CHAPTER 5

RESEARCH METHODOLOGY

The review of previous research studies and the models developed by the earlier research form the basis for constructing the methodology used in this study. The research design, sampling design, sampling method and the tools used for analysis is presented in this chapter.

Research refers to search of knowledge. Research is a systematic and scientific search for pertinent information on a specific topic (Kothari 2009). It is an investigation of finding solutions to scientific and social problems through objective and systematic analysis. Research involves search of information through a structured enquiry that utilizes acceptable scientific methodology to solve problems and create new knowledge that is generally applicable.

Research is a process of collecting data, analyzing the data and interpreting the information to find the answers for the questions or the assumptions.

The Advanced Learner’s Dictionary of Current English lays down the meaning of research as “a careful investigation or inquiry especially through search for new facts in any branch of knowledge.” D. Slesinger and M. Stephenson in the Encyclopedia of Social Sciences define research as “the manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art.” Fellows and Lui (2003)
defines research as “a voyage of discovery”. According to Naoum (1998) research is “an enquiry or investigation conducted in a careful, scientific and/or critical manner”. Williams et al (1996) defines research as “a quest for answers that involves answers and understanding, adding that it involves, methodical investigations into a subject or problem”.

The research is being undertaken within a framework of a set of philosophies (approaches); uses procedures, methods and techniques that have been tested for their validity and reliability; and is designed to be unbiased and objective (Dawson and Catherine 2002, Kothari 1985, Kumar 2005).

Methodology is defined as “A body of methods, rules, and postulates employed by a discipline of a particular procedure or set of procedures” and/or “the analysis of the principles or procedures of inquiry in a particular field.” (Encyclopedia Britanica 2007). Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research. Research methodology describes various steps that are generally adopted in studying the research problem along with the logic behind them. Research methodology provides the methodological approaches used in the study, shows how appropriate the chosen techniques are, and puts forward a justification of their use over other techniques.

Adler et al (1989) point out "choosing a methodology determines what we can study as well as the range of possible results and conclusions". Qualitative and Quantitative Research are the two main schools of research.
5.1 **QUALITATIVE VS QUANTITATIVE RESEARCH**

Qualitative research is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind. Qualitative research is inquiry aimed at describing and clarifying human experience as it appears in people's lives. Qualitative data are gathered primarily in the form of spoken or written language rather than in the form of numbers. Wright (1995) describes qualitative research to mean any research where number counting and statistical techniques are not the central issues, where an attempt is made to get close to the collection of data in their natural setting. Qualitative research is used to gain insight into people's attitudes, behaviors, value systems, concerns, motivations, aspirations, culture or lifestyles. It is used to inform business decisions, policy formation, communication and research. The three most common qualitative methods are participant observation, in-depth interviews, and focus groups.

Quantitative research involves analysis of numerical data. Quantitative research is based on the measurement of quantity or amount. It is applicable to phenomena that can be expressed in terms of quantity. Quantitative research methods entail the use of systematic and sophisticated procedures to test, prove and verify hypotheses (Glaser and Strauss 1968). In quantitative research, the aim is to determine the relationship between one thing (an independent variable) and another (a dependent or outcome variable) in a population. Qualitative research generates statistics through the use of large-scale survey research, using methods such as questionnaires or structure interviews. Wright (1995) states that “By combining qualitative methods to quantitative methods, the resulting research will be much more meaningful and will have a greater probability of being valid, of actually measuring what it purports to measure”. In this study, both qualitative and quantitative approaches were adopted at different stages of research process.
5.2 RESEARCH PROCESS

The research process was executed as two phases. Phase one includes the literature survey, finalization of the objectives of the study, identification of the variables and development of the theoretical framework. The extensive literature survey resulted in finalizing the objectives of the study and for developing the theoretical framework.

In phase two of the study, the researcher carried out the exploratory research to identify the nature of the data required for the research and tried to define the problem more precisely. The researcher also attempted to identify the relationship between the variables under study to develop the theoretical framework to be tested in the study.

5.3 EXPLORATORY RESEARCH

Exploratory research is most useful in the preliminary stages of a research project when the levels of uncertainty and of general ignorance of the subject in question are at their highest, when the problem is not very well understood and unstructured (Philips and Pugh 1987, Webb 1992, Ghauri et al 1995). Exploratory research clarifies problems, gathers data and creates initial hypothesis and theories about subjects. The primary point of exploratory research is to give researchers pertinent information and help them to form initial hypotheses about the subject.

The main aim of exploratory research is to uncover the boundaries of the environment in which the problems, opportunities or situations of interest are likely to reside and to uncover the salient variables that may be found there and which are relevant to the research project (Webb 1992). Exploratory research has to be normally flexible, unstructured and qualitative (Aaker et al 2000, Burns and Bush 2002). The exploratory research helped to
determine the best research design, data collection method, and to explore the relationship with the variables through in depth interview with the focus groups.

