A PREMIER OF RESEARCH METHODOLOGY FOR CO-OPERATIVE RESEARCH AND PLANNING OFFICERS

BY

PHILLIP P. CHILOMO

1980

INTERNATIONAL CO-OPERATIVE ALLIANCE
Regional Office for East & Central Africa
P. O. Box 946, MOSHI, Tanzania

FIRST DRAFT

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F O R

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TABLE OF CONTENTS

DEDICATION

This manual is dedicated to Okumu Odede a champion of co-operation, a fighter of just course for mankind, a practitioner and accademician of outstanding ability and researcher of international credibility.

His untimely death has left a shuttering blow to co-operators in East and Central Africa.

May his soul rest in peace.

PRE - FACE

The need for research and monitoring of research activities in the co-operative sector has received prominent attention during the last decade 1970 - 1980. This need for research was expressed at the co-operative research seminar at Langata, Kenya as early as 1971. The co-operative research and planning conferences in Arusha, Tanzania in 1974 and in Lusaka, Zambia in 1977. All these conferences expressed the need to develop a strong research base, within the co-operative movement, as a strategy for rapid, but orderly growth. It is with this in mind that the Research Unit of the ICA Regional Office at Moshi was established in 1975. To contribute to this need, I felt it my responsibility to produce this manual.

Although the manual is primarily for research officers in the co-operative movement, other students of rural development will find it immensely useful.

It is the intention of the author to keep the text as simple as possible, in order to accommodate those who have little mathematical background, but also not to unduly dilute the methodological approach of convertional scientific method.

The manual is divided into four parts. The first deals with Fundamentals of research required to understand and appreciate research. The second part deals with methods of data collection.

The third part deals with Data analysis and interpretation of results. The final part examines some special areas in research, case study methods, experiments, evaluation research, the research budget and report writing.

The style of writing the manual is such that it enables those who would like a quick review of research techniques to read only those chapters which they consider relevant to their needs, while the beginner is also accorded an opportunity to plough through the whole manual.

But this does not mean that the manual is disjoint. Every effort has been made to give it a smooth flow. All the complicated mathematical computation have been left to the appendixes.

This work is a result of the various Research Methodology workshops organised by the International Cooperative Alliance, Regional Office for East and Central Africa, for Cooperative Research and Planning Officers.

Like any other social science text, it cannot be claimed a pure work of one individual but a collection of many other schools of thought which have been advanced on the subject. The contributions in these workshops have come from such outstanding academicians and practitioners like Professor Goran Hyden of the Ford Foundation, Dr. S. Dandapani of the ICA London Office, Dr. Paul Meyer of Cooperative Switze, Dr. A. Chilivumbo of the University of Zambia, Dr. P. Alila of the University of Nairobi, Dr. B. Gilstrom of the department of Cooperatives in Kenya and many others too numerous to mention.

Special mention should however be made to colleagues at the ICA Office at Moshi whose contribution have also led to the success of these workshops and these are Messrs Tom Oyieke, Clement Kwayu, Charles Gashumba and the late Okumu Odede.

This does not in any way be-little the valuable contributions made by the participants of these workshops too many to mention individually. But the ideas in this book are not necessarily of the people mentioned above. Finally my thanks to Bella Kimario for her patience with the typewriter.

PHILLIP P. CHILOMO

Chapter One

Fundamentals of Research

Perhaps the best way to start discussing the subject of research is to ask what research is all about. There are so many definitions which have been brought forth by various authors as to what research is or what it is all about. There is without doubt no need to go into an examination of all of these definitions but we may adopt our working definition as, "Research is a systematic method of collecting data and analysing this data so that theoretical propositions can be validated or that logical and factual generalisations can be made".

Basic to all research is the intricate relationship between theory and fact. Theory is defined as the relationship between facts or the ordering of facts or a body of knowledge im a meaningful way so that predictable propositions can be made.. A fact is an empirically verified proposition or observation. It goes to say that if observations or propositions are gathered at random they are not likely to produce verifiable propositions or observations. However facts change as new and more convincing observations become available.

The Role of Theory in Research

There are countless important roles which theory plays in research but perhaps the most important ones are that:

1. theory enables the researcher to narrow the range of facts to be studied. For example, theory has it that a co-operative is a social organisation with a business dimention as its base. This implies that a co-operative society can be stulied as a social unit or a business entity. It can also be studied from the points of view of finance, organisation or human relations. This concentration on a small but specific area enables the researcher to limit himself to a managable proportion.

2. theory also enables the establishment of a structure of conceipts which make up specialised vocabulary that scientists use, other wise it would be difficult to conceiptualise precise meaning of abstract phenomenon. For example, when reference is made to a primary society, we all know its characteristics as distinguished from a secondary society. We know its position vis-a-vis other organisations above or below it in the hierarchical co-operative pyramid.

3. theory also helps to summarise what is already known about phenomenon or objects. Those summaries can be empirical generalisations such as "co-operatives cannot be build from the top" or the growth of co-operatives require member participation. They can also be systems of relationships between propositions such as "member education leads to higher productivity"

or "multipurpose co-operatives have a higher propensity to succeed than single purpose co-operatives.

4. theory also predicts facts. For example when a common observation has been made that there are a greater number of female members in consumer co-operative societies. When ever there is a new consumer co-operative coming up we predict that there will be more female members in it. Similarly if it has been observed that the dominant age group in agricultural co-operatives is the group 25 - 45 we would be surprised if we found otherwise.

5. theory also points to gaps in our knowledge. For example, theory may suggest that member education leads to higher productivity. If this education is given and higher productivity is not observed we decern a deficiency in our knowledge. This will lead us to further research to establish or fill this deficiency in conventional theory. At one time in history, it was believed that the the earth was flat. This no longer holds true.

The role of fact in Research

1. Facts on the other hand initiate theory. One person may have observed that when farmers work collectively on a field, their per capita output is higher than when they work individually on single plots. This may have led to formulation of theory such as "group work is more productive than individual effort".

2. Facts may also lead to reflection on or reformulation of existing popular theory. For example, the theory that "co-operatives which are initiated from the top are less likely to succeed. This theory can be doubted if there are a good number of co-operatives which have succeeded after being initiated from the top. The bone of contention here is that theory must adjust itself to fact if it has to survive. There are many examples in the world to day where popular theory has been negated. i.e. the sun went round the earth.

3. Facts will also adjust or re-define theory. As in our example above it could be popular theory that co-operatives which are initiated from the top will not succeed. But new evidence might come up that as long as members of such a society see and get their benefits such co-operatives do succeed. In this case conventional theory will be re-defined as "where members see and get benefits from their co-operative society, it is un-important whether the society is initiated from above or from the grass roots.

Objectivity in Research

Paramount to the whole notion of research is the influence that values impose on the researcher. Every person is a product of his own society in which case every researcher is influenced by his own social experiences such as education, reference group, his class, the profession he belongs to as well as career and other interests. In as much as there are these divergent backgrounds, there will be certain biases in the identification of research topics, let alone the elements of the research problem. While it is true that these influences are inevitable, they need not cause any alarm because they fall outside the realm of scientific methods. In any case they precede the actual conduct of research and validation procedures but it is true that they do affect research definitions and problem selection. In short they enable the researcher to take his own value position rather than other peoples value positions. Once this is done it enables particular value standards to be applied and thus allow other researchers within the same value references to validate or negate the previous research findings. For example a marketing expert is unlikely to conduct research on political attitudes.

But a researcher is sometimes confronted with moral issues which he enounters during the process of the research itself. How much error should be allowed? Or wheather he should go ahead and generalize conclusions from a sample which he knows is inadequate.

Should he abondon the research at the expense of his career development? All these questions do not have a simple answer. What the researcher needs to uphold is not to undermine his credibility and professional integrity. Where his budget constraint in terms of money, time and manpower impose limitations, he must disclose this. The researcher should not at any cost falsify his findings because he might lead other researchers into faulty conclusions.

Conceipts and use of conceipts in Research

Conceipts are words or phrases describing an abstract phenomenon. These came into use in most scientific disciplines in order to give specialised meanings in a concise manner. For example, it would take almost a whole page to discribe the state of mind described by the conceipt "schezophrenia". The researcher cannot dispense with the use of conceipts in research but they must be clearly defined so that they do not cause confusion. They must also not deviate from convertional meaning, unless there is good reason for it. Their applied meaning must be clear. For example the conceipt co-operator is sometimes used to mean members of a co-operative society and in some cases it is used to mean members and staff of a co-operative society. If we want to take the population of co-operators, we must state wheather we include members only or staff and members of our co-operative.

Objectives and uses of Research

The main purpose of research is to discover facts which bear upon a problem and to bring to light the facts discovered. But distinction must be made between problem solving research which is sometimes called applied research, and research aimed at broadening or deepening knowledge, which is known as pure research. Applied research appear to have found more usage in business organisations while pure research is mainly used in universities. Which ever is the case, both researches are of atmost importance. Pure research is most relevant to development of teaching or training materials while applied research is most suitable for consultancy work.

Sometimes there is a confusion between research and consultancy. While it is true that both are some kind of study, some distinction can be made in the sence that the former is self commissioned while the latter is commissioned by someone. Consultancy is directed more towards solving a specific problem while research, per say, takes the form of finding explantions to a problem(s).

Researchers sometimes are seen as indulging in controversy especially where existing knowledge and beliefs are challenged. This need not frighten the researcher. If his research is well done, other researchers will find his conclusions correct and his professional integrity will be enhenced.

Research Design

Research design refers to the entire process of planning and carrying out a research study or project. While it is true that there are no hard an fast rules as to the format of the research design, there are common characteristics which have became acceptable as steps to be taken. These steps are:

(i) stating the problem or the problem area on which one would like to research

(ii) acquintance with existing knowledge with in the problem area and consequently reducing the problem into a managable and researchable topic.

(iii) delineating variables and definition of conceipts.

(iv) develop and state the hypothesis or hypotheses.

(v) determining the sample, sample size and sampling technique(s).

(vi) determining the data collection technique or techniques to be used.

(vii) collection and processing the data.

(viii) analysing the data and inferences made there from.

(ix) writing and presenting the report.

All these steps will be looked into in greater detail. But, like we said before, they should not be treated as the omega of the research process or design.

Summary

We have so far seen that research is a systematic method of collecting data, analysing this data so that theoretical propositions can be validated or logical inferences can be made.

We have also seen that there is an intricate relationship between theory and fact which is sometimes not easy to distinguish. But generally that theory enables the researcher to narrow down his inquiry to a managable area. It also helps to summarise what is already known. It enables us to pin point gaps in existing knowledge.

We have also seen that facts initiate theory or reformulation of theory. This has particularly been true as popular myths have been disproved by further research.

We have also seen that a researcher needs to uphold objectivity in order to enhence his credibility and professional integrity and also not to mislead other researchers into faulty conclusions.

The use of conceipts is an indispensable part of research as these help to explain abstract phenomenon most precisely. However conceipts can be misleading if they are not well defined and consistent.

Finally the researcher has a duty to expansion of knowledge hence he should not fear indulgency into controvesy or controvesial areas. As long as his research is objective other researchers will prove him right and his credibility will be enhenced.

Chapter Two

Problem Identification

The Research situation:

Most researches which are conducted start with identification of a research situation. The research situation is the area which the researcher would like to cover. Examples of research situations are:
The rural or urban areas of Kenya, Tanzania or Zambia. A research situation can also be a primary society, a co-operative union or the entire co-operative movement in a given country. Delimiting a research situation will depend on what rescourses the researcher has in terms of money, manpower, time, etc. Thus a researcher may not find the time, money and man-power resources to extend his research to cover the whole subject rural development in a given country. He may reduce it to the co-operative movement. He might find it expedient to reduce his research situation even to cover a smaller area. Sometimes the sponsors interests may help do narrow down the research situation.

The Research Problem:

Basic to all research and contained in the research situation is the research problem or problem area. A research problem is usually commissioned because someone perceives a troubled situation. It could be because there is a constant decline in crop sales handled by a given co-operative union or the entire co-operative movement.

It could also be that there is a low level of member participation in a particular co-operative society. The statement of a problem sometimes is given by the people commissioning the research. But it must be examined closely because sometimes it only ends up being nothing but a symptom to the actual problem. For example, there might be a decline in the sales of a given society. The real problem might be low motivation for the sales staff.

Identifying a problem is not an easy task and is infact a problem on its own. Researchers from different disciplines will see the problem differently. There can be no hard and fast rules as to how a problem will be identified. But one thing can be said though. Background literature and people knowledgeable in the subject should be consulted before an attempt is made to define a problem.

Narrowing Down the Research Problem:

There are situations when the perceived problem is too wide and does not fit in with the constraints of the budget. It would help the researcher to disect the problem further because some aspects of this problem may have already been researched on. If he is extra lucky he may find that even the raw data from previous researches is available. Sometimes the researcher might find that he has no way out but to take the face value of other researchers' findings and pair them with his own in order to arrive at reasonable conclusions.

Where the research is not commissioned, the researcher may simply decide to investigate only those aspects which are in line with his specialisation and consequently give a partial explanation to the problem. Some people argue that this introduces researcher-bias into the research process. As has been said above, this does not negate the canons of scientific enquiry because the methods of data collection and validation have not been violated. All what the researcher has done is to confine himself to what he can do best and leave the rest to other researchers.

