CHAPTER-3
RESEARCH DESIGN

CHAPTER-III
RESEARCH DESIGN

The present study is an attempt to examine the impact of electronic banking on operational performance and service quality of banking sector in India. This chapter discusses the research methodology of the dissertation. It explains the scope, objectives, period and sample of the study. The statistical techniques used to analyze the data and limitations of the study have also been discussed.

3.1 Objectives of the Study

The objectives of study are as follows:

1. To study the nature, growth and extent of electronic banking services in the Indian banking sector.
2. To assess the impact of e-banking on service quality in the banking sector in India.
3. To examine the impact of e-banking on the operations, payment and clearing system in the banking sector.
4. To make comparative analysis of operational performance and service quality of public and private sector banks.
5. To identify the gaps in operational performance and service quality of the banking sector, and to make recommendations for improvement.

3.2 Sample Period

The present study relates to the period 2003 onwards as the Indian banking sector adopted electronic banking system mainly during this time period. Although ICICI Bank was the first to introduce internet banking in 1997, yet the services like Real Time Gross Settlement System, National Electronic Fund Transfer, Cheque Truncation System were introduced after the year 2003 only. Therefore, 2003 was selected as the base year of analysis to adjudge the performance of e-banking. To study the extent of e-banking services in India, a website analysis was conducted in June 2008. The services are mainly divided into four major categories, i.e., internet banking, phone banking, mobile banking and ATM.

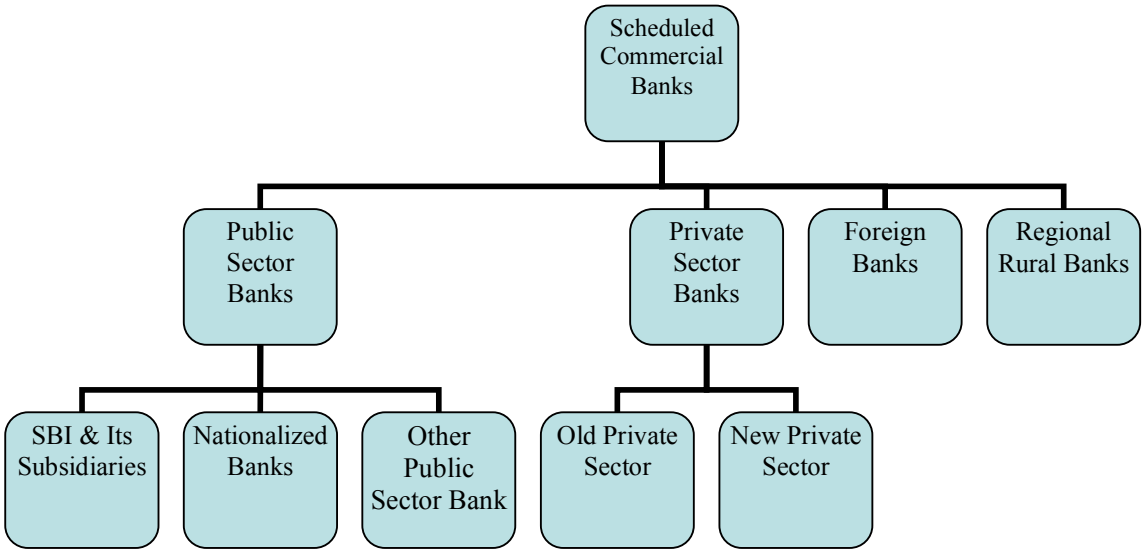
3.3 Universe of the Study

The universe of the study consists of scheduled commercial banks. The scheduled commercial banks are divided into public sector, private sector, foreign banks and regional rural banks. For the data collection, only public and private sector banks are

taken into consideration. Public sector banks include SBI and Nationalized banks, while private sector banks comprise of old private sector and new private sector banks. The structure of Indian banking system has been explained in the following figure:

Figure 3.1

Structure of Scheduled Commercial Banks



3.4 Sample of the Study

The universe of sample consists of public and private sector banks which were operating in India as on 31st March 2006 (Appendix-A). It includes 27 public sector banks (State bank of India and its 7 subsidiaries) and 18 private sector banks (7 New private sector banks and 11 Old private sector banks). New private sector banks include those banks which came into existence after liberalization reforms recommended by Narasimham Committee in 1991. Old private sector banks came into existence before liberalization. The sample of the present study is based on following criteria:

1. Only public and private sector banks have been taken into consideration.
2. Banks operating as on 31st March 2006 are considered. The banks which merged in other banks are, therefore, not included.
3. The banks whose homepages were not discovered in spite of the best efforts are considered as non-electronic banks.
4. Only the banks having transactional websites are further analyzed. Informational websites are not taken into consideration.
5. Banks from public and private sector for their operational performance and service quality are chosen on the basis of CAMEL model.

6. Electronic banking services mainly include retail services offered to customers.

All the public and private sector banks selected on the basis of their transactional websites have been undertaken to study the extent of electronic banking services. However, to study the impact of e-banking on service quality and operational performance, it was not possible to select all the banks. Therefore, four banks each from both public and private sector were selected and the criteria was the asset base i.e. the banks with bigger asset base have been selected . The public sector banks selected on the basis of their asset base structure include SBI, Bank of Baroda, Punjab National Bank and Canara Bank. The private sector banks include ICICI, HDFC, AXIS Bank and Centurion Bank of Punjab. But Centurion Bank was merged into HDFC Bank on 23rd May, 2008. So, the data was collected from seven major banks of Indian banking sector.

3.5 Sources of Data

The study is based on both the primary and secondary data.

3.5.1 Primary Sources:

To achieve the objectives of the study mainly primary data has been used. To study the extent of electronic banking services in India, a survey was conducted during the month of June, 2008. The search was conducted through a worldwide web with using a various websites viz. www.banknetindia.com and websites of banks found at www.rbi.org.in and www.google.com to discover the main pages and home pages of 50 public and private sector banks. These websites were monitored to have a close look at the services delivered to customers. A check list containing various e-banking services offered by the banks was prepared to check the extent of disclosure of banking services and products by the banks offering electronic banking services. All the data for the said purpose was collected through internet.

3.5.2 Measurement of Extent of Electronic Banking Services

For the purpose of extent of e-banking services, 48 services have been taken into account. These have been divided into four categories, viz. internet banking services, phone banking services, mobile banking services and ATM services.

3.5.3 Building of Index

In order to measure the extent of electronic banking services provided by the banks, it was considered necessary to convert the services into a numerical form. For this purpose, an Index was prepared. The e-banking services, 48 in all, have been divided into four categories, viz. internet banking services, phone banking services, mobile banking services and ATM services. One point has been assigned to each service. Each

bank can score a maximum of 48 points and minimum of zero point. Total score of the bank was calculated by adding all the points of electronic banking services, and the extent of services has been calculated by using the following formula:

Extent of E-banking of a particular bank = {Total score of the bank/ total number of electronic banking services (48 services)} x 100

Ranking of the banks has been done on percentage basis. The highest scoring bank has been given the 1st rank and so on.

Table 3.1

List of Electronic Banking Services

Service code	Electronic Banking Services	Points
	Internet Banking Services	
1	Balance Enquiry and Statement	1
2	Transaction History	1
3	Online Transfer of Funds	1
4	Card to Card Fund Transfer	1
5	Prepaid Mobile Recharge	1
6	Buy and Sell Mutual Fund	1
7	Send Money Order Anytime	1
8	Open Fixed Deposit and Recurring Deposit	1
9	Request for Cheque Book	1
10	Stop Payment Request	1
11	Request for Debit Cards	1
12	Monthly Bank Account Statement by E-mail	1
13	Reissue and Upgrade of ATM/Debit Card	1
14	Link Bank Account to ATM/Debit Card	1
15	Renewal/ Premature Closure of FD/ RD	1
16	Deactivate/ Activate ATM/ Debit Card	1
17	Change Password	1
18	Demat Holdings	1
19	Loan Details	1
20	Interest Rates Updates	1
21	Bills Payment	1

