CHAPTER 4
RESEARCH METHODOLOGY

4.1 Research Design

A research design is the master plan or blueprint which specifies the methods or procedures for the collection, measurement, and analysis of information (Zikmund, 2000; Cooper & Schindler, 2006). The main classification of research paradigm is of two types; positivism and interpretive. Positivist studies are the foundation of the existence of a priori fixed relationship within a phenomena, which is investigated using a structured instrument (Orlikowski & Baroudi, 1991). This approach is mainly used to test the theory which has formal propositions, quantifiable measures of variables, hypothesis testing, and can draw inferences from the sample to the stated population. Interpretive approach is more subjective, and the objective of this approach is to understand the deeper structure of a phenomenon.

The social science research has fallen into two distinct categories: quantitative and qualitative. Quantitative studies are empirical studies which use a theory (or hypothesis) and tests for confirmation or disconfirmation of that theory. According to Newman and Benz (1998), qualitative research is an interpretive, naturalistic approach to the phenomenon under study with an aim of developing a theory. The qualitative and quantitative research approach has philosophical roots in interpretive and the positivistic philosophies, respectively. The main research types are exploratory, descriptive, and causal. Exploratory research is used in the first stage during the research process, to understand the research problem, and the findings can be used in subsequent conclusive studies. Descriptive studies are used to describe the characteristics of the phenomena or the population under study. The main objective of the causal research is to identify the cause-and-effect relationships among variables (Zikmund, 2000). Moreover, exploratory and descriptive research precedes the cause-and-effect relationship studies.

The present research study was conducted to understand the impact of various consumer adoption factors and explore their relationships on intention to use mobile banking. This study used positivist research perspective, since this is quantifiable, which is dominant in information system research and used to test the theory of adoption behavior of banking
customers using mobile banking. The study used exploratory research at the initial stage to formulate the research questions. To formulate hypotheses, a comprehensive investigation into the literature regarding the studies done in similar areas has been conducted. The next stage used a descriptive research followed by an explanatory research, which specified the relationship between variables used in the theoretical model. The current study used a cross-sectional design which involves the collection of information from the sample once only. The present study used the quantitative data collection method, by employing a survey using a structured questionnaire to collect responses from the existing bank customers.

4.2 Research Instrument

The theoretical constructs used in this study, which is mentioned in Chapter 3 were measured using the validated multi-item scales from prior research. The adapted scales were reworded to fit the need for the current study. These scales had shown reliability and validity in their respective studies, from where it was adapted. Reliability and validity tests were conducted to verify the suitability of the adapted scales used in the present study. Cronbach Alpha was used to calculate the reliability of the constructs used in this study, and only those items having a Cronbach Alpha value of 0.7 or more had been used in this study (Hair et al, 2006). Content validity had been ensured by adapting the constructs from validated prior studies based on well accepted theoretical models. The construct validity was established through exploratory factor analysis.

4.3 Questionnaire Design

The survey questionnaire is an efficient tool to collect the data for the research study (Zikmund, 2000). Designing the questionnaire requires both artistic and scientific skills and to be devised to obtain accurate and complete information on the research problem. The data collection of the present study solely depends upon the responses gathered through the questionnaire. Therefore, the questionnaire development followed the questionnaire design principles such as brief questions, use of positive questions, and avoidance of leading questions (Cooper & Schindler, 2006; Zikmund, 2000). In the present study, the researcher made utmost care to keep the questions simple, easy to read and comprehend, and unambiguous. Most of the questions included in the questionnaire were close-ended structured questions to avoid response bias. In the present study, the questions were grouped
together based on the topic in a logical sequence by using the funnel approach moving from general to more specific questions (Cooper & Schindler, 2006). The following section provides a detailed explanation for the development of the questionnaire used in this study.

The questionnaire consisted of three parts. Part one contains the title of the study and an explanation about the purpose of the questionnaire. It also included the questions pertaining to whether they have an internet banking account. If the answer is No, the respondents are asked to choose among the reasons which they have not opened the internet banking account yet. The common reasons of not using internet banking were identified, from the existing literature of internet banking as well as the discussions from some of the bank managers and the bank customers. The reasons for not having an internet banking account included in the questionnaire are shown below.

