CHAPTER 3

RESEARCH METHODOLOGY

3.1. CHOICE OF PRODUCT

This Research is on mobile phone users of Assam and NE.

There are two kinds of Services provided by operators:

Prepaid: Customers **buy data and voice by making advance payment** and then use the services subsequently.

Postpaid: Customers **use data and voice first and make payment later** on once the bill is generated.

The average ARPU (Average Revenue Per User) in Postpaid is more than that in Prepaid. Customer stickiness is much more in Postpaid as people do not want to change the number frequently. In Prepaid customer churn is more than Postpaid

From the Operators side, customer life cycle management is paid greater attention in Postpaid where customer behavior and satisfaction are monitored at each level right from the moment a customer is acquired to the progression in the life cycle.

Since, Customers enjoy a credit limit in postpaid there is greater need to ensure customer stickiness so as to avoid churn and bad debts.

Postpaid is steady source of revenue for operators as these customers provide recurring revenue month on month.

However, due to MNP which allows a mobile customer to shift to another operator if they are not happy with the existing service provider, customer satisfaction plays a very important role in ensuring that customer sticks to a particular operator and does not move out.

Considering the cut throat competition and a high teledensity of 75%, it is customer satisfaction which determines whether a customer wishes to stay on with a particular operator or not.

For the above reasons, all the operators focus more on Postpaid customers with reference to the satisfaction level.

For the same reason, the Researcher has chosen Postpaid as the scope of research

The current teledensity in India is 75% and the average tele-density in Assam & NE combined is averaging at around 50%. There is a tremendous gap of 25% pointing to great untapped potential and therefore immense scope for growth.

The three key words which come out of the above description is customer satisfaction, Postpaid services and Assam & NE region. Hence, the current Research Scope narrows down to: The Customer Satisfaction of Postpaid Mobile Users in Assam and NE.

3.2. OBJECTIVES OF THE STUDY

- To understand customer satisfaction in Telecom sector at both macro level and micro level.
- To research on various variables impacting customer satisfaction
- To compare various parameters of customer satisfaction
- To understand if there is any difference in customer satisfaction from one operator to another or from one location to another.
- To understand if there is any difference in customer satisfaction in certain specific areas within operators, locations or parameters such as billing, network, value added services etc.
- To help the Telecom industry to understand specific improvement opportunities to improve customer satisfaction
- To help management students understand customer satisfaction level from the Telecom industry perspective

3.3. Hypotheses

1. **If there is any difference in customer satisfaction from service provider to Service Provider**

2. **If there is any difference in customer satisfaction from field-office to field-office**

3. **If there is any difference in customer satisfaction from centre to centre**

4. **If there is any difference in customer satisfaction in various sub segments like network experience, call center experience, billing experience etc.**

In all the above four hypotheses, the core aspect is to examine if the CS is same or different from one segment to another segment for a given variable. If the CS is same, the difference between the CS will be close to zero and if not then the difference will be non zero. Thus, the sameness or otherwise is going to be judged by calculating the difference. Commensurate with this explanation the same hypotheses are presented statistically. Accordingly the statistical hypothesis in respect of the above mentioned research Hypothesis are presented below

Research Hypothesis:

- **If there is any difference in customer satisfaction from service provider to Service Provider**

Statistical Hypothesis

- Null Hypothesis (H_0): *There is <u>no</u> difference* in customer satisfaction level from service provider to service provider.

- Alternative Hypothesis (H_1): *There <u>is</u> difference* in customer satisfaction level from service provider to service provider.

Research Hypothesis:

- **If there is any difference in customer satisfaction from field-office to field-office**

Statistical Hypothesis

- Null Hypothesis (H_0): *There is <u>no</u> difference* in overall customer satisfaction level from service provider to service provider from field office to field office.
- Alternative Hypothesis (H_1): *There <u>is</u> difference* in overall customer satisfaction level from service provider to service provider from field office to field office.

