CHAPTER 4

RESEARCH METHODOLOGY

This chapter describes the research methodology adopted for the study. Methodology explains how the investigation is carried out systematic, theoretical analysis of the methods applied to a field of study. The Methodology is the general research strategy that outlines the way in which a research project is to be undertaken and, among other things, identifies the methods to be used in it. The specific methods of how the research is done are explained by the research design. The research design is the blueprint for fulfilling objectives and answering the research questions. The research design will provide rigid structure, make enough provision for protection against bias and maximises reliability.

The components of the research design as explained by Kothari (2004) includes (a) the sampling design which deals with the method of selecting items to be observed for the given study; (b) the observational design which relates to the conditions under which the observations are to be made; (c) the statistical design which concerns with the question of how many items are to be observed and how the information and data gathered are to be analysed; and (d) the operational design which deals with the techniques by which the procedures specified. In this chapter, the operational, sample, observational and statistical designs are explained in detail.
4.1 OPERATIONAL DESIGN

This study is proposed to test the effectiveness of integrated marketing communication for the housing projects done by the builders. The effectiveness is measured in terms of whether the marketing communication through various promotion tools has reached the consumer and has created familiarity, liking and involvement towards the brand. The researcher does not have any control over the variable and can only report what is the perception, attitude or opinion of the subjects. This is termed as ex-post facto or a descriptive research (Kothari 2004). The major purpose of the descriptive research is the description of state of affairs, as they exist at present. Descriptive study will reveal who, what, when, where or how much from the concerned study questions or hypothesis, which asks the respondents to state something about size, form, distribution or existence of a variable. The method of research utilised in a descriptive study is usually the survey method.

The study is done in the natural environment among the consumers since there is no manipulation or control of any variables inside the organisation, this study can be said to be a non-contrived field study. The unit of analysis refers to the level of aggregation of data collected during the subsequent data analysis stage. In the study, the data from the individual consumers are aggregated to study the exposure to promotional tools, their brand awareness, brand familiarity, likeability and involvement, which is then generalised to the entire population; hence, the unit of analysis for this study is understood to be at the individual consumer level. The study was done in such a way that the data were collected only once, perhaps over a period of months, in order to get the answer for the research question. Therefore, this study can be called as one shot or cross-sectional in nature.
4.1.1 Variables and Operational Definition

An operational definition describes exactly what the variables are and how they are measured within the context of the study. To operationalize a variable, the behavioural dimensions, facets or properties denoted by the concept are taken into consideration. Operational definition for a variable is stated in terms of specific testing criteria or operations, specifying what must be counted, measured or gathered. The operational definition of the variables of the study is presented in Table 4.1.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Advertisement</td>
<td>Degree of exposure to paid, non-personal, public communication about housing projects through indoor and outdoor mass media.</td>
</tr>
<tr>
<td>2</td>
<td>Sales Promotion</td>
<td>Degree of exposure to sales promotion through the media and non-media marketing pressure applied for a predetermined, limited period of time in order to stimulate trial, increase consumer demand, or improve product availability</td>
</tr>
<tr>
<td>3</td>
<td>Direct Marketing</td>
<td>Degree of exposure to promotional messages directly delivered to an individual</td>
</tr>
<tr>
<td>4</td>
<td>Publicity</td>
<td>Degree of exposure to the form of a news item or story which conveys information about a builder</td>
</tr>
<tr>
<td>5</td>
<td>Personal Selling</td>
<td>Degree of exposure to specially designed message to a prospect by a seller, usually in the</td>
</tr>
<tr>
<td>S.No.</td>
<td>Variable</td>
<td>Definition</td>
</tr>
<tr>
<td>-------</td>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Interactive</td>
<td>Degree of exposure to marketing communication through internet media and mobile phones</td>
</tr>
<tr>
<td></td>
<td>Marketing</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Brand Awareness</td>
<td>Brand awareness is the extent to which a brand is recognized by potential customers, and is correctly associated with a builder</td>
</tr>
<tr>
<td>8</td>
<td>Brand Recognition</td>
<td>Brand Recognition is the extent to which a brand is recognized for stated brand attributes or communications. It is identification of the builder associated with the given logo.</td>
</tr>
<tr>
<td>9</td>
<td>Brand Recall</td>
<td>Brand Recall is the extent to which a builder’s brand name is recalled unaided as distinct from other brands</td>
</tr>
<tr>
<td>10</td>
<td>Brand Image</td>
<td>Perceptions about a brand are reflected by the brand associations held in consumer memory. It is the images evoked by exposure to a named brand</td>
</tr>
<tr>
<td>11</td>
<td>Familiarity</td>
<td>Brand familiarity reflects the extent of a consumer’s direct and indirect experience with a brand that have been accumulated by the consumer</td>
</tr>
<tr>
<td>12</td>
<td>Brand Likeability</td>
<td>The cognitive and affective element of consumer measured as the perceived attachment to brands</td>
</tr>
</tbody>
</table>
4.2 SAMPLING DESIGN