1. Not available through my bank
2. It is too new technology, I would like to see how it works, and then I may open an account
3. Don't see any real value in having this type of account
4. Haven't taken time to open an account
5. Concerned about security
6. Never heard of Internet banking
7. Others

For the internet banking consumers, the questionnaire includes questions pertaining to the name of the bank in which they have an internet banking account and the frequency of their internet banking usage. To measure the service quality and customer satisfaction of internet banking, Part one of the questionnaire includes questions, which measures five variables. These are (1) access, (2) web interface, (3) attention, (4) perceived credibility, and (5) customer satisfaction. Factors from 1 to 4 are the antecedents of service quality and customer satisfaction. The responses to the questions from the above part are to be answered by only by the users of internet banking.

Part two of the questionnaire includes the description of mobile banking and the three forms in which the mobile banking services are offered to Indian banking customers. The
respondents were asked whether they are interested to download an application to enable mobile banking. This part of the questionnaire consists of questions pertaining to the current available banking services offered through their mobile phone. The respondents were asked to choose the list of services available through their mobile phones. The options include are: viewing account balances, Branch / ATM locator, in-store payments or purchases (like a swipe credit card), deposit/withdrawal notices, transferring balances between my accounts, bill payment, and transferring money to other people on their mobile phones. These services are representative of the major services offered by banks through mobile banking, and are selected after visiting the websites of major banks and their mobile banking services. Part two of the questionnaire consists of questions measuring the intention to adopt mobile banking. The variables included in this study are (1) perceived ease-of-use, (2) computer self-efficacy, (3) social influence, (4) perceived cost, (5) trust, (6) security, and (7) behavior intention. Factors from 1 to 6 are the independent variables, and the factor 7 is the dependent variable of the study.

Part three consists of seven questions about their demographic profile. The demographic information includes gender, age, city/town/village, education, occupation, employment status, and income, which are measured using a nominal/ordinal scale.

4.3.1 Questionnaire Scale
The current study uses Likert scales to measure the responses, since this scale is widely used in marketing and social science research (Garland, 1991). The present study used a 7-point Likert scale from 1-7 where 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither disagree nor agree, 5 = somewhat agree, 6 = agree, and 7 = strongly agree to measure all the theoretical constructs.

4.3.2 Operationalization of Variables
The theoretical constructs used in this study are measured using the validated items from prior research. The adapted items are reworded to fit the need for the current study. The operationalization of items for each construct is described given below.
4.3.2.1 Operationalization of Behavioral Intention

The dependent variable behavioral intention (BI) is measured on a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on four items adapted from Davis (1989), Davis et al (1989), Venkatesh and Davis (2000), Luarn and Lin (2005), and Wang et al (2006) as follows.

BI1: Assuming that I have access to mobile banking systems, I intend to use them.
BI2: I intend to increase my use of mobile banking in the future.
BI3: I will frequently use mobile banking in the future.
BI4: I will strongly recommend others to use mobile banking service.

4.3.2.2 Operationalization of Perceived Ease of Use

The variable perceived ease of use (PEOU) is measured on a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on two items adapted from Venkatesh and Davis (2000), Luarn and Lin (2005), and Chen (2008). The adapted items were:

PEU1: Learning to use mobile banking is easy for me.
PEU2: It would be easy for me to become skillful at using mobile banking.

4.3.2.3 Operationalization of Computer Self-Efficacy

The construct computer self-efficacy is measured using a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on two items developed by Compeau and Higgins (1995). The items were as follows.

SE 1: I would conduct my banking transactions using the mobile phone if I have a built-in help facility for assistance.
SE2: I would conduct my banking transactions using the mobile phone if I had seen someone else using it before trying it myself.
4.3.2.4 Operationalization of Social Influence
The social influence (SI) construct is measured using a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on three items adapted from Venkatesh and Morris (2000), Venkatesh et al (2003), and Hong and Tam (2006). The items were as follows.

SI1: Friends and associates may influence my decision to use mobile banking.
SI2: Mass media (e.g. TV, newspaper, articles, and radio) will influence me to use mobile banking.
SI3: I will use mobile banking if the service is widely used by people in my circle.

