

CHAPTER-3

RESEARCH METHODOLOGY

3.1 BACKGROUND

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. In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them. It is necessary for the researcher to know not only the research methods/techniques but also the methodology. Researchers not only need to know how to develop certain indices or tests, how to calculate the mean, the mode, the median or the standard deviation or chi-square, how to apply particular research techniques, but they also need to know which of these methods or techniques, are relevant and which are not, and what would they mean and indicate and why. Researchers also need to understand the assumptions underlying various techniques and they need to know the criteria by which they can decide that certain techniques and procedures will be applicable to certain problems and others will not. All this means that it is necessary for the researcher to design his methodology for his problem as the same may differ from problem to problem. Similarly, in research the scientist has to expose the research decisions to evaluation before they are implemented. He has to specify very clearly and precisely what decisions he selects and why he selects them so that they can be evaluated by others also.

From what has been stated above, we can say that research methodology has many dimensions and research methods do constitute a part of the research methodology. The scope of research methodology is wider than that of research methods. Thus, when we talk of research methodology we not only talk of the research methods but also consider the logic behind the methods we use in the context of our research study and explain why we are using a particular method or technique and why we are not using others so that research results are capable of being evaluated either by the researcher himself or by others. Why a research study has been

undertaken, how the research problem has been defined, in what way and why the hypothesis has been formulated, what data have been collected and what particular method has been adopted, why particular technique of analyzing data has been used and a host of similar other questions are usually answered when we talk of research methodology concerning a research problem or study.

3.2 BASIC TYPES OF RESEARCH

- 3.2.1. Descriptive vs. Analytical: Descriptive research includes surveys and fact-finding enquiries of different kinds. The major purpose of descriptive research is description of the state of affairs as it exists at present.
- 3.2.2. Applied vs. Fundamental: Research can either be applied (or action) research or fundamental (to basic or pure) research. Applied research aims at finding a solution for an immediate problem facing a society or an industrial/business organization, whereas fundamental research is mainly concerned with generalizations and with the formulation of a theory
- 3.2.3. Quantitative vs. Qualitative: Quantitative research is based on the measurement of quantity or amount. It is applicable to phenomena that can be expressed in terms of quantity. Qualitative research, on the other hand, is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind.
- 3.2.4. Conceptual vs. Empirical: Conceptual research is that related to some abstract idea(s) or theory. It is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones. On the other hand, empirical research relies on experience or observation alone, often without due regard for system and theory. It is data-based research, coming up with conclusions which are capable of being verified by observation or experiment.

3.3 RESEARCH APPROACHES

The above description of the types of research brings to light the fact that there are two basic approaches to research, viz., quantitative approach and the qualitative approach. The former involves the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion. This approach can be further sub-classified into inferential, experimental and simulation approaches to research. The purpose of inferential approach to research is to form a data base from which to infer characteristics or relationships of population. This

usually means survey research where a sample of population is studied (questioned or observed) to determine its characteristics, and it is then inferred that the population has the same characteristics. Experimental approach is characterized by much greater control over the research environment and in this case some variables are manipulated to observe their effect on other variables. Simulation approach involves the construction of an artificial environment within which relevant information and data can be generated. This permits an observation of the dynamic behavior of a system (or its sub-system) under controlled conditions. The term ‘simulation’ in the context of business and social sciences applications refers to “the operation of a numerical model that represents the structure of a dynamic process. Given the values of initial conditions, parameters and exogenous variables, a simulation is run to represent the behavior of the process over time.” Simulation approach can also be useful in building models for understanding future conditions.

Qualitative approach to research is concerned with subjective assessment of attitudes, opinions and behavior. Research in such a situation is a function of researcher’s insights and impressions. Such an approach to research generates results either in non-quantitative form or in the form which are not subjected to rigorous quantitative analysis. Generally, the techniques of focus group interviews, projective techniques and depth interviews are used. All these are explained at length in chapters that follow.

3.4 RESEARCH DESIGN

Descriptive research method is used in this study. Creswell (1994) [9], defined descriptive research as a method in which information is gathered for existing state. The emphasis is on describing rather than interpreting and judging. The descriptive research emphasized onto defining and validating the already formulated hypothesis assuming current situation will prevail.

This is a flexible approach, thus the new questions arise during the course of research can be easily incorporated for further investigations.