Research Hypothesis:

- **If there is any difference in customer satisfaction from centre to centre**

Statistical Hypothesis

- Null Hypothesis (H_0): *There is <u>no</u> difference* in overall customer satisfaction level for the service providers from centre to centre.
- Alternative Hypothesis (H_1): *There <u>is</u> difference* in overall customer satisfaction level for the service providers from centre to centre.

Research Hypothesis:

If there is any difference in customer satisfaction in various sub segments like network experience, call center experience, billing experience etc.

Statistical Hypothesis

- Null Hypothesis (H_0): There is no difference in overall customer satisfaction level for the service providers from the above sub segments.
- Alternative Hypothesis (H_1): There is difference in overall customer satisfaction level for the service providers from various sub segments.

When one has to conclude about the population based on a sample drawn from that population it is necessary to use statistical procedures to arrive at conclusions

This is because the composition itself of the sample will vary from occasion to occasion if repeated sampling is done. Therefore the conclusion based on sample will vary from sample to sample, which is not appropriate because the population is fixed. Therefore the conclusion about the population based on the sample should be independent of the sample.

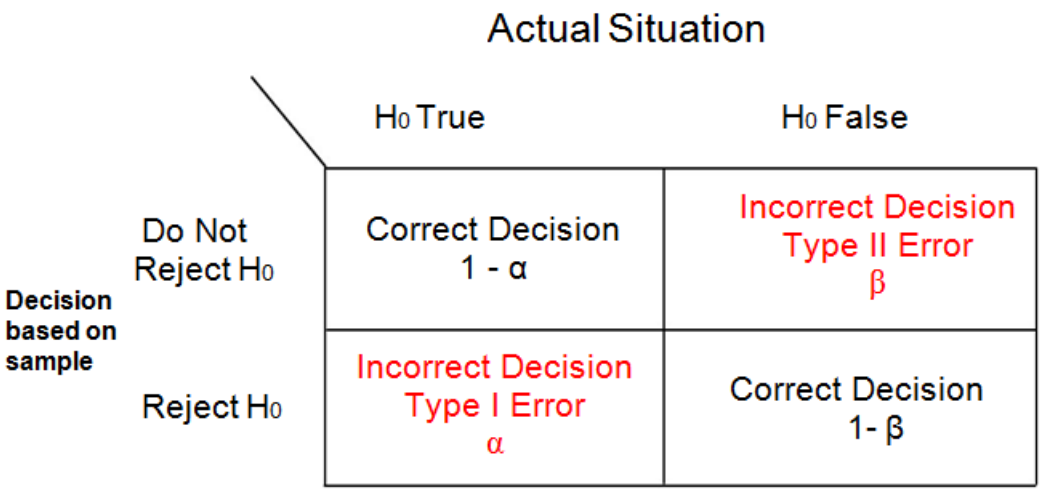
(Agarwal, Singhal, 2013)

3.4. TEST OF HYPOTHESIS AND DECISION RULE

Concluding about the population based on sample results leads to two types of errors associated with the conclusion.

The same has been summarised in the below diagram.