A sampling design is a blueprint of how the samples are obtained from the sampling frame. Sampling design is important to establish that the sample truly represents the population and the measures are collected without bias. Sampling design describes the sampling method and helps in determining the sample size required for the study.

4.2.1 Population

Monitor Group, India proposed that the capacity of a household to buy a new house is calculated by using a price to annual income ratio of around 3.5. It means that a household with an annual income of Rs 10 Lakhs will have a capacity to buy a new house of Rs 35 Lakhs. The housing projects in Bangalore region starts from a minimum of 500-sqft area and price starting from Rs 2500 per sq ft. Therefore, the minimum cost of a house will typically start from Rs 12.5 Lakhs. Using the price to annual income ratio of around 3.5, a household with an annual income of Rs 3.5 Lakhs is considered potential to buy a house. This roughly means that a person who is in the income tax bracket. There are around 4.5 lakhs income tax payers in Bangalore district (TOI, 2014). This can be considered as the population for the study.

4.2.2 Sampling Framework
Sampling frameworks are techniques for determining who will be in a study. In order to make appropriate statistical inferences, representative samples are necessary. A sampling frame is the source from which a sample is drawn. It is a list of all those within a population who can be sampled. Sample frameworks are taken from phonebook, health insurance enrolment list, school enrolment list, employee list, customer list etc. Such lists will have access details such as address, phone number and email. There are also many databases available in the markets that are collected by third parties that are separated category wise and city wise. Databases such as doctors, High Net worth Investor, Job Seekers, Professional and taxpayers are available. Indian Email Database that is validated and updated until April 2014 was used for the study. From the database details about taxpayers, residing in Bangalore urban district are separated. This is used as the sampling framework.

4.2.3 Sample Size and sampling method

Sample size determination is an important requirement of any empirical study because it has to be optimised to cost of data collection and the accuracy of the information that is required is to make inferences about a population. Sample size provides the basis for the estimation of sample error and impacts on the ability of the model to be correctly estimated (Hair et al. 2006). As with any statistical method, the critical question is how large a sample is needed. There are several methods used to calculate the sample size depending on the type of data or study design. The sample size is calculated using a formula when characteristics about population parameters such as standard error are known. They can be known from previous studies. If population parameters are not known, standard formula
based on the population size is used. Sample size is also determined based on the type of statistical test employed.

In this research the population size is known (4.5 lakhs) and hence the following formula has been used for finding the sample size with a standard deviation of 0.5 with 95 percent of confidence level (Z=1.96) and 3.77 percent as margin of error (Margin of Error is computed using sample size calculator from the following link, ttp://www.raosoft.com/samplesize.html) and thus the sample size is computed to be 384 as follows.

\[
\text{Sample Size (n)} = \frac{Z^2 \times p \times q \times N}{e^2 \times (N-1) + Z^2 \times p \times q}
\]  

Where,

\( Z = \) Corresponding Z score for 95 percent of confidence level (1.96)
\( P = \) Sample Defective Population (0.5)
\( q = 1 - p \) (0.5)
\( N = \) No. of sample (450000)
\( E = \) Margin of Error (0.05)

The Required Sample Size (n) = \( \frac{(1.96)^2 \times (0.5) \times (0.5) \times 450000}{(0.05)^2 \times (450000-1) + (1.96)^2 \times (0.5) \times (0.5)} \)

\( n = 384 \)
However considering the statistical analysis, there are 20 brands listed for the familiarity test and will require a minimum sample for testing them in each category. Given the probability level, the anticipated effect size, and the desired statistical power level, using the sample size calculator the minimum required total sample size and per-group sample size for a one-tailed or two-tailed t-test study can be found as:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipated effect size (Cohen's d)</td>
<td>0.5</td>
</tr>
<tr>
<td>Desired statistical power level</td>
<td>0.8</td>
</tr>
<tr>
<td>Probability level</td>
<td>0.05</td>
</tr>
</tbody>
</table>

(By convention, Cohen's d effect sizes of 0.2, 0.5, and 0.8 are considered small, medium, and large, respectively.)

