CHAPTER TWO

RESEARCH METHODOLOGY

2.1. INTRODUCTION

One of the vital keys to any research work is the research and analysis of its steps that are implemented. These steps must be appropriate to test hypotheses or questions of the research and also to facilitate the access ability of overall design of the research such as collection of data and analysis of data. This chapter describes the approaches that are used in this study in order to test the hypotheses of the problem under the study and provides the reader with a basis for evaluating the validity of findings, an understanding of the basis for choices that were made and sufficient details that another researcher can replicate this study. In this chapter, some vital objects related to research methodology such as problem under the study, initial literature review, objectives and hypotheses and their methodologies developed for them, data instruments including collection of data and analysis of data are in details explained and finally at the end of this chapter the limitations and conclusion of research methodology are stated.

2.2. RESEARCH DEFINITION

Kothari (2004) defines that the research is an original contribution to the existing stock of knowledge making for its development. The systematic approach concerning generalisations and formulation of a theory is also research. As such the term 'research' refers to the systematic method consisting of enunciating the problem, formulating a hypothesis, collecting the data, analysing the facts and reaching certain conclusions either in the form of solutions(s) towards the concerned problem or in certain generation for some theoretical formulation.[1] According to Greenfield (1996),

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[1] C.R. Kothari, "Research Methodology Methods & Techniques", Second Edition, New Delhi: New Age International publisher, 2004, PP. 1-2.

Research is an art aided by skills of inquiry, experimental design, data collection, measurement and analysis, by interpretation, and by presentation. A further skill, which can be acquired and developed, is creativity or invention.[2] Also Noltingk (1965) believes that Research is in essence an investigation into processes.[3]   Therefore a research is the finding of answers related to the questions. It is a systematic search for truth, finding new knowledge about our world through combination of ideas and facts.

2.3. ESSENTIAL QUALITY OF RESEARCH

A good research must meet the validity and reliability that are most important in evaluating a measurement tool of a research.

2.3.1. Validity

It can be stated that a research has highly validity if the study only contains what one wants to study and nothing else. Validity refers to how well the data collection and data analysis of the research captures the reality being studied. In other words the researcher must obtain the reality of responses of those people who are under the test through comparing their responses with such truth that in deed is truth.

2.3.2. Reliability

Supposes that if other person were to repeat a specific research study, he should be able to capture the same results. Reliability demonstrates that the operation of a study, such as the data collection procedures, can be repeated with the same outcome. The objective is to ensure that if a later researcher followed exactly the same procedures as described by an earlier research and conducted

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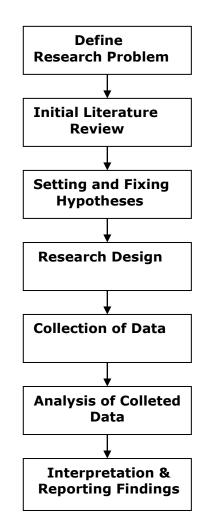[2] Tony Greenfield, "Research Methods: Guidance for Postgraduates", London: Arnold, 1996, P. 3.
[3] B.E. Noltingk, "The Human Element in Research management", Third Printing, Amsterdam: Elsevier Publishing Company, 1965, P. 57.

the same case study all over again; the later researcher should arrive at the same.

2.4. RESEARCH PROCESS

Under this headline the steps in which the researcher must to be taken are to be distinguished and demonstrated. It consists of a series of steps or actions that are necessary to execute a research in effective way. In the below chart, the steps in a research process are to be illustrated:

Exhibit 2.1: Graphical demonstration of research process

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        ┌─────────────────────┐
        │      Define         │
        │  Research Problem   │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │ Initial Literature  │
        │      Review         │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │  Setting and Fixing │
        │     Hypotheses      │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │   Research Design   │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │  Collection of Data │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │ Analysis of Colleted│
        │        Data         │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │   Interpretation &  │
        │  Reporting Findings │
        └─────────────────────┘
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2.5. RESEARCH PROBLEM

Research problem is a statement that wants to know what relation exist among some variables. The first step in a research after determining the area for research is defining the problem under the

study, so the time period of research, unit of analysis, variables and estimation of relationship (to set up the next step that is formulating the problem or setting up the hypothesis) are to be facilitated. In the following, the above-mentioned objects in Exhibit 2.2 are to be demonstrated and next to this, the problem under that study and need for the project are in details explained.

* *Time frame* for this study is 15 years from 1990 to 2004.

* *Unit of analysis* for this research is banking system including some selected Islamic banks in Middle East.

* *Variables* consist of one independent and four dependents so that the Electronic Data Processing (EDP) system as independent and audit of EDP system, control of errors, control of frauds and the use of Computer-Assisted Audit Techniques (CAATs) as dependent variables.

* *Estimated relationship* between the independent and dependent variables, mentioned above is causal so that the hypotheses of this study on such relationship are to be formed.

2.5.1. Problem under the study and need for the project

Bank in initial days, started its function through manual tools in where the whole of society was based on the paper society up to where the emphasis on paper society by technological advancements changed towards mechanical system. In this duration, performing the functions of various professionals in a bank including management, inspectors, auditors, shareholders, etc. was not so difficult and customers with simple wants through some normal banking products could be satisfied. Internal controls as a normal practice in banking system to prevent and detect errors and frauds and also to support and cover so numerous transactions in cash or readily cashable documents could be audited through manual and mechanical system as well. In other words it can be stated that in the above mentioned period the wants of customer through some introduced banking products by manual and mechanical systems could be satisfied and