Type I and II Errors



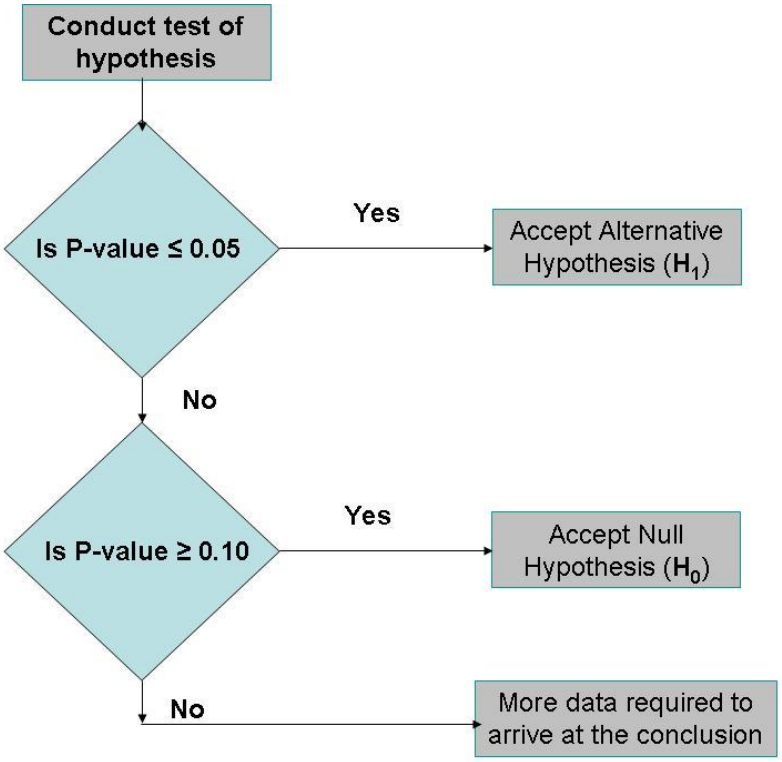
Generally β is fixed at 0.10 and α is fixed at a value 0.05 or less

Decision rule:

Depending upon the nature of the sample data, whether it is discreet or continuous, appropriate statistical test is performed to test the hypothesis. Testing means concluding if the H_o is to be accepted or rejected

Every test of Hypothesis performed yields a P value. P value is the probability of the null hypothesis being true given the sample. Closer the P value is to zero more unlikely it is that the sample comes from the given population. Away the P value is from zero more likely it is that the sample has come from the population. Thus value of P becomes the deciding factor to judge whether or not Ho is true and the cut off point is usually fixed as Type 1 error i.e α. From the preceding, the following decision rule emerges.

Decision Rule is explained in the flow chart given below:



Rejection of H_o would mean practically accepting the alternative Hypothesis (H_1):

(Agarwal, Jain, 2013)

3.5. LIST OF STATISTICAL TEST USED IN THE PRESENT RESEARCH

- One way analysis of variance: Comparing two or more averages for equality (difference zero)
- Correlation Coefficient: To judge if two variables are correlated
- Frequency Chi Square Test; To judge whether or not the frequencies of a given response is same across two segments

One Way ANOVA:

One Way ANOVA is a technique in which averages are compared by analysing the variances

Correlation Coefficient:

Correlation coefficient measures the extent and nature of relationship between two variables

Frequency Chi Square Test:

To judge whether or not the frequencies of a given response is same across two segments

3.6. Sample Size determination:

The Total Postpaid mobile users in Assam and NE are around 4 lacs

Since it is impracticable to conduct the Survey as part of Research covering all the 4 lacs customers, it was decided to focus on a sample which would be representative of the above Population.

In order to determine the sample size, following formula is used.

The formula for determining the sample size is given below:

$$n = \frac{Z^2 pq}{e^2}$$

n= Sample Size,

p= p is the estimated proportion of customer satisfaction that is present in the population

q= 1-p (estimated proportion of customer dissatisfaction that is present in the population)

e= e is the desired level of precision in estimating p

Z= Standard normal deviate corresponding to the desired confidence level

The above formula for populations that are large is due to Cochran (1963:75).

With reference to the present Research:

- There is no prior knowledge of p
- Even if p is not known the precision with which p is to be estimated is the choice of the researcher. For example, if the customer satisfaction level is suspected to be 60% but a variation of ± 5% from 60% is acceptable then the desired precision is 5% on either side of 60%. Thus e becomes 0.05 and p becomes 0.60
- In the scenario of no prior knowledge of p, the best possible choice is 50:50, that is to say p is 0.50
- Considering the nature of the study, a precision of 0.05 is acceptable, thus e is 0.05
- A confidence level of 95% in estimating p is acceptable. Now, the value of z corresponding to a confidence level of 95% is 1.96
- After substituting the above values of p, e and z, we get the sample size as follows.

$$n = \frac{Z^2 pq}{e^2} = \frac{(1.96)^2(.5)(.5)}{(.05)^2} = 385$$

Thus it can be observed that even if the population size is as large as 4 lacs or more a sample of 385 the maximum sample size needed to ensure 95% confidence in estimaitng the p value. In addition the conclusions based on the sample can be safely extended or generalised to the entire population with confidence.