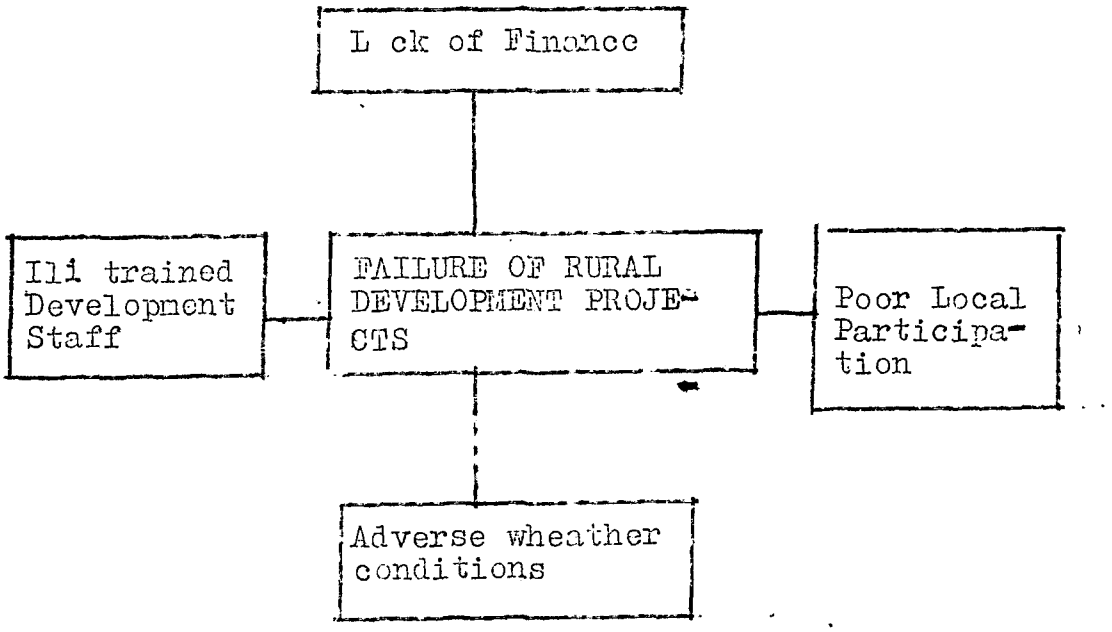
A research problem once stated should not necessarily be held static. The stated problem is usually modified as more and more information become available, the researcher becomes more familiar with his research problem.

Sometimes the researcher finds that the problem at hand has other sub-problems which render themselves to solutions by people from disciplines other than the researchers own. The researcher should not feel it a defeat to commission out investigation of such aspects or at least make his own investigations available for rectification by experts in the appropriate field. Better still, such a study given constraints of time and finance - should be done by an inter-disciplinary team of researchers.

To demonstrate what we have said so far, let us assume that the principal of the BANTU Co-operative College has been asked by the government to utilise

his staff to investigate why there is a wide spread failure of rural development projects in Gondwana. The research situation can be established as a Rural Gondwana, while the research problem can be identified as: Failure of rural development projects in Gondwana.

Once the research problem has been identified the next step is to determine which variables are likely to have caused this problem. Experience has shown that a brain storming exercise usually brings out the best results in identifying these variables or aspects of the problem. In our example above, the variables may well be lack of finance, ill trained and poorly motivated development staff adverse weather conditions or lack of or misguided local participation. These can be diagramatically presented as follows:



Once these variables have been identified, the researcher should relate them to background literature and information from the various consultations with experts in the field. The background literature may sometimes reveal that some of these aspects have been previously researched on. Sometimes there is a lack of resources to cover research on all the variables which have been identified. The researcher will use his common sence to eliminate those which he thinks are less important. He may just take the face value of the conclusions on those aspects which have already been researched on. In this way he will have narrowed down the problem into a researcheable topic. If all the above ideas do not work, he may simply research on some aspects and give a partial explanation to the problem.

Summary:

We have said that paramount to all research, particularly in applied research, is identifying a research problem. A research problem might be too wide, given the constraints of resources, hence it has to be narrowed down to a manageable proportion. Narrowing down a problem is done either by eliminating those areas which have already been researched on or confining the study to only those areas where the researcher feels he is professionally qualified. Sometimes the interest of the people commissioning the research will help narrow down the problem. When in doubt about your research problem, always consult experts in the field.

Chapter Three

Hypothesis formulation:

We have so far seen how a research situation is determined, how a research problem is formulated and consequently reduced to a researchable topic. . Our next stage is to look at how a hypothesis is formulated from the research problem, or topic.

A hypothesis is defined as "a tentative prediction of expected or assumed relationships between the causal variable and the effect variable(s)". The causal variable is sometimes known as the independent variable while the effect variable(s) is known as the dependent variable. A hypothesis is either derived from existing knowledge or from theory.

Characteristics of a good hypothesis:

A good hypothesis must be conceptually clear, it must be clearly defined, operationally possible and should be communicable. During one of our research methodology workshops we came across a number of poorly constructed hypothesis, too many infact to be reproduced here. But there was one outstanding one, which with no intention of offending any one, we would like to reproduce to demonstrate what we are talking about.

A group of participants wanted to develop a proposal which would test the effectiveness of teaching materials in accountancy at a college and the impact of accountancy training, from the college, in the field. They formulated their hypothesis as follows:

> "The effectiveness of teaching materials in the accounts advanced diploma course and the impact on the field".

This hypothesis has been reproduced as it was originally formulated. If one reads between the lines he would notice that two completely different research situation are being put together in a manner that operationalising the hypothesis will be almost impossible. This problem was later solved by breaking up the original hypothesis into two and these read as follows:

1. How effective are the teaching materials in the accounts advanced diploma course?
2. How effective is accountancy training from the college in enabling accounting officers to carry out their duties in the field?

It can be seen that in the original hypothesis an impression is given that training materials in accountancy will be tested in the classroom and in the field while in the second case the impression is that training materials will be tested in class room while the accounting knowledge acquired is what will be tested in the field.

A good hypothesis should also have some empirical reference. It should avoid inclusion of moral or value judgements in its body. The ultimate aim should always be validation by empirical facts not moral or value judgements.

A hypothesis must be operationally clear. That is all predictions and operations must be indicated. It should not be expressed in general terms. For example, where we want to indicate co-operative growth, we must be able to solicit some indices such as membership growth, business growth etc. Where we want to indicate, attitudes, we must solicit ratings on scales 1 2 3 4 5 etc.

A good hypothesis should be formulated within the available techniques. There is no point in formulating a hypothesis which will require for example factor analysis when the researcher is not acquinted with it or cannot get hold of someone who can analyse the data for him.

There is also no need to hypothesize for what only a computer can effectively use when there is no computer available. Otherwise hypothesising beyond the available techniques makes it impossible to test the hypothesis.

A hypothesis should also be related to a body of theory. If studies are isolated they cannot build up on knowledge, science being a systematic accummulation of knowledge.

Types of Hypothesis:

There are a variety of hypotheses but most of these can be grouped into three. Thus some hypotheses state the existence of empirical uniformities. This type of hypothesis is mostly found in surveys which are done to establish a fact from a collection of common sense terms. The most outstanding weakness of this type of hypothesis is that it does not test but merely adds up the facts. In other words it only sums up what everybody knows. But what every one knows might be incorrect. This is in fact the type of hypothesis which can be used to establish popularly held notions such as "co-operatives which start from the top are bound to fail".

Some hypothesis are concerned with complex ideal types. These hypothesis aim at testing the truth about logically derived relationships between empirical uniformities.

For example the notion, "the larger the co-operative society the more the chances of its survival. The major problem with this type of hypothesis is that there are many intervening variables which might lead the researcher to faulty conclusions. These variables may be political climate, the culture of the people, factor endowment etc.

The last group of hypotheses are those concerned with the relationship between analytical variables. This type of hypotheses deal with relationships between changes in one property and the changes in another. These are the types which are stated as "the growth of co-operatives depends on the political climate" or "member participation depends on member education".

A research problem sometimes has a major hypotheses and sub hypotheses. In this situation the sub-hypotheses will only be subject to test when the major hypothesis holds true. In our example above, a major hypothesis could well be "There is a failure of rural development projects in Gondwana. If we tested this and discovered that there was no failure then there is no need to go ahead testing the sub-hypotheses given above.

Summary:

Let us summarise this chapter by examples of hypotheses which could be derived from our failure of rural development projects in Gondwana. We had earlier identified the variables concerning this failure to probably be lack of finance, poor local participation, adverse wheather conditions and ill trained and poorly motivated development personnel. These can now be translated into hypotheses as follows:

(i) lack of adequate financial support is the cause of the failure of development projects in rural Gondwana.

(ii) ill-trained and poorly motivated development staff are the cause of the failure of projects in rural Gondwana.

(iii) poor and misguided response by the local population is the cause of the failure of rural development projects in Gondwana.

(iv) impassable roads arising from heavy rains or poor maintainance are the causes of the failure of rural development projects in rural Gondwana.

It must again be re-emphasised that formulation of a good hypothesis will go a long way in helping the design of a questionnaire or interview schedule. When in doubt, please seek assistance from people better versed that you on the subject.

Chapter Four

Sampling Techniques:

Basic to understanding sampling theory is a consideration of what we mean by a sample. Sampling as a technique is not new since it is regularly used in every day life. For instance, when a doctor wants to test a patients blood for malaria parasites, he does not drain the body of all the blood. Rather, he takes a little drop of blood which he analyses and there after generalises the results to the rest of the blood in the patients body. Similarly, when a housewife wants to determine whether the rice in the pot is cooked or not, she does not eat the whole pot of rice but merely takes a spoonful and generalises the results to the whole pot. What both the doctor and the housewife have done is what is called sampling. We define a sample then as "a small portion of a larger whole, which is said to be representative of the larger whole".

Before we come to a full discussion of sampling theory, let us clarify a few conceipts which will be used frequently in this chapter and hence forth. We define a population or universe to mean the entire collection of objects, or anything whatever on which we propose to conduct our research, one unit of the population is called an element, while a list of elements which form the totality of the elements from which the sample will be drawn is called a sample frame. In other words a list of names etc.

Examples of sample frames are a register of membership in a co-operative society, a record of population census or any other list from which samples can be drawn.

Why use sampling?

We use sampling in order to minimise the costs of research as sampling enables us to confine our study to a few cases. Sampling also increases the speed of research because only a small number is actually researched on. This does take a shorter time than would be the case if a whole population had to be researched on. Sampling enables us to use a fewer number of personnel hence economies on human resource are derived. Sampling also enables us to study, in greater detail, as we confine the analysis to a small portion, than would be the case if a whole population was being studied.

Qualities of a good sample:

A good sample must be large enough in order not to loose detail within the population. A 10% sample size is usually considered adequate. The sample must be considerably well spread in order to accommodate the variations which might exist in the sample frame. A good sample should take into account all the characteristics in the population which are immediately visible. The researcher should endeavour

to draw the sample himself because samples drawn by assistants are usually faulty, as the assistants prefer convinience in data collection or they are not simply sufficiently trained to apply sampling techniques.

Types of sampling techniques:

Sampling can be devided into two categories probability and non-probability sampling. Probability sampling uses probability theory and is generally called the scientific, while non-probability is called the unscientific. Probability sampling can use statistical inference which enables the researcher to state confidence limits, i.e. to what extent his conclusions will always hold true. Probability sampling also has the capacity of randomising errors in which case researcher bias is to a large extent eliminated.

Non-probability sampling on the other hand is largely simple to use. But its generalisation capacity is generally weak. It is however sufficient for most surveys and modest type researches in the humanities and sqcial sciences. This is probably the type which will render itself to frequent use in co-operative research.

A simple random sample rests on the premise that there are no abnormalities in the population under consideration, there is no important clustering of variables, no activity biases can be seen and there is an absence of value considerations such as religious or political dominance. It further depends on the fact that the researcher is able to establish a sample frame. However, care must be taken that the sample frame does not contain duds or dead elements.

A systematic random sample:

Sometimes it so happens that the sample frame which the researcher is working on is abnormally large but cannot be avoided. For example to draw a sample of 10% or 10,000 from a membership register which contains 100,000 names means that the researcher will have to make the draw 10,000 times. This is indeed very taxeing and time consuming. In order to obviate this problem we use systematic random sampling.

Systematic random sampling is defined as a sampling technique whereby the first element to be included in the sample is drawn by a lottery basis and the rest of the elements are selected according to a pre-agreed interval.

Whichever is the case choice of probability on non-probability sampling will depend on whether the researcher can establish a sample frame. Where a sample frame can be obtained it is preferable to use probability sampling.

Probability sampling:

Under probability sampling we record simple random sampling, systematic random sampling, stratified random sampling and cluster random sampling. There are other types such as multi-stage sampling, too complicated for our needs in such a modest text.

A simple random sample:

This is defined as a sample selected in such a way that each element in the population has an equal chance, at every draw, of being included in the sample. The sample is actually drawn on a lottery basis. That is to say, all the elements in the population or sample frame are allotted number tags 1, 2, 3, 4, 5, ...nth.

The number tags are placed in a bag and are throughly mixed. Then the numbers are drawn from the bag according to the size of the sample required. Some times random numbers are used.