The idea behind this research is to get a candid picture of the situation, people, and events. In this type of research it is compulsory that the researcher has a crystal clear view of the phenomenon under investigation before the data collection starts.

In descriptive research the data collected are obtained directly from the respondents, since this is the first hand data so the conclusions of the study are sound. In the above study, the descriptive research method is used to verify whether cloud computing is currently being used in Indian technical educational institutions, and to elucidate and verify the clear-cut role of used cloud computing services in the said technical institutions.

In order to gather relevant data the respondents used were the employees of data centers of these technical institutions and cloud experts. The descriptive method is a suitable approach which identifies the similarities and differences of the answer recorded from the respondents.

The primary data for this research comprises of the answers given by the participants, respondents in the course of survey process and the telephonic interviews. The secondary type of data for the descriptive research is from published documents and literature that are relevant to the topic of study. Thus, the primary data and the secondary data are combined to give a qualitative and quantitative approach of descriptive research. In order to gain this requisite knowledge needed to increase the quality of the work to write this thesis a desk research is conducted form capitalization books and scientific papers and articles.

3.5 INSTRUMENTS

3.5.1 The Questionnaire

An online questionnaire was designed, validated and conducted to verify whether technical educational institutions currently use cloud computing or not. It was also determined whether cloud computing was reliable or not, and what were the pros and cons of using cloud services.

To create a representative sample of the technical educational environment, E-Mail(s) were sent to 400 employees of technical educational institutions and data centers across India, with the request to complete the online questionnaire. The criterion for selection of these 400 universities/institutions was simple random sampling out of 4153 institutions across the country [10].

An overview of online questionnaire can be seen in the activity diagram given below in Figure 3.1, which has completed in a six month run time.

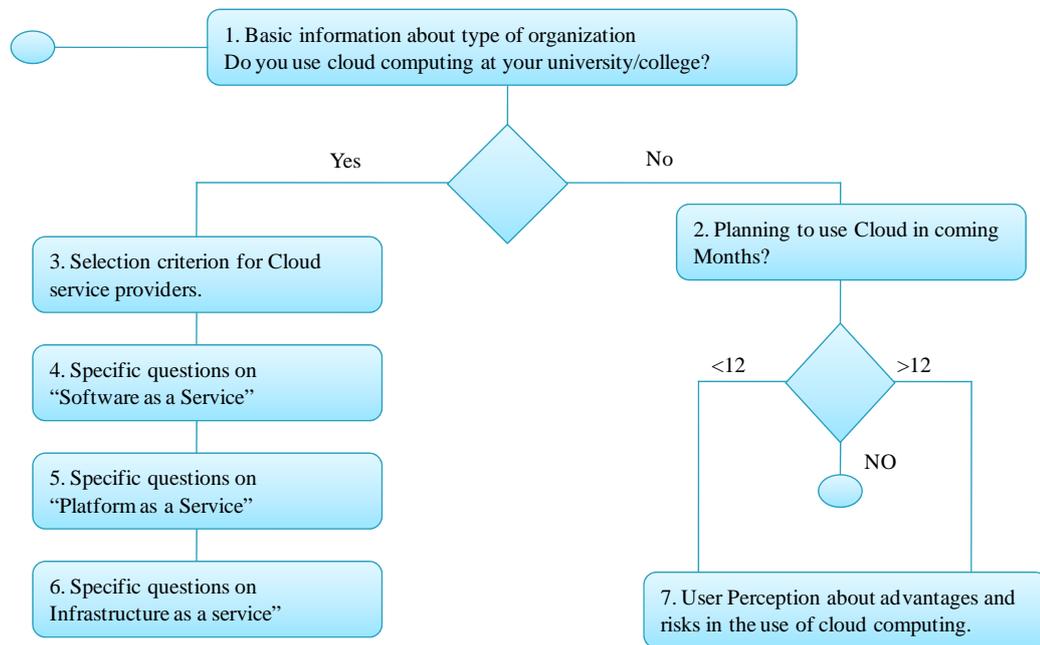


Figure 3.1: Activity Diagram for Online Questionnaire

On the basis of questionnaire the contacted sample of technical educational institutions was formed as following:

Figure 3.2 reveals that 31.7% (Count: 64 of 215) of the respondents are from universities and 68.3% (Count: 138 of 215) are from colleges. In a further step of classification of institutions as public/private 6.04 % (Count 13 of 215) have skipped the answer, remaining sample also represented 77.27% private institutions (Count: 153 of 198) and 22.72% public institutions (Count: 45 of 198), 1.98 % (4 of 202) have skipped the answer to this question (Figure 3.3). In one step further classification out of the 63 respondents from universities 39.68% (Count 25 of 63) and 60.32% (Count 38 of 63) are public and private universities respectively (Figure 3.4). Similarly classification of participating colleges from public and private is 14.81% (Count 20 of 135) and 85.19% (Count 115 of 135) respectively (Figure 3.5).