In the present reserach, sample of 558 is therefore exceeds the minimum requirement of sample size and also representative of the entire population

Generally the response rate is observed to be in the range of 30% to 40%. So, assuming that 35% of the respondents will respond to the questionaire, it was decided to reach out to at least 1400 postpaid subscribers. Accordingly, questionaires were sent to 1400 subscribers out of which 558 responded to the questionaire which had 95 individual questions related to different aspects of customer experience involved in judging customer experience. Various modes like mailers, personal interviews and telecalling was used. (edis.ifas.ufl.edu/pd006)

3.7. QUESTIONAIRE DESIGN AND CATEGORISATION

These 95 questions were arrived at after critically reviewing the existing surverys done by Govt. Agencies like TRAI and consultation was also done by the researcher with industry experts. Also at the beginning of the research around 50 customers were surveyed although not in a very formal way on what aspects matter to them when they think about customer satisfaction with respect to usage of mobile services

All the 94 individual questions (one question is for overall qulality of experience) depending upon the matter involved could be classified into 10 broad service parameters.

To reduce the dimensionality of questions from 95 to lesser number is necessary for the sake of brevity and better understanding, the 95 questions were categorised into 10 meaningful categories which are easy to understand and relate to.

Further these 10 different Service Parameters in customer's opinion weighed differently. For Ex. Most Customers will give more weightage to network than to customer loyalty. Hence, a separate survery was conducted to determine the weights to be assigned to these 10 parameters. The outcome of the same is listed below.

Determination of customer satisfaction taking into account differential weights assigned to the parameters will be more appropriate as compared to determining the customer satisfaction based on same weights being assigned to all the 10 categories.

Broad category	Count of individual Questions	Weight-age
Adv and communication	9	5
Billing	14	15
Brand Perception	12	10
Call center experience	12	10
Cost	5	20
Customer Loyalty	6	5
Network	9	15
Store Experience	13	10
Tariff Plan feedback	7	5
Value Added Service	7	5
Grand Total	**94**	

Since Assam and NE put together is a spread out geography covering 7 states and spread over hilly areas and plains, the researcher has covered the following locations in order to ensure representation of each of the locational variations. (Agarwal, Singhal, 2013)

The count of respondents from various locations within Assam and NE is summarised as below.

	Locations									
Circle	Agartala	Aizwal	Dibrugarh	Guwahati	Imphal	Nalbari	Shillong	Silchar	Tezpur	**Grand Total**
Assam			45	168		22		42	40	**317**
NE	23	43			106		69			**241**
Grand Total	**23**	**43**	**45**	**168**	**106**	**22**	**69**	**42**	**40**	**558**

Service Provider	**Count of Respondents**
AIRCEL	60
AIRTEL	123
RELIANCE GSM	251
VODAFONE	124
Total	**558**

Age Group	**Count of Respondents**
< 20	8
20-30	164
30-40	199
40-50	127
50-60	42
> 60	18
Total	**558**

Gender	Count of Respondents
Male	90
Female	468
Total	**558**

3.8. Test of Consistency

In statistics, **Cronbach's α (alpha)** is a coefficient of internal consistency

The theoretical value of alpha varies from zero to 1, since it is the ratio of two variances. However, depending on the estimation procedure used, estimates of alpha can take on any value less than or equal to 1, including negative values, although only positive values make sense. Higher values of alpha are more desirable. Some professionals as a rule of thumb, require a reliability of 0.70 or higher (obtained on a substantial sample) before they will use an instrument

Test done for this Research

- Cronbach's basic equation for alpha

$$\alpha = \frac{n}{n-1}\left(1 - \frac{\Sigma Vi}{Vtest}\right)$$

  - n = number of questions
  - Vi = variance of scores on each question
  - Vtest = total variance of overall scores (not %'s) on the entire test

Sum of variances for each of the individual questions: ΣVi = 1427.808

Variance of total score across the individual question for each of 558 respondents: Vtest = 27705.56

Total no. of cases: n = 558

Cronbach's alpha = (558/(558-1))*(1-1427.808/27705.56) = 0.950

High alpha is good. High alpha is caused by high variance. But why is high variance good? –High variance means one has a wide spread of scores, which means respondents are easier to differentiate. –If a test has a low variance, the scores for the class are close together.