For instance if it has been agreed that every fifth number will be chosen and the first number drawn is 3, the next numbers which will be chosen are 8, 12, 17, 23, 28, 32 etc. If the end of the sample frame is reached before the sample size is reached, the selections can be made in reverse order but one or two counts should be droped, i.e. the reverse order may take the fourth or third. items. Notice that only the first number is drawn by lottery method.

Systematic sampling operates most effectively where the sample frame does not have any repetitive or recuring items, otherwise the conditions are the same as in simple random sampling. Some people critisize this approach as not being pure probability sampling. But, as long as the conditions in simple random sampling are met and the first element is drawn on a lottery basis, it does fit exactly with probability sampling rules.

Stratified random sampling:

In most of the real life-research situations, the elements within a population are not evenly distributed. For example, in co-operatives, one finds that there is an over preponderance of male than female members. Or there could be a dominance of catholics,

moslems or protestants. Yet the predictive validity of the research may depend on these very factors - hence the researcher may want to take them into account. Stratified sampling is used to take care of these abnomalities in the population.

Stratified random sampling then can be defined as the sampling technique which allow drawing elements to be included in the sample from different sub-strutums of a sample frame or population in order to accommodate the variations existing in the population. In this technique, lottery draws are made on the sub-strata independently and then the elements are combined to form one sample, using the different weights representative of these sub-stratums. For example, if we have 500 catholics, 250 protestants and 250 moslems, the researcher might want this characteristic to be maintained in the sample. He will number the tags in each sub-stratum and draw a sample of 100 by lottery method, 50 from catholics, 25 from protestants and 25 from moslems. On the other hand he might not want the predominance of catholics to be reflected in the sample hence he can draw 50 from each sub-group to form a sample of 150. In short stratified sampling is used when the characteristics of the population show important stratification.

Cluster random sampling:

Cluster or area sampling, as it is sometimes called is used when there is no sample frame available but there is a strong need to apply randomisation to selecting the sample. Sometimes it is also prefered because the research situation is so widely dispersed that reaching the individual elements would be prohibitive. In this technique, a whole geographically dispersed region is sub-devided into small clasters. The clasters are numbered and there after lottery draws are made and then the individual elements in the selected clusters are studied in detail. In this case the equiprobability is given to the clasters rather than to the individual elements. This technique differs from stratified sampling because in stratified sampling, only the selected elements in the stratums are studied. More-over clusters are much smaller than stratums used in stratified random sampling.

There are other sampling types which combine some of the ones discussed above, called multi-stage sampling. These, as I said before, are too complicated for a text of this nature. Those with an enquring mind may find them in other research methodology texts.

Non-Probability sampling:

Accidental sampling:

Almost all the time the financial outlay for a pilot survey does not allow enough for vigourous and more elaborate work, hence researchers often resort to simple techniques such as accidental sampling. In this technique a researcher goes, for instance, to a co-operative union or primary society to obtain which ever data, from whoever he can find. The major weakness of this type of approach is that the researcher introduces bias in the selection of the respondents. He is most likely to approach those who appear accessible, yet the difficult looking ones may be the ones with vital information. Accidental sampling is in popular use on pilot studies.

Quota sampling:

Quota sampling as a technique is mostly used for pilot and adhoc studies. In this case, the researcher pre-determines the quotas for each stratum of the population which he would like to include in his sample. It has the advantage that the characteristics of the elements are considered at time of sample design. But bias is not completely removed. The researcher might give higher quotas to those respondents who he thinks will be more sympathetic to his biases or ideas.

Purposive sampling:

Is based on the premise that the researcher's judgement can enable him to systematically select those elements from which he can get the best and most reliable responses. By the same token, it is possible to make sure that all the important elements are included in the sample. The major problem with this approach is that researcher bias is automatically build into the sample design. But as long as the researcher is objective in selecting his respondents, this approach is the most superior of all the non-probability sampling techniques.

Sampling - errors:

Before coming to discuss the precedure which should be followed in sampling design, it will help matters if we clarified the two types of errors commonly associated with sampling design. One of these is the error arising from the researchers bias, that is where the researcher deliberately violates the principles of scientific inqury and bends the research design to suit his needs, i.e. selects parameters which agree with his values. There is also the error which arise when a researcher consciously or unconsciously selects a sample which is in adequate, which for example does not include all the charecteristics in the population.

Errors arising from researcher bias can be eliminated by the researchers self-discipline. Sampling errors, those arising from taking an in adequate sample, can be eliminate by taking a larger sample.

Steps in planning the sample:

The major steps to be taken when desighing your sample include:

(i) determination of the sample frame

(ii) determination of the individual elements to be included in the sample

(iii) considering the characteristics in the sample frame or population from which the sample will be drawn

(iv) determining the sampling technique which can take care of the characteristics in the population or sample frame

(v) decide your sample size

(vi) draw your sample

Determining the sample frame:

A sampling frame, as has been said before is any list from which the sample will be drawn. Sometimes the sample frame, in a form of a register will be readily available.

Sometimes it is not in existance and it has to be made. At one time, we were asked to evaluate the impact of international seminars conducted by the Swedish Co-operative Centre. There was no comprehensive list of the seminar participants readily available. By going through all the seminar reports over a period of 10 years we were able to establish this comprehensive list, which became our sample frame. When a researcher is dealing with a sample frame which is more than 10 years old extra care should be taken because the list might contain names of people who are long dead, or co-operative societies which have since wound up. A survey to validate or up date the sample frame is usually required.

Defining the individual elements to be included in the sample:

One of the problems associated with this step is that the elements may have more than one meaning. For example, a member of a co-operative society might mean a whole household in one case while it would mean the head of the household in another case. Similarly, a co-operative members produce might mean all what is produced by the household or only that which is produced by the head of the household, or it might mean only the members produce which is delivered to the co-operative society. Terms like low class,

upper class should be precisely operationalised i.e. low class can be those people with an income between 0 - 100 shillings while the upper class can be those with an income of 1000Shs and over per month etc. In short the researcher needs to define his elements precisely.

Distinguishing the charectaristics in the population or sample frame:

As has been said before, the researcher should scrutinise the sample frame or population in order to identify which characteristics are typical of the sample frame in use. The typical questions which a researcher must ask himself or her self are:

(i) does the sample frame show any geographical wide-spreadedness?

(ii) does the sample frame show an over-preponderance of sex, religion, age dominance or any other variable which has dominance?

(iii) are there some cyclic or recurring features in the sample frame?

(iv) are the elements normaly distributed and are they homogenious?

(v) is the sample frame abnormaly long but cannot be avoided?

(vi) is the sample fairly recent and up to date? etc.

The purpose of asking all these questions to one self is to determine which sampling technique or a combination of sampling techniques can take care of the existing characteristics.

Choice of sampling technique:

The choice of sampling technique, among other things, will depend on whether a sample frame is available. If it is not and cannot be created, the researcher should resort to non-probability sampling techniques. If it is available the researcher should choose the technique or combination of techniques which can best take care of the characteristics in the sample frame. For example if the sample frame is abnormaly long, the researcher will resort to systematic random sampling. If the sample frame contains elements which are spread over a very wide area, the researcher may resort to cluster random sampling etc.

Determination of the sample size:

Determining the sample size will depend on how much precision is required, the resources available both in terms of money time and man-power. But generally a sample should not be less than 10%. The larger the sample the more reliable will be the results. There are complicated formulae for determining the sample size but his is left to the appendix.

Drawing the sample:

Drawing the sample is basically a matter of operationalising the sampling technique which has been chosen. When the researcher is using more than one sampling technique, complications may arise. But when in doubt, always solicit assistance from someone more experienced than yourself.

Summary:

We have said that sampling is most useful because it enables the researcher to work with a small part of the population instead of the whole population. This allows cutting down costs, enables the research to be done in a much shorter time.

We have also said that a good sample should accommodate all the characteristics found in the population, in other words it should be representative of the population where it is coming from.

There are basically two groups of sampling techniques, probability and non-probability techniques. The former is more vigorous and scientific while the latter is less effective but is in common use because of its simplicity.

Attention has also been drawn to the fact that the generalisation capacity of samples is undermined by two types of errors. The researcher bias error and sampling error. The former can be eliminated by the self discipline of the researcher while the latter can be eliminated by taking a larger sample.

Chapter Five

Use of Documentary Sources of Data:

A literature survey both and during the design stage of a research project is of great importance. It is important and necessary whether a study is based on original data gathered in a field study or only upon desk research. On the one hand, general source materials have to be consulted for familiarity with the background of the problem: its environment as well as researches already undertaken in the particular field. It provides further orientation to the problem and at the same time avoids the possibility of duplication of effort. Moreover, valuable information on usable techniques may be gained from previous research reports.

The following sources of documentary materials may usefully be explored.

(i) Official documents: Government, Co-operative company or other agency owned.

(ii) Newspapers, periodicals, magazines or journals.

(iii) Private documents: which may take the form of personal letters and diaries.

(iv) Libraries: for books, pamphlets, journals micro-films tapes, etc.

(v) Archieves: constitute a valuable source of information especially because in most countries all files which are more than 13 years are surrendered to the archieves.

(iv) The Central Bureau of statistics: most governments have an agency which collect data on material accounts and is one of the most important source of statistical data.

Points to bear in Mind:

(i) Regulations and Document accessibility

Official and private documents may not be easily reached either because the regulations prohibit this or the people who have personal documents are unwilling to release them for research purposes. The tactics which will be used to obtain such information will depend on the individual researcher hence cannot be formulated here.

(ii) Library and Cataloguing and indexing:

The researcher must remember that time is one of his operational constraints. To avoid spending hours in a library trying to locate a book or other documentary material, it is essential that the researcher is (reasonably) familiar with the major cateloguing and indexing systems used in libraries. If the researcher does not know where to begin from, consultations with the librarian may save him valuable time.

(iii) Evaluation of Sources:

Not all published material are relevant or reliable sources of information. Secondary data may contain the bias or incompetence of the compiler or the proofreader. They should therefore be used as guide to the original sources which, as far as feasible, should be checked for the required data. Information about the compiler should be sought to establish his competence interests and prejudices.

In many published material - primary or secondary - the data to be used must be analysed within the limitations of the collection methods.

One should therefore approach published sources with a critical mind and analyse and evaluate them carefully before using them.

(iv) Generally, sources of confidential data should be disguised except where a quotation is the case, and has been permitted.

Chapter Six

Observation Techniques:

Observation techniques can be divided into two broad categories. The structured and the unstructured. Unstructured observation can further be divided into participant and non participant observation. Structured observation is sometimes known as systematic observation.

Participant observation:

In this situation, the researcher disguises his intention by taking up a role different from his actual purpose, the research i.e. the researcher may take up a job in a co-operative society as a work-hand in order to observe the behaviour of co-operative members in the field. The purpose of disguising himself is to ensure that normal behaviour is not disturbed. Most people behave differently when they know that they are being observed. Otherwise biased results might be obtained.

Observation can be defined as "a method of data collection whereby the researcher interacts, to a certain extent with the respondents being researched on". The researcher may disclose his identity or he may not.

Advantages of participant observation:

One of the advantages of participant observation is that as the researcher stays long with the group, he can obtain more data than he can do with a questionnaire or interview. The researcher is also able to give the context which lead to expression of certain opinions. A respondent who is in a bad mood for one reason or the other is likely to exaggerate facts. The researcher under this approach, has a greater latitude to check the statements of the members of the group he is researching on. The researcher can also modify categories under which data is being collected, thereby making them most suitable for the analysis of the problem which he is researching on. The researcher need not wait long months for a questionnaire which might not come back.

Disadvantages of participant observation:

One of the major disadvantages of participant observation is that as the researcher becomes a participant, he narrows the range of observations he can make. If he enters through a position of high status, he is automatically pre-cluded from the lower group or vise-versa. As the researcher participates with a given group he is bound to share their sympathy, hence loose objectivity which is the fulcrum of his research project.

He is likely to sympathise with the emotions of his group than the other. The problem of the observed and the categories being observed being peculiar to the researcher only, will mean that a second researcher cannot validate the first research findings i.e. the second researcher cannot re-construct the situation and obtain the same results. The researcher being diquised cannot record data immediately, even if he does this, he will do it in such a cumbersome way that some of the details will be lost.

Despite all these dis-advantages, participant observation is often used when conducting research in delicate situations such as member participation in board meetings.

Non-participant observation:

In the non-participant approach the researcher discloses his identity and his motives are fully explained to the respondents. The respondents reaction to the presence of the researcher will depend on how well the researchers method of entry into the research field augments the atmosphere in that research field. Otherwise when the respondents build confidence in the researcher, they will act normally and not bias the results.

Advantages of non-participant observation:

Non-participant observation eliminates the difficult of loosing detail since the disclosure of the researchers identity enables him to record data on the spot. As the researcher does not take any or takes only a limited role he is able to move quickly from one place to the other in search of data hence has a wider research field. Further, the researcher being disclosed, and once confidence has been established, also because he is a stranger in the environment, true members of the society will find it easy to discuss intricate matters with him, which they would not otherwise discuss with their colleagues.

Disadvantages of Non-participant observation:

The only major disadvantage of this approach, leave aside rapport problems is that it is difficult to carry it out, because of the ackwardness of the researcher being a donant observer. This problem is usually eliminated by taking a middle course between participant and non-participant observation.

