CHAPTER 4

RESEARCH DESIGN

The second chapter gave a comprehensive review of the earlier research conducted in the area of Service quality. The review of literature clearly established the need for building a construct for service quality which is specific to Indian airlines services. Also, a comprehensive review of the research done with respect to service quality, Use of Technology and Productivity in Airline services was done.

Rarely do we find any attempt to have been made to study relationship between Productivity, Use of Technology and Service Quality. There is not much literature on establishing a model linking all the three components of Productivity, Use of Technology and Service quality.

The third chapter outlined the theoretical foundation and the conceptual framework for the research work. In this chapter, the research design adopted for establishing a model linking the three components of Productivity, Use of Technology and Service quality is presented.

4.1 SIGNIFICANCE OF THE STUDY

In the literature on service marketing and productivity, relatively a limited number of attempts have been made to conceptualize the linkage between Service quality, Use of Technology and Productivity. Since Productivity has been often measured in hard numbers and service quality is perception based and hence a model linking the both has not been done.
Parasuraman (2006) provided the basis for such an investigation and the same had been discussed in detail in the previous chapter. Also, there is only scant evidence for empirical studies in Airline services across the world and more so for Indian Airline services.

Indian Airlines services are chosen for this study because this industry is a major infrastructural component of an economy, potentially making the findings applicable to other emerging and developing economies too. Also, the Airline industry uses technology in a very big way for delivering the service and technology is used at every customer contact point. Moreover, apart from using technology for delivering the service, the service providers are extensively using technology as an ideal tool for productivity enhancement. After the introduction of open skies policy by the Indian Government, the Airline services industry got a huge boost with the entry of many players. Over the years, the market has grown a high rate with more passengers served, with increased frequency and many location added. The consequent increase in competition has made both the use of technology and service quality as a key differentiating factor for Airline service providers to improve their market and profit positions.

The proposed study endeavors to model the relationship between Productivity, Use of Technology and Service Quality among Indian Airline service providers. This model would provide valuable information for the Indian Airline service providers. This information would help them to invest in Technology for enhancing productivity but without compromising on service quality. The model would also provide them with insights into components of service quality which are related to Technology. This information would be valuable to Airline service providers in other countries too because airlines services at present are more globally integrated one.
The present study is an improvement over the previous works in the following ways:

1. Considerable pains were taken to develop Service Quality inventory suitable for Indian Airline service providers.

2. The scale development and purification process using Exploratory Factor Analysis and Confirmatory Factor Analysis were exhaustively done.

3. Similarly, Service Quality scale developed for the study used a maximum number of possible models available in the extant literature as scale construction source.

4. Also, a focuses group interview was conducted for scale construction. The members of the focused group interview consisted of employees of Airline service providers and Ticketing and Travel agents.

5. A two stage questionnaire was developed. The first stage pertained to establishing the Service Quality inventory and the second stage was developed based on the analysis of service quality constructs to establish the relation between Productivity, Use of Technology and SQ. Responses were obtained from customers for all the three constructs under study, namely, Productivity, Use of Technology and SQ.

6. No other earlier studies have endeavored to establish a model relating the above three. Since the model is a first of its kind SEM technique was deployed to test the model proposed for the study.
The research provides a framework for modeling the relationship between Productivity, Use of Technology and SQ in Indian Airline Services and thus strives to contribute to body of research in the area of Productivity, Use of Technology and SQ

4.2 STATEMENT OF THE PROBLEM

The inventory of SQ have been the focus of research for many years. Though many empirical study have given SQ inventories, these have been more generic in nature, without adequate focus on a specific service industry (e.g. Cronin and Taylor 1992), thereby making the findings not generalizable. Though the SERQUAL model (Parasuramn et al 1985) was quite popular, there have been many instances when researches have questioned the relevance of the same. Saravanan and Rao (2007) after careful evaluation of SERQUAL model of Parasuraman et al have found that certain important aspects of service quality were not covered in it. There is still a lack of agreement about the magnitude of the impact of service quality on key marketing variables, as well as a theoretical model of service quality and its consequences.