functioning of banks in such systems through manual and mechanical tools could be run and managed and also supervised and audited.
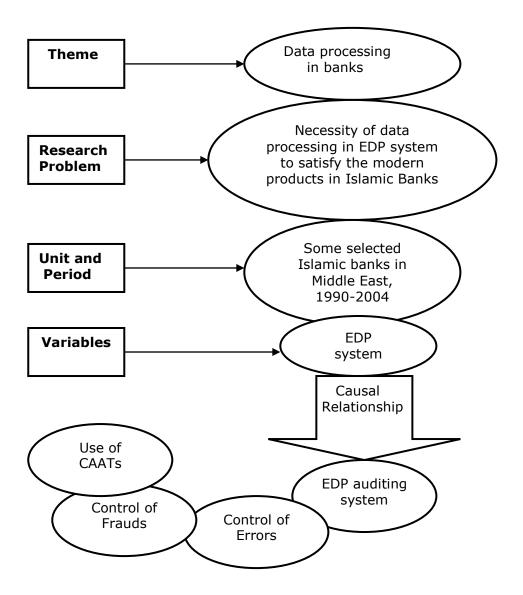
Exhibit 2.2: Graphical demonstration of research problem

With this regard that the technological advancements have changed all aspects of our environment, it may be stated, that nowadays the banks through manual and mechanical systems cannot process the data required to satisfy the new wants of their customers upon which is based on modern banking system. To support these wants, new banking products such as Internet banking have been required in where, they could not be processed through manual and mechanical systems and other data processing system namely Electronic Data

Processing (EDP) system must be used. This system has proved to facilitate the new banking products, but a computer as a major machine of such system might be used in proper manner or also unauthorized people might use it in improper manner and this matter has increased problems to this system. The necessity of this system is a fact but whether this system can reduce errors and frauds or increase them has not been searched specially in banks, nevertheless, as other fact, this system must be audited and controlled. To check and control this system, both manual auditing techniques as well as Computer-Assisted Audit Techniques (CAATs) must be utilized. This auditing software packages from one hand can improve the audit processes but from other hand may create problems such as special knowledge required for auditors to perform their functions. This study has been focused its emphasis on these above processes with references to banking system that had not been considered by previous literature and also has been focused to analysis of EDP auditing system in banks and is to be searched that such system will reduce or not the errors and frauds in processing data.

2.5.2. Objectives of the study

With regard to the above discussions related to the problem under the study and reasons behind the need for the project that could be summarized as:

In these days, in banking system the data has been forced to process in a complicated environment namely EDP system that the major machine of EDP system is a computer. It is a tool that can be used to lead the errors and frauds and also to devise the system to check the errors and frauds and as a result, the computer system must be controlled and audited. Auditing of these system because of complexity is differ from manual system and some test of controls in EDP system can be done without the computer but some other tests of controls must be done through the computer and for this purpose

some software applications have been developed that are known as Computer-Assisted Audit Techniques (CAATs).

Accordingly this study has concentrated its emphasises on the basis of such objectives like, meanings, scopes and standards of auditing in EDP system, control position of frauds and errors in such system, adequate auditing techniques addition to manual and mechanical techniques for auditing of EDP system, analysis of EDP auditing system or computer as a major electronic of such system in banks, necessity of banks to perform their functions in EDP system. To sum up, the objectives of this research are to be presented as follows:

*(1) To study the meanings, scope and standards of auditing in EDP system

*(2) To study the new auditing techniques (Computer-Assisted Audit Techniques or CAATs)

*(3) To study the auditing of EDP system in banks (significantly this objective is concentrated on the computer as a major machine of EDP system in banks)

*(4) To study the EDP system in banks as an essential

*(5) To study the necessity of EDP auditing system

*(6) To study the EDP system is able to control frauds and errors

2.5.3. Scope of the study

In this part of this chapter the scope of the study including the data for the study, period under the study would be expressed as under:

2.5.3.1. Data for the study

The data for this study including primary sources of data collection and secondary sources of date collection have been collected around the analysis of Electronic Data Processing (EDP) auditing system in banks with ignoring the differences between the banking systems (conventional and Islamic) and with special references to audit of a computer in banks that the processing of date

is to be set up on such system. Therefore the data for this study would be collected around the analysis of EDP auditing system in banks with ignoring the differences between the banking systems and with special references for audit of a computer in banks that the processing of date is to be set up on such system. These kinds of data are generally related to secondary sources of date in which through library would be collected. Other kind of data through primary collection sources of data namely interview and questionnaire in some selected Islamic banks in Middle East to scrutiny the hypotheses would be collected that may be the pointed hypotheses proved or not.

2.5.3.2. Period for the study

Period under the study is to be determined for 15 years started from 1990 ended till 2004. In this regard it may considerable to note that to collect secondary data return back to more than 40 years ago has been required, for example one direct resource (book) about auditing bank EDP systems was found written by Bank Administration Institute in 1968.

2.6. INITIAL LITERATURE REVIEW

Anderson et al. (1971)[4] say, "The review of literature is a task that continues throughout the duration of the thesis. It begins with a search for a suitable topic. Since a thesis aims to be a contribution to knowledge, a careful check should be made that the proposed study has not previously been carried out. Although completely new and original problems are rare, a previous study should not be exactly replicated unless the techniques used had been faulty or the findings and conclusions doubtful to shed new light on the problem. A good test is whether the problem still requires solution". Before final formulating of the problem and identifying its objectives and hypotheses and determination of population and selection of sample,

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[4] Janathan Anderson, Berry H. Durston and Millicent Poole, "Thesis and Assignment Writing", New Delhi: Wiley Eastern private Limited, 1971, P. 17.

initial literature review for this study was executed. This preliminary literature review through individual interview from experts in banks, software engineers in Information Technology (IT) institutions, chartered accountants and some other experts who had required information in the area under the study was performed. Consequently a list of data processing advancements and their impacts on auditing and also information relating to the new auditing software packages in Electronic Data Processing (EDP) system with special references to banking system for the purpose of a complete study about previous literature review was facilitated. The literature review in chapter three in details would be discussed.

