. Steiger & Lind (1980) suggested compensating for the effect of model complexity by dividing $F_0$ by the number of degrees of freedom for testing the model. Taking the square root of the resulting ratio
gives the population "root mean square error of approximation", called RMS by Steiger and Lind, and RMSEA by Browne & Cudeck (1993).

\[
Population \, RMSEA = \sqrt{\frac{F_0}{d}} \quad estimated \, RMSEA = \sqrt{\frac{\hat{F}_0}{d}}
\]

x. Rule of Thumb

“Practical experience has made us feel that a value of the RMSEA of about .05 or less would indicate a close fit of the model in relation to the degrees of freedom. This figure is based on subjective judgment. It cannot be regarded as infallible or correct, but it is more reasonable than the requirement of exact fit with the RMSEA = 0.0. We are also of the opinion that a value of about 0.08 or less for the RMSEA would indicate a reasonable error of approximation and would not want to employ a model with a RMSEA greater than 0.1.” (Browne & Cudeck 1993)

3.4 CONCLUSION

This chapter contains a detailed discussion on the nature of research methodology applicable for effective conduct of empirical research and the research conduct steps and strategies adopted by the researcher. Following Chapter 4 and 5 provided a detailed discussion of empirical results, analysis, interpretation and conclusion drawn by the researcher based on the field survey results.