Also, the findings have same been disputed by other researches over a period of time. Hence, it became necessary to develop a inventory of SQ for Indian Airlines services

Parasuraman (2006) Discussed about balancing service quality and Productivity Higher level of company inputs and lower level of customer inputs will lead to higher levels of service quality Service quality in turn influences the outputs from the perspective of companies and customer.

Kettinger and Lee (2005); and Pitt et al (2005) state that Technology is enabling and supporting the interactions of customer and
service provider. Hence there is a need to study the relationship between Use of Technology and Service Quality.

Also Kemal et al (2004) have empirically concluded that use of Technology is associated with enhanced firm productivity.

Though a lot of study has been made on the impact of technology, mostly these have been only done with respect to the financial outcome. There are not many studies done on non financial outcomes of using technology. Also, productivity and SQ have been seen to be indirectly proportional to each other, which need not be the case.

From the above it is clear that there is a need for establishing the relationship between Productivity, Use of Technology and Service Quality. The current study aims at filling up the vacuum left behind by the previous researchers in modeling a relationship between Productivity, Use of Technology and Service Quality. This body of research is indeed a humble beginning in that direction.

**4.3 RESEARCH QUESTIONS**

The research questions of the study stemming from the nature of the problem stated above are listed below.

1. Can customer’s perception of SQ be measured meaningfully? If so, what are the inventories of SQ in Indian airline service?
2. What is the impact of Technology on key service Quality inventory in Indian Airline service?
3. What is the impact of Technology on company’s input?
4. What is the impact of Technology on customer input?
5. What is the relationship between Productivity, Use of Technology and Service Quality?

6. Is there any significant difference in customer perception of Service Quality dimensions based on demographic variables?

4.4 OBJECTIVES OF THE STUDY

The objectives of the study, set on the basis of the statement of the problem and the research questions posed above, are:

i. To develop an inventory for Service Quality measurement for Indian Airline Services

ii. To assess the empirical validity of Service Quality for Indian Airline Services

iii. To analyze the impact of select demographic variables on Service Quality indicators.

iv. To develop a model establishing the relationship between Productivity, Use of Technology and Service Quality

v. To test the model using Structural Equation Modeling

4.5 HYPOTHESIS OF THE STUDY

Based on the conceptual framework and the above set objectives, the following hypothesis have been developed and tested in this study. Hypotheses $H_A, H_B$ are related to productivity. Hypotheses $H_C$ to $H_U$ are related to use of technology. All hypotheses are related to service quality.

$H_A$: Productivity achieved through increasing companies input will result in increased service quality
$H_B$: Productivity achieved through decreasing customer input will result in increased service quality

$H_C$: Use of Technology is an important component of Company’s input

$H_D$: Use of Technology has a positive effect on company input

$H_E$: Use of Technology has a negative effect on customer’s input

$H_F$: Use of Technology enhances the performance of Pilots

$H_G$: Use of Technology enhances the performance of the cabin crew

$H_H$: Use of Technology enhances the performance of airline staff at the airport

$H_I$: Use of Technology enhances the performance of aircrafts

$H_J$: Use of Technology enhances the performance of associated equipments

$H_K$: Use of Technology enhances the performance of communication tools

$H_L$: Use of Technology enhances the performance of flight routes

$H_M$: Use of Technology enhances the performance of flight timings

$H_N$: Use of Technology enhances the performance of On time flight take off

$H_O$: Use of Technology enhances the performance of On time flight arrival

$H_P$: Use of Technology enhances the performance of utilities provided at the airport provided by the airlines
H₀: Use of Technology reduces the time spent by the customer in availing the service

Hᵣ: Use of Technology reduces the effort put in by the customer in availing the service

Hₛ: Use of Technology reduces the price for the customer in availing the service

Hₜ: Use of Technology reduces the time spent by the customer in booking for the service

Hᵤ: Use of Technology reduces the time spent by the customer in the actual use of the service

4.6 SAMPLING DESIGN

The population for the study is the customers of Indian Airline service providers in Coimbatore city. Judgment sampling and snowball sampling techniques were used for selecting the samples of the study.