2.7. HYPOTHESES

So far the area of the study that is banking system with reference to some selected Islamic banks in Middle East for a period of 15 years have been determined and the problem under the study and need for the project and its objectives have been defined. Through defining the problem in the previous discussions, one independent variable and some other dependent variables distinguished. So it can be stated that a hypothesis struggles to set up a relationship between two or more variables. Observation, concepts and proposition are the basis of a hypothesis. In other words a hypothesis is a proposition that is put to test in research. For instance in our study a proposition talks about 'how the EDP system in data processing related, to a bank **is**' whereas a hypothesis speaks about 'how the EDP system in data processing, related to a bank **is expected** to be'.

Ryan et al. (1992)[5] say, "When the research problem has been identified, the problem is generally analysed by formulating a

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[5] Bob Ryan, Robert W. Scapens and Michael Theobald, "Research Method and Methodology in Finance and Accounting ", London: Academic Press limited, 1992, P. 99.

hypothesis. A hypothesis may be regarded as a statement of empirical relationship between a set of variables. In general, this type of hypothesis is referred to as a scientific hypothesis. A statistical hypothesis is a hypothesis about the parameters of a probability distribution. The probability distribution may be of the variables or the coefficients of (correlational) relationship between the dependent and independent variables. When a statistical hypothesis completely defines the probability distribution it is termed a simple hypothesis; all other types are composite hypothesis. Statistical hypotheses are generally investigated by specifying a null hypothesis (usually referred to as H_0) and an alternative hypothesis (often referred to as H_1), which is simply a negation of the null hypothesis. In studying the relationship between the variables, the null hypothesis is set up as stating that there is no relationship between the variables. Thus the scientific hypothesis is investigated by testing the statistical null hypothesis".

Accordingly and as mentioned in the beginning of this chapter, assumptions of this study are that, the Electronic Data Processing (EDP) system is essential in banks and through this system errors and frauds are highly controlled and computer auditing programs, known as Computer-Assisted Audit Techniques (CAATs) are useful for the bank's auditors to test the system of internal controls and also for testing the validity of the transactions performed by such system. Thus the researcher desires to test the following statement of hypotheses through this study.

*(1) EDP system in banks is essential

*(2) EDP system must be audited

*(3) Due to EDP system errors and frauds are highly controlled

*(4) Computer-Assisted Audit Techniques (CAATs) are useful for auditors

So to complete this section concerning to hypotheses and to set up a criteria for comparing the results of this study, two types of hypotheses namely null hypothesis that is symbolised as H_0 and

alternative hypothesis that is symbolised as H_1 are to be established as follows:

* Hypothesis One

H_0. EDP system in banks is not essential

H_1. EDP system in banks is essential

* Hypothesis two

H_0. EDP system must not be audited

H_1. EDP system must be audited

* Hypothesis Three

H_0. Due to EDP system errors and frauds are not highly controlled

H_1. Due to EDP system errors and frauds are highly controlled

* Hypothesis Four

H_0. Computer-Assisted Audit Techniques (CAATs) are not useful for auditors

H_1. Computer-Assisted Audit Techniques (CAATs) are useful for auditors

2.8. RESEARCH DESIGN

Kothari (2004) says, the research design is the conceptual structure within which the research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data. So the research design can be defined as a plan, structure and strategy of a research to find out alternative tools to solve the problems and to minimize the variances.[6]

2.8.1. Basic Elements of Research Design

Generally the overall research design may divided into the following parts:

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[6] C.R. Kothari, "Research Methodology Methods & Techniques", Second Edition, New Delhi: New Age International publisher, 2004, P. 31.

* *Problem design* which deals with the problem under the study, need for the project and distinguish the variables.

* *Literature review design* that includes an initial review of previous literature related to the problem under the study.

* *Hypothesis design* which deals with the establishment a relationship between variables and set up a basis of measurement.

* *Tools design* which deals with the method of studying such observation, interview, etc.

* *Sampling design* that deals with the decision about population or universe, sampling method, size, element, unit, etc.

* *Scaling design* that deals with selection of appropriate scale of measurement.

* *Statistical design* which deals the selection of appropriate statistical technique to analyse the data such as ANOVA (Analysis of Variance), chi-square test, t-test, etc.

2.8.2. Type of research Design

Research design according to the nature of the problem and also type of research changes. In our case the purpose of the study is to test the hypothesis and so called hypothesis-testing research. Kothari (2004)[7] says, "Hypothesis-testing research studies (generally known as experimental studies) are those where the researcher tests the hypotheses of causal relationship between variables. Such studies require procedure that will not only reduce bias and increase reliability, but will permit drawing inferences about causality". On this basis the research design in such type of studies can be formed through informal experimental design and formal experimental design, so that the statistical design such as chi-square, t-test, ANOVA to analyse the data could be utilized.

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[7] C.R. Kothari, "Research Methodology Methods & Techniques", Second Edition, New Delhi: New Age International publisher, 2004, P. 39.

2.9. POPULATION

In research, two terms namely population and sample are involved to each other so we define the population as total collection of elements and sample as a part of such population that is selected according to some rules and statistics. Two sampling method are probability sampling techniques and non-probability sampling techniques that the most emphasis of this study is on non-probability techniques. Population for this research is some selected Islamic banks in Middle East. (The complete list of the major Islamic financial institutions in the world has been listed in table 2.1).[8] Thus population for this research is some selected Islamic banks in Middle East, because:

2.9.1. Reason One;On the basis of fifteen years researcher's experiences in the Islamic banking system, out of two banking systems namely Islamic banking system and conventional banking system it was rationally had to be preferred to select Islamic banking system.

2.9.2. Reason two; the native place of researcher is Iran in where the full banking system is running under the Islamic banking system and it was rationally had to be preferred to select Islamic banks in Iran as a where the population could be selected.