In our case, the alpha is 0.95, which is very high

Cronbach's alpha	**Internal consistency**
$\alpha \geq 0.9$	Excellent (High-Stakes testing)
$0.7 \leq \alpha < 0.9$	Good (Low-Stakes testing)
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

(Wikipedia, Cronbach’s alpha)

3.9. SURVEY-DATA AND TRANSFORMATION OF SURVEY-DATA

Survey-data

Apart from some basic customer-information seeking questions, the survey-questionnaire included the following broad categories of questions, to which customers responded.

- Questions related to the customer-experiences relating to the mobile telephone services.
- Questions related to the customer-experiences relating to the billing and pricing.
- Questions related to the customer-experiences relating to resolution of issues.
- Questions related to the overall customer-perception about the service providers.

Responses

Responses to all questions were qualitative in nature, as described below.

5-point Agreement Scale:

- **Strongly Agree**
- **Agree**
- **Neither Agree Nor Disagree**
- **Disagree**
- **Strongly Disagree**

5-point Opinion Scale:

- **Excellent**
- **Very Good**
- **Good**
- **Fair**
- **Poor**

5-point Likelihood Scale:

- **Extremely Likely**
- **Very Likely**
- **Somewhat Likely**
- **Not Very Likely**
- **Not At All Likely**

5-point Degree Scale:

- **Very Low**
- **Low**
- **Moderate**
- **High**
- **Very High**

2-point Yes-No Scale:

- **Yes**
- **No**

Transformation of Responses

The Need for transformation

There are more than 95 questions, to which every respondent was to respond using the 5 qualitative scales mentioned above. In other words, the customer experience, in a way, was captured in terms of 95 dimensions. As is evident these 95 questions relate to several aspects of customer satisfaction.

Just as it is important to know the level of customer satisfaction with regard to these different aspects independently, it's equally important to know the overall level of customer satisfaction combining all these aspects. Further, expressing a qualitative aspect in quantitative terms has various advantages, like ability to make comparison, ability to depict variability and also to enable perform deeper statistical tests even at micro levels for to dig out insights that could be brought out only through deeper analysis.

It's difficult to comprehend such large dimension, especially when the answers to questions are in opposite directions. It is necessary, therefore, to reduce the dimensionality of the answer, preferably to one. This is possible by doing the following.

- For each respondent, assigning a quantitative or numeric score to the qualitative response, for each question.
- Combining the assigned numeric scores to arrive at a single numeric % score. This measures the satisfaction level of the respondent.

Having established the need for quantification of qualitative responses, the choice of scale is to be decided. Broadly speaking the choice of scale could be one of the following two:

- Linear Scale: Feature: Any two consecutive scores **are** equidistant (example- 1, 2, 3, 4, 5 etc., 1, 3, 5, 7, etc.).
- Non Linear Scale: Feature: The distance between consecutive scores increases as one progress up the scale. (Example: 1, 2, 4, 8, 16 etc....1, 3, 9, 27...etc.)

3.10. LOGIC FOR CHOOSING ON A PARTICULAR NUMERIC SCALE FOR QUANTIFYING VERBAL RESPONSES

The purpose of Research is to measure the Customer Satisfaction and therefore the choice of the scale should be such that as one moves from highest level of CS to next highest level of CS, from next highest level to the next to next highest level of CS and so on, the distance should be increasing to be able to make the highest level of Cs stand out against all other levels of CS. This is not possible if one chooses Linear Scale as all the consecutive CS levels are equidistant whereas in case of Non Linear Scale the distances keeps on increasing one level to another starting from the highest level of CS.

