CHAPTER – 3

RESEARCH METHODOLOGY

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3.1 INTRODUCTION

In the process of doing research work, the tailor-made methodology makes the work well-directed and interiorized. Keeping this point into mind, this chapter has been devoted to the research methodology adopted for the present research project.

3.2 RESEARCH DESIGN, METHOD AND SCOPE

3.2.1 Research Design

Research design is the conceptual structure within which research would be conducted. According to Seth Ginsburg, Owner and Consultant, Sethburg Communications, "A research design is the heart and soul of a research project. It outlines how the research project will be conducted and guides data collection, analysis, and report preparation."

The function of research design is to provide for the collection of relevant information with minimal expenditure of effort, time and money. It includes research method/s adopted and research scope. In this study, exploratory-cum-descriptive research design has been used by the researcher.

3.2.2 Research Method

Empirical research can be orchestrated either in quantitative or qualitative approach (Yin, 1989). Quantitative approach is most often used in the studies which are having well-defined research problems and clearly stated hypotheses. On the other hand, however it usually discusses the problem from the board perspective. Quantitative research aims to count and measure phenomena, (Minichello and Huberman, 1994). The objective of quantitative research approach is to develop and employ mathematical models, theories or assumptions pertaining to natural phenomena. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships. It is generally conducted via a survey on a sample that must be representative of a population so that the result can be extrapolated to the entire population studied. It requires the preparation of standardized questionnaire. On the contrary, qualitative research approach goes more in depth with the observations and investigates the phenomena from the inside. In general, qualitative approach provides deeper information of complex situations than quantitative survey, but the generalization is far more difficult. It is concerned with understanding the process.
which underlie various behavioral patterns. It is more exploratory and usually needs a much smaller sample than quantitative research. Qualitative research attempts to capture people’s meanings, definitions, and descriptions of events (Minichello and Huberman, 1994). Additionally, Bonoma, (1985); Lincoln and Guba, (1985); Neuman (1994) asserted that a qualitative research approach is more theory-building than theory-testing oriented.

In this study, qualitative as well as quantitative research approaches (which includes exploratory as well as descriptive) have been used by the researcher in order to dig out the constituents of Intellectual Capital which acts as a key value driver in an organization for enhancing the business value and testing of those variables using mathematical models, development of their conceptual texture and then development of measurement model on the basis of that conceptual framework or texture.

3.2.3 Research Scope

This study contributes in recognizing and realizing the intellectual capital constituents or components in an organization. By recognizing the constituents, knowledge-based organizations in service sector can pay due or desired attention to maintain or to improve its market value because in the prevailing business scenario, real value of an organization lies in Intellectual Capital instead of in financial or other kind of capital. It is evident that the result of this study will help the corporate as well as the academician more readily understand the components of Intellectual Capital and provide insight into developing and increasing it within an organization.

3.3 SAMPLE DESIGN

“A sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given population”.

Sample design process consists of certain steps like Defining the target population, Determining the Sampling frame, Sampling size, and Sample technique.

3.3.1 Target Population

The target population is the collection of elements or objects that posses the information sought by the researcher and about which inferences are to be made. In this study, knowledge-based organizations of services industry have been taken because this is the industry which basically works upon or excel upon the soft or Intellectual Capital. Service industry mainly includes various kinds of sectors, but in
this study seven strata’s of the same have been taken up, i.e. Banking, Insurance, Information Technology, Consultancy, Telecommunication, Hospitality, and Education sector. In order to attain the data pertaining to the constituents of intellectual capital, the managers or branch managers or the CEO’s have been selected for filling the survey instrument.

3.3.2. Sampling size

This refers to the number of elements to be included in the study. Initially, a sample of 160 organizations was selected and collected, but at the time of application of the Structural Equation Modeling Technique, the researcher realized that at least 200 samples were the minimum requirement for running this technique. Then, later on, the researcher extended the sample size from 160 to 201. Originally, 600 questionnaires have been sent, and in return, the researcher got only 201 (means response rate was 33.5%). Hence, a total of 201 sample size has been used in this study.