(By convention, this value should be greater than or equal to 0.80.)

(Also known as the p-value, alpha level, or type I error rate. By convention, this value should be less than or equal to 0.05 to claim statistical significance.)

Minimum sample size per group (one-tailed hypothesis): 51

Minimum sample size per group (two-tailed hypothesis): 64

For 20 groups we will require 20 x 64 = 1280 samples. However, to complete the survey with required sample size, it is necessary to consider the response errors that arise from people taking the survey. Respondent error occurs when respondents provide misleading information or fail to respond (Kothari 2004, p. 154). Therefore, the sample size is arrived at by looking at the response rates already experienced in the same research population.
Web surveys are known for notoriously lower response rates. Response rates for e-mail surveys vary from a low of 6 percent (Tse et al, 1995) to a high of 75 percent (Kiesler and Sproull, 1986). Response rate dependents on various factors such as length of the questionnaire, interest of topic, etc. As a rule of thumb, 10-20% is a common survey response rate. Therefore, the study aims at sending the questionnaire to a minimum of 15000 people randomly selected from the email database. Since the database is available in MS-Excel format, it is easy to pick random samples. A new column with serial number is provided in the spreadsheet. The random number function in the MS-Excel is used to select random 15000 random numbers between 1 and 250000.

4.3 OBSERVATIONAL DESIGN

When opinions, attitudes, intentions, expectations, motivations, experience and knowledge need to be understood, survey is the best suitable method. A self-administered questionnaire by regular or electronic mail is suitable in contacting a mass number of respondents and is cost effective, accessible beyond gatekeepers; provide flexibility of time and anonymity to the respondent. It is desirable to use pretested, structured instruments for measuring. To maximise the probability of response rate in an email survey, Dillman (2007) proposed a Tailored Design Method (TDM). It minimises the burden on the participants by designing questionnaire that are easy to read and offers clear response directions. It also provides a systematic procedure for survey implementation.
4.3.1 Questionnaire Development

The survey instrument was developed by adopting the items developed by Lerman and Garbarino (2002) for brand recall, Dreze and Hussenherr (2003) for Brand recognition, Zaichkowsky (1994) for involvement, Jack Landis (1963) for brand familiarity and Reysen (2005) for brand likeability. The exposure and experience of the promotional tools were listed from various sources and the scale measuring the frequency of exposure to the promotional tool of a particular brand was included.

Demography details of the respondent such as Age, Gender, Education, Occupation and Income are also measured. The scale options were given as a radio button, where the respondent was asked to tick his/her option against each statement. Wherever multiple-choice questions were asked, a square tick box was provided against each option. Table 4.2 presents the measurement items and their scale.

Table 4.2 Measurement items and their Scale

<table>
<thead>
<tr>
<th>Construct</th>
<th>Indicators and Measurement Scale</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand Recall</td>
<td>2 items Open Ended</td>
<td>Lerman and Garbarino (2002)</td>
</tr>
<tr>
<td>Brand Awareness</td>
<td>1 items Very often to Never Scale 4 items of agreeableness Likert scale</td>
<td>(Dreze and Hussenherr 2003).</td>
</tr>
<tr>
<td>Construct</td>
<td>Indicators and Measurement Scale</td>
<td>Source</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>Advertisement</td>
<td>13 items Very often to Never Scale</td>
<td></td>
</tr>
<tr>
<td>Sales promotion</td>
<td>8 items Very often to Never Scale</td>
<td></td>
</tr>
<tr>
<td>Personal Selling</td>
<td>3 items Very often to Never Scale</td>
<td></td>
</tr>
<tr>
<td>Direct Marketing</td>
<td>4 items Very often to Never Scale</td>
<td></td>
</tr>
<tr>
<td>Interactive marketing</td>
<td>8 items Very often to Never Scale</td>
<td></td>
</tr>
<tr>
<td>Publicity/personal relationship exposure</td>
<td>5 items Very often to Never Scale</td>
<td></td>
</tr>
<tr>
<td>Personal Involvement Inventory</td>
<td>10 items of agreeableness Likert scale</td>
<td>Zaichkowsky (1994)</td>
</tr>
<tr>
<td>Familiarity</td>
<td>20 Brands Q Score</td>
<td>Jack Landis (1963)</td>
</tr>
<tr>
<td>Brand Likeability</td>
<td>17 item Semantic Differential</td>
<td>Reysen, 2005</td>
</tr>
</tbody>
</table>
4.3.2 Validation of Questionnaire