This logic is explained as below

Scale	Verbal Response as obtained in survey				
	Strongly Agree	**Agree**	**Neither Agree Nor Disagree**	**Disagree**	**Strongly Agree**
	Verbal Response as obtained in survey standardized				
	Most Favourable	**Favourable**	**Non Committal**	**Unfavourable**	**Most Unfavourable**
Linear	**5**	**4**	**3**	**2**	**1**
Distance between consecutive options in Case of Linear Scale	**1**	**1**	**1**	**1**	-
Non Linear	**16**	**8**	**4**	**2**	1
Distance between consecutive options in Case of Non Linear Scale	**8**	**4**	**2**	**1**	-

Irrespective of whichever scale is chosen, towards one end of the verbal responses the scores are quite similar (ex: Most Unfavourable and Unfavourable)

However, towards the other end of the verbal responses, the scores are substantially different. (Example for most favourable liner scale will give a score of 5 where as non linear scale will give a score of 16, a difference of 11 units). For a given set of frequencies of 5 options

So the question arises which is the right scale.

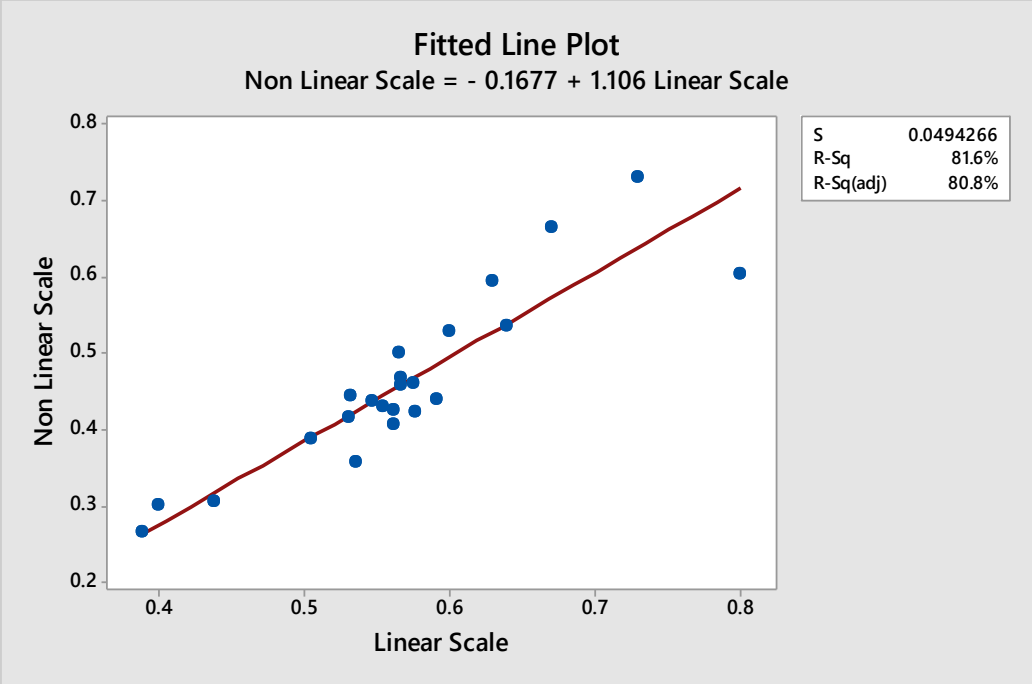
Let us look at the below illustration

	Most Favourable	Favourable	Non Committal	Unfavourable	Most Unfavourable		
Linear Scale	5	4	3	2	1		
Non Linear Scale	16	8	4	2	1		
Illustration						Customer Satisfaction	
Scenario	Frequency of Most Favourable	Frequency of Favourable	Frequency of Non Committal	Frequency of Unfavourable	Frequency of Most Unfavourable	Linear Scale	Non Linear Scale
A	50	20	15	10	5	80%	60%
B	5	10	15	20	50	40%	30%
C	5	20	50	20	5	60%	53%