3.3.3. Sampling Technique

Initially, stratified random sampling technique was used by following the criteria:

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banking Sector</td>
<td>25</td>
</tr>
<tr>
<td>Information Technology Sector</td>
<td>25</td>
</tr>
<tr>
<td>Consultancy Sector</td>
<td>25</td>
</tr>
<tr>
<td>Education Sector</td>
<td>25</td>
</tr>
<tr>
<td>Insurance Sector</td>
<td>25</td>
</tr>
<tr>
<td>Hospitality Sector</td>
<td>25</td>
</tr>
<tr>
<td>Telecommunications Sector</td>
<td>10</td>
</tr>
</tbody>
</table>

But, when the researcher needed an extension in the sample size as well non-availability of respondents in Information Technology and Hospitality sector, then convenient non-probability sampling has been used to increase the sample size. In upshot, Stratified and Convenient Non- Probability Sampling have been used in this study with a total of 201 sampling units as under:

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banking Sector</td>
<td>38</td>
</tr>
<tr>
<td>Information Technology Sector</td>
<td>23</td>
</tr>
<tr>
<td>Consultancy Sector</td>
<td>31</td>
</tr>
<tr>
<td>Education Sector</td>
<td>46</td>
</tr>
<tr>
<td>Insurance Sector</td>
<td>29</td>
</tr>
<tr>
<td>Hospitality Sector</td>
<td>23</td>
</tr>
<tr>
<td>Telecommunications Sector</td>
<td>11</td>
</tr>
</tbody>
</table>

In this way, a total of 201 samples were collected using the above-mentioned criteria, in order to attain the objectives of the study.
3.4. DATA COLLECTION

In dealing with any real life problem it is often found that data at hand are inadequate, and hence, it becomes necessary to collect data that are appropriate. There are several ways of collecting the appropriate data which differ considerably in context of money costs, time and other resources at the disposal of the researcher. In this study, the primary data were required which have been collected through survey. In the case of a survey, data can be collected by any one or more of the following ways:

(i) By observation: This method implies the collection of information by way of investigator's own observation, without interviewing the respondents. The information obtained relates to what is currently happening and is not complicated by either the past behavior or future intentions or attitudes of respondents. This method is no doubt an expensive method and the information provided by this method is also very limited. As such this method is not suitable in inquiries where large samples are concerned.

(ii) Through personal interview: The investigator follows a rigid procedure and seeks answers to a set of pre-conceived questions through personal interviews. This method of collecting data is usually carried out in a structured way where output depends upon the ability of the interviewer to a large extent.

(iii) Through telephone interviews: This method of collecting information involves contacting the respondents on telephone itself. This is not a very widely used method but it plays an important role in industrial surveys in developed regions, particularly, when the survey has to be accomplished in a very limited time.

(iv) By mailing of questionnaires: The researcher and the respondents do come in contact with each other if this method of survey is adopted. Questionnaires are mailed to the respondents with a request to return after completing the same. It is the most extensively used method in various economic and business surveys. Before applying this method, usually a Pilot Study for testing the questionnaire is conducted which reveals the weaknesses, if any, of the questionnaire? Questionnaire to be used must be prepared very carefully so that it may prove to be effective in collecting the relevant information.
(v) **Through schedules:** Under this method the enumerators are appointed and given training. They are provided with schedules containing relevant questions. These enumerators go to respondents with these schedules. Data are collected by filling up the schedules by enumerators on the basis of replies given by respondents. Much depends upon the capability of enumerators so far as this method is concerned. Some occasional field checks on the work of the enumerators may ensure sincere work.

In this study, the researcher has developed a well-structured questionnaire on five point Likert scale, from “Strongly Agree” to “Strongly Disagree.” 33 statements, concomitant with the constituents of Intellectual Capital, were put in a randomized way in order to identify new constituents by applying Common Factor Analysis which is also known as Principal Component analysis with Equamax Rotation. During Pilot study, the researcher found that Cronbach Alpha value was good (.832); then questionnaires were implemented on large scale.

Questionnaires were filled through personally as well as through on-line mode by preparing a questionnaire on Google Doc. (On-line survey).

### 3.5. **DATA ANALYSIS**

Raw data from a research project cannot be generally directly used for analysis. It has to be prepared and converted into a suitable form. Raw data of any type is in the form of source documents- completed questionnaires, interview schedules, observation sheets, or records of different types. In order to analyze, data should be presented in a relevant form. Yin (2003) emphasised that data analysis entails examining, categorizing, tabulating or otherwise recombining the collected data. Miles and Huberman (1994) highlighted that describing qualitative data concentrates on data in the form of words and the processing of these words is an aspect of the analysis procedure. Miles and Huberman (1994) also classified the three concurrent flows of activity.

- **Data Reduction:** The practice of selecting, focusing, simplifying, abstracting and transforming the information, in an organized manner so that conclusion can be drawn and verified.