The research design uses Structural Equation Modeling. While using Structural Equation Modeling, one has to be careful about the sample size. It is generally understood among statisticians that SEM requires large sample sizes (Kline, 2005). More complex models may require the estimation of more statistical effects, and thus larger samples are necessary in order for the results to be reasonably stable. The type of estimation algorithm used in the analysis also affects sample size requirements. There is more than one type of estimation method in SEM, and some of these may require large samples because of assumptions they make (or do not make) about the data.

According to Kline (2005), “With less than 100 cases, almost any type of SEM analysis may be untenable unless a very simple model is
evaluated. Such simple models may be bare-bones. Sample sizes less than 100 would be considered small. A sample between 100 and 200 subjects is considered medium and is a better minimum, but again this is not absolute because things such as the model’s complexity must also be considered. Sample sizes that exceed 200 cases could be considered large.

Another empirical guideline about sample size is given by Breckler (1990), who surveyed 72 studies published in personality and social psychology journals in which some type of SEM was conducted. The median sample size across these studies was 198, which is approximately medium, according to the guidelines given by Kline (2005). The range of sample sizes reported by Breckler 40 to 8650 cases. A sample of 18 studies (25 percent) had sample sizes greater than 500, but 16 studies (22 percent) had fewer than 100 subjects or small sample sizes. One survey by MacCallum and Austin (2000) of about 500 applications of SEM published in 16 different research journals from 1993 to 1997 found that about 20 percent of studies used samples of fewer than 100 cases.

McQuitty (2004) suggested that when SEM is used, it is important to determine the minimum sample size required in order to achieve a desired level of statistical power with a given model prior to data collection. Schreiber et al., (2006) mentioned that although sample size needed is affected by normality of the data and estimation method that researchers use, the generally agreed-on value is 10 participants for every free parameter estimated. Although there is little consensus on the recommended sample size for SEM, Sivo et al (2006) proposed a “critical sample size” of 200.

In other words, as a rule of thumb, any number above 200 is considered to provide sufficient statistical power for data analysis while using SEM. This study meets the recommended size of above 200 samples. Hence the sample of 655 is considered sufficient and justified.
The research required a two stage questionnaire, first questionnaire designed to establish the service quality inventory suitable for Indian Airline service providers and the second questionnaire suitable for modeling the relationship between Productivity, Use of Technology and Service Quality based on the analysis obtained from the first questionnaire were used. Both the actual questionnaire administered to the customers of Indian Airline service providers are given in the appendix of this report.

4.6.1 Place of Study

The study was conducted in the geographical area of Coimbatore city in the State of Tamilnadu in India. Coimbatore city is considered as a tier two city, next only to the major metros of India, along the lines of Chandigarh, Kochi and Pune, which are flowering as the true indicators of the growing Indian economy.

In the state of Tamilnadu, Coimbatore is considered as the second big industrial hub after the capital city of Chennai. The city’s industrial growth started in 1920’s and accelerated after independence. Off late, Information Technology companies have started opening development centers in the city. Major type of industries located in Coimbatore include, Textile mills, Power looms, Hosiery units, Motors, Pumps and Foundry units, Wet grinder and accessories units. Twenty percent of India’s foreign exchange is earned by the Textile and Hosiery units in and around Coimbatore.

More significantly, the city of Coimbatore has the distinction of being one of the active commercial centers of South India where almost all the major Airline service providers are providing connectivity to all the metros of India and to many regional centers too. And finally, the paramount reason for choosing Coimbatore city as the place of study is that the
investigator is located here and familiar with the place and some of the persons working in the branches of various Airline service providers.

4.6.2 Data Collection Period

The data collection for the study, by using structured Questionnaire, was completed over a period spanning nine months in two stages between January 2011 to April 2011 and between June 2011 and September 2011. The month of May 2011 was used to analyse the data obtained from the first structured Questionnaire and for designing the second structured questionnaire.