22	Online Shopping	1
23	Ticket Booking	1
24	Mobile Top-Up	1
25	Share Trading	1
26	Online Tax Payments	1
27	Convert to EMI	1
28	Online Loans	1
29	Customer Correspondence	1
30	Demonstration of I-Banking	1
31	Corporate Internet Banking	1
	Phone Banking Services	1
32	Enquire Your Account-Balance	1
33	Statement of Account	1
34	Request for Fund Transfer	1
35	Stop Cheque Payment Instructions	1
36	Mobile Banking Registration	1
37	Latest Interest and Exchange Rates	1
	Mobile Banking Services	
38	Account Balance	1
39	Making Payment of Bills	1
40	Details of Credit Card Balance	1
41	Loan Information	1
42	I-Mobile	1
43	Purchase and Redemption of Mutual Fund Units	1
44	Last Three Transactions	1
	ATM Services	
45	24 Hours Access to Cash	1
46	Transfer Fund Between Accounts	1
47	View Account Balances and Mini Statement	1
48	Pin Change Option	1

A questionnaire was designed to achieve the second objective of the study which related to find the impact of e-banking on service quality. The data required for

conducting this study was collected using self-administered questionnaire especially designed to achieve the said objective, which was drawn from customers of both public and private sector banks in the state of Punjab. A total of 470 customers were approached from five districts of Punjab, viz. Ludhiana, Patiala, Jalandhar, Bathinda and Mohali; and 400 of them completely filled the questionnaire comprising 80 from each district.

The questionnaire was prepared for the purpose. It consisted of three sections. First section related to the demographic information. It contained information about the respondents regarding their gender, marital status, educational qualification, occupation and household income. Second section was again divided into three sub parts. First part comprised of 43 items, which were meant to measure consumer's extent of agreement regarding e-banking services in terms of ten main dimensions. Second part carried the opinion of the customers regarding e-banking services. Third part covered the service problems encountered by the customers and reaction of the bank towards their complaint. Third section contained ten statements to find the impact of e-banking on payment and clearing system and their awareness regarding the services. A pilot study was conducted to test the questionnaire; and an effort was made to cover the aspects of quality, customers' satisfaction, their behavioural intention concerning the banking sector.

3.5.4 Drafting of Research Instrument for Service Quality

To analyze the impact of e-banking on service quality from customers' angle, a modified SERVQUAL type questionnaire relevant to the banking industry was prepared. The questionnaire included 22 items from the original five dimensions (i.e. Tangibility, Reliability, Responsiveness, Assurance and Empathy) of the SERVQUAL instrument developed and updated by Parasuraman et al. (1994). In order to obtain an even more comprehensive and banking industry specific measure of the service quality, five more dimensions including 21 additional items were added to the SERVQUAL scale. So, the present study consists of mainly ten dimensions .The additional items were derived by going through the review of literature of the studies conducted in the banking sector, personal interviews with managers, employees, officers and customers of public and private sector banks.

Thus, in total 43 items were included under ten dimensions (i.e. Tangibility, Reliability, Responsiveness, Assurance, Empathy, Creditworthiness, Courtesy, Communication, Security and Understanding) to measure the service quality. The respondents were asked to evaluate their level of satisfaction on 43 items. All the items

were measured on the five-point Likert scale from 5 (strongly agree) to 1 (strongly disagree). Apart from service quality, the questions regarding internet banking services, ATMs, mobile banking services, e-payment system and overall customer satisfaction were also included in the questionnaire. Factor analysis was used for data reduction and for the calculation of desirable results. To check the reliability of data Cronbach alpha, KMO and Bartlett test of sphericity were applied.