2.9.3. Reason three; to select only Iranian banks as the population for the study, there was some problems such as;
2.9.3.1. The language of business, education, etc. in Iran is only Persian
2.9.3.2. In Iran only Iranian banks have been permitted to run banking industry and up to now there is no any foreign banks to run banking operation whether Islamic or conventional and therefore,

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[8] Website 'IBF NET' that is http://islamic-finance.net/banks.html (Visited on 20,12,2005)

there is no any external competition for Iranian banks that are performing banking operation.

2.9.4. Reason four; To remove these deficiencies and to improve the quality of research, it was necessary to increase the area of the research and the best selection could be decided to add other countries like India or Middle East's countries.

2.9.5. Reason five; To implement the matters mentioned in the last above line, selection of India because, the foreigner's students could not be permitted to search on Indian financial aspects, was not facilitated and other alternative was exist that researcher could select some Islamic banks in Middle East's countries so the reasons behind it are:

2.9.5.1. The majority Islamic banks have been established in the Middle East

2.9.5.2. In each country in Middle East there are some Islamic banks

2.9.5.3. The most of these banks are only running banking operation and it could be separated from one that are running other function like insurance that there is no any focus on it by this study.

Table 2.1: List of major Islamic financial institutions

Middle East		South-East Asia		Asia Subcontinent		Africa		Rest of the World	
Country	No.	Country	No.	Country	No.	Country	No.	Country	No.
Bahrain	9	Brunei	3	Bangladesh	3	Algeria	1	Turkey	1
Iran	14	Indonesia	2	India	5	Gambia	1	UK	2
Jordan	2	Malaysia	4	Pakistan	4	Sudan	4	USA	4
Kuwait	2	Philippines	1			South A.	1		
Lebanon	1								
Qatar	3								
Saudi A.	6								
UAE	4								
Total	41		10		12		7		7
Total: 77 major Islamic banks and financial institutions in the world.									

Accordingly and on the stand of the above reasons, out of 77 major Islamic financial institutions all around the world, only those Islamic financial institutions were selected that have been set up in Middle East and out of 41 major Islamic financial institutions in Middle East only those Islamic financial institutions were selected that are running merely Islamic banking operation and accessibility to collect primary data through questionnaire by direct handed-over or Internet were to be facilitated (Some Islamic financial institutions are not running merely Islamic banking operation like Kuwait Finance House, The International Investor, Qatar Islamic Insurance Company, etc. and in some cases there was no E-mail address of banks or the website of banks was accessible only through native language like Arabic). Therefore, out of 41 major Islamic financial institutions in Middle East only 25 Islamic banks in six countries as population for this study were selected. (The list of all major Islamic financial institutions in the world and selected Islamic banks in Middle East as population and sample could be seen in Appendix 1)

2.10. SAMPLE AND SAMPLING PROCEDURES

In every research work the data through two approaches namely census (in where all units of a population are studied) and sample (in where a part of a population are studied) could be collected. Generally the most desirable way to collect data is sampling approach that it is addressed with, the type of universe, sampling unit, sampling frame, size of sample and sampling techniques. *The type of universe* might be finite (in where the number of item is certain like the number of Islamic banks in middle East) or infinite (the number of item is infinite like the number of stars in the sky). *The sampling unit* refers to an element in a sample like an Islamic bank in the Middle East. *The sampling frame* that also known as source list refers to all units in the universe like 25 Islamic banks in Middle East. The size of sample refers to selected units of population that should neither be excessively large, nor too small and

generally it must be optimum. The size of sample depends to some factors like size of population, the nature of population, kind of study. *The sampling technique* is divided into two techniques namely probability and non-probability. The probability sampling techniques is the techniques that every units of universe has the equal chance to be as a member of sample. According to Kothari (2004)[9] the non-probability sampling technique "also known by different name such as deliberate sampling, purposive sampling and judgement sampling. In this type of sampling, items for the sample are selected deliberately by researcher; his choice concerning the items remains for supreme. In other words, under non-probability sampling the organizers of the enquiry purposively choose the particular units of the universe for constituting a sample on the basis that the small mass that they so select out of huge one will be typical or representative of the whole". Therefore for this study the non-probability techniques including convenience sampling and purposive sampling was as sampling techniques used. The primary data through questionnaire would be collected from some management, auditors, inspectors and experts in some selected Islamic banks in Middle East who are available and satisfy to share and issue their information, opinions, views and attitudes.

It must be stated that to send questionnaire as main tool for collecting primary data through common way of sending namely mail could not be because of spreading of units of population among some countries utilised and instead of mail, all questionnaire through direct-handed over (through myself and my friends in selected countries as sample) and through E-mail (in rare case the respondents filled questionnaire and answered the researcher) were sent. Therefore with regard to the above matter, those Islamic banks were selected as sample that the accessibility through direct-handed over was facilitated and on this basis the sample for this study was

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[9] C.R. Kothari, "Research Methodology Methods & Techniques", Second Edition, New Delhi: New Age International publisher, 2004, P. 59.

selected that in the bellow table the numbers of Islamic banks chosen as sample are to be presented. (The list of sample has been given in appendix 1). (Appendix 1 includes, the list of all major financial institutions in the world and those Islamic banks in Middle East that as population and sample for this study have been selected)

Table 2.2: No. Of Islamic banks in Middle East as sample

Country	No. Of Islamic bank
Bahrain	4
Iran	14
Saudi Arabia	1
UAE	3
Total	22

Therefore some selected Islamic banks in the Middle East as population or universe for this study were chosen and on the basis of Non-probability sampling method including convenience and purposive procedures the required data identified in the formulating of problem and its objectives and hypotheses would be collected.