Systematic observation:

Systematic observation is used when the research project requires more than a mere simple observation.

In this case controls are placed on the observer or the observed or on both. By control here is meant that the observation procedures are standardised and the situation underwhich observation is taking place is well defined. Observation schedules are set up in advance. The research situation however can be natural or contrived. The researcher can disclose himself to the respondents or not.

Where the intention is the researcher to obscure himself a one way glass is used. Sometimes a pannel of observers is used and notes are compared afterwards.

The essence of this approach is that the observation can be reconstructed so that other researchers can make the observations and validate or disprove the original conclusions. This approach however need not concern us much, since it is not likely to be used in co-operative research. It is mostly useful in psychology.

Summary:

We have said that a researcher who decides to use observation techniques to collect his data will either disclose or disguise his identity. There are advantages for disclosing or disguising ones identity mostly associated with rapport problems.

There are also disadvantages for disclosing or disguising ones identity mostly associated with data recording. Wheather the researcher should use one and not the other the choice he has to make depends on the atmosphere in the environment in which he is researching. H is acceptance in the research field will depend on his personal attributes, qualities and tact.

Chapter Seven

Questionnaires:

A questionnaire is a detailed form or list of questions arranged in a systematic manner, and intended to solicit information from respondents. A questionnaire is self administered but sometimes it is administered by an emunerator or the researcher himself. In the second case, where it is not self administered, it is called an interview schedule.

A questionnaire can be close ended, in the case where possible answers are provided by the researcher and all the respondent does is tick which one he thinks is correct; or it can be open ended, where the respondent is free to enter any answer which he thinks appropriate to the question.

A questionnaire can be structured, this should always be the case for a mailed questionnaire or it can be unstructured. The second case is what is mostly used in interviews.

Advantages of a self-administered questionnaire:

One of the greatest advantages of a self administered questionnaire whether mailed or distributed is the anonymity given to the respondent. Since the respondents name is seldom asked he or she is likely to give more candid answers, than those which can be given in an interview situation. Secondly the questionnaire it self can be made to reach a wider audience especially because postage is still relatively inexpensive in most parts of the world today.

Dis-advantages of a self administered Questionnaire:

The major disadvantages of self administered questionnaires include:

That questionnaires depend on a high level of literacy hence is only suitable for certain groups of people. This is probably a big handicap for a researcher in rural development studies considering the low level of literacy in the rural areas of the third world. Another, often encountered, reason is the low response rate of questionnaires. Sometimes this response rate can be as low as 30%. This renders the generalisation capacity considered at the time of sampling design very weak.

There is also the problem of loss of control by the researcher over his research field. Apart from the fact that there is no way of knowing who completed the questionnaire, the flexibility of explaining questions that the respondent might not understand is also lost.

Where the questionnaire is open ended, there is also the possibility that coding of the responses might be difficult. The responses may not simply fall in clear cut categories. In this way some valuable information may not be used effectively.

A further difficulty which might be experienced is that questionnaires, especially if they are mailed, depend on a good and efficient postal system. For the time being in East and Central Africa, the service has not been effectively extended to the rural areas. Sometimes it takes 7 days to receive mail from Europe while it takes over one month for a letter to travel from one rural town to another.

The Structured Questionnaire:

A structured questionnaire is one in which every respondent is presented identical questions, which are asked in the same order thereby achieving a good measure of standadization. It can be used both in the interview or the self-administered questionnaire situation. The greatest advantage of this approach is that it simplifies data analysis as responses can be pre-determined and categories can be build up in advance. The approach is commonly used in survey type research where indepth studies are not required. But in most practical situations it is commonly used in combination with other approaches.

The un-structured Questionnaire:

This approach is commonly used in interview situations especially because the researcher or enumerator is allowed greater latitude to change the flow of questions to suit the interview situations. Sometimes it is useful because one questionnaire can be used to interview different groups of respondents and all the researcher does is skip the questions which are irrelevant to the interview which is in progress. This approach also enables the researcher to put down only the topics which he would like to cover during the interview process.

It is obvious from the above that an instructured questionnaire is not suitable for mailing.

Closed Ended Questionnaires:

Closed ended questions are the type which constrain a responded to choose from the answers provided. Such questions are usually tricky to construct because they require that all possible answers are given. A task which is not very easy at all. For example, if we would like to determine the age composition of a primary society and pose the following question:

What is your age (please tick one)?

20 - 25 _____

26 - 30 _____

31 - 35 _____

36 - 40 _____

41 - 45 _____

46 - 50 _____

We might believe that the age grouping is likely to fall in at least one of these categories. What happens when there is some one under twenty or over fifty years. To improve our questionniare, we will need to add two more categories below twenty and over fifty. Closed ended questions however have the advantages that they could be precoded and information is readily transferable on to a data matrix or computer card.

Close ended questions may not effectively represent the respondents thinking. The easiest way to overcome this problem is to combine both the open and close ended questions on the same questionnaire. Close ended questions are useful where we want to solicit factual information such as: are you male or female, are you an employee of the society or not etc.

Open Ended Questions:

These are the type of questions where the respondent is allowed to think out his own answer. Their greatest weakness, especially where the question is ambiguously phrased, is that so many variety of answers can be obtained for the same question that sometimes it becomes difficult to compare them. Despite such a limitation, they should be used when the question requires an expression of attitudes.

They should also be used in pilot studies when the researcher is not sure how the responses will be like. The responses obtained in the pilot study can form the basis of close ended questions in the main study.

Guidelines to Questionnaire construction:

The most important starting point to begin constructing a questionnaire is to draft the possible questions. This will probably be most effectively done through a brain storming exercise. It is important at this stage to reconstract the research problem, the hypothesis, the size of the sample and the various other constituent variables which may impinge on the questionnaire. Then the researcher should ask himself or herself what kind of data need to be collected in order to study this problems.

Attention should also be paid to the length of the questionnaire. The researcher must realise that the respondents do not have all the time in the world. A respondent may be put off by filling a questionnaire which takes him 2 or more hours.

The language in the questionnaire should also be plain and straight forwards. Avoid use of technical terms unless you are sure that the respondents will understand them, especially

where it is a mailed questionnaire. Most villagers will not probably understand what you mean by calory intake, or vitamin content or even what you mean by a balanced diet.

Avoid words which have a vergue meaning such as many or often. Ask for concreate quantitative terms. How many times do you attend meetings in a year? How many bags of maize did you produce last year?

Avoid questions which contain more than one question. Are you a school leaver looking for work? (a respondent may be a school leaver not looking for work or looking for work but not a school leaver).

Avoid leading questions. "Some people in this district have told us the Nyanza Co-operative Society is not doing well", what do you think? etc.

It must be qualified that questionnaire construction is a matter of personal style and one cannot provide the best format but mistakes like the ones above should generally be avoided.

There are no hard and fast rules as to what the questionnaire format should be like, but the following points may be observed.

(i) The questionnaire should start with an introduction of what the research is all about and its justification. Sometimes the sponsor should be disclosed.

(ii) Factual information, preferably those which are simple and cannot cause resistance to answering the rest of the questionnaire, should come out first.

(iii) Where possible questions should be pre-coded.

(iv) There should be a meaningful flow of questions so that the respondent is not made to jump to and from.

(v) All difficult questions should be left towards the end of the questionnaire but not so late when the respondent is already suffering fatigue.

(vi) Directions as to how to answer the questionnaire should be build into the questionnaire body.

(vii) Guarantee of anonymity is sometimes very important and should not be left out.

(viii) Do not forget to applaud or show some appreciation to the responded for the time he has taken.

(ix) Enclose a self addressed, stamped envelop in the case of a mailed ques- questionnaire.

(x) Always pretest your questionnaire, unless there are serious problem to make you dispense with this.

Summary:

We have seen that the success of a research project depends on collection of good and reliable data, which in turn depends on a good questionnaire interview schedule. A questionnaire can be self administered or can be administered face-to-face with the respondent. In the latter case it is called an interview schedule.

We have also seen that a questionnaire can be structured or unstructured. A questionnaire can also be close or open ended. There are advantages for both approaches but usually a researcher combines all of them in order to arrive at a good questionnaire format.

The most important fact to consider in questionnaire construction is that it should be the best possible instrument with which to obtain data to enable the researcher to take care of his research problem. In other words it should obtain data related both to the research problem and capable of testing the hypothesis at hand.

We have not dwelt much with the interview schedule because it is a subject of the next chapter.

CHAPTER EIGHT

INTERVIEWS:

Definition:

An interview is defined as "a meeting of persons face to face especially for the purpose of formal conference on some point".
(Madge 1971)

This approach is primarily designed for use where questionnaires and observation techniques cannot produce the required results. And it is most relevant for soliciting data on opinions, motives and attitudes.

Interviews can be general or of an indepth type directed at individuals or groups.

Interviews can also be conducted by telephone but this approach is probably not useful for rural development type research owing to poor communication systems.

Superiority of interviews:

Interviews are most superior because more questions can be asked than in the case of a questionnaire. More over it is more difficult for a respondent to refuse an interview than it is easy for a questionnaire to be thrown into the dust bin. Verification of responses is also much better done in an interview situation than in the case of a questionnaire. Interviews are not adversely affected by low literacy levels.

LIMITATIONS:

Interviews have the disadvantage of travelling costs by the researcher. This can however be minimised if the research field is subdivided into clusters. Interviews have also the problem of being more susceptible to interviewer bias and cheating. These can however be minimised by ample supervision, and the self integrity of the researcher.

Interviews are also subject to respondent bias. Sometimes respondents like to aggrandise themselves so that they can be seen with superiority in the eyes of the interviewer. The interviewer should seek ways of checking up the facts given to him. For example an interviewer might ask what the income of a respondent is. He can double check the validity of this income by asking the respondent how much he spends on general consumption and how much he saves. Then if the figures do not tally he can prob. e further.

Establishing Rapport with Respondents:

Introduction from influential people well known to the person to be interviewed is probably the best way to establish rapport. In most cases the personal tact and physical attributes of the interviewer are important considerations. The interviewer should not overdress or underdress for the interview. The interviewer should not rush the respondent to the interview until he is convinced that general acceptance of the research has been struck.

Ordinary or standard interviews:

In the ordinary or standard interview model, the interviewer has an interview schedule which he uses for questions sometimes also for recording responses. He uses a standardized questionnaire which is applied to all respondents. This approach is sometimes called a structured interview. The reason for standardising the questions is to ensure that responses can be compared.

Individual Depth interviews:

In the indiv dual depth interview or probe the interviewer does not have a specific set of questions. What he has are specific areas of enquiry. The interviewer formulates questions as the interview proceeds. The interviewer should under no circumstance affect the contents of the responses. He should only ask for comments on the general topics. He could improve the probe by asking questions like, "why did you say that?" or "can you tell me more?" etc.

Group Depth interviews:

The group depth interview is where the interviewer brings together a group of respondents, introduces a subject and allows the debate to continue. He makes sure that the conversation does not digress from the main topic while at the same time he records the ideas and opinions expressed. A good example of group indepth interviews are debates.

There are many advantages in this type of approach, the major one being that individual opinions are tested against those of others hence provides more accurate data. The group interview is not only more exiting but also has the advantage that one member can trigger off a whole discussion and flow of information from others. Sometimes shy and naive people find the security of the croud an opportunity to give more information, especially that the questions from the interviewer are being directed at them all and not at an individual.

But group interviews have their own flaws. The small size of the sample that can be utilised in a group interview means that the generalisation capacity of this technique is very low. The technique also requires that there be highly qualified interviewers to enterpret the expressions and opinions from the respondents. There should also be some kind of enducement to be given in order for respondents to come and assemble at a given place. There is also the problem of depth not being as ideal as it can be in individual depth interviews. This technique then is mostly suitable for exploratory research and other modest studies.

Summary:

We have seen that an interview is a meeting of people for the purpose of a formal conference on some topic or point, and that this approach is preferred where questionnaires, observation and other techniques cannot achieve the same results.

Interviews can be ordinary or standardized or they can be indepth directed at individuals or groups.

Interviews have the advantage that they can use more questions, the interviewer cannot be easily brushed away and verification of responses is much higher.

They however have the disadvantage of cost, they are subject both to the respondents and interviewers biases and cheating.

In some situations individual indepth interview are more superior to group depth interviews but as to whether the one or the other is to be used depends on the judgement of the interviewer. There are no hard and fast rules.

Chapter Nine

Data Analysis I:

Basic Statistics for Research:

It is of absolute importance that we now digress a little and refresh on some of the statistical conceipts which will be required to understand data analysis. Even at the expense of thoroughness the mathematics is kept very simple in order not to frighten the mathematically un initiated.

We have seen that research is basically concerned with inquiry into phenomenon. The objects of inquiry are explanation and prediction. Prediction is the ability to anticipate some given outcome. Anticipation in turn is predicted on phenomenon such that knowledge and control of one phenomenon will permit prediction of the other. Prediction is, however, possible without explanation. i.e. causal connection is not necessarily implied.

More often than not, however, social scientists use numbers in their analysis of, and intepretation of data. The importance of mathematics in research therefore cannot be sufficiently emphasised. It aids measurement. Even so quantification is not a substitute for a good research.