Content validity ensures the degree to which the items of the test matches a concept that is being measured. Content validity ordinarily includes evaluating the questionnaire by a topic expert. Content validity is a non-statistical type of validity that involves the systematic examination of the questionnaire to determine whether it aligns with the concepts being measured and to the nature of the respondents who will be the subjects of the study. The questions were pooled from the various literature reviewed. The questions were validated at three stages.

First, the exhaustive list of questions was evaluated on a scale of essential, useful but not essential and not necessary by subject experts (Marketing related) and industry experts (Housing project related). In the second stage, the selected questions were framed with relevant scale. This questionnaire was again validated with the academicians and language experts. At the third stage, the questionnaire was validated by administering directly to people with the potential characteristics of the respondents. This was to observe the actual time taken by the respondent for filling the question, the clarity and ease of use of the instrument.

At the last stage, a pilot test was conducted. For pilot study, the questionnaire was sent to five hundred respondents randomly chosen from the database. Seventy-eight responses were received after a fortnight of sending emails. The examination of the pilot study demonstrated a good response to the questions and utilization of the scale.
4.3.3 Survey Implementation

The validated questionnaire was designed in the Google forms. Google Forms provide free and a fast way to create an online survey, with responses collected in an online spreadsheet. After creating the survey, the respondents are invited by email or any social networking sites by posting the link for the survey. People can answer the questions from almost any web browser - including mobile Smartphone and tablet browsers. You view each response in a single row of a spreadsheet, with each question shown in a column.

Due to restriction on number of emails that can be sent in day, the survey link through email to randomly selected sample respondents were continuously sent in a phased manner for almost a month. Tailored design utilises five elements for achieving high response rates. Dillman (2007) suggests that these five elements can be refined for specific situations and each element is complemented by the other element. These elements include: (1) respondent friendly questionnaire, (2) up to five contacts, (3) return envelope, (4) personalised correspondence and (5) a token of financial incentives. However, for web surveys, the return envelope was not necessary. Due to the resource constraints, the financial incentive was not provided. However, an appeal to help on an academic cause was send to the respondents.

The questionnaire for the study was constructed on the design principles proposed by Dillman (2007). The questionnaire was a designed with proper sections that had briefing about the concept being measured and the instructions for filling the questionnaire. The first page of the survey conveyed the purpose and objective of the survey. The demography
information was asked in the last page. At the end of the last page, words of gratitude to the respondent were added.

A brief pre-notice letter was sent to the respondents explaining the importance of the survey that would arrive in a few days and requesting them to support by participating in the survey. After a week, the mail with the link for the survey was sent to the respondents. An Excel database was maintained about sending a pre notice, the survey link and the responses received. A reminder was sent after a week to those who did not respond. Another reminder after fifteen days also was sent. A thank you mail was sent to those who completed the survey.

The survey routine explained above was carried out for a period of 5 months. The responses were slowly collected in the spreadsheet connected to the survey form. The receipt of survey responses at the end of the period was slowly lagging but still coming in at the rate of five or six responses a day. It was decided to close the survey at one point so that the data can be retrieved for further analysis. Finally, there were 1413 responses received.

4.4 DATA PREPARATION

The questionnaire used open-ended questions, Close ended questions that are measured by agreeableness Likert scale, 5-point frequency scale, Q Score scale, semantic differential scale etc. Due to web survey, except for deliberate non-response for some questions, cross marking, ambiguous marking are not present. The responses through Google survey using Google forms collect the information in a Spreadsheet. The Spreadsheet column has variables and the row has the cases. The
options are stored in the worded response and needs coding before analysis. The responses are exported to MS-Excel Spreadsheet first and using ‘Find and replace’ function the responses are converted into numbers. The Semantic differential scale was directly recorded in numerals. Since there were negative worded questions used in the questionnaire, the codes were reversed.