3.5.5 Items of Final Draft of the Research Instrument

S. No.	Attitude Factor	Item No.	Total Items
1.	Reliability	26,27,28	3
2.	Responsiveness	29,30,31,34	4
3.	Competence	13,23,24,25	4
4.	Access	32,33,35,36	4
5.	Courtesy	41	1
6.	Communication	17,18,19,20,21,22,42	7
7.	Credibility	37,38,39,40,43	5
8.	Security	12,14,15,16	4
9.	Understanding	7,8,9,10,11	5
10.	Tangibility	1,2,3,4,5,6	6

The fourth objective was to study the impact of e-banking on operational performance of banking sector. To achieve this objective, employees' opinion and e-banking impact on their work is taken into consideration. The reason being that with the introduction of core banking solution, electronic fund transfer, real times gross settlement system and electronic clearing services, there is a major change in the methods of performing their duties and improvement in the productivity and operations. The centralized data base, online data availability, any branch banking, paperless transactions and up-to-date information led to sweeping changes in productivity and operational performance of the banks. Therefore, a pre-tested and well structured questionnaire was designed and got filled from the employees of four public sector banks and three private sector banks situated in five districts of Punjab, viz. Ludhiana, Patiala, Jalandhar, Bathinda and Mohali. A sample of 100 employees was drawn from the banking sector, comprising 7 banks, i.e., 4 from the public sector and 3 from the private sector. These banks are: SBI, PNB, Canara Bank, Bank of Baroda, HDFC, ICICI and

AXIS Bank. A specifically designed questionnaire was used as a tool and bank employees were requested to complete it during the office hours. Different branches from different regions were selected for the purpose. At least five employees from a branch were selected to fill the questionnaire. Questionnaires were got filled from employees working at different levels like executive manager, assistant manager, relationship manager, branch manager, officer, cashier, clerk and front desk executive. The questionnaires found incomplete were rejected. So, out of 120 questionnaires only 100 were considered for analysis.

3.5.6 Secondary Sources

The secondary data has been collected from various IBA Bulletins published by Indian banks, statistical tables relating to banks of India, Trends and Progress Reports of RBI, and annual reports of the banks.

The growth of ATMs has been studied by dividing the banks into five categories, i.e., nationalized banks, SBI group, old private sector banks, new private sector banks, and foreign banks. These have been further classified into onsite ATMs and offsite ATMs. The compiled data relates to the period from 2004-05 to 2007-08. To study the growth of ATMs, growth to previous year and to total has been calculated. Third objective is based upon both the primary and secondary data. The data regarding Electronic clearing services (debit and credit), Electronic fund transfer, Debit cards, Credit cards, Real time gross settlement system and Magnetic Ink Character Recognition (MICR) has been collected through published sources. Both volume and value based transactions are calculated. The data was collected for the period 2003-04 to 2008-09. No sector- wise division has been made for this objective. In order to know the trend of e-payment, growth to previous year has been calculated. The fourth section of questionnaire filled by the customers provides the data which helps to achieve this objective of the study.

Following sources are used for the collection of data:

1. IBA Bulletins published by Indian Banks Association (various issues).
2. Statistical tables relating to banks in India available at the website of Reserve Bank of India (www.rbi.org.in)
3. Various journals and magazines issued by the banks from time to time.
4. Trends and Progress Reports of Reserve Bank of India, RBI Bulletin (various issues).
5. Reports on Currency and Finance, annual publication of RBI (various issues).

6. Various speeches delivered by RBI governor from time to time on E-payment system.
7. Other sources to have an updating of electronic banking transactions and services:
   - Annual reports of banks.
   - Professional Banker, The Management Accountant and other banking update journals.
   - Journal of Internet Banking and Commerce, Indian Journals and other publications.

3.6 Parameters Used to Assess Operational Performance

As discussed earlier in the primary sources, a questionnaire based upon the following parameters was designed to measure the operational performance of e-banking:

1. Reduction in processing time
2. Minimization of cost
3. Time taken in responding queries to customers
4. Complexity of transactions
5. Reduction of risk
6. Increase in trust
7. Facilitate Centralized data base
8. Online real- time data availability
9. Reduces inventory holdings
10. Enables paperless transaction
11. Automatic reconciliation of remittance
12. Processing and settlement on real time
13. Immediate finality of transaction

To have a deeper look at the performance of banking sector, these parameters have been analyzed and interpreted by calculating mean and standard deviation and weighted average scores on the basis of 5-point Likert scale.