2.11. MEASUREMENT OF SCALE

As mentioned earlier, each question in prepared questionnaire assigned by four choices (answers) scaled by percent, means less than 25%, 26% up to 50%, 51% up to 75% and 76% up to 99%. The scale of this measuring also can be compared with scales such as Poor, Average, Good and Excellent respectively for the less than 25 percent, 26 to 50 percent, 51 to 75 percent and 76 to 99 percent.

2.12. COLLECTION OF DATA

The methods of data collection depend upon the sources of data collection including primary source of data and secondary source of data. For this study to collect primary data, field visit, interview and for the most usage through questionnaire and to collect secondary

date, websites and external sources were utilized. In this study the both set of methods of data collection have been utilized in the same emphasis and they have created valuable information to this research. In the following, first primary sources of data collection and next, the secondary sources of data collection are to be expressed: (Exhibit 2.3 represents in details the methods of the sources of data collection)

2.12.1. Primary Sources of Data

Primary sources of data collection through bank's visit, interview and questionnaire on the basis of 15 years researcher's experience in the Islamic banking system have been taken place. The problem under the study by banks visits was initially formed and then, through taking more data via interview with the some concerned people was formulated and required propositions were identified. To continue this process, the primary and secondary sources of data through appropriate methods have been collected and under the analysis step would be analysed. In the following, the two methods of primary data collection namely interview with a short consideration and fewer attention and questionnaire with a complete detail are to be described.
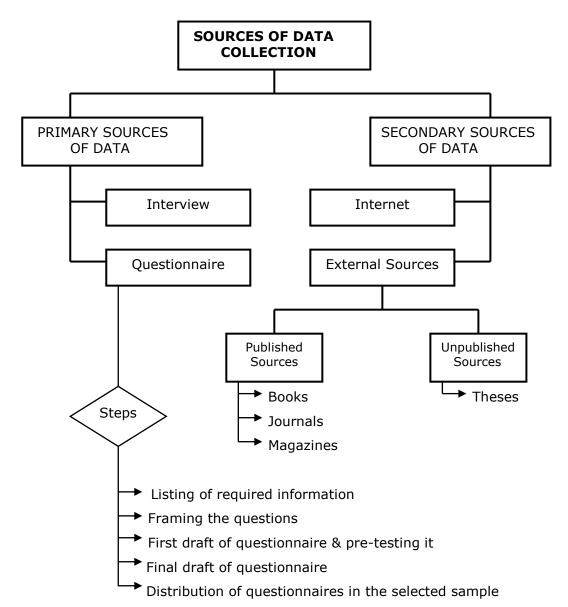
2.12.1.1. Interview

The initial literature review utilized the interview method to get the real understanding of the problem under the study through unstructured interview from some top management in Islamic banking system[10] and some software engineers in IT institutions[11] and on this basis, the problem under the study and hypotheses formulated so that the other step that was the providing the

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[10] Researcher's Note: a) Majid Hajinorouz, Director banking supervision Dept. of The Central Bank of The Islamic Republic of Iran. b) Hamidreza Sofiabady, Director general security of The Central Bank of The Islamic Republic of Iran. c) Alireza Heydarabadipour, Board Member of Bank Sepah, Tehran, Iran.
[11] Researcher's Note: Some software engineers in IT institutions in Pune, India.

questionnaire to collect primary data and to test the hypotheses was facilitated.

Exhibit 2.3: Sources of data collection

2.12.1.2. Questionnaire

Questionnaire method was the most important approach through which the primary data in this study was collected. For this purpose the following steps were taken place:

A) Listing of required information on the basis of pre-determined hypotheses

B) Framing questions with suitable scale of measurement

C) First draft of questionnaire and pre-testing it

D) Final draft of questionnaire

E) Distribution of questionnaires in the selected sample

In the following, the said steps are in details described:

A) Required information on the basis of research hypotheses

As mentioned earlier the problem under the study was formulated as ' EDP system in banks is essential and via this system errors and frauds are highly controlled and Computer-Assisted Audit Techniques (CAATs) are useful for bank's auditors to perform their functions'. And so the hypotheses were identified as, EDP system in banks is essential, EDP system must be audited, due to EDP system errors and frauds are highly controlled and Computer-Assisted Audit Techniques (CAATs) are useful for bank's auditors. Therefore the required information that on the basis of these pre-determined hypotheses had to be collected were:

i) Existence of banks as a necessity for every society

ii) Banks involve with so numerous transactions (cash and cashable)

iii) Need for banking services anywhere, anytime and anyway

iv) Need to give choice, convenience and control to customers

v) Special attention to test internal controls in banks

vi) Special attention to detect and prevent frauds in banks

vii) Special attention to detect and prevent errors in banks

viii) Need for EDP system and EDP auditing system

ix) Need to improve manual auditing techniques towards Computer-Assisted-Audit Techniques (CAATs)

B) Framing questions with suitable scale of measurement

After listing required information, the next step is the framing and listing questions to set a questionnaire so that the hypotheses of the research could be tested and such collected data could be analysed. In this step the scale of every question for the purpose of measuring the answers of the respondents was determined. To collect primary data through questionnaire, one closed-ended questionnaire including fixed four-choice questions with the scale of percentage

developed. Every question was given a set of four answers that the respondent with the choice of one out of four answers represents his[12] opinion. The scale of measurement for every answer of every question was assigned on the basis of percent and each answer was given different percentages so, for the first answer 'Less than 25%' and for the second answer, '26% to 50%' and for the third answer '51% to 75%' and for the fourth answer '76% to 99%' and for example if a respondent selects the first choice means he agrees with the researcher's idea up to 25% and if he selects the second choice means he agrees with researcher's idea from 26% up to 50% and so on.