4.3.2.5 Operationalization of Perceived Financial Cost
The variable perceived financial cost (PC) is measured on a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on three items adapted from Luarn and Lin (2005). The adapted items were as follows.

PF1: I think mobile banking services are expensive to use.
PF2: I think mobile banking enabled handsets are expensive.
PF3: I think the subscription fee to use mobile banking is expensive for me.

4.3.2.6 Operationalization of Security
The variable security is measured using a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on four items adapted from Mcknight et al (2002), Khalifa and Shen (2008), and Chen (2008). The items were as follows.

S1: I believe my mobile banking transaction information will not be lost during an online session.
S2: I believe my mobile banking transaction information will only reach the target bank account.
S3: The mobile device has enough safeguards to make me feel comfortable using it to conduct banking operations.
S4: I am comfortable in conducting banking operations on the mobile.
4.3.2.7 Operationalization of Trust

The construct trust is measured using a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on four items adapted from McKnight et al (2002), Gefen et al (2003), and Bhattacherjee (2002). The items were as follows.

T1: My bank is modern enough to conduct transactions online.
T2: My bank has access to the information needed to handle transactions appropriately.
T3: My bank is open and receptive to customer needs.
T4: My bank takes extra efforts to address most customer concerns.

4.3.2.8 Operationalization of Service Quality Antecedents

4.3.2.8.1 Operationalization of Access

The antecedent of service quality attributes access is measured using a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on six items adapted from Jayawardhena (2004). The items were as follows.

A1: I can log onto my internet banking account at any time.
A2: I can speak with a person (either through remotely using a telephone or in person at a branch) at Bank in case I have problems with my internet banking.
A3: I can retrieve a significant amount of information and transaction details on my account with internet banking.
A4: Internet banking enables me to carry out a wide range of transactions (account functionality).
A5: I can log onto my internet banking account from anywhere in the world using any computer, without installing additional software.
A6: There are email links and/or a web based query facilities so that I can get in touch with my bank.

4.3.2.8.2 Operationalization of Attention

The construct attention is measured using a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on three items adapted from Jayawardhena (2004). The items were as follows.
At1: My bank understands the needs of their customers.
At2: My bank is very accurate in their responses to my queries/requests.
At3: My bank is able to provide me with personalized newsletters/alerts that recommend new products, etc. to help me to keep my costs down and maximize my returns.

4.3.2.8.3 Operationalization of Web Interface
The construct web interface is measured using a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on three items adapted from Jayawardhana(2004). The items were as follows.

W1: The web pages in the internet banking site are downloaded quickly.
W2: Internet banking site is updated regularly.
W3: Internet banking site incorporates a good color scheme, easy on the eye, visually attractive and incorporates an effective layout.

4.3.2.8.4 Operationalization of Perceived Credibility
The variable perceived credibility (PC) is measured on a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on three items adapted from Yang et al (2004) and Yuen et al (2010). The adapted items were:

PC1: The internet banking has enough specialists to detect fraud and information theft.
PC2: I believe that money will not be lost in unauthorized electronic fund transfers.
PC3: Other people cannot view my bank account information.

4.3.2.9 Operationalization of Customer Satisfaction
The variable customer satisfaction is measured on a seven point Likert scale with 1 = strongly disagree and 7 = strongly agree based on five items adapted from Yang et al (2004). The adapted items were:

Sat1: Overall, the service quality of my internet banking is excellent.
Sat2: Overall, my internet banking comes up to my expectations of what makes a good online banking experience.
Sat3: Overall, I am very satisfied with my bank.
Sat4: Overall, I am very satisfied with Internet-based transactions.
Sat5: Overall, I am very satisfied with the services offered through my internet banking.