The charts below present an overview of the participation of different categories of institutions based on their type of funding ('Universities versus Colleges /Institutions and then 'Public institutions versus Private institutions').

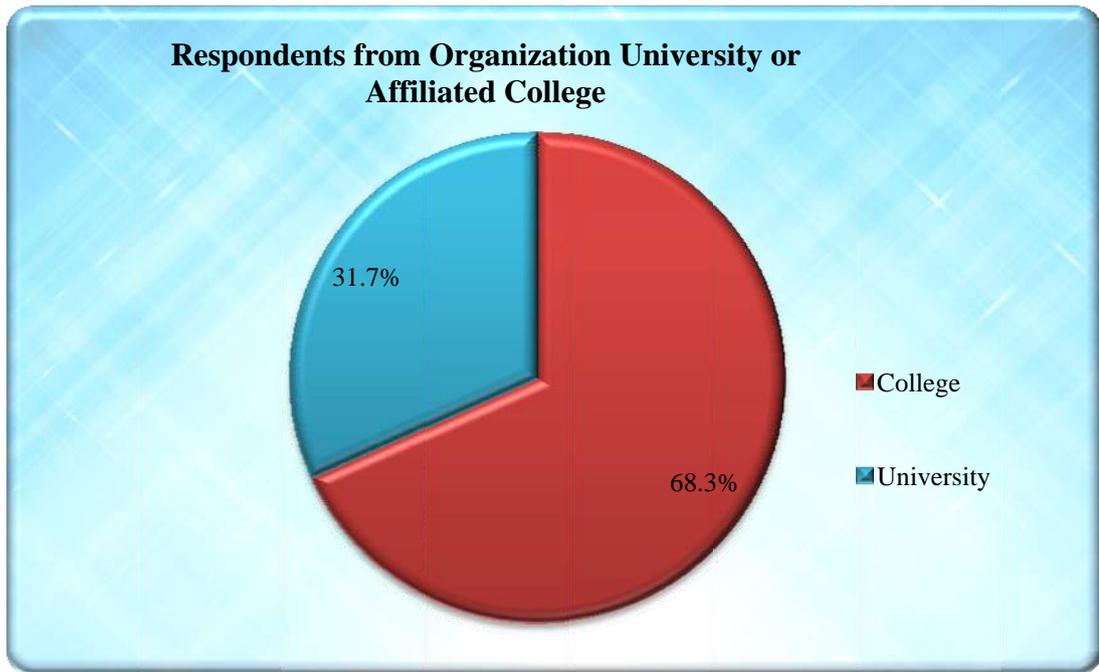


Figure 3.2: Representation of Respondents in Online Questionnaire (Universities vs. Colleges/Institutes)

The sample selected is representative sample since the samples of participants in different categories are independent of each other based on the following Null Hypothesis and related Chi-Square tests presented in Table 3.1 and Table 3.2.

Asymptotic significance is .000 as per Table 3.2 which is less than the confidence interval .05 therefore H_0 is rejected and the respondents samples in two categories are independent of each other, therefore the sample is true representative of the population.

H_0 : Two categorical samples of participants are dependent on each other

Category -1: Universities

Category -2: Colleges

H_1 : Two categorical samples of participants are independent of each other

Table 3.1: Frequencies of Respondents from different type of Institutions Universities/Colleges

		Observed N	Expected N	Residual
Universities	64.00	64	101.0	-37.0
Colleges	138.00	138	101.0	37.0
	Total	202		

Table 3.2: Chi-Square Test Statistics for sample independence between respondents from Universities/ Colleges

	Frequencies	
Chi-Square	27.109 ^a	a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 101.0.
Df	1	
Asymp. Sig.	.000	