- **Data Display:** Allows the researcher to illustrate the findings and results of the data in a structured way in order for conclusions to be easily drawn.
Conclusion drawing/ Verification: The explanation of the relevant answers—
noting regularities, patterns, explanations, possible configurations, causal
flows and proportion.

While analyzing the data in this study, the researcher has decided to pursue (Miles
and Huberman, 1994) suggested proposition of data analysis. Two types of analysis
regarding qualitative data have been provided by Miles and Huberman (1994) --
within-case analysis and cross-case analysis. For each research question, the
researcher has compared the empirical findings to the Literature and theories featured
in our conceptual framework in order to first make a within-case analysis for each
case. Secondly, the data from the two cases will then be compared by illustration of a
cross-case analysis in order to finally draw conclusions of the patterns of similarities
and differences determined in the data reduction and data display.

As has been said above, first the data was edited which includes taking care of
missing data and ambiguous answers, checking of accuracy and quality of the data,
and finally computer editing. Data have been rectified or cleaned by doing treatment
with missing values. In this study, missing values have been substituted by assigning
neutral value to them. Codes were assigned to all the responses in the following
manner:

Strongly Agree -5  Agree -4  Neutral- 3
Disagree -2  Strongly Disagree -1

And all the respondents were assigned numbers: R 1, R 2, R 3……R 201. Data were
then tabulated as per the need of statistical tool applied.

**Total Table Constructed in Present Study = 72**

**Total Graph Constructed in Present Study = 6**

**3.5.1. ANALYTICAL TOOLS USED (OBJECTIVE- WISE)**

Analysis starts with the checking of reliability of scale. Cronbach's alpha is a test to
measure internal consistency of scale/questionnaire, i.e. how closely related a set of
items are as a group. A "high" value of alpha is often used (along with substantive
arguments and possibly other statistical measures) as evidence that the items measure
an underlying (or latent) construct. Technically speaking, Cronbach's alpha is not a statistical test but it is a coefficient of reliability (or consistency).

Cronbach's alpha can be written as a function of the number of test items and the average inter-correlation among the items. Below, for conceptual purposes, the formula for the standardized Cronbach's alpha has been presented:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N - 1) \cdot \bar{c}}$$

Here 'N' is equal to the number of items, \(\bar{c}\) is the average inter-item covariance among the items and \(\bar{v}\) equals the average variance. It can be noticed from this formula that if the number of items is increased, it would increase the value of Cronbach's alpha. Additionally, if the average inter-item correlation is low, alpha will be low. As the average inter-item correlation increases, the value of Cronbach's alpha increases as well (holding the number of items constant).

All the dimensions of this study report Cronbach's alpha at over 0.915 (refer Table No. 4.63), reaching high reliability standards, which indicate that the measurement design is highly credible, suggesting that the items have relatively high internal consistency. (Note that the reliability coefficient of .70 or higher is considered "acceptable" in most social science research situations). Exceeding the level of 0.7 is considered good for exploratory research (Nunnally, 1978).

In objective 1, the researcher has evaluated the existing constituents of Intellectual Capital by using several types of statistical tools like Mean, Standard Deviation, Ranges, Proportion Analysis, Frequency Distribution, T-Test, and Structural Equation Modeling.

Data type = Ordinal

Variable Type = Independent

3.5.2., VARIABLES WISE OR CONSTITUENT-WISE ANALYSIS has been done using Mean, Proportion test, and Frequency distribution by formulating four Hypotheses in order to ascertain the respondent’s score on each constituent.

3.5.3. SECTORAL ANALYSIS OF CONSTITUENTS USING T-TEST has been done in order to check whether the variable is performing similar kind of function in all the sectors namely Banking, Insurance, Telecommunication, Information
Technology, Hospitality, Education, and consultancy sector or having any significant difference.

3.5.4. INTRA-CONSTITUENT ANALYSIS USING T-TEST: In this analysis, differences or similarities between the constituents of a factor have been analyzed to know whether being a part of the same factor they were having any relationship or not. Here, relationship means significant relationship. This helps in apprehending the nature of the factor more precisely.

3.5.5. SECTORAL ANALYSIS USING PROPORTION, MEAN AND STANDARD DEVIATION: It intends to apprehend the status of each variable/constituent in every sector taken under study. This descriptive kind of analysis has been done by the researcher. With the help of this analysis, the researcher has been able to dig out which variable/es played noteworthy role and vice-versa. This facilitates in knowing and detecting to which variable/es should be paid more attention or not in that particular sector in order to excel in the market or in the industry to which that sector belongs. The data in this table have been analysed on the basis of percentage analysis (means how much percentage of respondents were: strongly agree, agree, neutral, disagree and strongly disagree on each statement pertaining to every variable) through range and mean or averages.