4.3.3 Questionnaire Pre-Test

Pre-testing the questionnaire is essential before the actual data collection to improve the survey results. The major benefits of pretesting of a questionnaire: (1) to discover participant interest, (2) to learn whether respondents will remain to engage in the completion of the survey, (3) to check content, wording, and sequencing of questions, and (5) to improve the overall quality of survey data (Cooper & Schindler, 2006). To test the initial instrument for measurability, context, and respondent's perceptions of the topic of the current study; the questionnaire was shown to academicians in the IS and marketing fields and practitioners. The questionnaire was pre-tested by collecting responses from five internet banking consumers and five non-internet banking consumers to check the wording, sequencing, and completeness. Based on the feedback from respondents, sequencing of the questionnaire was modified, ambiguous questions were deleted, and some of the wording was changed as needed. The feedback received from both the groups is incorporated into the questionnaire to improve the clarity, relevance, and consistency and the questionnaire were revised after pre-test.

4.3.4 Pilot Study

Pilot study helps in the research process to identify the potential problems which occur during the research design or the survey instrument which affects the quality and reliability of the results. A pilot study was conducted with a sample size of 128 respondents drawn from bank customers of various public sectors, private, and foreign banks from Mumbai city. A total of 150 respondents participated in the survey. Out of these 150 samples, 22 were eliminated due to partial response and missing data. Thus, only 128 samples were used with a response rate of 85 percent. This sample was used to test the reliability and validity of the scales for the study. Some items with lower factor loadings (<0.5) and cross loadings were deleted after the pilot study. To assess the internal consistency of each construct, the Cronbach’s alpha coefficients were computed. TABLE 4.1 shows the reliability of all the constructs of both mobile banking adoption scale and internet banking e-service quality and satisfaction scale.
### Table 4.1: Reliability Coefficients for All Construct Items Used in Pilot Study

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Cronbach’s Alpha</th>
</tr>
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<tbody>
<tr>
<td>Perceived Ease of Use (PEOU)</td>
<td>0.88</td>
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<tr>
<td>Computer Self-Efficacy</td>
<td>0.72</td>
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<td>Security</td>
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<tr>
<td>Behavioral Intention</td>
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</table>

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Cronbach’s Alpha</th>
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<tr>
<td>Access</td>
<td>0.73</td>
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<td>Web Interface</td>
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<tr>
<td>Attention</td>
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<td>Perceived Credibility</td>
<td>0.80</td>
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<tr>
<td>Customer Satisfaction</td>
<td>0.88</td>
</tr>
</tbody>
</table>

The results showed that reliability of all the constructs exceeded the proposed value of 0.7, recommended by Nunnaly (1978) implies that measurement constructs are internally consistent.

### 4.4 Sampling

Sampling is a procedure which uses represent parts of a given population as a basis for drawing conclusions about the whole population (Zikmund, 2003). The main advantage of sampling is it helps the researcher to save the time and resources and cut the cost of data collection because it would be impossible to cover all elements of a population to measure the desired characteristics. The measurements which are made on the sample characteristics are used to estimate the characteristics of the population. The two major objectives to be considered in a sample design are, first a sample should be the representative of the population, and the second is the size of the sample to be adequate to get the desired accuracy (Krishnaswami et al, 2006).
4.4.1 Sampling Process

The main steps involved in selecting a sample are as follows: (i) definition of the target population, (ii) specification of sampling frames, (iii) selection of the sampling method, (iv) specification of the sampling unit, (v) determination of the sample size, and (vi) selection of the actual sampling unit (data collection). The sampling process undergone for this research study is explained in the following section.

4.4.1.1 Definition of Target Population and Sampling Frame

The purpose of this research study is to investigate the consumer adoption of mobile banking as well as measuring the service quality and customer satisfaction of internet banking. For conducting this study, the target population identified is the bank customers who have operational bank accounts from various public, private, co-operative, and foreign banks in India. The population group of bank centers is classified as rural, semi-urban, urban, and metropolitan based upon the population of the centers as available in the 2001 census. The population less than 10000 are considered as rural, 10000 and above less than 1 lakh as semi-urban, 1 lakh and above less than 10 lakh as urban, and 10 lakh and above as metropolitan (RBI, 2010).

The sample frame is the list of elements from which a sample may be drawn called as the working population. The sample frame for this research study is the bank customers in India from various public, private, co-operative, and foreign banks. To study the consumer adoption of mobile banking, the sample frame used is the list of bank customers who have operational bank accounts in any public, private, co-operative or foreign banks, which has bank branches anywhere in India. For measuring the service quality and customer satisfaction of internet banking, the sample frame used is the list of bank customers who availed the internet banking facility from their respective bank branches.