The questions with five point Likert scale were coded as:

- Strongly disagree = 1
- Disagree = 2
- Neutral = 3
- Agree = 4
- Strongly agree = 5

The 5-point frequency scale was coded as:

- Never = 1
- Seldom = 2
- Sometimes = 3
- Often = 4
- Very Often = 5

Though the Q-Score is calculated based on frequency for easy handling by the statistical software, it is also coded as:

- Never Seen or Heard of Before = 1
- Poor = 2
- Fair = 3
- Good = 4
- Very Good = 5
- One of My Favorites = 6
For demography questions that were measured in ranges, the coding was done sequentially starting from ‘one’ and thereon with an increment of one for next range. From the Spreadsheet the data is imported to Statistical software ‘SPSS’. Initially the missing data will appear as a dot. This has be coded or edited based on imputation method. Categorisation or classification of the variables such as the items measuring a concept are all grouped together.

Thirty-nine responses were found incomplete and unusable. There were a few missing data. The missing data per case was less than four, and missing data per variable was not more than 2%. Since percentage of missing data is very negligible, the mean value of the respective variable is substituted for the missing datum. After data preparation, the final tally of responses that are suitable for data analysis was found to be 1374. The multiple items that measure a single concept such as Advertisement, Sales Promotion, Direct Marketing, Publicity, Personal Selling, Interactive Marketing, Brand Awareness, Brand Recognition, Brand Recall, Brand Image, Familiarity, Brand Likeability and Involvement are categorised and computed by aggregating them into a new variable.

4.5 STATISTICAL DESIGN

The conceptual model for the study shows the effectiveness of the promotional tools is measured by its influence on the brand awareness, familiarity and likeability. Familiarity is calculated by the Q-score and the synergy is tested by the interaction effect of promotional tools on brand outcomes.
4.5.1 Q Score for Brand Familiarity

Q Score is the recognised industry standard for measuring consumer appeal of personalities, characters, licensed properties, programs and brands developed by Marketing Evaluations Inc., NY, USA. Q Score uses brand logos rather than a listing of the brand names so that a more genuine assessment of brand equity can be measured (http://www.qscores.com/).

4.5.1.1 Calculating the Q Score

Each brand is rated on the following scale:

“One of My Favourites”
“Very Good”
“Good”
“Fair”
“Poor”

“Never Seen or Heard of Before”

The sum of the “One of My Favourites” through “Poor” scores is the “Total Familiar”. The “One of My Favourites” score is an absolute measure of appeal or popularity, as it is based on 100%. However, some brands are not very well known and would, therefore, have a low “Favourite” score. Thus, the Q Score is developed in order to provide another way of evaluating the appeal of a lesser known brand. The Q Score, therefore, is a ratio of the
“Favourite” score to the “Familiar” score. It answers the question: “How appealing is it among those who are familiar with it?” This relative measure (Q Score) is used to reflect the potential of lesser-known brands and, therefore, provides an equivalent basis for comparison with more established brands.

<table>
<thead>
<tr>
<th>Example:</th>
<th>Brand A (%)</th>
<th>Brand B (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Familiar</td>
<td>90</td>
<td>57</td>
</tr>
<tr>
<td>“One of My Favourites”</td>
<td>29</td>
<td>18</td>
</tr>
<tr>
<td>“Very Good”</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>“Good”</td>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>“Fair” or “Poor”</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Never Seen or Heard of Before</td>
<td>10</td>
<td>43</td>
</tr>
</tbody>
</table>

QSCORE* 32 32
NEGATIVE QSCORE** 9 11

* % of total sample who rated brand "One of My Favourites" divided by only those who are familiar with brand
** % of total sample who rated brand "Fair” or “Poor” divided by only those who are familiar with brand.
4.5.1.2 Rating Scale Explained