As there were limited studies on the performance of incubators and the factors influencing the performance, exploratory research was carried out. As part of the exploratory research, the incubation managers representing India and other countries were interviewed by the researcher during participation in the conferences, seminars, and other events to understand the various factors that influence the success of the incubator. The interviews and the views of the incubation managers were the base for the researcher to develop the questionnaire to understand the issues related to the performance of the incubators.

5.4 DESCRIPTIVE RESEARCH

Descriptive research involves gathering data that describe events and then organizes, tabulates, depicts, and describes the data. A descriptive study is more rigid, preplanned and structured, and is typically based on a large sample (Churchill and Iacobucci 2004, Hair et al 2003, Malhotra 1999). Descriptive research designs are basically quantitative in nature (Burns and Bush 2002, Churchill and Iacobucci 2004, Hair et al 2003). There are two basic techniques of descriptive research namely cross-sectional and longitudinal. Cross-sectional studies collect information from a given sample of the population at only one point in time, while the latter deals with the same sample units of population over a period of time (Burns and Bush 2002, Malhotra 1999). The cross-sectional study is also referred to as a sample survey in which selected individuals are asked to respond to a set of standardized and structured questions about what they think, feel and do (Hair et al 2003)
For this study, a cross-sectional study was adopted. The cross section of incubators with more than one year of establishment, representing different thrust areas, different economies and different operating models were considered for the survey by the researcher to identify the impact of incubator facilities, support services, selection criteria, graduation criteria, financial support to the start-ups, mentoring, networking and incubation governance on the performance of the incubators. The preliminary literature survey and the interview resulted in developing a detailed list of factors influence the performance from the incubator managers’ perspective and helped in finalizing the parameters to evaluate the performance of the incubators.

5.5 RESEARCH INSTRUMENT

The questionnaire design is involved in selecting question content, wording, measurement scales, response format and the sequence of questions. The personal experience by participation in the international and national conferences, discussions and in depth interview with the incubation managers and the literature support had given the researcher the insights into the factors influencing the performance of the incubators, to confirm the existing knowledge on the incubation process and to develop a questionnaire with the clear ideas of the contents to be included in the questionnaire.

The rating of the factors influencing the performance of the incubators was designed as closed-end questions where the respondents have to make their response in a 5 point Likert scale varying from “Not at all important” to “Extremely Important”.
The scale was adopted because of the following reasons (Kassim 2001).

- It yields higher reliability coefficients with fewer items than the scales developed using other methods.
- This scale is widely used in market research and has been extensively tested in both marketing and social science (Garland 1991).
- It offers a high likelihood of responses that accurately reflect respondent opinion under study (Burns and Bush 2002, Zikmund 2000).
- It helps to increase the spread of variance of responses, which in turn provide stronger measures of association (Aakter et al. 2000).

In relation to question content and working, questions were designed to be short, simple and comprehensible, avoiding ambiguous, vague, estimation, generalization, leading, double barreled and presumptuous questions (Kassim 2001). Negative worded questions were not used to avoid confusion to respondents in answering the questions.

The questionnaire in this study consists of three parts: general information about the incubator, key statistics on the performance of the incubator and rating of the factors influencing the performance of the incubators. The general information about the incubator includes host institute, year of establishment, thrust area of the incubator, objectives of the incubator, and services provided by the incubator. The key statistics on the performance include the operational details of the incubator. The third part of the incubator includes the rating of the incubation managers on the factors
influencing the performance of the incubators. The four variables such as occupancy level, sustainability of the incubator, number of incubatees in thousand sq.ft and survival rate of the incubatees were considered to evaluate the performance of the incubator.

5.6 SAMPLING DESIGN

The sampling design explains the plan for obtaining a sample from the population i.e., the group of people whom the researcher is interested to know about. In this study, all the incubators who extend physical incubation facility to the start-ups and who has registered as members in the infoDev incubator network was considered as the population. The sample frame comprised of incubators listed in the infoDev incubators network. This list was chosen as it is the only list which contains cross sections of incubators in the world.

Purposive / Judgmental sampling is the sampling method deployed for selecting the sample for the study. In Purposive / Judgmental sampling the samples are chosen based appropriate people for the study. This is used primarily when there is a limited number of people who have expertise in the area being researched.

As part of the judgment process the incubation managers were interviewed and appropriate incubators were shortlisted as part of the sample based on the year of establishment of the incubator, participation in the incubation events and experience of the incubation managers.

5.7 SAMPLING SIZE

Sample size calculation makes use of many thumb rules. The most common way to determine the sample size is to use the power analysis. For this purpose G power 3 software is used. G power 3 software calculates the sample sizes as follows:
Effect size is a measure of the strength of the effects being studied in the research and is considered as 0.50. The researchers usually study the largest relationship between variables. The significance level $\alpha$ is also known as type 1 error. It is the probability of rejecting a correct hypothesis. The commonly used value for $\alpha$ is 0.05. The power of a test (1-$\beta$) is 0.80. Any lower values will indicate a test that is not powerful enough. The degree of freedom is 2. These four values are fed into the software and the resultant output contains the required sample size.