4.4.1.2 Sampling Method and Justification

Sampling method is the way in which the sample elements are selected. Sampling methods can be grouped into non-probability sampling and probability sampling. This research study used convenience sampling, one of the non-probability sampling methods as the choice for selecting the respondents to this survey to collect the sample elements. Due to the
unavailability of the total banking customer list, and it is expensive and time constraint to collect the response from each individual bank customer; this study used convenience sampling as a method to collect the responses from the survey questionnaire. The sample frame spread over great distances across different parts throughout the country. The choice of a respondent is highly specific, such as a computer literate who uses the internet banking facility or a customer who has a mobile phone wishes to enable mobile banking facility. Hence, getting such a customer profile is highly difficult, which leads to the sampling method as a convenience sampling method. Prior studies on mobile adoption from both developed and developing countries was also used convenience sampling as a method to collect the data (Yang, 2005; Luo et al, 2010; Puschel et al, 2010; Sripalawat et al, 2011; Zhou, 2011) This is the easiest and cheapest method to obtain the samples in this research study.

**4.4.1.3 Sampling Unit and the Sample Size**

The sampling elements or the target respondents were the individual bank customers from the public sector, private sector, co-operative, and foreign banks. The sample was collected from all over India, which consists of metro, urban, and rural bank centers.

The sample size can be determined based on the statistical analysis performed on the sample, or it can be modified by considerations of availability, cost, and accessibility of the sample. When the sample size becomes larger, it assures the confidence with which the estimates of the population can be obtained. In multivariate techniques like multiple regression analysis, the sample size should be at least ten times larger than the number of variables being considered (Schwab, 1978 cited in Hinkin, 1995; Bartlett et al, 2001; Hair et al, 2006). The minimum sample size required for SEM (Structural Equation Model) analysis is 200 (Hair et al, 2006).

Krejcie and Morgan (1970) formulated a table (TABLE 4.2) for calculating the sample size based on the formula published by the National Educational Association in the article “Small Sample Techniques”.
The formula is as follows

\[ s = \frac{X^2 NP (1-P) + d^2 (N-1) + X^2 P (1-P)}{d^2} \]

$s$ = required sample size.

$X^2$ = the table value of chi-square for 1 degree of freedom at the desired confidence level.

$N$ = the population size.

### TABLE 4.2: TABLE FOR DETERMINING SAMPLE SIZE FROM A GIVEN POPULATION
(KREJCIE & MORGAN, 1970)

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</table>

*Note:* $N$ is population size.

*S* is sample size.
The population proportion.

d= the degree of accuracy expressed as a proportion (.05).

The researchers pointed out that for the larger populations; the sample size required is, moreover, increased at a constant rate and the number of samples required is not increasing at a proportionate rate.

Bartlett et al (2001) described the procedures for determining the sample size for continuous and categorical variables using Cohran’s (1977) formula and formulated a table (TABLE 4.3). The table formulated is based on three alpha levels and a set of error rate. The Cohran’s (1977) formula for calculating sample size for continuous data is given below.

\[ n_0 = \frac{(t)^2 * (s)^2}{(d)^2} \]

Where \( n_0 \) = required return sample size.

\( t \) = value for selected alpha level.

\( s \) = estimate of standard deviation in the population.

\( d \) = acceptable margin of error.

**TABLE 4.3: TABLE FOR DETERMINING REQUIRED SAMPLE SIZE FOR CONTINUOUS DATA**

(BARTLETT et al, 2001)

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<thead>
<tr>
<th>Population Size</th>
<th>Sample Size (Margin of error = .03)</th>
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<td>t = 1.65</td>
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<td>65</td>
</tr>
<tr>
<td>400</td>
<td>69</td>
</tr>
</tbody>
</table>
The present study used multivariate techniques such as exploratory factor analysis, regression analysis, and SEM analysis. The research study used 42 continuous variables and based upon the calculation of 10 observations per variable suggested by Hair et al (2006), the minimum sample size required is 420 observations.