In the context of mean, the variables whose mean value was greater than ‘3’ have been treated as the active variable in that particular sector because as per the 5 point likert scale used in this study for data collection, 5 stands for strongly agree, 4 for agree, 3 for neutral, 2 for disagree, and 1 for strongly disagree, which indicates that the mean value below 3 means that variable is not active or influential in that particular area undertaken in the study. Sectors which have been undertaken include Banking, Insurance, Telecommunication, Information Technology, Hospitality, Education, and consultancy sector.

3.5.6. MACRO-ANALYSIS:

Macro-analysis means an evaluation of macro factor that influences the behaviour of a particular thing or happening. These analyses have been used by the researcher here to study the behaviour of the main components of Intellectual Capital e.g. human, structural, relational, and organisational culture and value system as a whole in order
to conclude. Being a part of the same family, the Intellectual Capital, they have some similarities or dissimilarities.

3.5.7. STRUCTURAL EQUATION MODELING USING SPSS AMOS -18 VERSION

After conducting descriptive analysis, i.e. mean, range, frequency distribution and proportion or percentage analysis as per the requirement of this study, SEM (STRUCTURAL EQUATION MODELING) using SPSS AMOS-18 and PATH analysis was conducted. PARTIAL LEAST SQUARE is a common structural equation modeling data analysis technique that is commonly used in business research including various soft capital based studies. PLS was chosen over other covariance-based techniques because it places lesser restrictions on data distribution and normality issues and it is often used to test the hypothesis derived from the theory. SEM model consists of two models: the measurement model and structural model. The measurement model depicts how observed variables represent the construct or latent variables, uses Confirmatory Factor Analysis (CFA) in which the researcher specifies which variables or measures define which construct or latent variables or factor. In other words, CFA is used to test the hypothesis that a relationship between observed variables and underlying latent construct exists. The researcher uses knowledge of the theory, empirical research, or both; postulates the relationship pattern a priori; and then tests the hypothesis statistically. In structural model, whether any relationship between constructs exists or not is evaluated.

In this study, as the first objective is to evaluate the existing variables for intellectual Capital, the researcher has bifurcated further Intellectual Capital into four parts (on the basis of evidence found from literature) e.g. Human Capital, Structural Capital, Relational Capital, and Organisational culture and value system Capital. By reviewing knowledge of the theory or previous empirical researches, the researcher extracted indicators or manifest or measured variables for all the three construct or latent variables e.g. human, structural, relational capital, and Organisational culture and value system capital. Hence, till here measurement model of SEM was applied by the researcher in order to check the relationship between construct and their manifest variables. In conclusion, the measurement model of SEM was applied in order to attain the objective.
3.5.8. ASSESSING THE MEASUREMENT MODEL RELIABILITY AND VALIDITY

After specifying the measurement model, the next step is to test the validity and reliability of the measurement model in order to check the variance between the estimated covariance matrix \((\Sigma_k)^\prime\) and the observed covariance matrix \(S\). Model fit is based on \(|S- \Sigma_k|\). A residual is the difference between the estimated and the observed value of covariance. It should be noted that SEM works on the covariance rather than on raw data, because covariance contains greater information and provides more flexibility.

It is assumed that model is supposed to be identified when there is enough information in the covariance matrix. Estimation of model parameter is based upon each unique variance or covariance among the observed variables. If there are \(x\) observed variables, then up to a maximum of \([x(x+1)]/2\) parameters can be estimated. This number is the sum of all unique covariances, \(x(x-1)/2\) and all variances, \(x\). Thus,

\[
[x (x+1)]/2 = x(x-1)/2 + x
\]

It is supposed if the actual number of estimated parameters, \(k\), is less than \([x(x+1)]/2\), the model is over-identified (in this case, there is positive degree of freedom) and conversely, if \(k\) is greater than \([x(x+1)]/2\), the model is supposed to be under-identified and a unique solution cannot be found. As a general rule, having at least three observed variables for each latent construct helps in model identification. This practice is, therefore, recommended. For taking this rule into account, in this present study, the researcher has used 5 measured variables for human capital, 8 measured variables for structural capital, 8 measured variables for the relational capital, and 12 measured variables for organizational culture & value system capital.