No amount of mathematical logic or wizardry can salvage an illeconceived research project. Quantification can, however, reveal problems in a manner which makes their solutions possible. Numbers are used in research for two basic purposes; as descriptive statements or measures of relationships and association.

Numbers as Discriptive statements:

For instance statements like, "of all the Co-operative members interviewed 50% have had some primary school education, 30% never went to school at all, 18% finished secondary school and the remainder are university graduates". The above statement is definately superior to one like most members of an Ujamaa Co-operative Society have had some education. Descriptive statistics like frequency counts, averages and ratios , together with supplementary devices such as graphs, tables and charts serve our research purpose better than terms such as most, a few, almost all, some or several etc. It must however be pointed out that numbers can too easily give us a sense of precision. We must always remember that they are subject to errors of collection, interpretation and presentation.

Indeed one advantage of quantification is that it alerts the researcher to many possible sources of error and in consequence he ought to produce more careful work than otherwise is the case when numbers are avoided.

Numbers as measures of Relationships and Association:

The second use of numbers involves the determination of relationships or association between variables. These statistics involve ranking or differentiation of the things being studied. For instance we can say that area A is more productive than area B, by taking stock of their output over a given period of time. Another example can be the statement that "co-operatives which are initiated from the top are bound to fail". We can take stock of those co-operatives which have been intiated from the top and those from the grassroot and study their failure rate over a period of time. The count will enable us to accertain the validity of the statement. We look at the relationship between failure and how the co-operative was initiated.

Levels of Measurement:

The statistical techniques employed in research depends not only on the questions they seek to answer but also on the nature of the data to which they have to be applied. By measurement is meant the process of assigning values or scores to the observed phenomenon. The rules governing the assignment of an appropriate value were developed by S.S. Stevens (1946) and these have now become the standard four level classifications: The nominal, ordinal, interval and ratio scales. The distinction between these different levels of measurement depend on the ordering and distance properties inbuild in the measurement rules.

The Nominal Scales:

The nominal level of measurement is the simplest as well as the lowest level of measurement. It considers no values about phenomenon other than that of lablelling it. No assumption of ordering or distance between these lables is made. For example Machanja Co-operative Society is simply a lable distinguishing it from Kafulafuta Co-operative Society. It does not attribute any particular value. Examples of nominal scales are boy or girl; father or mother. The chairman etc.

A further observation must be made that sometimes we use numbers such as 1, 2, 3, 4, 5 etc. or A, B, C, D, E etc. to represent these lables or nominal scale. We do this in the earnest belief that a computer or some other machine or even manual tabulation; can easily read off the lables. This does not mean that we have assigned values to nominal scales.

The ordinal Scales:

This is the next level of measurement. Variables on this scale possess qualities which enable as to rank-order according to some criterion such as the chairman is less capable than the secretary general but no one can tell precisely by how much. While it is true that the ordinal scale has the property of ranking, it also continues to have the property of labelling. It makes it possible for us to say $A \geq B \geq C$ thus $A \leq C$, but not precisely by how much.

The Interval Scales:

Besides the properties of labelling as well as ordering, the interval scale has the property of allowing the distances between categories to be defined on the basis of fixed equal units.

For example if Natwange Co-operative society has a membership of 1000 people and Jitenge Co-operative Society has a membership of 500 people we can say that Natwange Co-operative Society is twice as large as Jitenge Co-operative Society. Of course this is assuming that all other factors are held equal. With the interval scale: the members 1, 2, 3, 4, 5, 6 etc; we are able to add, subract, devide and multiply.

Ratio Scales:

This level of measurement is more common in the physical sciences. But it is not completely out of context in co-operative research. It has all the properties of the nominal, ordinal and interval scale. Its distinguishing feature in addition to the above is that it has an arbitrary zero or starting point. A thermometer is such an example. A zero degree centigrade does not mean an absence of heat. Another example is counting of peoples ages. When Katongo celebrates his 21st birthday, it does not mean that he is 21 years old. What has happened to life while in the mothers womb or even for that matter as a cell in the ovary. People have come to accept the date of birth as an arbitrary zero point for the convinience of not culculating the pregnancy periods.

FURTHER STATISTICAL ANALYSIS:

Statistical thinking can be approached from the point of view of HOM MANY to HOW MUCH. That is to say, how many = CASES, whereas how much = VARIABLE VALUES. Research methodology, on the other hand, relates to the sample size of cases and the values or measures given the variables. Before looking at the key statistics useful in data analysis. We will look at some of the other ways in which data may be presented.

Proportions:

These are a description of a segment of data in terms of a whole. Thus, if we have 58 women and 47 men in a co-operative society we can say that the proportion of women is 58 to 47 and that of men is 42 to 58.

Proportions are useful when a researcher is comparing between units of analysis e.g. two co-operative societies, when otherwise it would be very difficult to compare absolute numbers. Let us illustrate this by an example:

Membership	Coop I	Coop II
0 - 5 yrs	78	88
6 - 10 yrs	83	147
11 and over	481	1181
	642	1416

In this illustration it will be difficult to tell which co-operative society has a relatively larger number of membership 0 - 5 years without reducing them to a common denominator i.e. proportions. This becomes:

Membership	Coop I	Coop II
0 - 5 yrs	12.15%	6.22%
6 - 10 yrs	12.93%	10.38%
11 - over	74.92%	83.40%
TOTAL	100%	100%

It is now easy to see that Coop I has a relatively large number of new members, although 78 is less than 88.

Percentages:

Percentages are also a good form of explaining the relationships between variables. Percentages are proportions expressed in terms of a hundred, hence they will always add up to a hundred. However, percentages may not give accurate interpretations unless the number on which they are based is greater than 50. It is also necessary to report them together with the number on which they are based.

Ratios:

Ratios are values which are expressed in terms of the other. In our example above we c can say that Coop I has a ratio of 78:88 new members to Coop II in which case it has a proportion of 78/166 or 39/83.

Rates:

These are also commonly used statistics and are simply a type of ratio which shows change over a given period of time. If the size of membership in a co-operative movement increased from 50,000 to 65,000 between 1968 and 1978, we can calculate the growth rate within the 10 years as $\frac{65,000 - 50,000}{50,000} = .30$

Note that it corresponds to 30%.

SUMMARISING DATA:

Another area of common occurrence in research is presentation of data in summaries. When data is presented in summaries it enables the reader to see things more clearly. Examine Table I data which were scores obtained by a class of 40 pupils.

Table I

44, 42, 47, 43, 42, 48, 45, 44, 46, 47
47, 45, 43, 44, 47, 45, 42, 48, 46, 49
46, 41, 42, 47, 49, 46, 43, 48, 43, 45
40, 43, 44, 41, 43, 46, 45, 44, 43, 46

Now the same data can be presented in a frequency table as follows:

FREQUENCY TABLE:

score	frequency
40	1
41	2
42	4
43	7
44	5
45	5
46	6
47	5
48	3
49	2
50	0
	40

It can clearly be seen that the same data in Table I is seen better when it is presented in a frequency table. But much more can be done to improve the presentation.

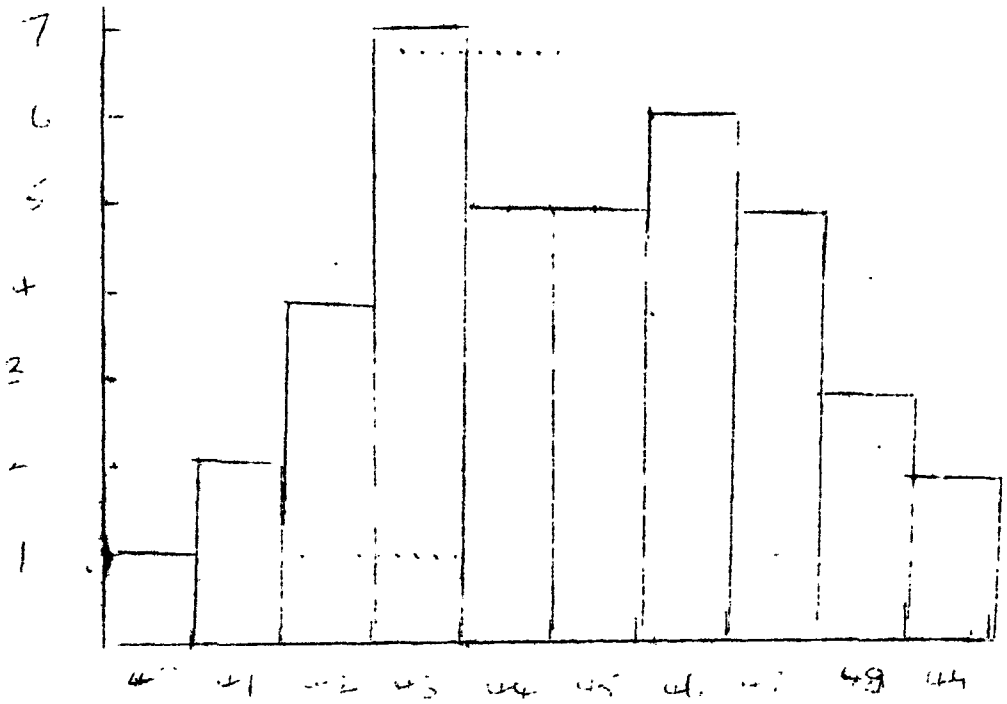
For example, the same data can be presented in a form where interval scale properties are added on:

score	frequency
40 - 41	3
42 - 43	11
44 - 45	10
46 - 47	11
48 - 49	5
	40

The data has been further compressed hence some detail has been lost. But this need not alarm anybody because sometimes the degree of precision required may not justfy the cost. Moreover, when this compressing is done to a very large body of data, most details is not lost. Conversely the detail may really not be required. A researcher should, however, ensure that these intervals do not overlap.

Data can also be presented in a form of graphs, pie-charts, histograms or frequency polygons. A histogram based on the same data, is presented below.

A H I S T O G R A M



MEASURES OF CENTRAL TENDENCY:

Arithmetic mean:

Is the sum of scores divided by the total number of cases involved and is usually designated by the symbol $\bar{X}$.

The formula for the arithmetic mean is:

$$\bar{X} = \frac{x_1 + x_2 \ldots\ldots\ldots + Xn}{N}$$

where X_1 is first score and N is the total number of cases.

In our earlier example of the exam scores by pupils, the mean would be calculated thus

$$\frac{44 + 42 + 47 + 43 + \ldots\ldots\ldots + 46}{40} = 44.73$$

There are other formulae for computation of the mean but these are not discussed here. The arithmetic mean is meaningfully used in situations where the results are evenly distributed otherwise it is affected by extremes.

The Median:

The median is calculated by re-ordering data in a hierarchical manner from high to low and then taking the middle value. Suppose we have the following data:

40, 60, 17, 18, 25, 16, 42, 29, 33, 39, 19.

The median is obtained by re-ordering the above data thus: 16, 17, 18, 19, 25, 29, 33, 39, 40, 42, 60, and the median then is 29. If the mid value falls between two numbers the two numbers are added together and then it is divided by two. The median is used when data has extreme values at the end.

There are more complicated formulae for calculating the median but these are not discussed here.

The mode:

The mode as a measure of central tendency refers to the value that has the most occurence. The mode is usually used when data is very large but there is one value with the greatest occurence. In our earlier examination scores, the data has a bi-modal 43 and 46.

MEASURES OF DISPERSION:

Another important group of statistics with common usage are measures of dispersion and these are the range, the mean deviation and the standard deviation. This is by no means an exhaustive list but it is adquate for our needs.

The Range:

The range is simply the difference between the lowest and the highest scores. It is a crude way of showing the variations especially to the less initiated. Using our scores the above the range would be 49 - 40 = 9.

The mean deviation:

Is the average of all the deviations from the mean and is given by the formular.

$$MD = \frac{\sum |x - \bar{x}|}{N}$$

The mean deviation is not a useful statistic other than to explain the calculation of the standard deviation. So it will not be discussed any further.

The standard deviation:

The standard deviation is a much more steady measure of dispersion than any other measure. It is therefore the most important statistical measure of dispersion and is widely used when dealing with the area under a normal curve. Its properties will not be dealt with now until we come to deal with statistical inference.

The formula for standard deviation is:

$$SD = \sqrt{\frac{(x - \bar{x})^2}{N}}$$

Example:

To find the standard deviation of the scores 72, 81, 86, 69 and 57 we proceed as follows: Let us call our scores x_1

x_1	$(x - \bar{x})$	$(x - \bar{x})^2$
72	+1	1
81	-8	64
86	-13	169
69	+4	16
51	+16	256
365	0	506

$\bar{x} = \frac{365}{5} = 73$ and S.D. $= \sqrt{506 \div 5} = \sqrt{101.2} = 10.06$

This can be explained in words as:

Step I: find the mean of the scores;

Step II: subtract the scores from the mean;

Step III: square the results in step II;

Step IV: substitute the results in the formula;

Step V: simplify.

Chapter Ten

DATA ANALYSIS II:

Categories, Coding and Tabulation:

We have so far seen how important some basic statistics are to the whole process of research let alone data analysis. Readers should make an extra effort to pursue other statistical books in order to bring themselves to a satisfactory level of statistical knowledge which will enable them to understand research better. We make no assumptions that the statistical conceipts outlined above are by any means a satisfactory statistical background for research.