C) First draft and pre-testing of questionnaire

The first draft of questionnaire through providing three questionnaires separately for three groups of banking occupations including (a) manager and assistant of bank's branches (b) internal auditors and inspectors of banks (c) and management such as managing director, board of director, head of departments and other pioneering in Islamic banking system was developed. These said questionnaires by direct interview and some of them by mailing and E-mailing as pre-tested step were examined and consequently this step improved and final draft of questionnaire provided.

D) Final draft of the questionnaire

After passing the above steps and modifications in which implemented, final draft of questionnaire with the following details was developed:

i) Population: Three bank's occupation including management (top and executive), auditors and inspectors, and other experts in 25 selected Islamic banks in 6 countries in the Middle East.

ii) Type of questionnaire: One closed-ended questionnaire with four multiple questions.

iii) Number of questions: seventeen questions

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[12] Researcher's Note: The pronoun 'he' instead of she also is used and the purpose in this study are both.

iv) Scale of measurement: Percentage (a) first answer, less than 25% (b) second answer, 26% to 50% (c) third answer, 51% to 75% (d) fourth answer, 76% to 99%.

And finally the numbers of 250 of these questionnaires into two stages (in the first stage 200 and in the second stage 50) were sent out by mail, E-mail and direct handed-over amongst some selected Islamic banks that had been selected as sample in Middle East to obtain a list of responses. (The sample of the said closed-ended questionnaire in the appendix 2 has been presented.)

E) Distribution of questionnaires in the selected sample

After listing the required information, assignment of suitable scale of measurement, first draft and pre-testing of questionnaire and final draft of the questionnaire, the next step that is distribution of questionnaires in the selected sample of pre-determined population has been facilitated. For this research the population is 25 Islamic banks in six countries in where the population is further divided into three sub-populations as (a) management including top management such as managing director, board of director, head of departments and executive management such as branch manager (b) bank's Auditors and Inspectors (c) other banks' experts. And finally the numbers of 250 of these questionnaires on the basis of the Non-probability sampling including convenience sampling and purposive sampling were sent out by mail, E-mail and direct-handed over and so, the next stage that is Processing of data and Analysis of data would be facilitated.

2.12.2. Secondary Sources of Data

To collect data through secondary sources of data, some sources including Internet (web sites) and external sources were used. Secondary data of the above sources were collected for a minimum of 15 years period (1990-2004). To collect secondary data, the most emphasis has given through library (external sources) and the Internet as another source of secondary data with the fewer

application were utilized. As a limitation of data collection, it was related to other secondary sources of data namely internal sources such as audit reports and internal reports with which because of safety matters in banking system was not facilitated.

2.12.2.1. Internet

Polonsky (2004-2005)[13] believes that "You must use the Internet with caution, especially when you are basing an entire research project on Web-based information, which does not include specific database searching. Of course, this is not to suggest that all information on the Internet is inappropriate. The Internet provides an extremely useful research tool in conjunction with other types of information". Therefore to collect data, many websites in Internet were used and only those data were picked out that original sources of those data could be found out. For this study the valuable websites such as AltaVista, Yahoo, Google were utilized.

2.12.2.2. External sources

Generally external sources including published sources like Books, Journals, Newspapers, Magazines, etc. and unpublished sources like unpublished theses and reports can be accessed in a library and to collect these kinds of data for this study some library such as NIBM library (National Institute of Banks Management), British library, Pune university's library, etc. all in Pune, India have been utilized.

2.13. ANALYSIS OF DATA

In this stage of research, the collected data should be processed and analysed. The processing stage includes the editing, coding, classification and tabulation of collected data that are ready to analyse. The analysing stage includes hypotheses testing and interpretation of findings through statistical tests of significance to

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[13] Michael Jay Polonsky, "Designing and Managing a Research Project: A Business Student's Guide", Response Books (A division of Sage Publications India Pvt. Ltd.) 2004-2005, P. 99.

determine the validity in which the conclusions would be based on. In other words analysis of data represents the way of testing hypotheses and supports the approach of achievement of findings and so the conclusions of the research is to be facilitated. In the following through Exhibit 2.4, the process of data and analysis of data executed in this study are to be shown.

2.13.1. Processing of data

The questionnaires after collection must be arranged. In other words it means that out of all received questionnaires some of them are useful and others not and therefore in this step, these received questionnaires must be edited, coded, classified and tabulated.

2.13.1.1. Editing

The purpose of editing is that careful scrutiny of all collected questionnaires to produce completeness, error-free and readability.

2.13.1.2. Coding

The purpose of coding is the assigning codes (numbers) for each category of answers, for example the code No 1 for the answer less than 25%, the code No 2 for the answer 26% up to 50% and so on.

2.13.1.3. Classification

The purpose of classification is to divide the received questionnaires on the basis of their groups. For example in this study the received questionnaire is divided into three groups including, group one (top management and executive managers), group two (auditors and inspectors) and group three (experts).

2.13.1.4. Tabulation

The purpose of tabulation is the process of summarizing data and displaying them in the appropriate tables that further analysis are to be facilitated.
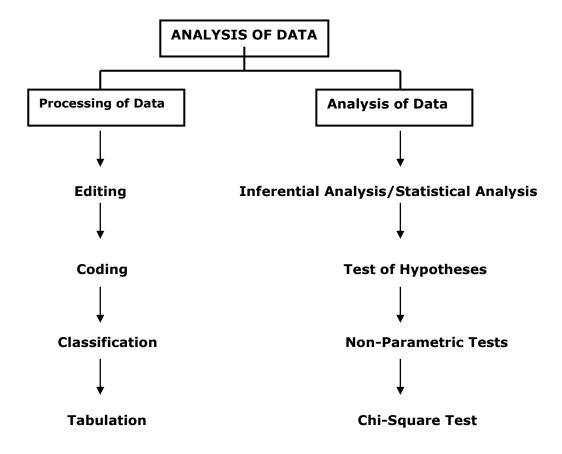
Exhibit 2.4: Steps in analysis of data