RELIABILITY:

Reliability of the measurement model depends upon the Coefficient alpha and composite reliability which are calculated as follows:

(a) Coefficient alpha

\[
\alpha = \frac{N \cdot \hat{c}}{\bar{V} + (N - 1) \cdot \hat{c}}
\]
Here ‘N’ is equal to the number of items, c-bar is the average inter-item covariance among the items and v-bar equals the average variance. One can see from this formula that if the number of items is increased, it leads to the increase of Cronbach’s alpha. Additionally, if the average inter-item correlation is low, alpha will be low. As the average inter-item correlation increases, Cronbach’s alpha increases as well (holding the number of items constant).

\[(b) \text{ Composite Reliability (CR)} = \left( \sum_{i=1}^{p} \lambda_i \right)^2 + \left( \sum_{i=1}^{p} \delta_i \right)^2\]

This is defined as the total amount of true score variance in relation to the total score variance. Where,

\[\lambda = \text{Completely standardised factor loading}\]
\[\delta = \text{Error variance}\]
\[p = \text{Number of indicators or observed variables}\]

As general guidelines, composite reliabilities of 0.7 or higher are considered good but estimates between 0.6 to 0.7 may be considered acceptable, if the estimates of the model validity are good.

In Human Capital Cronbach Alpha is .708 and Composite Reliability is .851, in Structural Capital Cronbach Alpha is .714 and Composite Reliability is .835, in Relational Capital Cronbach Alpha is .841 and Composite Reliability is .905, and in Organisational Culture and Value System Capital Cronbach Alpha is .813 and Composite Reliability is .870.

Hence, this infers that measurement models of all the constructs (human, structural, and relational capital) had good and acceptable reliability.

VALIDITY:

The validity of the measurement model depends on the goodness-of-fits results, reliability, and evidence of construct validity, especially convergent validity.

3.5.9. PARAMETERS FOR GOODNESS-OF-FITS OR FIT INDICES

The fit indices were intended to inform how closely the data fit the model. Basically, standard levels for these fit indices are considered for making interpretation about model fit which is as follows:
**Chi-square (X²) = p < 0.05**

The X² value is a measure of the difference between what the actual relationships in the sample are and what would be expected if the model were assumed correct. This test provides the difference in the covariance matrices such that \( X^2 = (n-1) (S- \sum_k) \) where \( n \) is the sample size, or

\[
X^2 = (n-1) (S- \sum_k)
\]

At the specified degree of freedom since the critical value of the X2 distribution is known, the probability that the observed covariance is actually equal to the estimated covariance in a given population can be found. It is assumed that \( p < 0.05 \); the greater will be chance that the two covariance matrices are not equal. For SEM, the degree of freedom if determined by the formula:

\[
df = \frac{1}{2} [(x) (x +1)] - k
\]

Where \( x \) is the number of observed variables and \( k \) is the number of estimated parameters. Although the chi-square is the only statistically based fit measure or test, its limitation is that it increases with sample size and observed variables, introducing a bias in the model fit. Hence, along certain other model fit indexes are also observed in order to reach at a decision e.g. CFI, GFI, and RMR, RMSEA, etc.

**CFI**

CFI = 1 - \( (X^2_{prop}/ df_{prop})/ X^2_{null}/df_{null} \) where \( X^2_{prop} \) and \( df_{prop} \) are chi-square and degree of freedom of the proposed model and \( X^2_{null} \) and \( df_{null} \) are the same for null model. A null model is the one in which all variables are assumed to be un-correlated. CFI is not affected by the model complexity. A good fitting model should have CFI greater than .90.

**GFI**

The GFI was devised by Jöreskog and Sörbom (1984) for ML and ULS estimation, and generalized to other estimation criteria by Tanaka and Huba (1985). The GFI is given by

\[ GFI = 1 - \frac{\hat{F}}{\hat{F}_b} \]
where \( \hat{F} \) is the minimum value of the discrepancy function defined in Appendix B and \( \hat{F}_g \) is obtained by evaluating F with \( \sum \langle g \rangle = 0 \). An exception has to be made for maximum likelihood estimation, since (D2) in Appendix B is not defined for \( \sum \langle g \rangle = 0 \). For the purpose of computing GFI in the case of maximum likelihood estimation,

\[
f\left( \sum \langle g \rangle ; S \langle g \rangle \right) = \frac{1}{2} \text{tr} \left[ K \langle g \rangle^{-3} \left( S \langle g \rangle - \sum \langle g \rangle \right) \right]^2
\]

with \( K \langle g \rangle = \sum \langle g \rangle (\hat{Y}_{ML}) \), where \( \hat{Y}_{ML} \) is the maximum likelihood estimate of \( \hat{Y} \).