3.7 Main Quantitative Techniques Used in the Study

The following statistical tools were employed for the analysis of data:

1. **Descriptive Analysis**: Measures of central tendency such as mean, standard deviation, weighted average score, ranks, etc. were worked out to study the nature and distribution of scores on different variables.
2. **T-test**: In order to measure the distinctiveness between two constructs, t-test has been carried out. The test statistics, 't', is calculated from the sample data and then compared with its probable value based on t-distribution at a specified level of significance for concerning degrees of freedom for accepting or rejecting the null hypothesis.
3. **Kendall's Coefficient of Concordance**: Kendall's Coefficient of Concordance (W) is considered as an appropriate measure of studying the degree of association among three or more sets of rankings. If N is larger than 7, we may use χ^2 value to be worked out as $\chi^2 = K (N-1)$ with d.f. = (N-1) for judging W's significance at a given level in the usual way of using χ^2 values.
4. **Cross Tabulation**: Cross Tabulation can be done by combining any of the two questions and tabulating the data together. It was carried to understand relationship between demographic variables like age/sex, education/occupation, type of account/ occupation, etc.,
5. **Chi-square Test**: In case of cross tabulation, featuring two variables, a test of significance called the Chi-square test can be used to test if the two variables are statistically associated with each other significantly.
6. **Mann-Whitney Test**: Mann-Whitney test was conducted to compare the ranks of two statements. This test has been conducted to know that both samples are taken from the same population.
7. **Factor Analysis**: The factor analysis is a statistical approach that can be used to analyze inter-relationships among a large number of variables and to explain these variables in terms of dimensions called factors. Before describing different methods of factor analysis, it seems appropriate that some basic terms relating to factor analysis be well understood.
    - **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 study and the number of variables involved in it.

- **Factor Loading:** Factor loadings are those values which explain how closely the variables are related to each one of the factors discovered. They are also known as factor-variable correlation.
- **Communality (h^2):** Communality, symbolized as h^2, shows how much of each variable is accounted for by the underlying factor taken together. It is worked out in respect of each variable as under:

  h^2 of the i^{th} variable=(i^{th} factor loading of factor A)^2+(i^{th} factor loading of factor B)^2 + …..
- **Eigen Value (Latent Root):** When the sum of squared value of factor loadings relating to a factor is taken, then such sum is referred as Eigen value or Latent Root.
- **Total Sum of Squares:** When Eigen values of all factors are totaled, the resulting value is termed as total sum of squares.
- **Rotation:** Different rotations reveal different structures in the data. If the factors are independent, orthogonal rotation is done; and if the factors are correlated, an oblique rotation is made. Communality for each variable will remain undistributed regardless of rotation but the Eigen value will be changed as a result of rotation.
- **Factor Scores:** Factor scores represent the degree to which each respondent gets high score on the group of items that load high on each factor.

Factor analysis is mainly used for data reduction. There are two stages in factor analysis. Stage 1 is called as factor extraction process, where the objective is to identify how many factors can be extracted. The most popular method is called principal component analysis. There is also a rule of thumb based on the computation of an eigen value which helps in determining as to how many factors should be extracted. The higher the eigen value the greater will be variance explained. Before extracting the factors, each factor has an eigen value equal to 1. As the objective is to reduce the variables to a fewer number of factors so only the factors having eigen value of greater than 1 have been retained. 2^{nd} stage is called rotation of principal components. After the extraction of factors the next step is to name and interpret the factors. Values close to 1 represent high loadings and those close to 0 show low loadings. If factor 1 is loaded by 3 variables then factor 1 is a linear combination of these 3 variables.

8. **Cronbach Alpha**: This statistical tool is used in factor analysis to measure the reliability of data. If the value of cronbach alpha is greater then 0.5 then the data for the said purpose is reliable for factor analysis.
9. **Kaiser-Meyer-Olkin (KMO)** measure of sampling adequacy and Bartlett's test of sphericity help in measuring the reliability of data.

All statistical calculations have been made by the use of Microsoft excel and SPSS software

version 17 for the objective.