Prior studies on mobile banking adoption also used varied sample size ranging from smaller samples below 200 to larger samples above 1000 using various data collection methods (Brown et al, 2003; Suoranta & Mattila, 2004; Luarn & Lin, 2005; Amin et al, 2008; Laukkanen & Pasanen, 2008; Natarajan et al, 2010; Cruz et al, 2010; Koenig-Lewis et al, 2010).

Based on the guidelines of the sample size calculations discussed above and the prior studies on mobile banking adoption, the sample size estimated for the current research study is **1000**.
bank customers from various public, private, co-operative, and foreign banks in this research study, which is an adequate sample size for the study.

4.4.1.4 Data Collection and Response Rate
A total of 1000 questionnaires were distributed using a combination of self-administered method and by sending e-mail through personal contacts. 875 filled questionnaires were collected from bank customers in whom 855 were used with a response rate of 85.5%. The sample size was considered robust by Nunnally (1978) as cited by Hinkin (1998).

4.5 Statistical Analysis Techniques
The primary data collected from the questionnaire were tabulated and analyzed using SPSS (Statistical Package for Social Sciences) version 12.0. The data obtained were analyzed and interpreted using various statistical techniques employed in social science research such as univariate, bivariate and multivariate analysis. Reliability test is conducted using Cronbach Alpha to assess the internal consistency of the scales. The validity of the measures is conducted using factor analysis. To measure the relationships between the variables and test the theoretical model appropriate bivariate and multivariate analyses were used. Structural Equation Modeling (SEM) using AMOS 16.0 is used for measurement model analysis.

4.5.1 Reliability Test
Reliability is the degree to which a variable or a set of variables is consistent in what it is intended to measure (Hair et al, 2006). Cronbach Alpha is used to assess the reliability of the mobile banking adoption scale and internet banking e-service quality and satisfaction scale. The alpha value range from 0 to 1 and a value above 0.70 is recommended (Hair et al, 2006).

Composite reliability, which is the most commonly used reliability measures in SEM analysis. In this study, composite reliability is computed for the mobile banking adoption scale and e-service quality and satisfaction scale of internet banking. A value above 0.70 is the commonly accepted reliability measure (Hair et al, 2006).
4.5.2 Validity Test

Validity is the ability of a measurement scale to measure what it is intended to measure (Zikmund, 2003). Reliability is a necessary condition for validity, but a reliable instrument may not be valid. Validity is of two types; mainly content (face) validity and construct validity. Content validity is a subjective agreement among the professionals whom the measurement instrument logically appears to accurately measure what it is intended to measure. In this research study, the measurement scale is shown to few banking experts and few banking customers. Their recommendations were incorporated, and modifications were made on the measurement scale. Construct validity is the extent to which a set of measures reflects the construct which they measure (Hair et al, 2006). Construct validity is of two types: convergent and discriminant validity. Construct validity was evaluated in this research for both mobile banking adoption scale and internet banking e-service quality scale by using factor analysis. Convergent validity assesses the degree to which two measures of the same concept are correlated (Hair et al, 2006). Discriminant validity is the degree to which two conceptually similar concepts are distinct (Hair et al, 2006). In this study, the convergent and discriminant validity were assessed by using confirmatory factor analysis (CFA).

4.5.3 Univariate Analysis

In this study, descriptive analysis is used to compute the frequencies, percentages, mean values and standard deviations of each variable to make out the difference among the groups of the sample data and getting the overall structure of the sample. The frequency and percentage are computed for internet banking users, non-users, reasons for not having an internet banking account, frequency of internet banking usage; frequency of users wished to enable mobile banking, and the list of banking services available through their mobile devices. It is also used to summarize the demographic profile of the respondents for understanding the characteristics of the respondents. The mean and standard deviation are computed for every measurement item of each construct of mobile banking adoption scale and internet banking service quality and satisfaction scale.
4.5.4 Bivariate Analysis

Bivariate analysis tests the differences between two variables or measures the association between two variables at a time. In this research study, three types of bivariate analysis were used, which are correlation, independent t-test, and One-way ANOVA.