Before we turn to look at what we mean by tabulation, let us first of all define what we mean by data analysis. We recognise that there are many definition which have been put forward by various authors. Some of them you may agree with or quarrel with. But our working definition will be that data analysis is the process of breaking down data into meaningful categories. Coding these categories and tabulating them in such a manner that causal relationships can be infered. Data analysis can be qualitative or quantitative or both.

The first point then to start explaining data analysis is to explain the process of establishing categories. Categories are groups of responses obtained from respondents either by way of background literature, observations, interviews and questions or any other kind of technique which may have been used. In the close ended questionnaires, structured observations or interviews; the categories may be precoded. This allows a quicker transference to the computer card or tabulation sheet.

But categories must satisfy certain conditions.

(i) They should be derived from a single classification. That is we talk of co-operators who are willing to work on Sunday being category I and co-operators who are not willing to work on Sunday being category II. The classification from whence these categories arise from is co-operators.

(ii) The set of categories should be exhaustive. What if, for example, a group of co-operators are being interviewed for a given opinion and we use the above categories co-operators who are willing to work on Sunday and those who are not willing to work on Sunday. And our interview reveals that there are co-operators who are undecided.

The categories above will be inadequate. We need to add a third category to show co-operators who are undecided in order to make our categories complete.

(iii) Categories should be mutually exclusive. What is meant here is that categories should enable responses to fit in one group. There should be no over lap. A situation where a response could be "either" "or" should be avoided.

Once categories have been established, they should be coded either with numbers or letters or any other symbol which a researcher would like to use. The reason behind coding them is to ma ke it easier for tabulation and also to reduce the problem of identification.

There are numerous difficulties associated with coding data after it has been obtained. Most of these difficulties arise from poorly designed questionnaires, incompetent interviewers etc. When these difficulties are experienced, interogation of the interviewers might improve the data. In other words all data which is brought in from the field should be checked for (1) legibility (2) comprehensiveness (3) consistency (4) completeness (5) uniformity and (6) in-appropriateness.

Only when the chief researcher is satisfied with the above should he allow coding to take place.

To demonstrate the above ideas with a practical example; we assume questionnaires were sent out to solicit information on the age, religion education and length of membership in Bagamoyo co-operative union. The returned questionnaires show that the ages of co-operators in the said union spread from 16 - 55 years, there are a variety of religions including some who have no religion. Education levels range from none to post-graduate. The duration of membership ranges from nero to 45 years. We can attempt to draw a hypothedical case of how such data may be coded. You will by now have noticed that our classifications are the very variables which were requested; age, religion, education and length of membership. Categories can then be derived and coded as follows:

Age	code
16 - 20	1
21 - 30	2
31 - 40	3
41 - 50	4
50 and over	5

A few observations can be made here especially with regard to how our coding has taken care of overlapping problems. Any given age from the responses will fit into one category only. But in practice one may find that there are some responses from members with an age less than 16 years. In this case it is advisable to have another category, "below sixteen".

Religion can also be categorised and be coded as follows:

Religion	code
Catholics	1
Lutherans	2
Muslims	3
Watchtower	4
Any other	5
No religion	6

Notice how we have avoided the use of the category protestants since protestants can be a number of different denominations. The use of the category "any other" is also build in case there is one religion which we do not know of or cannot remember at the time of designing the questionnaire.

Education levels can also be categorised and coded in the same manner:

Level	code
None	A
Primary	B
Secondary	C
Diploma	D
Degree	E
Postgraduate	F

Note that categories need not be represented by numerical figures only. But as a matter of simplicity especially where machines are being used numerals will be most superior.

We leave the categorisation and coding of duration of membership to the readers imagination.

After all the categorisation and coding has been done the next stage isto put this information on a tabular sheet sometimes called a data matrix. The advantages of doing this are numerous with the major ones being easy storage of data, computation becomes easier and infering conclutions becomes even easier.

A manual data matrix might look like this:

Questionnaire No.	Age	Religion	Marital status	Education	Membership	etc
1	3	1	1	2	4	
2	4	2	1	1	3	
3	1	1	2	2	1	
4	4	2	2	3	4	
5	5	3	1	1	1	
6	2	2	1	1	1	
7	1	2	2	1	1	
8	2	2	2	1	2	
9	4	2	1	1	1	
Total cases	9	9	9	9	9	

Chapter Eleven

DATA ANALYSIS III:

Interpretation of Results:

So far we have seen how a researcher goes about obtaining his data categorising this data and tabulating it and finally we need to see how he interprets his findings from the said data. We shall dispence with statistical inference from this chapter in order not to confuse or frastrate the mathematically uninitiated but some examples of statistical tests will be given in an appendix.

One of the most important inferences which can be obtained from the data matrix is what is typical of the population on which we have been researching. This is given by what statisticians call measures of central tendency we discussed in chapter eleven. The arithmetic mean will be found useful where we are dealing with data of an interval scale; i.e. "which is the most productive age group in a co-operative society". We can say that on the average the age 25 - 30 is the most productive after taking the averages of the produce of the various age groups in different societies, and find the 25 - 30 age group to be the most productive.

Sometimes we might want to find the most popular board meeting day of the week. The data we will obtain, the particular day, is of a nominal type. The mode is the statistic we would like to use in order to determine what is typical, i.e. by taking the day with the highest frequency.

Suppose the union would like to evaluate the ability of the society managers arfiliated to it. They may solicit members to rate the ability of these managers on a continum from 1 - 4. The data which will be obtained is of an ordinal type, hence the typicallity of the responses can be obtained by use of the median.

Sometimes we want to learn how the productivity of members in a co-operative society varies. We can do this by calculating the range, the standard deviation etc. The highier the standard deviation the larger the differences between members produce.

There are other statistics which can be used to show the relationship between variables such as correlation, analysis of variance etc. which we leave to the mathematical enthusiast to find from statistical text books. We, however, urge every researcher to aquaint his person with up to date statistical knowledge and ideas.

Sometimes there has been confussion whether non-quantifiable data forms a good basis for analysis. No one can doubt the fact that non-quantifiable data sometimes can be the only possible way to infer relationships. Non quantified data is usually used in a form of quotations to emphasise a point or to stimulate new insights. More over in most co-operative research there is likely to be more of qualitative as opposed to quantitative data collected due to the low level of research sofistication available.

To demonstrate one such way that inferences inferences can be made, let us use an example of a semi-experimental situation which we used to assess the impact of a training workshop at Taita Hills lodge in May 1980. Seminar participants were asked to rate their ability to identify a research topic before and after the workshop, on a continum from 1 to 7 as follows:

1	2	3	4	5	6	7
very poor	poor	slightly good	good	slightly good	very good	un-decided

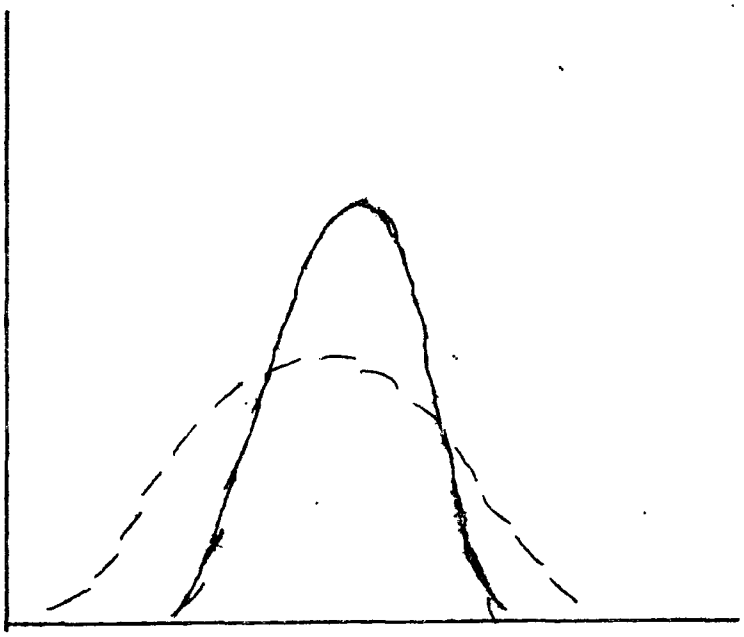
Ratings before workshop

Ratings	1	2	3	4	5	6	undecided
frequency	1	3	5	4	1	-	2

Ratings after workshop

Ratings	1	2	3	4	5	6
frequency	-	-	3	7	5	1

In order to simplify the analysis the two frequency tables were converted into frequency polygons as follows:



——— Before Workshop
_____ After Workshop

From the two graphs many interesting deductions can be made. The first one of course is that the two curves approximate a normal curve, which implies that there are no abnomalities in the sample which was being used. The second is that the average level of understanding of r ... problem identification, as a research techniques is at around 3 a category which is represented by "slightly good". After the workshop this ability has shifted to 4 which is represented by category "good". The shift in the average from 3 to 4 is one of the gains that the workshop has achieved. On further inspection we can see that the curve for; "before the workshop" is much larger than the one for "after the workshop". This implies that the former has a large standard deviation while the latter has a small standard deviation. This discrepancy can be explained that there was a greater disparity in knowledge among the course participants before the workshop than there was after the workshop. This is another score to the successes of the workshop. There are so many various ways of infering facts from data. We shall, in the appendix, include a few more.

Summary:

We have said that interpretation of results will depend on the researchers professional ability to design and conduct the research. There are many techniques both quantitative and qualitative which can be used but we leave this to the discretion of the reader to persue other books so that he can up-grade and supplimont the knowledge he has obtained from this one.

CHAPTER TWELVE

THE CASE STUDY METHOD

Case studies are distriptive or written historical accounts of organisations, or industries such as hospitals, villages, co-operative societies or unions etc. Case studies have been traditionally used in law and medicine but many other professions have build upon the idea incorporated them in their own studies.

The case method has received so much wide acceptance because it offers the closest possible substitute to an on the job experience and is particularly a most suitable means for teaching inter-displinery subjects.

While admitting that there are many different ways of approaching case analysis, the one we use in this book has a business flavour. Of course this is in recognition of the need to use better management techniques in co-operative organisations.

While admitting that cases are an invincible tool for analysing business situations or teaching college students, we also recognise the fact that cases have their own limitations. Cases are time specific hence render themselves out of date. This problem can be eliminated by continuous upgrading of

case material, as more information becomes available, but it must be appreciated that no case should be presented outside the ream of it's historical perspective. Cases are sometimes very difficult to analyse for the beginner hence can discourage the beginning student, but such a problem can be resolved by giving such students cases which progress from the most simple to the most difficult. Such an approach does not only provide the motivation to the student but also enables him to gain experience in handling cases.

Are cases scientific or unscientific?

The case method, although some Authors do not agree with this, has as much methodological approach as any other kind of research. All the data collection techniques discribed above can be applied in the process of collecting and building up information for the case. More over when a researcher wants to build up a case he cannot dispense with field data collection techniques. In order to randomise the errors in the data he has to collect he has to use probability sampling techniques to select the organisations which will be included in his sample. In short the whole research process is as much applicable to the case method as it is applicable to all other types of research.

Use of case Studies in Teaching:

Colleges can build case banks by using students, as part of their field work, to go out and collect data. This data should later be edited by the more experienced lecturers so that areas of interest can be highlighted. Where the time and money constraints allow, lecturers themselves can go into the field to collect this data, more over this data collection process will give them much valuable practical experience.

When this cases have been build up they should be placed in one central place, possibly the library and should be appropriately indexed for easy reference.

Cases for teaching should forecast on a particular area of interest, except of course where the interest is an inter-disciplinery approach, such as marketing, finance, organitional, manpower or any other aspect where the course being tought is forecast.

Cases should be build both for poorly managed societies or unions as well as the well managed. But they should not fail to show what let the organisation to its present position. The purpose of doing this, of course, is to give the student a greater latitude of handling co-opera tive problems.

The cases compiled should also enable the students to experience a variety of situations that they are likely to encounter in their career as a co-operative officers: As consultants, as chairmen of a societies etc.

The most logical way to teach with cases is that at the introductory stage, the lecturer should analyse a case together with the students in a class or tutorial. Later on, in subsequent tutorials or classes, the lecturer should assign a case to two or three students, to present before the class. The rest of students should also be given the same case to read in advance. This approach allows maximum participation by the class and enables the students to learn to defend their arguments. But the lecturer should, towards the end of the session, give a synopsis of the strenghts and weaknesses in the analysis.

Case Analysis: A simplified Approach:

A very basic requirement in case analysis is that you read the case over and over in order to get familiar with the main features of it.

The second stage will be to identify the major problem or problems facing the organisation. Make sure you do not bring out a miriad of less important problems. There will always be a few major ones on which the minor ones rest.

An accurate identification of the major problem usually renders the solution of minor problems very simple.

Minor problems will usually be found in functional areas such as marketing, finance, production, personnel, organisational and management etc. Once the minor problems have been found, it will be possible to re-group them in a strengths and weaknesses profile. Weaknesses are all those disadvantages which the society or union is facing, such as high production costs, lack of liquid assets, lack of interest on the part of members, a poorly skilled management team etc. The strengths are all those advantages that the society or union has over other organisations in the same field. These include easy access to cheap raw materials, monopoly for certain types of produce, tax holidays and concessions, a dynamic and inovative management team, access to cheap transport etc.