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                        ┌─────────────────────┐
                        │   ANALYSIS OF DATA  │
                        └─────────────────────┘
                  ┌───────────────┴───────────────┐
        ┌───────────────────┐           ┌───────────────────┐
        │ Processing of Data│           │  Analysis of Data │
        └───────────────────┘           └───────────────────┘
                  │                               │
                  ▼                               ▼
              Editing        Inferential Analysis/Statistical Analysis
                  │                               │
                  ▼                               ▼
              Coding                      Test of Hypotheses
                  │                               │
                  ▼                               ▼
          Classification                  Non-Parametric Tests
                  │                               │
                  ▼                               ▼
            Tabulation                     Chi-Square Test
```

2.13.2. Analysis of data

This step has vital impact on research process so that the testing of pre-determined hypotheses would be implemented. So far we have collected a mass of data that through the previous steps has been proceed, however they are unable to generalize any information. In other words whenever the mass of data is collected the statistics comes into account and it creates the procedures to support processing of data and also analysis of data.

2.13.2.1. Statistics in research

As mentioned, the statistics in research cover both the processing data through editing, coding, classification and tabulation and also analysis of data. Generally in every research, the data is collected through sampling methods and to adopt the process of generalization from sample to population, the researcher has to use the statistics that includes descriptive statistics and inferential

statistics. Descriptive statistics explain the numerical data whereas inferential statistics is related to test the hypotheses. Therefore in the following the process and approaches of analysis of colleted and processed data with definition of vital terms that would be implemented in chapter six (analysis of data) are to be presented.

A) Inferential analysis

This is concerned to the test of hypotheses. Through inferential statistics, the validity of data that the conclusions of research based on could be determined. It is also concerned with the estimation of the population values and the task of interpretation of findings. Thus the inferential analysis helps the researcher to test the hypotheses and to generalize the findings resulted from sample to the population.

B) Test of hypotheses

A hypothesis is a formal question derived from the formulating problem under the study or a hypothesis is a proposition that is put to test in research. The test of hypothesis is a process to state the probability of population parameters. A parameter is a characteristic of a population, against it; a statistic is a characteristic of a sample. To test the hypothesis, basic concepts of testing hypothesis are required to explain as follows:

i) Null hypothesis and Alternative hypothesis

As mentioned in the earlier stage, two types of hypotheses namely null hypothesis that is symbolised as H_0 and alternative hypothesis that is symbolised as H_1 are to be used in statistical analysis. H_1 is usually one that a researcher wishes to prove it and H_0 is the one, which a researcher likes to reject it.

ii) Level of significance

It is an important term for testing hypothesis. In 5 percent level of significance means that in a population including 100 cases, specific event will happen in 95 cases and that event may not happen in 5 cases due to chance. It means that the level of confidence is 95 per case and level of significance is 5 per case (100-95). Thus if the confidence level is 99%, the level of significance is 1% (100-99).

Therefore as a result and as a rule of accepting, it should be stated that the significance level (.05) is the maximum value of probability of rejecting the H_0.

iii) Type error I and II

Error I, if we reject H_0 when H_0 is true;

Error II, if we accept H_0 when H_0 is not true;

In other words:

Type error I occurs when we reject a hypothesis that should be accepted.

Type error II occurs when we accept a hypothesis that should be rejected.

iv) Chi-square test

The Chi-square test, symbolically written as $X\square$ (pronounced as Chi or Ki-square) is an important statistical means in inferential statistics. Chi-square test as a non-parametric test (It does not make an assumption about the parameters of the population and also does not make use of the parameters of the distribution. A parameter is a characteristic of a population like mean or mode but when we talk about such measures as characteristic of a sample, they are known as statistic.) to evaluate whether observed frequencies (of two or more variables) differ significantly from those that could be expected under some assumptions. In other words this test is based on the frequencies and is utilised to test the hypothesis with no rigid assumptions that are necessary in regard to the type of population. As this research is a hypothesis-testing research, it is considered adequate by the researcher to conduct the Chi-square test as a non-parametric test (Chi-square as a test of independence). Chi-square as a test of independence tries to see that two attributes are associated or not e.g. EDP system and control of errors. So we make the null hypothesis or H_0 that implies two attributes are independent that means EDP system is not effective in control of errors and to continue this process the expected frequencies are to be calculated. As a result

at a certain level of significance (.05) for a given degree of freedom it could be stated that:

If calculated $X\square$ < table value <u>then</u> H_0 is accepted that means the EDP system has no effect on controlling of errors.

If calculated $X\square$ > table value <u>then</u> H_0 is rejected that means the EDP system is effective on controlling of errors and two attributes are associated and the association is not on the basis of chance factor but it exists in reality.

2.13.2.2. Practical analysis of collected and processed data

Test of hypotheses with non-parametric statistics or distribution-free statistics are known as non-parametric tests. In this research to test and prove the hypotheses, the Chi-square tool as a non-parametric test is used. To calculate the value of $X\square$ and report findings, two software packages namely Excel and SPSS are utilized. Excel for entering the data and creating graphs and the SPSS for calculating the value of $X\square$ to compare with the value of table and to taking necessary decisions to accept or reject null hypotheses are to be used. In the following the methodology that the analysis of data should be based on, is to be presented. For this purpose the questionnaire had to be so designed that each hypothesis through some questions is to be tested. The following arrangements show the utilized approach to analyse the data. (The following numbers of questions have been assigned according to the questionnaire).

A) Methodology for testing of hypothesis one;

Generally the first hypothesis is related to previous works done by another authors in banking, auditing, accounting and EDP system and the said hypothesis through two ways, first a given discussion in depth and in details in chapter three and second by four questions (Qs. No.2, No.3, No.4, No.5) in one provided closed-ended questionnaire would be considered and tested.