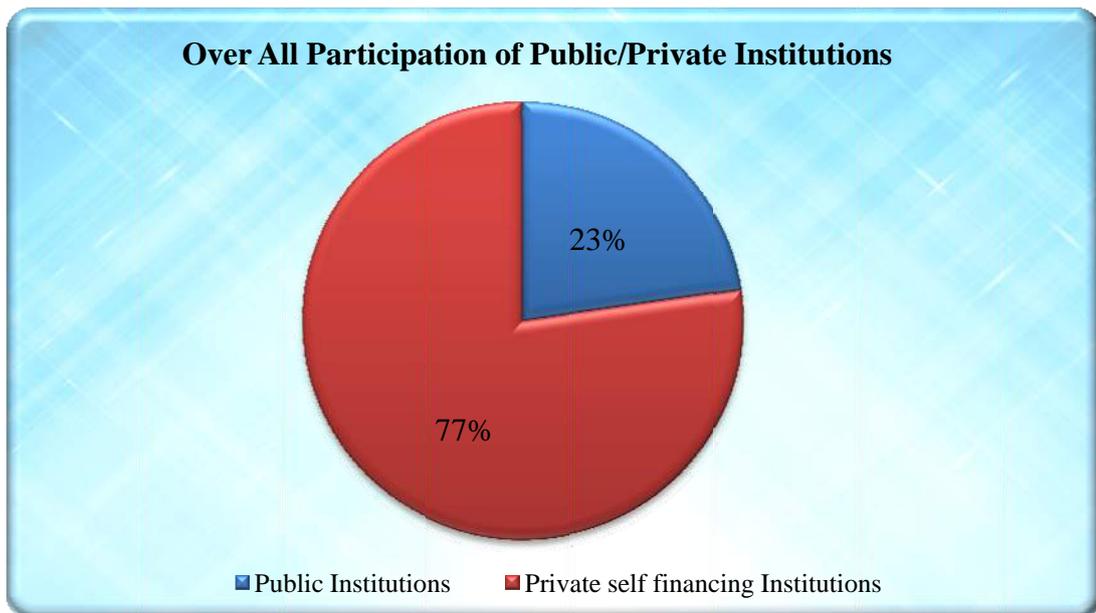


Figure 3.3: Representation of Respondents in Online Questionnaire (Public vs. Private Institutions)

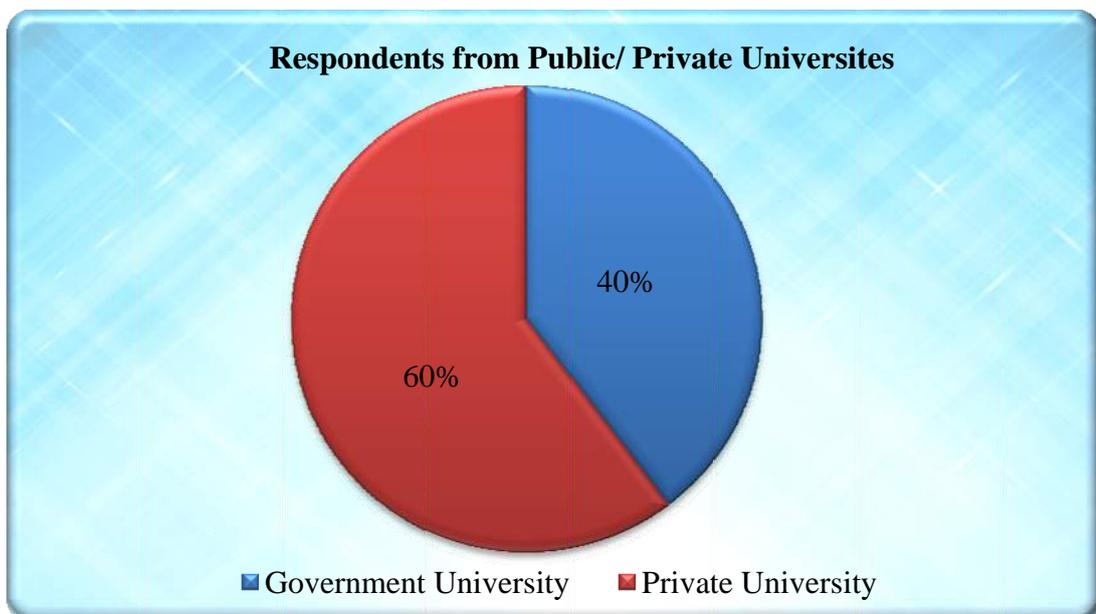


Figure 3.4: Representation of Respondents in online questionnaire (Public vs. Private Universities)