The strengths and weaknesses of the society or union constitute the internal environment of the organisation. These are advantages and disadvantages for which the society has control over.

The next stage is to recognise the opportunities and constraints facing the society or union. Opportunities are all those factors in which the society or union is well positioned and can take advantage of.

But usually, other organisations may also be favourably dispositioned to take advantage of them. Generally these factors are outside the control of the organisation. These include a favourable government policy towards co-operatives, discovery of new improved seeds, development aid geared towards co-operatives, government guarantee for purchase of particular agricultural produce. Constraints are all those unfavourable factors which are facing the society or union but the union or society has little or no latitude of action on them. These ... include price control in relation to raising costs, bad weather, export and import restrictions, lack of foreign exchange etc. The opportunities and constraints constitute the external environment of the co-operative union or society.

The next stage will be to look at the alternative actions open to the society or union given the strengths and weaknesses which the society or union has. Some of the key questions to ask will include:

(i) Given the strengths and weaknesses facing the society or union, which is the most possible and profitable action or actions to take?

(ii) Does the line of action taken eliminate all or at least the major weaknesses and fully take advantage of the opportunities in the environment?

(iv) Does the option anger well with the financial, manpower and other limitations of the society or union?

(v) Is the line of action well conceived to withstand the impact of environmental threats and constraints?

All these questions are designed to eliminate some of the options identified and enable the researcher to make lucid recommendations.

Summary:

We have seen that case studies though originate from medical and law disciplines, have attained wide acceptance in both research and teaching. Teachers can use cases for teaching in order to give students a close enough experience to their future working environment. Cases also enable the researcher or business analyst to scan the environment very effectively and make lucid recommendations.

CHAPTER THIRTEEN

EXPERIMENTAL METHODS:

Experiments are processes whereby the researcher deliberately manupulate one variable so that the effects of the manupulation on one variable can be measured against the other variable. The variable which is being manupulated is called the independent valuable while the variable which reflects the changes due to manupulation on the other is called the depend variable.

There has been much conflicting views as to whether an experimental situation is possible in most social research situations especially due to the difficulty of controlling external influence of interverning or extraneous variables, asthey are usually called. While admitting that there is truth in such statements the limitations imposed by such a problem does not render experiments irrelevant in co-operative research. The predictive validity of quasi experiments, explained in greater detail below, will be sufficient for our needs. More over well designed experiments can avoid such errors. A researcher in co-operative problems will not require such rigorous tests as needed by psychology for example.

Common Errors in Experimental Design:

The common errors which affect experiments include the following:

(i) Pre-measurement effects
(ii) Maturation effects,
(iii) History effects,
(iv) Instrument decay effects,
(v) Selection bias effects,
(vi) Loss of respondents effects,
(vii) Reactive errors,
(viii) Measurement timing effects.

Let us now discuss each of these errors in greater detail.

Pre-measurement effects:

Pre-measurement effect errors arise when a pre-test evokes an effect on the post-test not arising from the manupulation of the dependent variable. Suppose an experiment is being conducted to test the effect of an educational programme on member participation. A pre-test is taken before the treatment. Some members, knowing they will have to be post t sted continue to be actively engaged in co-operative work. The post-test will contain some values that cannot be attributed to the effect of the educational programme. If this effect is sufficiently strong the conclusions may be misleading.

Maturation effects:

These type of errors arise when the experimental period is long enough as to allow for pysiological or psychological

changes to take place. People grow older. People become insolent when they are being post-tested in the afternoon when they are tired. In other words length of the period between the pre-test and the post-test enables the changes in the variables being measured to take place.

History Effects:

History effects refer to what happens else where to influence the dependent variable, during the duration of the experiment. For example, suppose an experiment is being conducted on the productive capacity of an individual co-operative member working on an individual plot or on a communal plot. The member has to work under the two different conditions. Suppose while working on the communal farm he watches a film or reads an article on communal farming in Korea. He might be motivated to highier productivity or be discouraged. If these forces are sufficiently strong, the results might not reflect the true picture.

Instrument Decay Effects:

This problem arises from the fact that most events which are conducted over a period of time start with a highier enthusiasm and end up with a lower morale. This could reflect that the measuring instrument is better operationalised

at the beginning (pre-test) than at the end (post-test). On the other hand interviewers might start poorly but as they gain experience they can record better. In this way the pre-test and post-test will be affected differently and give misleading conclusions.

Selection Bias Effects:

The problem of selection bias arises from the difficulty of finding homogeneity in the experimental and the control groups. In most cases the researcher uses a matched pairs approach; respondents are selected according to some criteria. This, of course, introduces bias by the researcher. Some people may argue that randomisation of the errors by use of an equal chance approach, solves the problem. This might be so but a pauper can be counter balanced by a millionaire statistically.

The loss of respondents effect:

When an experiment is beind conducted over a long period of time there is likely to be a loss of respondents through moving, deaths, loss of interest etc. More over loss from the two groups is likely to effect the two groups differently. If such a thing happens, the difference between the results of the pre-test and the post-test will not be solely attributable to the treatment.

Reactive Errors:

Are those errors which occur when respondents are aware of the experiment taking place and alter their behaviour in order to give resonses which were anticipated by the researcher.

This problem is very much similar to the problem of conducting non-participant observation.

Measurement timing effects:

This problem arises from the difficulty of establishing when the impact of the treatment on the independent variable has taken place. When a post-test has been applied too early, the impact of the treatment will not come out clearly. When the post-test is applied too late, the impact of the treatment will already be too weak. The problem at issue here is how to estimate the gestation period of the treatment applied.

Designing Experiments:

Generally experiments will fall into two broad groups each of which have their own subdivisions thus we distinguish between laboratory and field experiments.

Laboratory experiments are those which are conducted in artificial environments designed to eliminate all or most of the

extraneous variables and are sometimes called controlled experiments. They have the major problem that the artificiality of the experimental situation may not evoke the true responses which can be found in the field situation. There is also the prohibitive cost of cost of having a large enough sample to enable precise generalisation of the results to the population. Laboratory type behevioral experiments are commonly used in Psychological research but is of little use to the researcher in co-operatives.

Field experiments are those type of experiments which are conducted in the natural setting of the respondents or which ever variables we are trying to measure. Some natural scientists refute these to be experiments proper but they are the ones which often finds common use in co-operative research. Field experiments may use or dispense with control groups. They may or may not fully control the extraneous variables. It is in fact more for the former reason that they are termed quasi-experiments.

Conceipts used in Experiments:

It is of great importance that we disgress a little to examine a few conceipts which are frequently used in experimental research and will be used a great deal in this chapter.

Control group:

A control group is the part of the sample which is not given any treatment in the experiment so that it can be used as the best measure of the impact of the treatment.

Experimental group:

An experimental group is the part of the sample to which a given treatment is applied so that the impact of the treatment can cause measurable changes.

Treatment:

Treatment, in experiments, is used to mean what ever i put which is applied to the experimental group to see how much impact it can bring about. Training materials in a class-room experiment is as much a treatment as a particular type of fertiliser which is being tested on a farmers plot.

Pre-test:

A pre-test is any form of assessment which is given to the experimental and control groups to establish homogeneity or to measure the current level of efficiency before the treatment.

Post-test:

A post-test is the form of assessment which is given at the end of the treatment to see how much impact the treatment has had.

Matched pairs selection:

Is selection whereby the characteristics of the variables which go into the experimental and the control groups are equated. That is if there is one person aged 22 in the control group there should be one aged 22 in the control group as well.

Random selection:

This is the situation where selection left to chance; i.e. selection by lottery methods or random numbers.

Types of Experiments:

Let us now look at the various types of experimental methods which may be of interest to us. We examine three different approaches but these are not an exhaustive list. We urge readers to expand their knowledge by use of other books on experimental design.

The Post-test no control group model:

In this experimental design the researcher simply introduces attreatment to an experimental group and then records the behaviour of the experimental group after wards. If there is a significant positive change in the variable being experimented on, he concludes that treatment has had some impact on the experimental group. But this impact might not arise from the treatment, due to extranious variables.

An example of this is what is commonly used when introducting new fertilizers in agricultural co-operative societies. The production capacity of a given acreage is examined after the introduction of a given fertilizer. If it shows a highier % change then the treatment, introduction of the fertilizer, is said to be the cause. Suppose the wheather was simply more favourable, or that the farmers worked and managed their plots better then before?

A consumer shop might also insert an advertisement in the shop on a particular day and record a relatively large % growth in sales. The increased sales might result from an increase of prices by other shops selling the same commodity. It could also be that the sales were spasmodically increasing even previously. Although this model is widely used it is not a superior model as it is affected almost by all the kind of errors discussed above. It is only advisable to use it in less serious studies. It is particularly recommended for the study of inanimate objects.

Pre-test and Post-test model:
without control group:

This is the situation where a pre-test is given in order to determine the level of response before the treatment is applied. But all the elements in the sample are exposed to the treatment. A post-test is given at the end of the treatment. It is very similar to the above except for the addition of the Pre-test. An example of this is the situation where a classroom teacher decides to experiment on new teaching materials. He gives a pre-test in order to establish those children with more or less the same level of intelligence. He administers the treatment, which is the new set of teaching materials. He gives a post-test to see if the score levels have significantly gone up. But this approach is particularly very succeptible to pre-measurement effects. The pre-test on its own may induce students to work harder, especially if they know or suspect that they are being measured. This problem can be eliminated by giving the pre-test and post-test to different members of the same group.

Pre-test and Post-test model with control group:

This approach is the most efficient of all the quasi-experimental models mentioned above. It involves the use of an experimental group and a control group. A post-test is

first given in order to establish homogeneity to both the experimental and the control group. Then the homogenious group is split into two groups either by random or matched pairs selection mentioned above. The treatment is given to the experimental group and then a post-test is given to both groups. If theexperimental group scores considerably much highier than the control group the gains can be atributable to the treatment. This is of course assuming that extraneous variable do not interfear.

There are many variations to these models explained above which can be developed in a bid to take care of the types of errors discussed above. Further more, there are many more complicated approaches which are beyond the scope of this text. The researcher can pursue other books if he is interested. We feel that the above are sufficient for the modest researches we have in mind.

Summary:

Experiments are extensively used in research in the pure science displines, but there is ample room for it to be used in behavioral type research. It is admitted that the nature of social science phenomenon renders controlled experiments difficult, except only in pyschological laboratories.

Controlled experiments suffer a great deal from the artificiality of the environment. For certain kinds of research only perhaps quasi-experiments can giventhe best results.

We have also seen that experiments are affected by a myriad of errors but the most outstanding are those arising from (1) pre-measurement effects, (2) maturation effects, (3) history effects, (4) instrument decay effects, (5) selection bias effects, (6) measurement timing errors. When a researcher designs experiments he must do his best to eliminate at most 80% of these errors unless the study is not required for more involving decisions.

There are several types of experimental designs which can be employed, some of them of course are very basic, while others are more complicated. The researcher in co-operatives will gain most by confining himself to the less complicated, unless he has more skilled knowledge which we do not claim this book to provide.

CHAPTER FOURTEEN

EVALUATION RESEARCH

Many a time a researcher is called upon to evaluate a firm or an on going programme. The set of circumstances that confront his study are somewhat different from those that confront the researcher when the study at hand is his own making. This has, as a result, brought about new research theory which has come to be known as "Evaluation Research".

There are many reasons why an evaluation study is commissioned among the outstanding ones are to continue or discontinue a programme; to improve its performance; to adjust or zero in the direction of the programme, to ensure an equitable further provision of resources, to delay an important decision and sometimes to shift the responsibility of an important decision from the decision maker.

There are also many contending views as regards the efficacy of using inside or outside evaluations. There are, of course, a number of arguments in favour of evaluation from within. These include the fact that internal officials have a long experience with the organisation hence can use this experience to reach sound conclusions and recommendations. It is also felt that once these recommendations are adopted there is readily available within the organisation

a consultancy service as regards their practical implementation. Despite all this, there is also the ppposing views such as that people engrossed with the organisation may not readily see the various issues falling outside their own experiences. They are too pre-occupied with the order of things to initiate new ideas. There is also the problem of "human element" when it comes to recommend the closure or stop page of a project or programme from which, they together with their collegues, derive a living. They have an in build loyalty to the organisation.

Outside evaluators are favoured mostly because of their impertiality to the organisation as they have no loyalities to contend with. It is also true to say that because they are not engrossed with the organisation's day to day affairs, they may be able to see what insiders cannot see. However, they also suffer the problem of lack of sufficient knowledge of the organisation or programme. But if the evaluators have long experience, the lack of inside knowledge can be compensated by the knowledge they posses from evaluation of other organisations and programmes.

The Design of an Evaluation:

The design of an evaluation will vary depending on the type of organisation or programme that is being evaluated. An evaluation will use any of the research techniques or a combination of techniques discussed above and will generally follow this format.

(1) Identification of the objectives or goals of the organisation or programme.

(2) A historical account of the performance of the organisation or programme.

(3) Assessment of the ability of the organisation or programme to achieve these objectives.

(4) Identifying the causal effects for the success or failure of the organisation or programme.

(5) Formulating alternative remedies to the situation.