D	7	10	55	8	0	64%	54%
E	10	4	22	50	1	54%	36%
F	1	2	13	53	25	39%	27%
G	1	3	41	15	0	57%	46%
H	8	3	45	29	0	58%	42%
I	5	17	30	10	15	57%	50%
J	0	11	38	39	1	53%	45%
K	0	2	55	23	0	55%	44%
L	0	2	25	28	0	51%	39%
M	2	7	49	20	2	57%	47%
N	7	4	30	32	0	56%	41%
O	7	2	44	19	0	59%	44%
P	1	4	12	72	5	44%	31%
Q	7	12	30	30	3	58%	46%
R	7	6	42	33	2	56%	43%
S	1	22	37	2	0	67%	67%
T	3	3	44	22	2	55%	43%
U	1	22	46	12	0	63%	60%
V	9	31	29	1	1	73%	73%
W	0	1	51	26	1	53%	42%

As can be seen from the above illustration, in each of the three scenarios, the CS when non linear scale is used is less than the CS when linear scale is used. Thus it seems the CS is independent of distribution of frequencies of Most Favourable etc. It depends on the choice of the scale.

In general it be concluded that CS based on Non Linear scale is always going to less than the CS based on Linear Scale.



As seen from the scatter plot above, there is very high correlation between the CS based on Linear Scale and CS based on non Linear scale. Hence, in either of the scales the conclusion will not differ but use off non linear scale will act as **motivating factor to initiate improvement for the Service Provider.**

Hence, Non Linear Scale is used in Present Research.

Also in order to remove any ambiguity in the use of scales, the Researcher indents to compare few of the Hypotheses using both the scales in the end. (Part of the above has been accepted for presentation at the 6th IIM Ahmedabad Conference on Marketing in Emerging Economies to be held on Jan 7th 2015)

3.11. QUANTIFICATION OF VERBAL RESPONSES

3.11.1. The Scheme of Assigning Score

Type of Scale	Response Options				
5-point Agreement Scale	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
5-point Opinion Scale	Excellent	Very Good	Good	Fair	Poor
5-point Likelihood Scale	Extremely Likely	Very Likely	Somewhat Likely	Not Very Likely	Not At All Likely
5-point Degree Scale	Very Low	Low	Moderate	High	Very High
Score (*)	16	8	4	2	1
2-point Yes-No Scale	Yes	No	-	-	-
	16	1			

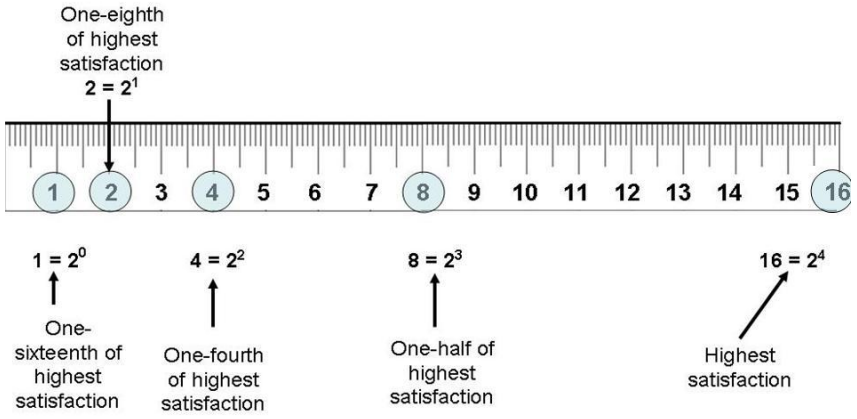
Score assignment rule: Score of 16, if response option selected represents the highest satisfaction and 1 if it represents lowest satisfaction. Score of 2, 4 or 8 if the response option selected is from middle of the scale. (Agarwal, Singhal, 2013)

3.11.2. JUSTIFICATION FOR ASSIGNING 16, 8, 4, ETC. SCORES

As has been described above, score of 16 corresponds to the highest satisfaction level. Similarly, when to assign a score of 1, is also explained. The justification for assigning scores of 8, 4, and 2 is given below.