GFI is less than or equal to 1. A value of 1 indicates a perfect fit.

**RMSEA**

This examines the difference between the actual and predicted covariances, i.e. residual or specifically, the square root of the mean of the squared residuals.

\[
\text{RMSEA} = \sqrt{\left( \frac{X^2/df - (n-1)}{(n-1)} \right)}
\]

adjusts the chi-square value by factoring in the degree of freedom and the sample size. Lower RMSEA values indicate better model fit. A RMSEA value of \( \leq .08 \) is considered conservative.

**P-CLOSE**

It is a "p value" for testing the null hypothesis that the population RMSEA is no greater than .05: (i.e. \( H_0: \text{RMSEA} \leq .05 \))

By contrast, \( P \) is for testing the hypothesis that the population RMSEA is zero: (i.e. \( H: \text{RMSEA} = 0 \))

Based on their experience with RMSEA, Browne and Cudeck (1993) suggest that a RMSEA of .05 or less indicates a "close fit". Employing this definition of "close fit", P-CLOSE gives a test of close fit while \( P \) gives a test of exact fit.

**3.5.10. CONSTRUCT VALIDITY (through convergent validity)**

Convergent validity measures the extent to which the scale correlates positively with other measures of the same construct. Basically the size of the factor loadings provides evidence of convergent validity. Higher factor loadings indicate that the manifest variables converge on the same construct. At a minimum, all factor loadings
should be statistically significant and higher than 0.5, ideally higher than the 0.7. A loading of 0.7 or higher indicates that the construct is explaining 50 percent or more of the variation in the observed variable since, \((0.71)^2 = 0.5\). Sometimes, a cut off level of 0.6 is used. Besides this, another measure used to assess the convergent validity is the average variance extracted (AVE), which means the variance in the indicators or manifest variables that, is explained by the latent construct.

AVE is calculated:

\[
\text{AVE} = \frac{\text{Sum of the squared standardised loadings}}{\text{Sum of the squared standardised loadings + Sum of the indicator measurement error}}
\]

The value of AVE varies from 0 to 1, and an AVE of 0.5 or more indicates satisfactory convergent validity, which means that latent construct accounts for 50 percent or more of the variance in the observed or manifest variables.

In this way, 19 constituents were extracted as the key performers in the Indian Service industry.

3.5.11. In objective 2, To identify new variables for Intellectual Capital, PRINCIPAL COMPONENT ANALYSIS WITH EQUAMAX ROTATION USING SPSS-18 VERSION

For applying the Principal Component Analysis, the requirement is to fulfill certain conditions which are delineated as under:

- Appropriate sample size (KMO should be more than 0.5)
- Each variable correlates perfectly with itself \((r = 1)\), but has no correlation with the other variables \((r = 0)\).
- Reliability Statistics \((\alpha)\) should be more than 0.7.
- The variables or items are appropriately measured on an interval or ratio scale.
- The variables or items included in factor analysis should be specified based upon past research, theory, and judgment of the researcher.
- In Bartlett’s Test of Sphericity \(p<.05\)
For assessing sample size adequacy, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy has been employed, which is often used to examine the appropriateness of EFA. This index compares the magnitudes of the observed correlation coefficients with the magnitudes of the partial correlation coefficients. The values lie between 0.5 and 1.0 indicates that factor analysis is appropriate and a value below 0.5 implies that factor analysis may not be appropriate to be conducted.

Bartlett's Test of Sphericity serves to examine the hypothesis that the variables are uncorrelated in the population. For EFA to work, some relationship between variables are required and if the R matrix were an identity matrix then all correlation coefficient would be zero. Therefore, for this study, this is very significant (i.e. have a significance value less than 0.05). Significance tells that R-Matrix is not an identity matrix; therefore, there are some relationships between the variables to include in the analysis. For the present study, Bartlett’s test is highly significant (p < 0.001) and therefore factor analysis is appropriate, i.e. its associated probability is less than 0.05.

Then Principal Component Analysis has been applied using equamax rotation. In factor analysis, the model fit is determined through residual value. Residual value is the difference between the observed correlations (as given in the input correlation matrix) and the reproduced correlations (as estimated from factor matrix). If there are many large residuals, i.e. greater than 0.05, which means the factor model doesn’t provide a good fit to the data and the model should be reconstructed. Residual values are given in the upper triangle of "Reproduced Correlation Matrix."