(6) Choice of best alternative

The Objectives of the organisation or programme:

Objectives are those goals that the programme or organisation is intended to achieve. Objectives may be written or may be oral, in

which case the researcher may sometimes have to deduce them from the operating manuals. Objectives save three purposes the first being to provide a clear understandable ducumentation of the need for improvement and the comitment made to it, to provide a basis for measurement of performance, and to give positive motivation for the performer.

Once the objectives are laid down there is a greater latitude of action by key executives. Key executives know the direction of the organisation and the upper and lower boundaries within which they can act on their own initiative. Espocially when they are written, objectives do provide a clear documentation of the organisation or programmes direction and how officers are committed to the programme.

They also provide a means of assessing the success of the organisation or programme as they make it possible for achievement to be tested against these objectives. If for example the objectives of a union had been to increase cash income to members as well as provide social amenities, we can test the achievement of the union by observing how the incomes of members have changed as well as what social amenities have been provided during the life of the union.

We can test the achievement of the union by observing how the incomes of members have changed as well as what social amenities have been provided during the life of the union. We can also use key factor ratings to assess other qualitative variables that may be relevant.

It is also clear that once objectives are collectively derived the people who have been part of the formulation thrive to achieve these objectives as they identify with them as their own objectives. In other words the individuals objectives also become the organisation's objectives.

2. A Historical Account:

The historical account of the performance of the programme can be given either in financial or other quantitative variables. It can also be given in qualitative terms. The purpose of tracing the historical performance of the organisation or programme is to produce data which will be used to test how far the objectives of the organisation or programme are being achieved. When collecting data on the historical account, official records such as reports, financial statements,

correspondence etc are usually the best sources of this data. Sometimes interviews by long standing official will provide very valuable information. Other data collection techniques, though may be of little value, can be used.

Assessment of the ability of the organisation to achieve its objectives:

This stage is very similar to the one suggested for case studies, that is to test the organisation's or programme's resources against its ability to achieve the objectives.

In the case of personnel, the senior management's capacity can be seen through their responses to given threats or how well they took advantage of the situation. In the case of financial resources accounting ratios, or financial statements can help one to assess how well the programme or organisation had coped, given the internal problem facing it.

Identifying causal effects:

After the capacity of the organisation or programme has been assessed, the next stage is to identify those major reasons causing bottlenecks. These may be internal to the programme or organisation, in which case they are capable of being adjusted from with in.

They may also be external, the key executives of the organisation or programme do not have control over them. It may be possible to influence decisions in the programmes favour.

Finding Remedies to the Problems:

Once the causal effects have been identified, the next stage is for the evaluator to find remedies for the problem. Sometimes the evaluator might find the organisation or programme doing very fine and will recommend that it continues as it is (although this is very rare). Sometimes the evaluator finds that the objectives have become redundant with the passing of time, or that the operational techniques do not tie in very well, he may recommend for adjusting the course of the programme. Sometimes the researcher finds the programme not achieving its objectives and has to recommend for its scraping.

A moral issue arises whether an evalutor has to take consideration of the fate of the families or people that are going to be affected by such a recommendation.

One thing to bear in mind is that it is not the responsibility of the evaluator to stop the programme. He merely points at the facts, which may not make the programme continue. If he does not disclose facts which he knows well to be important, it is a failure on his part to execute his responsibility properly. Moral considerations should be kept outside the study.

Summary:

We have seen that evaluation is another useful tool at the disposal of the researcher. Evaluations use some of the research techniques such as documentary sources, interviews, case studies and experimental methods, already explained above.

Evaluations have their merit and demerits if they are conducted by insiders or outsiders. The persons commissioning the study will normally weigh the pros and cons before they finally decide who should do the study.

The evaluator must maintain his professional integrity by not allowing moral consideration to influence his findings.

CHAPTER FIFTEEN

The Research Budget and Research Administration:

Although we have, some where above mentioned the resource contraints which a researcher faces when preparing to carry out a research, we have not given it a thorough treatment. We now discuss the various problems involved in budgeting and administering the research.

When a researcher makes an application for funds from a foundation it is almost all the time that he will never get all the funds he needs. When a student is getting ready to plan his thesis he is faced with the constrant of having too little money to carry out his investigation thoroughly. Even when a foundation sponsors a study, its control on the funds may be lost. It is then of at most importance that there is a clear understanding of the process of planning the study in order to maximise its results. In research budgeting we consider four important areas. These are time, personnel, transportation, stationery and other forms of equipment, secretarial services etc.

Time:

Most of the studies which are commissioned have a specific time dimention in which the study has to be accomplished. When this is the case, especially where the study is required for a specific event, the researcher has very little that he can do about stretching the time. One of the commonest ways of dealing with the problem of time is to break down the various research activities into smaller components. The researcher may use what is called a network. By breaking down the research into smaller components, he is able to see which components can be done simultaneously and which ones can be contracted out. Sometimes when the project is over a long period of time it can be broken down in stages.

The importance of time lie in that it gives the researcher a basis for estimating personnel and financial requirements.

Personnel:

The magnitude of the research project will determine the amount of personnel needed and personnel will also help to cut down on time.

The major difficulty however is to find experienced research personnel which can be used readily. This problem is mostly overcome by using students during their long vacation. The advantage with this approach is that it does not only assist the researcher in cutting down training costs, but it also enables the students to gain valuable practical experience. The only problem with this is that students are usually only available during long vacation.

When students are recruited as enumerators, they should be given training in basic interview and interogation techniques, before they are sent into the field. Even with this basic training, it will be most prefered if the chief researcher accompanies them on their initial interviews. But this might prove very difficult where the area of coverage is very geographically dispersed. The researcher may then use research assistants. Research assistants are those enumerators who are more experienced and can supervise others.

Transportation:

Transportation plays a major role in that it provides the ability for the researcher to move from one poace to the other.

In a situation where a national study is being made it is imperative that reliable transport ought to be secured. Reliance on public means creates numerous delays which increase the cost of the research project. More over if the difficulty of reaching certain areas are pronounced, it may only make eneumerators falsify the questionnaires.

The calculation of the costs must be based on anticipated mileage to be covered. Sometimes it might be useful to estimate the cost to the atmost outlying areas although the sample drawn might not reach as far out as this. It is better to have more funds than to run short.

Stationery and Equipment:

It is no doubt that a research will take a large quantity of stationery. This is usually under-estimated at the time of application for funds. Care must be taken not to underestimate this because no matter how well a research is done, it is only so when it is put on paper and others can read it. It is of no use conducting a study which at the end of all the effort, there are no funds for producing sufficient reports.

Sometimes when the interviews are extensive, there is need to buy such equipment as tape recorders. All these must be anticipated within the budget. Paper clips, drawing pins, pens etc are all items which are important during the research.

In some studies computer time might be needed, but in our kind of research, this might not be necessary. However provisions must be made for photocopying costs. The researcher may well need to do this instead of wasting the valuable time he needs during field work on reading one long pamphlet.

Secretarial Services:

Secretarial services are the necessary typing and printing work which will be needed during the course of the research. The researcher must decide whether he will need to employ a full or part-time typist or he should hire one as the need arises. It must be clarified here that cost and degree of competence required must be reckoned with. There is no need to employ a substandard secretary when the report is required for a high level audience.

Contigencies:

Contigencies are those kind of costs which are impossible for the researcher to anticipate. These will include sudden changes in prices. The inability to reach a respondent on the first attempt. Some form of inducement to the respondent when it appears difficult to secure an important interview etc. But this does not include inflationary trends which can be anticipated. Generally it is advisable to allow 10 - 15% on the basic cost.

Sources of Research Funds:

There are a number of foundations which offer funds for research throughout the world. Most National Governments will also sponsor research but the crucial issue is that a good proposal be prepared and be circulated far in advance of the anticipated time when the research will be conducted. One attempt may be unsuccessful but the researcher should not be discouraged. He should attempt a second time taking note of the reasons why the proposal had been rejected.

Research Administration:

It has been observed above that research involves a number of people. There is the people who are actually conducting the research, there is also the people on which the research is being conducted, then there is the people who are sponsoring the research. All of these have diverse interests, which require some form of research administration to be developed, to handle them. There are no hard and fast rules on how research administration is conducted as this will largely depend on the sponsors.

There is a need to have an advisory committee, which will act as a means of identifying the research priorities and act as a sounding bell to what is happening in the field. Such a committee has the advantage that it checks the researchers from engaging in ego-centric studies which may not have common use.

There is also the need to build in some form of training component so that new ideas can be desseminated, as well as act as a means to staff development.

Before any research commences, there is need to obtain clearence from authorities concerned, as a matter of protocal, so that studies are not frastrated in mid-course.

There is also a need to monitor the research project either by visiting the field, or requesting periodical reports. Some times the release of funds for the next stage is also tied up with the periodical reports.

There has also been an increasing amount of frustration on the part of the respondents who, sometimes, are promissed outcomes which have nothing to do with the study. This is usually done by ambitious and unscrupulous researchers. This has the problem of making it difficult for other researchers to obtain responses from these same people. The researcher must attempt to go back and explain the outcome of the research and he should not promise people the miracles he cannot create.
The researchers must always uphold an honest approach to the whole study.

CHAPTER SIXTEEN

Report Writing:

When a researcher has finally carried out his study, it remains now that he should write out his report to the sponsors of the research and all other interested parties. When preparing to write this report the researcher must confront himself with a number of important issues. First, he must determine the style of presenting the report inview of his audience. Should the report b. be technical or should it be from a lay mans point of view? Second, he must ensure that the language which is used is not one which will cause confusion or misunderstanding. In other words the report will go a long way in explaining the report findings if it is presented in clear and simple language. Third, some reports are intended to be of a confidential matter. The researcher should not abuse the authority of the sponsors by circulating the report to other than those authorised to read it. Even where the intention of the sponsors is that they should have an exclusive right to the report, the researcher is bound by the requirements of the sponsors, but of course such issues should be settled before the study is actually conducted.

Steps in Report Writing:

The first step in report witing is obviously to determine the audience, which in turn will enable the researcher to decide whether it will be a technical report or a lay mans report. Where a lay mans' report is the case the researcher may dispence with disclosing the research instruments and types of tests used. Where the report is to be technical the researcher must include all the research instruments used, the techniques used in data collection and any other processes which require to be disclosed in order to enable other researchers to examine the work done more effectively.

Once the above has been done, the next stage is to make an outline or sketch of the report itself. This should be done shortly after the data analysis has been completed in order not to allow the ideas to rust. The sketch must forecast on the major issues to be contained in the report. It should contain punch line statements which will be expanded later.

There are no hard and fast rules at to what the contents of a report should be, but a standard outline appears to be generally acceptable and this takes the following format:

(i) The title page
(ii) The table of contents
(iii) Summary of the findings
(iv) Background
(v) Objectives of the research
(vi) Research design
(vii) Findings
(viii) Limitations
(ix) Conclusions and recommendations
(x) Appendicies if any

The Title page:

The title page is usually the front cover of the report which is usually made on thick paper in order to reinforce the rest of the report. But it need not necessarily be on thick paper. It should contain the title of the study which is actually a brief statement of the problem being studied. Sometimes it also contains the names of the author(s) of the report. It should also contain the date when the report was published.

The Table of contents:

The table of contents provides an easy reference to the contents of the report and should be used when ever the report is long enough to warrant easy and quick reference.

Summary of the study:

Is important where the audience, does not have much time to peruse through all the text. The summary of contents takes about one page. Some authors argue that placing the summary at the beginning reduces the possibility of the text being read. This may be true, but in most non-academic research the people who make decisions do not read the full text of the report. They usually assign the reading to some other techinical official who later advises them regarding the findings and conclusions in order that they may take the decisions. In this respect the summary in front of the text should not be dispensed with.

Background:

The background to the study will show how the study was conceived and what ever relevant justification. It should also show any background literature or other similar studies which have been consulted and their relevance to the study at hand.

Objectives of the Research:

This is merely a tabulation of what the research is intended to achieve. It could be an improvement of managerial skills, it could be solving an existing problem, or it could be to increase knowledge in a certain area, etc.

Research Design:

This will contain the methodological issues such as sampling techniques applied, methods of data collection. It might also contain the justification for the use of such techniques as have been applied.

Findings:

The findings are conclusions which have been derived from the study. Sometimes it also explains the confidence levels of such findings.

Limitations:

We have said some where before that, a researcher is usually confronted with having to conduct the study with very limited resources, in which case he may not be as thorough as he would have liked to be. It could also be that he discovered some limitation in his research instruments. All these factors must be disclosed. He may also suggest other studies by which such issues might be clarified.

Conclusions and Recommendations:

These are the same as those which were included in the summary above. The only difference is that they are more detailed at this stage.

Appendixes:

Appendixes save the purposes of removing the mumbo-jumbo of tables and figures, which if included in the main text will cause some disencantment or confusion to the reader. They also save the purpose of leaving out the most complicated calculations to the last pages, out of the main text, hence they can be given thorough treatment.

Dispite having given such a detailed list, it should be only treated as a guideline. The individual researcher is free to develop his own style.

Summary:

We have seen that report writing is a complicated affair which can only be mastered through the researchers own experience. However a few points need to be observed when a report is being written. Use a simple and straightforward language, know your audience well, so that the report may be designed to accomodate them. Write your first draft soon after your field work so that the ideas from the field do not rust.