4.7 INSTRUMENTATION

For the purpose of studying the objectives set and to test the hypothesis, two structured questionnaires were developed. The first structured questionnaire was designed to establish the service quality inventory suitable for Indian Airline service providers and the second questionnaire was designed for modeling the relationship between Productivity, Use of Technology and Service Quality. Both the questionnaires used five point Likert scale.

4.7.1 Sources of Service Quality Dimensions

The first structured questionnaire consisted of questions to capture demographic data and statements to identify the relevant service quality dimensions. The statements for identifying the SQ dimensions were designed based on the various service quality constructs chosen from the literature review. The following table explains the sources from which the items of the statements were obtained from.
Table 4.1 Sources of Service Quality Dimensions from Literature review

<table>
<thead>
<tr>
<th>Construct</th>
<th>Dimensions</th>
<th>No of items</th>
<th>Source of items</th>
</tr>
</thead>
</table>

However, apart from the above mentioned sources of dimensions, a focused group interview consisting of employees of Airline service providers, employees of Airline Travel agents and frequent customers of Indian Airline service providers.

The following table provides details of items of the statements that were obtained from the focused group interview conducted.

Table 4.2 Sources of Service Quality Dimensions from Focused group interview

<table>
<thead>
<tr>
<th>Construct</th>
<th>Dimensions</th>
<th>No of items</th>
<th>Source of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Quality</td>
<td>2</td>
<td>16</td>
<td>Focused group interview</td>
</tr>
</tbody>
</table>

The Service Quality constructs and the items of statements framed through the literature review were also discussed in the focused group interview and the statements for identifying the constructs of SQ were framed as an outcome of the focused group interview.

4.7.2 Service Quality Dimensions

The Part two of the first structured questionnaire consisted of forty seven statements capturing the twelve dimensions of service quality perceptions of respondents.
Internal consistency reliability measure was computed using Cronbach Alpha coefficient. All the statements were designed to reflect the SQ measurement from the context of the Indian Airline Service Providers. The wordings of the statements were made to suit the context of the Indian Airline service providers.

The below table shows a set of few statements that were designed to capture the Dimensions of Service Quality

**Table 4.3 A select list of statements for capturing SQ dimensions**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I feel convenience of flight timing is very important</td>
</tr>
<tr>
<td>2</td>
<td>I feel on time take-off of flight is very important</td>
</tr>
<tr>
<td>3</td>
<td>I feel that it is important for Airlines to provide me with messages regarding flight delay</td>
</tr>
<tr>
<td>4</td>
<td>I feel timing of connecting flight is important</td>
</tr>
<tr>
<td>5</td>
<td>I feel that the availability of connecting flight is important</td>
</tr>
<tr>
<td>6</td>
<td>I feel that the pilot should provide clear information regarding flight take-off</td>
</tr>
<tr>
<td>7</td>
<td>I feel that the pilot should provide clear information regarding weather conditions</td>
</tr>
<tr>
<td>8</td>
<td>I am very particular about the leg room in my seat</td>
</tr>
<tr>
<td>9</td>
<td>I require the airline to provide me with a wheel chair in the airport before boarding the flight</td>
</tr>
<tr>
<td>10</td>
<td>I want all entertainment facilities in my seat itself</td>
</tr>
<tr>
<td>11</td>
<td>I am particular about the type of food served to me</td>
</tr>
<tr>
<td>12</td>
<td>I feel that the crew members should talk to me in my mother tongue</td>
</tr>
</tbody>
</table>
4.7.3 Pilot Study

After finalizing the number of items in the SQ instrument, a pilot study was undertaken for the following reasons:

1. To assess the reliability of the SQ instrument constructed
2. To ascertain the viability in the administration of the complete Questionnaire

Pilot study for this research was conducted by administering the Questionnaire to 52 respondents. The data collected from the pilot study was subjected to reliability test using Cronbach Alpha to check for internal consistency. Cronbach Alpha is the most prominent reliability coefficient. It measures the reliability of a set of indicators. Value ranges from zero to one. The resultant reliability coefficient of the variables chosen was found to be more than 0.6 and thus confirming the internal consistency. The Cronbach Alpha values are given in the Table 5.3 in the next chapter. The transaction during the pilot study also suggested that the administering of the questionnaire was practical, elicited the necessary information and on an average too around 15 minutes to complete answering the questionnaire.