(Agarwal, Singhal, 2013)

In order that highest satisfaction level stands out, its score should be *highest* and *distant* from the rest of the scores assigned to *all* lower satisfaction levels.
Please note, the ratio of a higher score to adjacent lower score is 2.



3.11.3. COMBINING ASSIGNED SCORES TO CALCULATE SATISFACTION SCORE

Assigned scores are combined to arrive at satisfaction level for each respondent. The method is described below through an example, assuming 4 questions answered by a single respondent. (Agarwal, Singhal, 2013)

Question	Question-1	Question-2	Question-3	Question-4	Total
Response selected by the respondent	Excellent	Somewhat Likely	Neither Agree Nor Disagree	Yes	-
Scores assigned following the rule	16	8	4	16	44
Score corresponding to highest satisfaction	16	16	16	16	64
Satisfaction level	-	-	-	-	100*44/64 = 68.8%

3.12. ACTUAL CALCULATION OF CUSTOMER SATISFACTION BASED ON RESPONSES OF 558 RESPONDENTS

- Assigning scores to survey responses to transform verbal/qualitative responses to quantitative numbers.
- Summarizing the verbal responses for each of 95 questions
- Summarizing the verbal responses into quantitative scores for each of these 95 questions
- Categorization of 94 questions into 10 Service parameters
- Assigning weights to each of the 10 service parameters
- Calculation of customer satisfaction in quantified manner

The above sequence was followed in detailed manner to calculate the customer satisfaction in different ways both at macro and micro levels. For ex. operator wise satisfaction, region wise satisfaction etc.

It would be important to mention that one specific question was asked on "what does customer think on the overall quality of service" which may be termed as "top of the mind" (something that comes upfront in the mind of the customer, this however may or may not capture the actual satisfaction completely, nevertheless this impression does count.

It may be worthwhile to investigate whether the top of the mind satisfaction and the weighted customer satisfaction are correlated or not. If they are found to be correlated then it will establish that there is a definite meaning in the quickly judging the satisfaction by asking one single question instead of trying to capture the same by asking number of questions. If they are found to be un- correlated then it would mean that we need to do an elaborate exercise and should not relay on a single question for judging CS. Also if this is found to be correlated then it signifies that whole exercise been done in manner it should be done

3.13. Listing of Application of the above mentioned three tools in present research

Statistical Test	The variable to which the test is applied	Stratification Factors
One Way ANOVA	Weighted Customer Satisfaction	Filed Offices of Assam and NE
		The Four Operators namely Aircel, Airtel, Vodafone and Reliance
		Centers within Assam and NE
		Respondents age on network (old customer, very new and not old)
		Average bill Amount
		Gender
		Age Group
	Each of 10 Service Parameters	Filed Offices of Assam and NE
		The Four Operators namely Aircel, Airtel, Vodafone and Reliance
		Centers within Assam and NE
		Respondents age on network (old customer, very new and not old)
		Average bill Amount
		Gender
		Age Group
	Each of select 18 Individual Questions	Filed Offices of Assam and NE
		The Four Operators namely Aircel, Airtel, Vodafone and Reliance
		Centers within Assam and NE
		Respondents age on network (old customer, very new and not old)
		Average bill Amount
		Gender
		Age Group
Correlation Coefficient	Comparison of Linear Scale v/s Non Linear Scale	Qualtification of the qualittative/verbal responses requires use of a defined scale. Broadly the scales could be categorised in two categories- 1) Linear and 2) Non Linear Scale. The researcher has used non linear scale in greater detail for analysis rather than the linear scale. Therefore, there may be a need to check conclusion based on linear scale also so as to remove any possibility of variance in the conclusions arising out of choice made
Frequency Chi Square	The observed frequencies of verbal responses received from respondents to the individual questions	Field Offices of Assam and NE
		The four Operators namely Airtel, Vodafone, Aircel and Reliance
		Centers within Assam and NE
		10 Categorised Service Parameters