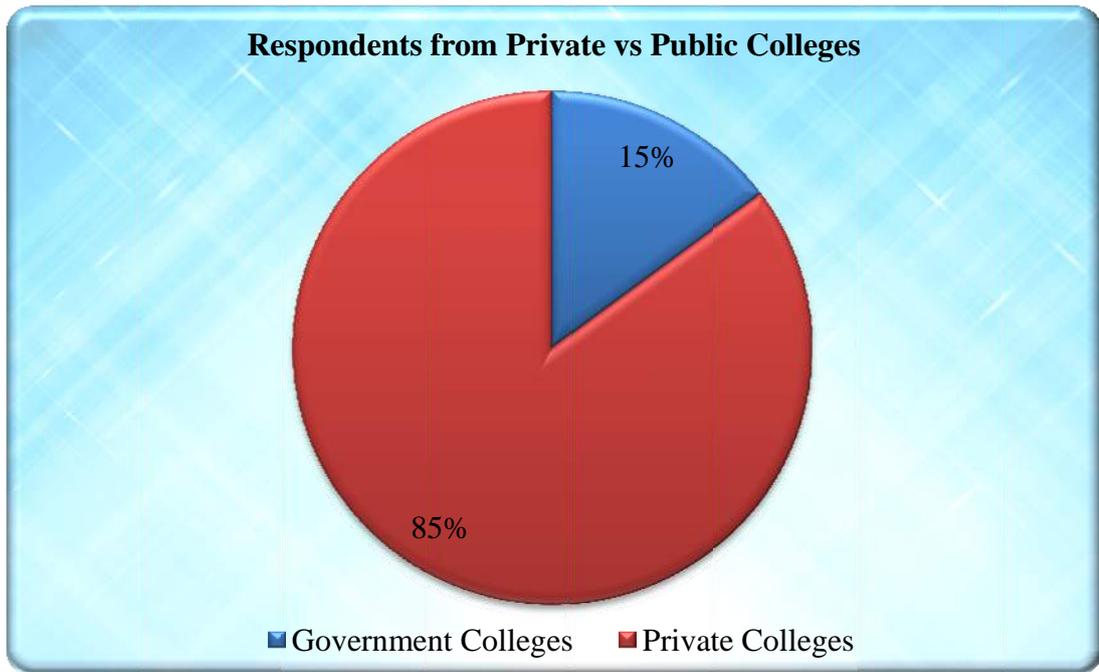


Figure 3.5: Representation of Respondents in Online Questionnaire (Public vs. Private Colleges)

Similarly, overall participation of public institutions/ private self financing institutions are also independent of each other which again supports the statement that sample is representative of the true population.

Results of Chi-Square test for above mentioned two categories are presented in Table 3.3 and Table 3.4 below where Asymptotic significance is .000 which is less than the confidence interval .05 therefore H_0 is rejected and the respondents samples in two categories are independent, therefore the sample is true representative of the population in case of sub categorical variables public/private institutions also.

H_0 : Two categorical samples of participants are dependent on each other

Category -1: Government Institutions

Category -2: Private Institutions

H_1 : Two categorical samples of participants are independent of each other

Table 3.3: Frequencies of Respondents from different funding type of Institutions (Public/Private)

		Observed N	Expected N	Residual
Public Institutions	46.00	46	101.0	-55.0
Private Institutions	156.00	156	101.0	55.0
	Total	202		

Table 3.4: Chi-Square Test Statistics for sample independence between public/private funded institutions

	Frequencies	Remarks
Chi-Square	59.901 ^a	a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 101.0.
Df	1	
Asymp. Sig.	.000	

3.5.2 Conducted Interviews

To gather a deeper understanding of the views of selected cloud experts, telephonic interviews of selected experts were undertaken.

The interviews were conducted for two categories of experts.

- I. Experts from Industries:
 - A. Microsoft Academy India Division.
 - B. IBM Academic Initiative Programs
- II. Experts from academics
 - A. Public Institutions.
 - B. Private Institutions.

3.6 ETHICAL CONSIDERATIONS OF RESPONDENTS

Confidentiality of personal information of respondents was guarded. It has been ensured that their names, personal titles or any other personal information was not disclosed. Only the relevant details which were essential for the research were included.