“One of My Favourites” represents “fans” of a brand. These are the most enthusiastic responses and it is this “top box” measure of appeal or “liking” that goes into the Q Score. “Very good” is a positive response but reflects something less than enthusiasm. If this rating were given to a product, its sales would be half the amount enjoyed by a product rated “One of My Favourites” (or “Excellent”). “Good” is a neutral response – coming mid-way between the two positive and two negative choices. It permits respondents to give a “safe” rating, especially when their knowledge or information about a brand is limited. “Fair” is a negative response where people tend to go when not absolutely turned off by a brand? It is not a positive or even neutral response – view it as a “milder negative” but a negative nonetheless. It correlates with “I don’t like it”. “Poor” is the most negative response – the polar opposite of “One of My Favourites”. It represents “turn-off”. The previous example shows a combined “Fair” or “Poor” rating. In our judgment, there is little to be gained by splitting the “Fair” and “Poor” apart. Both are negative; the “Fair” being the fourth rating choice out of the five possibilities. While the “Poor” rating is most reflective of audience “turn-off”, being rated “Fair” is still not a good response to have under any conditions. Why spend large sums for a “Fair” brand?

On the positive side, there is a temptation to combine “One of My Favourites” with “Very Good” in order to gain a “total favourable”. All this really does is to give equal weight to two scale points that do not have equal value. Use the “One of My Favourites” as the absolute measure of appeal if the brand has a high familiarity and use the Q Score when familiarity is modest or low.
4.5.2 Interaction (Moderation) effect

The study proposes to test the interaction effect of the promotional tools and understand the synergy of the promotional tools in integrated marketing communication. There are different ways of testing the interaction effect. Two most used methods are, multiple regression and Two-factor ANOVA / Multi-way ANOVA.

To test the effect in regression, the moderation effect test as suggested by Kenny (2013) is done. The individual effect of exposure to advertisement, sales promotion, personal selling, direct marketing, publicity and interactive marketing on Brand recall, recognition, awareness, familiarity, involvement and likeability can be tested by simple regression. In which each promotion tools are held as independent variables and the each brand outcomes as dependent variable. If the independent variable is considered as X, the moderator as M, and the dependent variable as Y, moderator effects are indicated by the interaction of X and M in explaining Y. The following multiple regression equation is estimated:

\[ Y = i + aX + bM + cXM + E \] (1)

The interaction of X and M is used as a product of X and M in the regression test. Note that coefficients ‘a’ and ‘b’ measure the simple effect of X, and M. Coefficient ‘c’ measures the interaction effect. In this study, each promotion tool is considered as the independent variable and the product of all the promotion tools as moderators.

The two-way ANOVA compares the mean differences between groups that have been split on two independent variables (called factors).
The primary purpose of a two-way ANOVA is to understand if there is an interaction between the two independent variables on the dependent variable. The interaction term in a two-way ANOVA informs you whether the effect of one of your independent variables on the dependent variable is the same for all values of your other independent variable (and vice versa). Additionally, if a statistically significant interaction is found, you need to determine whether there are any "simple main effects", and if there are, what these effects are (we discuss this later in our guide).

A regression analysis with one dependent variable and many independent variables is NOT a multivariate regression. It is a multiple regression. Multivariate analysis ALWAYS refers to the dependent variable. Therefore, in SPSS, we choose univariate GLM for this model, not multivariate. SAS (n.d.) GLM handles models relating one or several continuous dependent variables to one or several independent variables. The independent variables may be either classification variables, which divide the observations into discrete groups, or continuous variables. Thus, the GLM procedure can be used for many different analyses, including

- simple regression
- multiple regression
- analysis of variance (ANOVA), especially for unbalanced data
- analysis of covariance
- response-surface models
- weighted regression
- polynomial regression
- partial correlation
- multivariate analysis of variance (MANOVA)
• repeated measures analysis of variance

The typical treatment of interactions in linear models is to consider the interaction as a product term of the main effects variables.

This takes the form

\[ Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i1} X_{i2} \]

Where \( \beta_3 \) is the coefficient estimate corresponding to the product. The complete product term, \( \beta_3 X_{i1} X_{i2} \), is called a first-order interaction or sometimes a two-factor interaction, where for obvious reasons the order is one less than the number of factors.

4.6 SUMMARY

This study had adopted the survey method to collect the data. The concepts and their constructs identified from the literature were operationalized and measures of the constructs were developed. A questionnaire was designed, validated, pretested and piloted. The instrument was suitable modifications were carried out before the final survey. The survey was done by sending the link of the Google forms to randomly selected sample respondents to their email ID. Through repeated follow up their email, 1374 useful responses were received. This chapter has explained the research design in terms of operational design, observational design, instrument design, sample design and statistical design. The data analysis and the detailed findings are discussed in the following chapter.