Out of 399 listed incubators, 80 incubators with more than one year of operation and with the representation in the incubators network of infoDev were considered for the study. The responses were received from 42 incubators. The response rate is 50.1%. From the Table 5.1 is observed that the sample size which responded meets the minimum requirement as per the Gpower3.

### Table 5.1 Apriori Sample Size Calculation

<table>
<thead>
<tr>
<th>$\chi^2$ tests – Goodness-of-fit tests: Contingency tables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis: A priori: Compute required sample size</td>
</tr>
<tr>
<td>Input: Effect size $w$                                      = 0.50</td>
</tr>
<tr>
<td>$\alpha$ err prob                                         = 0.05</td>
</tr>
<tr>
<td>Power (1-$\beta$ err prob)                                = 0.80</td>
</tr>
<tr>
<td>Df                                                        = 2</td>
</tr>
</tbody>
</table>
| Output: 
  Noncentrality parameter $\lambda$                    = 9.750000 |
  Critical $\chi^2$                                        = 5.991465 |
  Estimated Total sample size                               = 39 |
  Actual power                                              = 0.804979S |
5.8 DATA COLLECTION

The data collection was done by circulating the questionnaire to the incubator managers of the infoDev network through online. The prospective managers were given explanation over email about the objectives and purpose of the study. The study was carried out during the period from February to May 2011. Completed responses were scrutinized and 42 responses were considered for the study.

5.9 RELIABILITY

A construct is reliable if it measures a dimension the same way, every time with minimum variance. Cronbach’s alpha is the one of the popular measures of reliability. Alpha ranges from 0 to 1. A pre validated construct is said to be reliable if the value of alpha is more than 0.7 and a newly proposed construct is said to be reliable if the value of alpha is more than 0.50.

Construct reliability analysis was done using Cronbach’s alpha measure with SPSS software to determine the reliability of the various dimensions being studied.

The Table 5.2 provides the Cronbach’s alpha measure for the constructs of the study:

Table 5.2 Cronbach’s Alpha Measure

<table>
<thead>
<tr>
<th>S No.</th>
<th>Factor</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Incubator Facilities</td>
<td>0.8051</td>
</tr>
<tr>
<td>2</td>
<td>Support Services</td>
<td>0.7632</td>
</tr>
<tr>
<td>3</td>
<td>Incubation Program</td>
<td>0.7692</td>
</tr>
<tr>
<td>4</td>
<td>Financial Support</td>
<td>0.8242</td>
</tr>
<tr>
<td>5</td>
<td>Selection Criteria</td>
<td>0.7828</td>
</tr>
<tr>
<td>6</td>
<td>Graduation Criteria</td>
<td>0.7974</td>
</tr>
<tr>
<td>7</td>
<td>Mentoring and Networking</td>
<td>0.8728</td>
</tr>
<tr>
<td>8</td>
<td>Incubator Governance</td>
<td>0.3184</td>
</tr>
</tbody>
</table>
Though the reliability coefficient is low for incubator governance because of the theoretical importance, the construct incubator governance is retained with same measurement.

5.10 STATISTICAL ANALYSIS TOOLS

The following statistical tools are used in the study.

Path analysis is the analysis of the interdependent variables together. Path Analysis is the statistical technique used to examine causal relationships between two or more variables. The aim of PLS path modeling is to analyze the interdependent relationships between factors and the unidimensionality of factors in one analysis algorithm. Path analysis is a subset of Structural Equation Modeling (SEM), the multivariate procedure that, as defined by Ullman (1996), “allows examination of a set of relationships between one or more independent variables, either continuous or discrete, and one or more dependent variables, either continuous or discrete.” PLS path modeling is a combination of confirmatory factor analysis and path analysis.

A SEM was conducted on the model proposed to ascertain the validity of the constructs proposed and the paths postulated in the model. SEM provides a convenient framework for statistical analysis that includes several multivariate procedures. SEM is a technique used to determine whether the model developed for research is valid for data. The process of pre deciding factors and testing them for unidimensionality is known as confirmatory factor analysis. PLS was considered ideal, if the conditions relating to sample size, interdependence, or normal distribution is not met and if predictions are more important than parameter estimation.
A Structural Equation Model (SEM) with all constructs used in the study was analyzed using Visual PLS 2.0 for identifying significant relations between variables of interest in the study.

Visual-PLS is a Graphic-User-Interface program for Latent Variables Path Analysis with Partial Least Squares Version 1.8. It helps the researchers to prepare, edit, and do the PLS analysis more easily. This software allows the researchers to focus more on their appropriateness of the research model and data set rather than on how to get the program to run, which will dramatically decrease the time and efforts needed to complete a PLS analysis.

Cross Tabulation was performed along with the chi-squared test using SPSS software to determine the association between certain nominal variables.

Demographic classifications were carried out by taking frequencies and percentages.

Data Analysis was done using arithmetic means as a comparison tool on the variables influencing the performance of the incubators.