A brief description of some important tools and the formulas is given as under:

1. Mean $(\overline{X}) = \frac{\sum x}{N}$

   $\sum$ = symbol for summation

   Where, $\sum x$ = sum of series of observation

   N = number of items

2. S.D. $(\sigma) = \sqrt{\sum x^2/N}$

   Where, $\chi = (x - \overline{x})$, $\overline{x}$ is the mean of the series and $(x - \overline{x})$ is the deviation from the mean

   N = number of items

3. Wilcoxon Mann- Whitney test (U-test)
4. $U = n_1 - n_2 + \frac{n_1 (n_1+1)}{2} - R_1$

Where, n_1 and n_2 are the sample size; and R_1 is the sum of ranks assigned to the values of the first sample (In practice, whichever rank sum can be conveniently obtained is taken as R_1, since it is immaterial which sample is called the first sample

5. $$t = \frac{x_1 - x_2}{\sqrt{(n_1-1)\sigma^2_{s1} + (n_2-1)\sigma^2_{s2}}{n_1 + n_2 - 2}} X \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

   With d.f. = $(n_1 + n_2 - 2)$

3.8 Reliability Analysis

Prior to the analysis of results, the research instrument was tested for its reliability. The internal consistency of the grouping of the items was estimated using reliability co-efficient called Cronbach's alpha and alpha value of 0.50 or above is

considered to the criterion for demonstrating internal consistency of new scales and established scales respectively.

The Cronbach's (alpha) α value of service quality dimensions more than 0.5 testifies strong scale reliability.

Cronbach's α is defined as

$$\frac{N\left(\sigma^2_x - \sum_{i=1}^{N} \sigma^2_{yi}\right)}{\sigma^2_x}$$

Where, N is the number of components, σ^2_x is the variance of the observed total test scores, and σ^2_y is the variance of component i.

3.9 Limitations of the Study

Every research work is subjected to certain limitations; and this study is also not an exception.

The present study has the following limitations:

1. The responses for the study have been solicited from the state of Punjab only. The expectations of the customers in Punjab may vary from those of the rest of India.
2. The present research explores the key dimensions of the service quality in the Indian banking industry. A total of 43 parameters under ten dimensions were used to measure customers' level of agreement regarding service quality. Although an attempt has been made to extensively identify the attributes of the customers regarding service quality, yet there is possibility of missing the key dimensions influencing the customers' expectations on service quality.
3. Any primary data based study carried through a pre-designed questionnaire suffers from the basic limitation of possibility of difference between what is recorded and what is truth, no matter how carefully the interview has been conducted. The present study may also suffer from this limitation because the people might not have deliberately reported their true opinion due to some biasness. Two objectives of the study are based upon primary data, one is from customers' perspective and the other from employees' perspective. So, the study may suffer from the elements of biasness; and it is difficult to reach at the real situation.

4. The customers of only seven banks were selected for the present study to compare service quality of the public and private sectors. As a result, the generalization of the findings of the present research should be considered carefully. Furthermore, the sample was restricted to commercial banks only. The other major banks like co-operative banks have also started offering electronic banking services. The analysis of e-banking services primarily concerns retail banking services only; and services of corporate e-banking have not been analyzed.
5. To assess the operational performance, several ratios, financial indicators, ROA and ROE can be used to judge the difference between electronic and non-electronic banks. But this performance is judged only by taking the employees' point of view and judgment is formed only on that basis. More rigorous analysis needs to be done for better understanding of the results.
6. The secondary data based information collected for this study carries all the limitations inherent in such data.
7. Non-availability of the data and non-response from the banks are the other major limitations of the study. As no published data is available on the electronic banking services provided by the banks in India, so the study mainly relies upon websites for analyzing the extent of electronic banking services.
8. The techniques used to measure the electronic banking services and the determinants in the study are those which have been applied on other studies of e-banking and internet banking. More advanced techniques like ANOVA, multiple regressions, correlation can be used for further analysis. But the analysis of data and e-banking services is simply based upon percentages.
9. Many structural changes have taken place in the Indian banking sector since 1997. Mergers and acquisitions held during the study period have been considered, e.g., merger of Bank of Punjab with Centurion Bank Ltd. with effect from October 1, 2005 and merger of Centurion Bank with HDFC Bank on May 23, 2008; merger of IDBI Bank Ltd. into IDBI Ltd. with effect from October 2, 2005.