Questions are:

Q.2- Banks, as a necessity for every society are directly involving in the Public Interests.

Q.3-Today the bank's clients want choice, convenience and control at anywhere, anytime and anyway.

Q.4-Because of technological progress, the process of data in banks has been required to perform in EDP system.

Q.5-ATMs, Internet banking, etc. as some modern banking products are only being running in EDP system.

B) Methodology for testing of hypothesis two;

This hypothesis in a common view for all industries without any consideration to special industry by many authors has been searched. Here in this study, first by a given complete discussion in chapter three and through four questions (Qs. No.10, No.11, No.12, No.13) in the questionnaire with special reference to banking system would be considered and tested and also may be proved.

Questions are:

Q.10-Due to its own internal system of checking in EDP system, errors in the process of data in banks are highly controlled.

Q.11-Due to its own internal system of checking in EDP system, frauds in the banking operation are highly controlled.

Q.12-If we accept that a computer as a major machine in EDP system can lead the frauds and also it can devise the system to check the frauds, thus the computer, as a basis in the EDP system must be audited.

Q.13-Today EDP systems are complex and processing is often on-line and real-time and this may mean no audit trails exist.

C) Methodology for testing of hypothesis three;

To support and cover this hypothesis, previous works have not in direct way in other industry and at all in banking industry done. Approach used in this study to support and cover the said hypothesis through complete discussion in depth and in details in chapter five namely analysis of EDP auditing system in banks would be continued. Other way to search this hypothesis by four questions (Qs. No.6, No.7, No.8, No.9) in the said questionnaire in banking system is tested and may be proved.

Questions are:

Q.6-Due to EDP system, errors in the banking operation are highly reduced.

Q.7-Due to EDP system, frauds in the banking operation are highly prevented.

Q.8-Due to EDP system, errors in the banking operation are timely detected.

Q.9-Due to EDP system, frauds in the banking operation are timely detected.

D) Methodology for testing of hypothesis four;

To consider this hypothesis, a common view from previous works could be found out but there was not found special tracks in banking industry and therefore approach used in this study to support and cover the said hypothesis through more discussion in chapter five and through three questions (Qs. No.14, No.15, No.16) in the questionnaire in banking system is tested and may be proved.

Questions are:

Q.14-On the basis of question No.13, in the EDP system, manual audit methods for some test of controls like Application systems, Internet Banking, etc. cannot be utilized and other audit techniques, such as CAATs have been required.

Q.15-CAATs enable the auditor to deal effectively with a large quantity of data.

Q.16-CAATs provide the auditor with the ability to access, manage, analyse and report in a variety of formats for running the auditing.

E) Methodology for description of objective one;

Basically the first objective is depended to the previous works done by another authors in auditing and this study concentrates its points to meanings, scope, concepts, operations and standards of auditing in EDP system. To cover this purpose, previous literature in the above mentioned area in chapter three and with sufficient details and in depth in chapter five would be reviewed.

F) Methodology for description of objective two;

The second objective of this study is related to auditing techniques, useable in EDP system. To support this objective, sections of two chapters of this study are involved, firstly a short review would be given in literature review in chapter three and secondly in analysis of EDP auditing system of banks in chapter five, but also since the purpose of this objective and forth hypothesis is close to each other, therefore through three questions (Qs. No.14, No.15, No.16) in the questionnaire, this objective would be analysed.

G) Methodology for description of objective three;

It can be stated that the main aims of this study is gathered in this objective that explains the analysis of auditing in EDP system in banks with special aimed to computer as major element of EDP system. This objective involves in analysing the audit of EDP system with special reference to banking industry in which is divided into two systems, namely Islamic and conventional system. This study pays attention to analyse the auditing of EDP system in banking industry without any respect to differences between Islamic banking system and conventional banking system and the emphasis of this research work is involved to audit of computer as major machine of such system in banks with ignoring the differences between the said two methods of banking practice, although it is considerable to note that one part of the primary data would be collected through one closed-ended questionnaire only in Islamic banking system, in other words the universe of this study is only some selected Islamic banks in Middle East. Therefore to support and cover this objective, a short review of Islamic banking system in chapter four and analysis of auditing in EDP system in banks in chapter five are discussed.

H) Methodology for description of objective four;

Mainly the forth objective is depended to previous works done by another writer and authors in banking, auditing, accounting and to study the EDP system in banks as an essential, first a given discussion in depth and in details in chapter three and second by four

questions (Qs. No.2, No.3, No.4, No.5) in the questionnaire would be considered.

I) Methodology for description of objective five;

The audit of EDP system by many authors in a common view for all industries without any consideration to special industry has been studied. Here in this study, first by a complete discussion in chapter three and through four questions (Qs. No.10, No.11, No.12, No.13) in the questionnaire with special reference to banking system would be studied and considered.

J) Methodology for description of objective six;

To study the EDP system is able to control frauds and errors, previous works have not in direct way in other industry and at all in banking industry done. Approach used in this study to support and cover the said objective through complete discussion in chapter five in banks would be continued. Other way to search this objective by four questions (Qs. No.6, No.7, No.8, No.9) in the above questionnaire in the banking system would be studied and considered.

2.14. LIMITATIONS

In this part of research methodology, some limitations involved in this research work, can be stated as follows:

a) Sample banks are selected from Middle East and they are representative of the whole of Islamic banks.

b) The period of study is only 15 years for generalization of findings.

c) The findings are based on the ability of respondents to inquire of the researcher and if respondents are not given their true information it leads marginal error.

2.15. SUMMING UP

This chapter provided practical approach to the research steps and methods that were selected to obtain the objectives and to test the hypotheses identified for covering and supporting the problem

under the study. In the next chapter that is related to the review of previous literature, these discussions with more details would be followed.