4.5.4.1 Independent t-test

The t-test assesses the statistical significance of the difference between two independent sample means. The t-statistic is the ratio of the difference between the sample means to their standard error. In this study, it is used to test the hypothesis H7.

H7: There is significant difference exists between variations of gender in behavioral intention to use mobile banking.

4.5.4.2 One-way ANOVA

One-way analysis of variance (ANOVA) compares the means of samples from more than two groups to verify whether their differences are statistically significant is called one-way because it deals with only one independent variable, while several levels of that variable may be used. One-way ANOVA is used for this research to test the hypotheses H8, H9, and H10.

H8: There is significant variance exists across different age categories in behavioral intention to use mobile banking.

H9: There is significant variance exists in different type of bank centres in behavioral intention to use mobile banking.

H10: There is significant difference exists between customers who wish to enable mobile banking and their intention to use mobile banking.

H13: There is a significant variance exists between bank customers who frequently use internet banking and their intention to use mobile banking.

4.5.4.3 Correlation

Correlation analysis is a statistical technique which measures the relationship of one variable to another. The Pearson correlation coefficient, r, measures the covariation, or association, between variables. The r value ranges from +1.0 to -1.0. If the value of r is 1.0, there is a perfect positive linear relationship or if the value of r is -1.0, there is a perfect negative linear relationship and if r=0, there is no correlation between the variables. In this study, correlation
was used to test the following hypothesis H12a which tests the relationship between e-service quality dimensions and customer satisfaction of Internet banking.

H12a: The e-service quality dimensions of internet banking comprising of responsiveness, efficiency, and perceived credibility are positively related to customer satisfaction of internet banking.

4.5.5 Multivariate Analysis
Multivariate data analysis is the statistical methods that allow the simultaneous investigation of more than two variables. The two types of multivariate techniques are dependence methods and interdependence methods. In this research study, multiple regression analysis, which is a dependence method and factor analysis, which is an interdependence methods, was used.

4.5.5.1 Multiple Regression Analysis
Multiple regression analysis is a statistical technique which investigates the effect of two or more independent variables on a single interval-scaled dependent variable. The multiple regression equation is represented as $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots + \beta_n X_n$ where $\beta_1, \beta_2,$ and so on are called the coefficients of partial regression which represents the percentage of the variance in the dependent variable that is explained by a single independent variable, with the other independent variables held constant (Zikmund, 2003). The coefficient of determination, $r^2$, is the proportion of variance in the dependent variable that is explained by the variation in the independent variables. The F-test is used to determine the statistical significance.

In this research study, multiple regression analysis was used for testing the hypothesis H12.
H12: The e-service quality dimensions of internet banking comprising of responsiveness, efficiency, and perceived credibility is significantly influencing the customer satisfaction of internet banking.
4.5.5.2 Factor Analysis

Factor analysis is a multivariate technique which analyzes the structure of the interrelationships among a large number of variables by defining a set of common underlying dimensions, known as factors. There are two types of factor analysis; exploratory and confirmatory. Exploratory factor analysis (EFA) is used to generate a theory by exploring the factors which account for the variations and interrelationships of the manifested variables (Henson & Roberts, 2006 cited in Matsunaga, 2010). On the other hand, the confirmatory factor analysis (CFA) is used for theory-testing, which confirm a pre- specified relationships among the constructs.

Factor analysis using Principal Component Analysis (PCA) using varimax rotation is used in this study to assess the construct validity of the measurement scales of both mobile banking adoption scale and internet banking e-service quality satisfaction scale.

4.5.6 Structural Equation Modeling (SEM)

Structural equation modeling (SEM) is a multivariate technique combining aspects of multiple regression and factor analysis to estimate a series of interrelated dependence relationships simultaneously (Hair et al, 2006). SEM techniques can address a wide variety of causal relationships. The two types of analyses performed are confirmatory factor analysis (CFA) and the estimation of a series of structural equations. The CFA is used to determine the ability of a predefined factor model to fit an observed set of data. CFA can be used to establish the validity of the measurement model. The main objective of SEM is to determine whether the theoretical model of the study is supported by sample data or the model fits the data well. The two basic components of SEM are latent variables and observed variables. SEM consists of two models; measurement model and structural model. Measurement model which relates the measured variables to the constructs while the structural model represents the hypothesized relations between the constructs.