3.5.12. Objective 3: Conceptualization of Intellectual Capital

The researcher, by applying Principal Component Analysis (Common Factor Analysis) with Equamax rotation, has identified 29 variables of Intellectual Capital: these 29 variables were divided into five factors in which Factor 1 consists of 11 variables; Factor 2 consists of 7 variables; Factor 3 consists of 4 variables; Factor 4 consists of 3 variables; and Factor 5 consists of 4 variables (shown in Table No. 1).

Now the researcher conceptualizes the term Intellectual Capital on the basis of the new factors identified through Principal Component Analysis with equamax rotation of orthogonal method.
Table No. 3.1: CONCEPTUALISATION OF INTELLECTUAL CAPITAL

<table>
<thead>
<tr>
<th>FACTOR 1</th>
<th>FACTOR 2</th>
<th>FACTOR 3</th>
<th>FACTOR 4</th>
<th>FACTOR 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees’ understanding of target market</td>
<td>Sound relationship with partners</td>
<td>Organisational structure</td>
<td>Information System</td>
<td>Energy, zeal, and enthusiasm of employees</td>
</tr>
<tr>
<td>Consistent best performance of employees</td>
<td>Healthy relationship with customers</td>
<td>Prevalence of fraternity values</td>
<td>Employee’s competency</td>
<td>Care for customer’s need</td>
</tr>
<tr>
<td>Structure imbibed with proper coordination skill</td>
<td>Sound relationship with suppliers</td>
<td>Feedback from clients or customers is disseminated in organisation</td>
<td>Research &amp; Development</td>
<td>Preparedness towards sudden discontinuance of service from employee’s side</td>
</tr>
<tr>
<td>Comprehensive recruitment policy</td>
<td>Customers’ confidence towards continuation of association ship</td>
<td>Quality of service</td>
<td></td>
<td>Receptive towards employee’s new ideas</td>
</tr>
<tr>
<td>Supportive and conducive environment and culture</td>
<td>Updated database</td>
<td>Loyalty and goodwill among customers</td>
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<tr>
<td>Up gradation of skill and knowledge of employees by the organization</td>
<td>Self-sufficiency in software’s and e-resources</td>
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<tr>
<td>Continuous interaction with customers/ clients’ Continually on schedule</td>
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<tr>
<td>Recognition to employee’s efforts</td>
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<tr>
<td>Efficient Grievance redressal mechanism</td>
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<td></td>
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<tr>
<td>Organisation’s adaptability towards new idea</td>
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</table>

On the part of the researcher, it was very intricate to name these factors because besides second factor which consists of all variables concomitant to relational capital or are of same nature. In this study, the researcher has tested these variables using Principle Component Analysis and found that the variables in each specific factor, as given in the previous conceptualizations, doesn’t lie in that particular factor. So, in this ambivalent situation, it becomes convoluted to assign specific names to these factors. That’s why; the researcher has not assigned any specific name to these factors as given in the literature as per the nature of the variables or constituents in the factor. Hence, the researcher, besides giving specific name to each factor, assigned a single name to this whole conceptual framework as the "FIVE FACTOR METAPHYSICS OF INTELLECTUAL CAPITAL."
3.5.13. Objective 4: Development of Comprehensive Model for Measurement of Intellectual Capital

For developing model, there are four types of methods:

Direct Intellectual Capital Methods (DIC): This method estimates the dollar value of intangible assets by identifying its various components. Once these components are identified, they can be directly evaluated, either individually or as an aggregated coefficient.

Market Capitalization Method (MCM): MCM calculates the difference between a company’s market capitalization and the book value of its shareholders’ equity as the value of its IC or intangible assets.

Scorecard Method (SC): The various components of intangible assets or IC are identified and indices are generated and reported in scorecards or as graphs. SCM methods are similar to DIC methods, except that no estimate is made of the dollar value of the intangible assets. A composite index may or may not be produced.

Return on Assets Method (ROA): ROA method is the average pre-tax earnings of a company for a period of time divided by the average tangible assets of the company. The result is a company ROA that is then compared with its industry average. The difference is multiplied by the company’s average tangible assets to calculate average annual earnings from the intangibles. Dividing the above average earnings by the company’s average cost of capital or an interest rate, one can derive an estimate of the value of its intangible assets or IC.