4.8 DATA COLLECTION

Two sets of questionnaires were administered and it was done sequentially. Out of the 889 customers contacted for data collection 740 customers accepted to answer the questionnaire. Among the respondents who accepted to answer the questionnaire some of the customers expressed their desire to fill up the questionnaire and return it at a convenient date. For those respondents a stamped postage cover with the investigators address was also given.
Thus, by the end of the September 2011, data from 760 responses were obtained for both the Sets of questionnaires included.

However, it is to be mentioned here that both the sets of Questionnaires were not given to the same respondents but different sets of respondents were used for the two sets of questionnaires. This is due the fact that the second questionnaire was developed only after the analysis of the first questionnaire. Also, it is almost impractical to meet the same of set of respondents who answers the first set of questions to answer the second set too, considering the time lag of four months between administering the first and second set of questionnaire.

Out of the 760 responses obtained only 655 responses were useful due to lack of information for certain questions and lack of clarity in the tick marks made. So, out of 889 customers contacted only 760 responded and out of these responses only data from 655 responses were suitable for analysis, yielding a response rate of 86.2 %. and a sample size of 655.

4.9 STATISTICAL TOOLS USED

A combination of univariate and multivariate statistical techniques like comparison of mean score, one way ANOVA, Multiple regression, Exploratory Factor Analysis, Confirmatory Factor Analysis and Structural Equation Modelling were used for data analysis of the study.

4.9.1 Exploratory Factor Analysis

Exploratory Factor Analysis is a convenient method of identifying redundancy based on their variability and simultaneously pointing out groups of variables which constitute independent response sets. A Principal Component Analysis type of factor analysis (Varimax rotated) is applied
in the present study to the Service Quality scale with 56 items. The purpose was for identifying those items that are not loaded in any one of the dimensions.

4.9.2 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was used for the purpose of purification of service quality scale developed for the present study. CFA seeks to determine if the number of factors and loadings of measured (indicator) variables on them confirm to what is expected on the basis of pre-established theory (Clement and Israel, 2005). Indicator variables are selected on the basis of prior theory and factor analysis is used to see if they load as predicted on the expected number of factors.

CFA can mean the analysis of alternative measurement (factor) models using a Structural Equation Modeling package such as

or LISREL. While SEM is typically used to model causal relationship among latent variables, it is equally possible to use SEM to explore CFA measurement models. The model is run like any other model and is evaluated like other models, using Goodness of Fit measures generated by the SEM package. The logic of CFA is that given a set of variables (say, 53 items in the present study for twelve dimensions of Flight timings, Flight delay, Flight connection, Frequent flyer programme, Baggage, crew members, etc.,) the model attempts to confirm these dimensions. One major advantage of CFA over EFA is that CFA considers and eliminates the measurement errors in relating variables to the dimensions. To that extent, the results are reliable. Further, through CFA, a researcher can reduce the number of variables attached to a construct. Moreover, unlike EFA, the results obtained through CFA can be statistically tested for validation, which is indeed unique and the same is performed for the present study.
4.9.3 Structural Equation Modeling

Structural Equation Modeling (SEM) is a modeling technique widely used in behavioral research. It is capable of handling a large number of endogenous and exogenous variables that are latent. A latent variable is one which cannot be directly observed and therefore needs to be specified through a combination of observed variables. SEM is divided into two parts, namely a measurement model and a structural model. The measurement model is used to specify the relationship between observed variables and latent variables. The structural variable measures the impact of one variable on the other. Suppose if it is required that we are to identify the relationship between constructs such as Use of Technology, Productivity and Service Quality.

This involves three major aspects, firstly, the variables related to the each of the constructs are to be confirmed that they do share variance or relationship with their respective constructs or latent factors. This involves the application of CFA. Secondly, the amount of impact of one construct upon the other (i.e., the effect of Use of Technology on Service Quality) has to be studied. These form of directional relationships are generally examined using either the Path analysis or regression analysis. However, it must be noted that these Path analysis or regression analysis can be used for measured or indicator variables only and not for the constructs themselves. Indeed, SEM is a combination of Factor Analysis, Regression Analysis and Path Analysis. Thus SEM is a new approach to hypothesis testing when we have a number of constructs and some of them are simultaneously treated as both dependent and independent variables in the model (as in this case, Productivity is a dependent latent variable while it is independent latent variable to Service Quality).

Thus, SEM enables one to test the hypothesized pattern of directional and non-directional linear relationships among a set of measured
variables in addition to providing the structural indices for checking the fit of the model. In the present study, the researcher makes an attempt to explain the Service Quality relationship with productivity and Use of Technology among the Indian Airline service providers through the application of SEM.

4.9.4 One Way ANOVA

ANOVA is a statistical technique for examining the differences among means for two or more populations. Essentially ANOVA is used as a test of means for two or more populations. The null hypothesis typically is that all means are equal. In one way ANOVA, the dependent variable is denoted by Y and the dependent variable by X. X is a categorical variable having c categories. There are n observations on Y for each category of X.

In examining the differences among means, One way ANOVA involves the decomposition of the total variation observed in the dependent variable. This variation is measured by the sums of squares corrected for the mean (SS). ANOVA is so named because it examines the variability or variation in the sample (dependent variable) and, based on the variability, determines whether there is reason to believe that the population means differ.

In ANOVA, two measures of variation are estimated: within groups and between groups. Within groups variation is a measure of how much the observations, Y values, within the group vary. This is used to estimate the variance within a group in a population. However, because it is not known that all groups have the same mean, the variance of all observations cannot be calculated together. The variance for each of the groups must be calculated individually, and these are combined into an “average” or “overall” variance.
4.9.5 Multivariate Analysis of Variances

Multivariate Analysis of Variances (MANOVA) is an extension of Analysis of Variances (ANOVA), used to test the impact of one or more categorical independent variables (also known as predictor or treatment variables) on two or more continuous scaled dependent variables (also known as criterion variables). Using MANOVA, one can test the independent and interactive effect of the predictors on a set of dependent variables. It takes into account the inter-correlation existing among the dependent variables, thereby reducing the information loss.

MANOVA is a dependence technique and is formulated as:

\[ Y_1 + Y_2 + Y_3 + Y_4 + Y_5 + \ldots + Y_n = X_1 + X_2 + X_3 + X_4 + \ldots + X_n \]  (4.1)

In this study, the Y variables on the left hand side are dependent variables that are measured on a continuous scale i.e. Service Quality dimensions and the X variables on the right hand side of the equation are the independent variables, namely, age, education and income, MANOVA aims at finding out how far different categories of service Quality dimensions are different across the set of demographic variables which is known as dependent covariate.

4.9.6 Multiple Regression Analysis

Multiple Regression analysis is a parametric analysis, used to find out the impact of metric (continuous) independent variable on a single dependent variable in a study. It helps the researcher mainly in two ways: First, it enables him to identify size or quantum of impact of each explanatory (independent) variable on the criterion (dependent) variable after adjusting for other independent variables in the model; Second, it also provides an index o
combined explanatory variable taken together on the dependent variable in the form $R^2$. A significant high $R^2$ gives the overall impact of the variables in the model. The overall model’s fit is indicated with F-statistics. In this study, Multiple Regression is applied to indicate the effect of demographic variables on dimensions of Service Quality.

The description about the analytical tools used concludes this chapter. The analysis of data and its interpretation and Service Quality measurement are described in the next chapter.