In SEM, once the model is specified; the fit of the model should be evaluated, which determines the degree to which the structural equation model fits the sample data (Schermelleh-Engel et al, 2003). For fitting, a model to the data, the method widely used is the Maximum Likelihood (ML) estimation, which assumes multivariate normal data and a
reasonable sample size. The statistical significance of the model can be assessed by the chi-square statistic; nevertheless, this statistic is sensitive to the sample size. Researchers have proposed a variety of alternative fit indices to assess the model fit. The goodness-of-fit measures are classified under three types: (1) absolute fit measures, (2), incremental fit measures, and (3) parsimonious fit measures. Absolute fit measures assess only the overall model fit with no adjustment for the degree of “over fitting” that might occur. Incremental fit measures compare the proposed model to another model proposed by the researcher while parsimonious fit measures adjust the measures of fit to provide a comparison between models with differing numbers of estimated coefficients (Hair et al, 2006). The most popular and widely used fit indices are GFI (Goodness of Fit), CFI (Comparative Fit Index), and AGFI (Adjusted GFI). Tucker-Lewis Index known as the Non-Normed Fit Index (NNFI) and the Normed Fit Index (NFI). Another fit index, which assesses how well a given model approximates the true model, is RMSEA (Root Mean Square Error of Approximation) and when the approximation is good, the RMSEA should be small (TABLE 4.4).

<table>
<thead>
<tr>
<th>Fit Measure</th>
<th>Good Fit</th>
<th>Acceptable Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$</td>
<td>$0 \leq \chi^2 \leq 2\text{df}$</td>
<td>$2\text{df} &lt; \chi^2 \leq 3\text{df}$</td>
</tr>
<tr>
<td>p value</td>
<td>$.05 &lt; p \leq 1.00$</td>
<td>$.01 \leq p \leq .05$</td>
</tr>
<tr>
<td>$\chi^2/\text{df}$</td>
<td>$0 \leq \chi^2/\text{df} \leq 2$</td>
<td>$2 &lt; \chi^2/\text{df} \leq 3$</td>
</tr>
<tr>
<td>RMSEA</td>
<td>$0 \leq \text{RMSEA} \leq .05$</td>
<td>$.05 \leq \text{RMSEA} \leq .08$</td>
</tr>
<tr>
<td>NFI</td>
<td>$\geq .95$</td>
<td>$\geq .90$</td>
</tr>
<tr>
<td>NNFI</td>
<td>$\geq .95$</td>
<td>$\geq .90$</td>
</tr>
<tr>
<td>CFI</td>
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</tr>
<tr>
<td>GFI</td>
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<td>$\geq .90$</td>
</tr>
<tr>
<td>AGFI</td>
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</tbody>
</table>

SEM analysis is used in this study using AMOS 16.0 to test the theoretical model and to confirm the factor structure of e-service quality of internet banking obtained from exploratory factor analysis. It is also used to test the theoretical model and measure the hypothesized
relationships in the model. Analysis of Moment Structures (AMOS) is used to conduct covariance based SEM analysis.

4.6 Ethical Consideration

The objective of ethics in research is to ensure that no one is harmed or suffers adverse consequences from research activities (Cooper & Schindler, 2006). Ethical aspects regarding the confidentiality, privacy, and consent of the data were seriously considered during the research process. During the data collection process, the respondents were debriefed about the objectives of the study, and ensured data were not being used for any other purpose than the academic research objectives. There is no attempt of deception in this study to improve the response rates. The researcher obtained informed consent from the respondents who participated in the survey. The respondent’s personal information is guarded from all people other than the researcher. Privacy is maintained by not obliged the respondent to answer any question in the survey instrument which he chooses not to answer. To ensure the confidentiality and privacy of the respondents, only aggregate results were used. No respondent was forced to answer any question in which they were not comfortable. In this research study, it is adhered to the purpose of the study, objectivity, protected respondents’ confidentiality, and avoided misrepresenting the research findings. Respondents’ personal information such as name, address, contact information, and bank name was not used in the study.