Sveiby (2002) suggests that different measurement methods offer different advantages. The financial methods that offer dollar valuation, such as ROA and MCM, are useful in merger and acquisition situations and for stock market valuations. They can also be used for comparisons between companies within the same industry and they are good for illustrating the financial value of IC. The advantages of the DIC and SCM methods are that they can create a more comprehensive picture of a company’s health than financial metrics, and that they can be easily applied at any level of a company. They measure closer to an event and reporting can therefore be faster and more accurate than purely financial measures (Sveiby, 2002).

Since the objective of the present study is to develop a comprehensive model for the measurement of Intellectual Capital, indicators for the same have also been extracted
as well identified using Principal Component Analysis with Equamax rotation of orthogonal method. So, Direct Intellectual Capital Method is pertinent. Hence, was used by the researcher.

3.6. REFERENCE STYLE USED

Referencing is an institutionalised way of acknowledging the sources of information and ideas that have been used in assignments and which allow the sources to be identified. These are extremely important to avoid plagiarism, to verify quotations and to enable readers to follow up what has been written and more fully understand the cited author’s work. In this present research report, American Psychological Association (APA) style has been used. This is a generic author-date style for citing and referencing information in assignments and publications and is widely accepted in the social sciences and other fields such as education, business, and nursing. This citation format requires parenthetical citations within the text rather than endnotes or footnotes. Citations in the text provide brief information, usually the name of the author and the date of publication, to lead the reader to the source of information in the reference list at the end of the paper. The references are given chapter-wise at the end.

3.7. TIME TABLE

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>TIMING</th>
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</thead>
<tbody>
<tr>
<td>REVIEW OF LITERATURE &amp; INTRODUCTION</td>
<td>OCT. 2010 TO JAN. 2011</td>
</tr>
<tr>
<td>DEVELOPMENT OF SURVEY INSTRUMENT</td>
<td>FEB. 2011</td>
</tr>
<tr>
<td>PILOT STUDY</td>
<td>5 MAR. TO 20 MAR. 2011</td>
</tr>
<tr>
<td>QUESTIONNAIRES ADMINISTERED ON LARGE SCALE</td>
<td>FROM 22nd MAR. 2011 onwards</td>
</tr>
<tr>
<td>SUBMISSION OF FIRST PROGRESS REPORT</td>
<td>7 JUNE, 2011</td>
</tr>
<tr>
<td>DATA COLLECTION COMPLETED</td>
<td>31 AUG. 2011</td>
</tr>
<tr>
<td>DATA CLEANING, EDITING, CODING, &amp; TABULATION</td>
<td>SEP, 2011 TO OCT. 2011</td>
</tr>
<tr>
<td>DATA ANALYSIS</td>
<td>NOV. 2011 TO FEB, 2012</td>
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<tr>
<td>REPORT WRITING OR INTERPRETATION</td>
<td>MAR, 2012 TO MAY, 2012</td>
</tr>
<tr>
<td>SUBMISSION OF SECOND PROGRESS REPORT</td>
<td>10 MAY, 2012</td>
</tr>
<tr>
<td>PRE-SUBMISSION SEMINAR</td>
<td>21 AUG, 2012</td>
</tr>
</tbody>
</table>
3.8 OVERVIEW OF THE DISSERTATION

As mentioned previously, the present study aims to evaluate and identify constituents of intellectual capital, and the development of the measurement model. The chapter 1 outlined the background of intellectual capital, elucidation of the term intellectual capital, its characteristics, classification, significance, and delineation of the measurement aspect of intellectual capital.

Chapter 2: Definition of intellectual capital and its components are provided. Then, existing theories underpinning the classification of intellectual capital are discussed. A significant part of literature review has focused on reviewing of the existing methods and models measuring intellectual capital.

Chapter 3: It outlines the research methodology employed, describing the chosen sampling technique, the way the data for the study has been collected and the statistical techniques used to analyze the data.

Chapter 4: It presents the elucidation of the empirical results which includes all the steps conducted to analyse the data. These steps includes, descriptive analysis (macro, micro, inter-factor, intra-factor, and variable-wise), tests of reliabilities, test of sample adequacy, SEM results, Exploratory factor analysis results, conceptualization of term, and model for the measurement of intellectual capital, and interpretation of the empirical results.

Chapter 5: Finally, it covers the discussion of the results and concluding remarks along with the implications derived from the results, the limitations of the present study and future avenues for Intellectual Capital measurement research.
3.9 REFERENCES:


