II.BA: ECONOMICS

MATHEMATICAL METHODS-I

BY

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UNIT-I

INTRODUCTION TO STATISTICS

DEFINITION

- "Statistics is defined as collection, Presentation, analysis and interpretation of numerical data".

Acc. Croxton & cowden

- statistics is the sciences and art of dealing with figure and facts.

R.Dh@ker, Lecturer, PCNMS

Use & Application of Statistics

- It facilitates comparisons
- It simplifies the message of figure
- It helps in formulating and testing hypothesis
- It help in prediction

R Dh@ker, Lecturer, PCNMS

Descriptive statistics

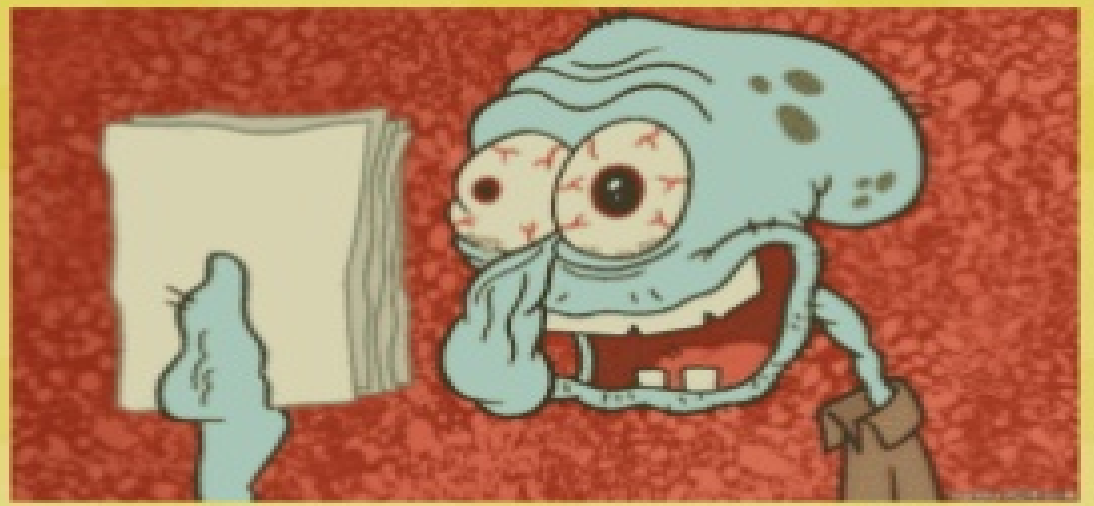
- Descriptive statistics use to organize and summarize the data to draw meaningful interpretations.
- Descriptive statistics deal with the enumeration, organization and graphical representation of data.

Characteristics of Statistics:

1. Statistics are aggregate facts
2. numerically expressed
3. It can be estimated
4. Collected with reasonable standard
5. Placed in relation to each other

DATA

A collection of observable information or facts.



Notes # 1

QUALITATIVE VS QUANTITATIVE DATA

Quantitative Data

These are numerical information obtained from counting or measuring that which can be manipulated by any fundamental operation.

Notes # 1

SOURCES OF DATA:

PRIMARY AND SECONDARY DATA

PRIMARY DATA

- Primary data are those which are collected afresh and for the first time and thus happens to be original in character.

- It is the real time data which are collected by the researcher himself.

SOURCES OF PRIMARY DATA

- Observation Method
- Interview Method
- Collection Of Data Through Questionnaires
- Collection Of Data Through Schedules

OBSERVATION METHOD

- The observation method is the most commonly used method specially in studies relating to behavioural sciences.

- Observation method becomes a scientific tool and the method of data collection for the researcher , when it serves a formulated research purpose is systematically planned and recorded .

- It is subjected to checks and controls on validity and reliability

- Under this method , the information is sought by way of investigator's own direct observation without asking from the respondent

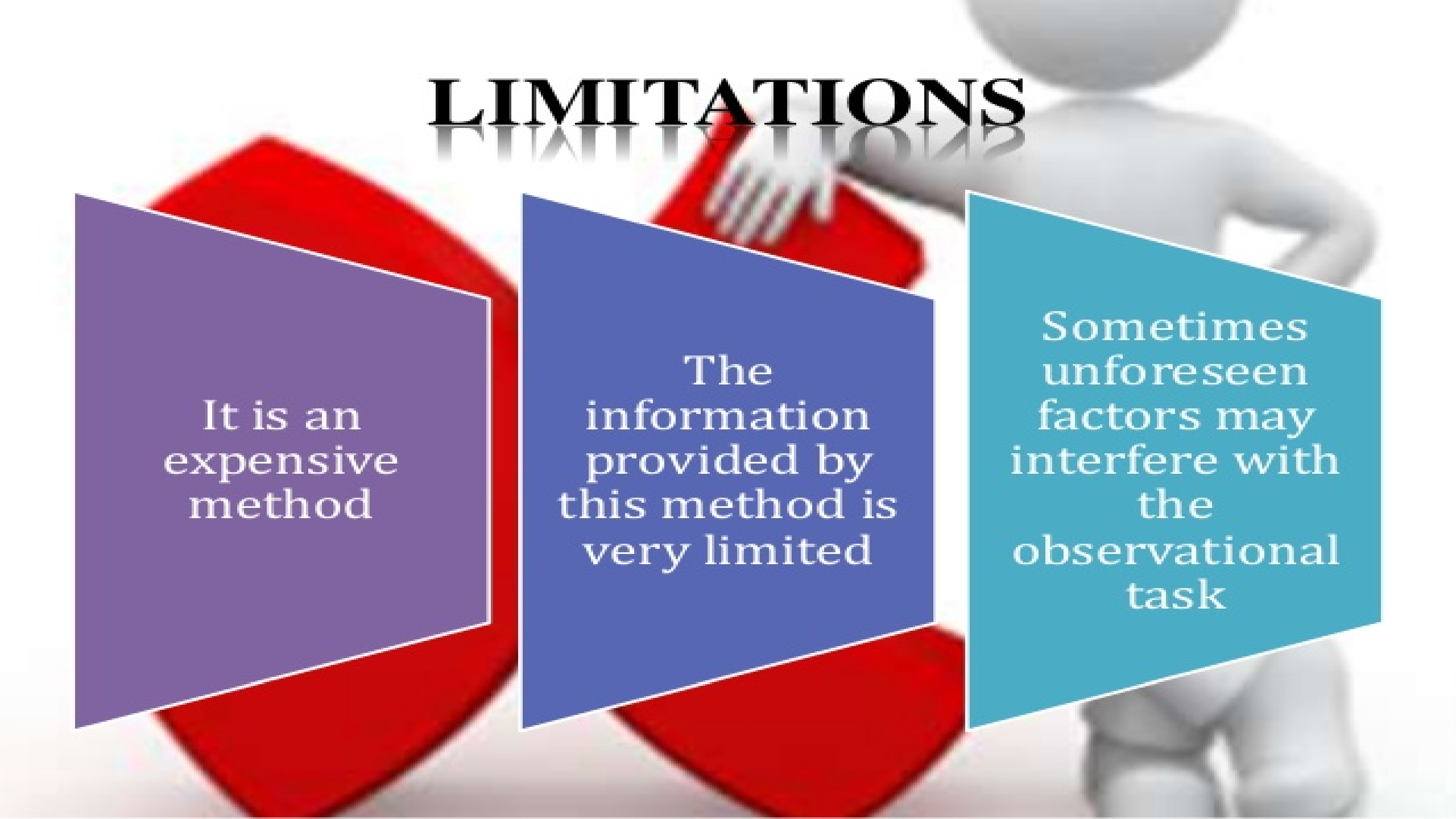
ADVANTAGES

Subjective bias is eliminated, if observation is done accurately.

The information obtained under this method relates to what is currently happening

This method is independent of respondent's willingness to respond.

LIMITATIONS



It is an expensive method

The information provided by this method is very limited

Sometimes unforeseen factors may interfere with the observational task

TYPES OF OBSERVATION

- Structured Observation
- Unstructured Observation
- Participant Observation
- Non-Participant Observation
- Controlled Observation
- Uncontrolled Observation

INTERVIEW METHOD

- The interview method of collecting data involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses.

- This method can be used through personal interview and if possible through telephone interviews .

PERSONAL INTERVIEW

- Personal interview method requires a person known as the interviewer asking questions generally in a face-to-face contact to the other person or persons

- This sort of interview may be in the form of direct personal investigation or it may be indirect oral investigation.

- In the case of direct personal investigation the interviewer has to collect the information personally from the sources concerned.

- This method is particularly suitable for intensive investigation.

- But in certain cases it may not be possible to contact directly the persons concerned or on account of the extensive scope of enquiry, the direct personal investigation technique may not be used

- In such cases an indirect oral examination can be conducted .

- ✓ In Indirect oral examination the interviewer has to cross examine other persons who are supposed to have knowledge about the problem under investigation and the information , obtained is recorded.

TYPES OF PERSONAL INTERVIEW

- STRUCTURED INTERVIEW
- UNSTRUCTURED INTERVIEW
- FOCUSSED INTERVIEW
- CLINICAL INTERVIEW
- NON-DIRECTIVE INTERVIEW

- ***Structured Interviews*** are those involving the use of a set of pre-determined questions and of highly standardized techniques of recording.

- The ***Unstructured Interviews*** are characterised by a flexibility of approach to questioning . They do not follow a system of pre determined questions and standardized techniques of recording information.

- ***Focussed interview*** is meant to focus attention on the given experience of the respondent and its effect.

- The ***Clinical Interview*** is concerned with broad underlying feelings or motivations or with the course of individual's life experience.

- In the case of ***Non-directive Interview*** , the interviewer's function is simply to encourage the respondent to talk about the given topic with a bare minimum of direct questioning.

ADVANTAGES

More information and that too in greater depth can be obtained.

Personal information can as well be obtained easily under this method

Samples can be controlled more effectively as there arises no difficulty of the missing returns

The interviewer can usually control which person (s) will answer the questions.

LIMITATIONS

It is a very expensive method ,specially when large and widely spread geographical sample is taken

There remains the possibility of the bias of the interviewer as well as that of the respondent

This method is relatively more time consuming

Under this method the organization required for selecting , training and supervising the field staff is more complex with formidable problems

Interviewing at times may also introduce systematic errors

TELEPHONE INTERVIEW

- This method of collecting information consists in contacting respondents on telephone itself.

- It is not a very widely used method but plays an important part in industrial surveys , particularly in developed regions.

MERITS

- It is more flexible in comparison to mailing method.
- It is faster than other methods
- Cheaper than personal interviewing method
- There is a higher rate of response than in mailing method
- No field staff required

DEMERITS

Surveys are restricted to respondents for considered answers

Extensive geographical coverage may get restricted by cost considerations

Possibility of the bias of the interviewer is relatively more

Questions have to be short and to the point.

QUESTIONNAIRES

- This method of data collection is quite popular , particularly in case of big enquiries.

- It is being adopted by private individuals ,research workers , private and public organizations and even by govts.

- In this method a questionnaire is sent to the persons concerned with a request to answer the questions and return the questionnaire .

- A questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms.

- The questionnaire is mailed to respondents who are expected to read and understand the questions and write down the reply in the space meant for the purpose in the questionnaire itself.

- The respondents have to answer the questions on their own.

MERITS

There is low cost even when the universe is large and is widely spread geographically

It is free from the bias of the interviewer

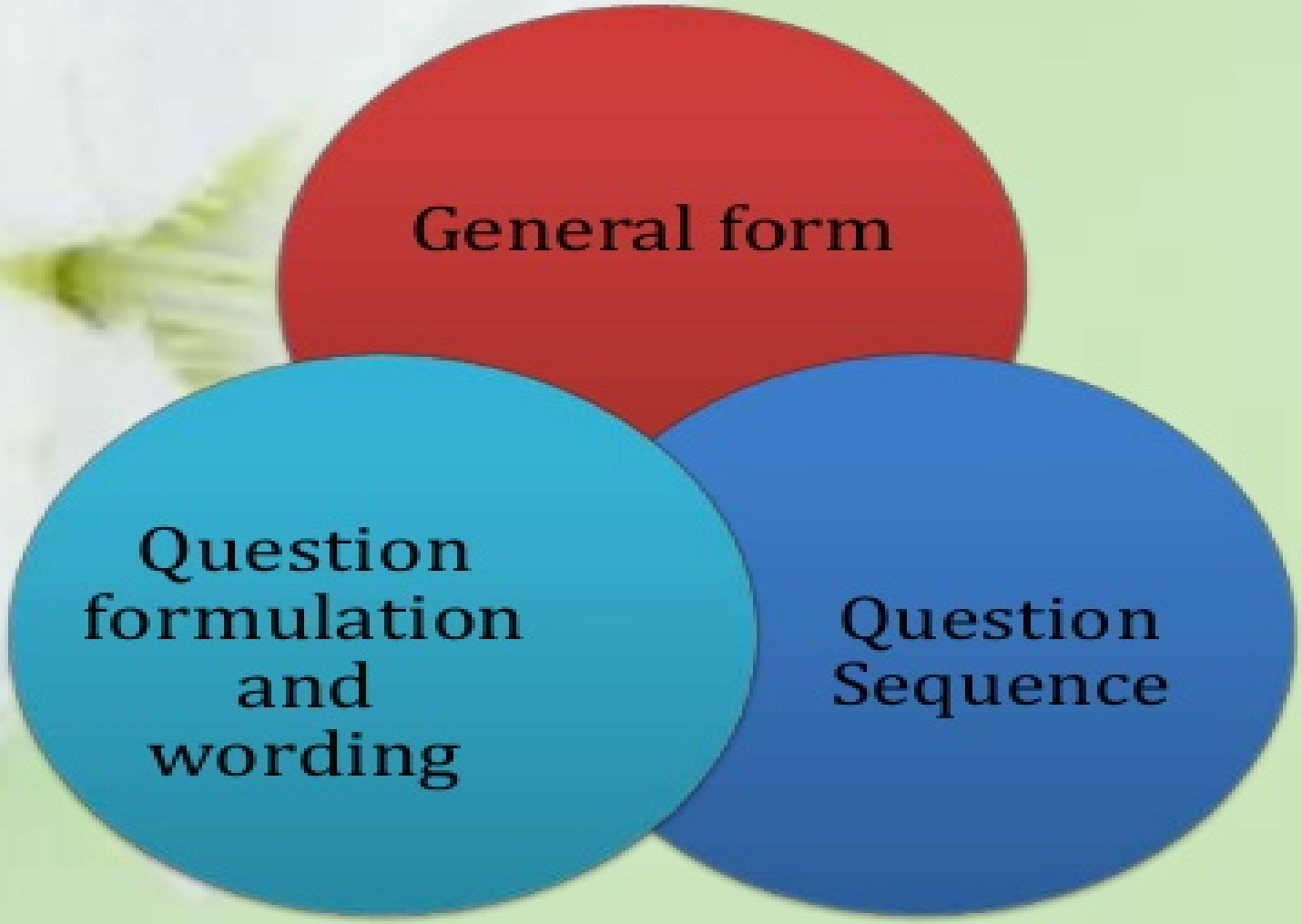
Respondents have adequate time to give well thought out answers

Respondents who are not easily approachable can also be reached conveniently

DEMERITS

- Low rate of return of the duly filled in questionnaires ; bias due to no-response is often indeterminate
- It can be used only when respondents are educated and cooperating
- The control over questionnaire may be lost once it is sent.
- It is difficult to know whether willing respondents are truly representatives

MAIN ASPECTS OF A QUESTIONNAIRE



GENERAL FORM

- As the general form of a questionnaire is concerned, it can either be structured or unstructured questionnaire.

- Structured questionnaires are those questionnaires in which there are definite, concrete and pre-determined questions.

- The questions are presented with exactly the same wording and in the same order to all respondents. The form of the question may be either closed (i.e., of the type 'yes' or 'no') or open (i.e., inviting free response).

QUESTION SEQUENCE

- In order to make the questionnaire effective and to ensure quality to the replies received, a researcher should pay attention to the question-sequence in preparing the questionnaire.

- A proper sequence of questions reduces considerably the chances of individual question being misunderstood.

- The question-sequence must be clear and smoothly-moving.

QUESTION FORMULATION AND WORDING

- The researcher should note that each question must be very clear for any sort of misunderstanding can do irreparable harm to a survey.
- Question should also be impartial in order not to give a biased picture of the true state of affairs.
- Questions should be constructed with a view to their forming a logical part of a well thought out tabulation plan.

ESSENTIALS OF A GOOD QUESTIONNAIRE

- Questionnaire should be comparatively short and simple.
- Questions should proceed in logical sequence moving from easy to more difficult questions.
- Questions may be dichotomous (yes or no answers), multiple choice (alternative answers listed) or open-ended.

- There should be some control questions in the questionnaire which indicate the reliability of the respondent.
- Questions affecting the sentiments of respondents should be avoided.
- Adequate space for answers should be provided in the questionnaire to help editing and tabulation
- Brief directions with regard to filling up the questionnaire should invariably be given in the questionnaire itself.

SCHEDULES

- Schedules are being filled in by the enumerators who are specially appointed for the purpose.

- These enumerators along with the schedules go to respondents , put to them the questions from the proforma in the order the questions are listed and record the replies in the space meant for the same.

- In certain situations, schedules may be handed over to respondents and enumerators may help them in recording their answers to various questions in the said schedules.

- Enumerators explain the aims and objects of the investigation .
- They also remove the difficulties which any respondent may feel in understanding the implications of a particular question or the definition or concept of difficult terms.
- This method requires the selection of enumerators for filling up schedules or assisting respondents to fill up schedules and as such enumerators should be carefully selected.

Collection of Data

Secondary Data

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Secondary Data

Secondary data means data that are already available i.e., they refer to the data which have already been collected and analysed by someone else. When the researcher utilizes secondary data, then he has look into various sources from where he can obtain them.

Characteristics of Secondary Data

- Insight into Total Situation
- Helpful in Hypothesis Formulation
- Supplementary Information
- Cost, Time and Effort Saving
- Helpful in Testing the Hypothesis

1. Insight into Total Situation:

The purpose of the available materials is to explore the nature of the data and the subjects to get an insight into the total situation. While looking for the data required by the researcher, he may uncover more available data than are often assumed to exist. This contributes significantly to the unfolding of hidden information.

2. Helpful in Hypotheses Formulation:

The secondary data helps in the formulation of research hypothesis. While an investigator may have one or two hypotheses, which he might have deduced from theory, the study of available materials may suggest further hypothesis.

3. Supplementary Information:

Available documents may be used to supplement or to check information gathered specifically for the purposes of a given investigation.

4. Cost, Time and Effort Saving:

The secondary data is the information that is already created by someone else. Therefore, it saves cost, time and effort. The researcher gets accurate and ready data.

5. Helps in Testing the Hypothesis:

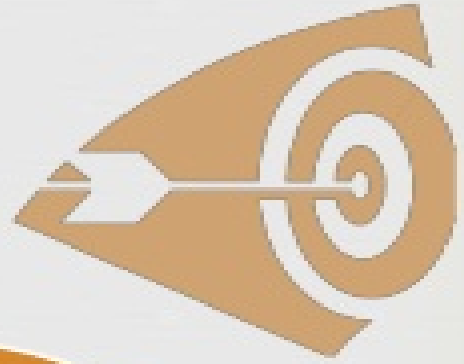
The available records may help in testing the hypothesis.

Importance of Secondary Data

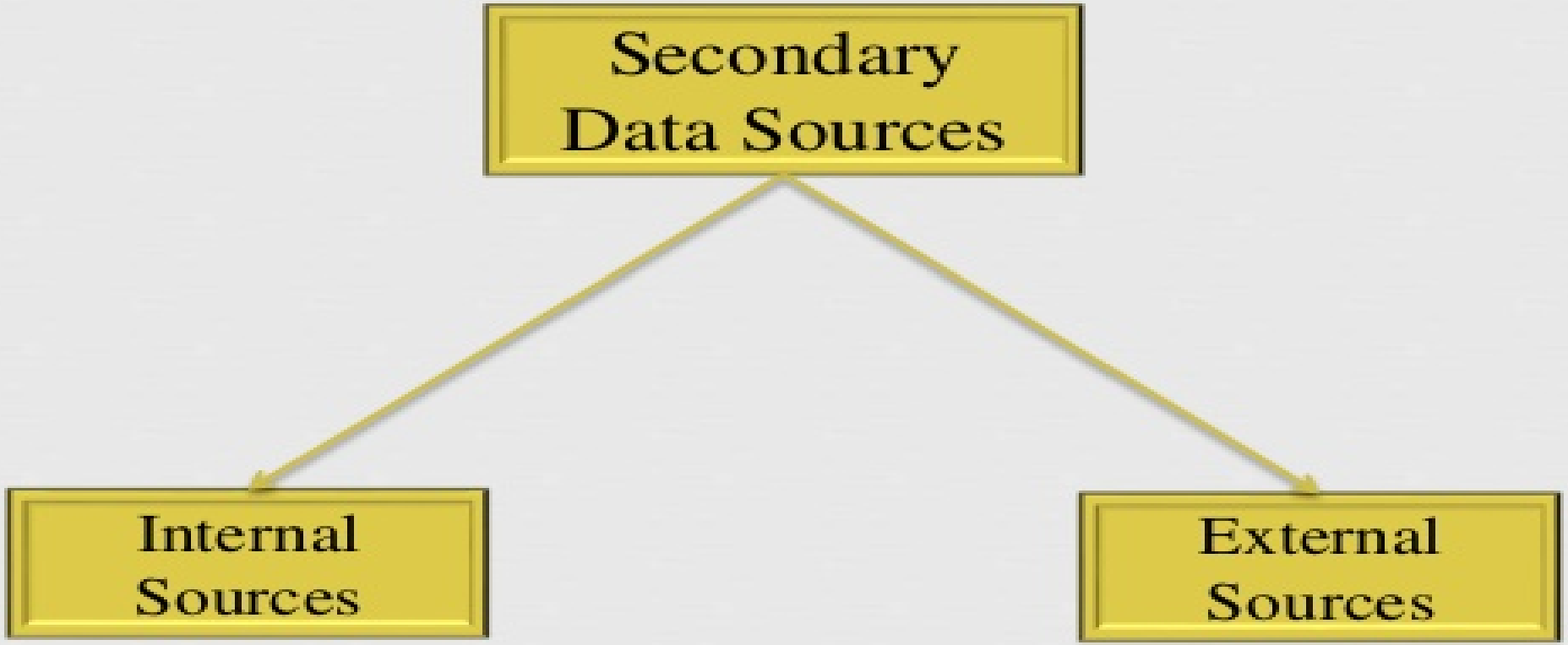
Importance of Secondary Data

- Easily Available
- No issues regarding disclosure
- Helps in comparative analysis
- Helps define the population

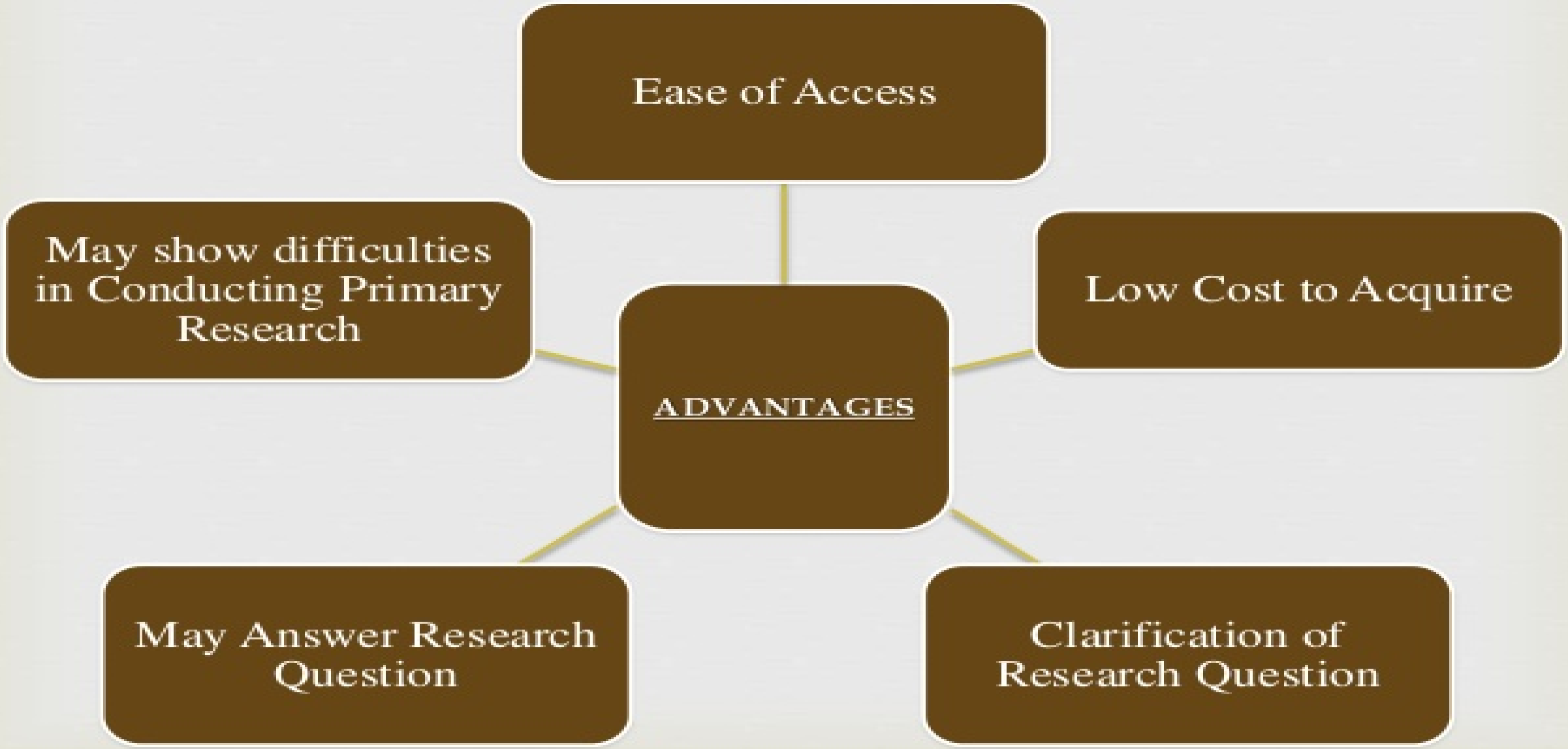
Factors to be considered for Secondary Data



Sources of Secondary Data



Advantages of Secondary Data



Disadvantages of Secondary Data

“Tabulation”

INTRODUCTION

The classification of data leads to the problem of presentation of data. The presentation of data means exhibition of the data in such a clear and attractive manner that these are easily understood and analyzed. There many forms of presentation of data of which the following three are well known: (i). Textual Presentation, (ii). Tabular Presentation, (iii). Diagrammatic Presentation. Here, we discuses in detail Tabular method of data presentation.

What is a Table:

- A table is a symmetric arrangement of statistical data in rows and columns.

DEFINITIONS

"Table involves the orderly and systematic presentation of numerical data in a form designed to elucidate the problem under consideration."

---According Prof. L.R.Connor,"

"Table in its broadest sense is an orderly arrangement of data in column and rows. "

---According to Prof. M.M. Blaire

MEANING

In the light of above mentioned definitions we can say in brief, **"Table is systematic organization and presentation of data in the form of rows and columns. Whereas rows are horizontal arrangements and columns are vertical arrangements.**

Features of a good Table

- Title as compatible with the objective of the study
- To facilitate comparison.
- Ideal Size
- Stubs
- Use of Zero
- Heading

cont…

- Abbreviation
- Footnote
- Total
- Source of data
- Size of Columns
- Simple, Economical and Attractive

Objectives of Tabulation

- To carry out investigation
- To do comparison
- To locate omissions and errors in the data.
- To use space economically
- To simplify data
- To use it as future reference

Parts of a Table

- Table number
- Title of the table
- Caption and stubs
- Body
- Prefatory or head note
- Footnotes

Parts of a Table

Table Number and Title [Head or Prefatory Note (if any)]

Subheading	Caption		Total(Rows)
	Subhead	Subhead	
Column-head	Column-head	Column-head	
Sub Entries			
Total (column)			

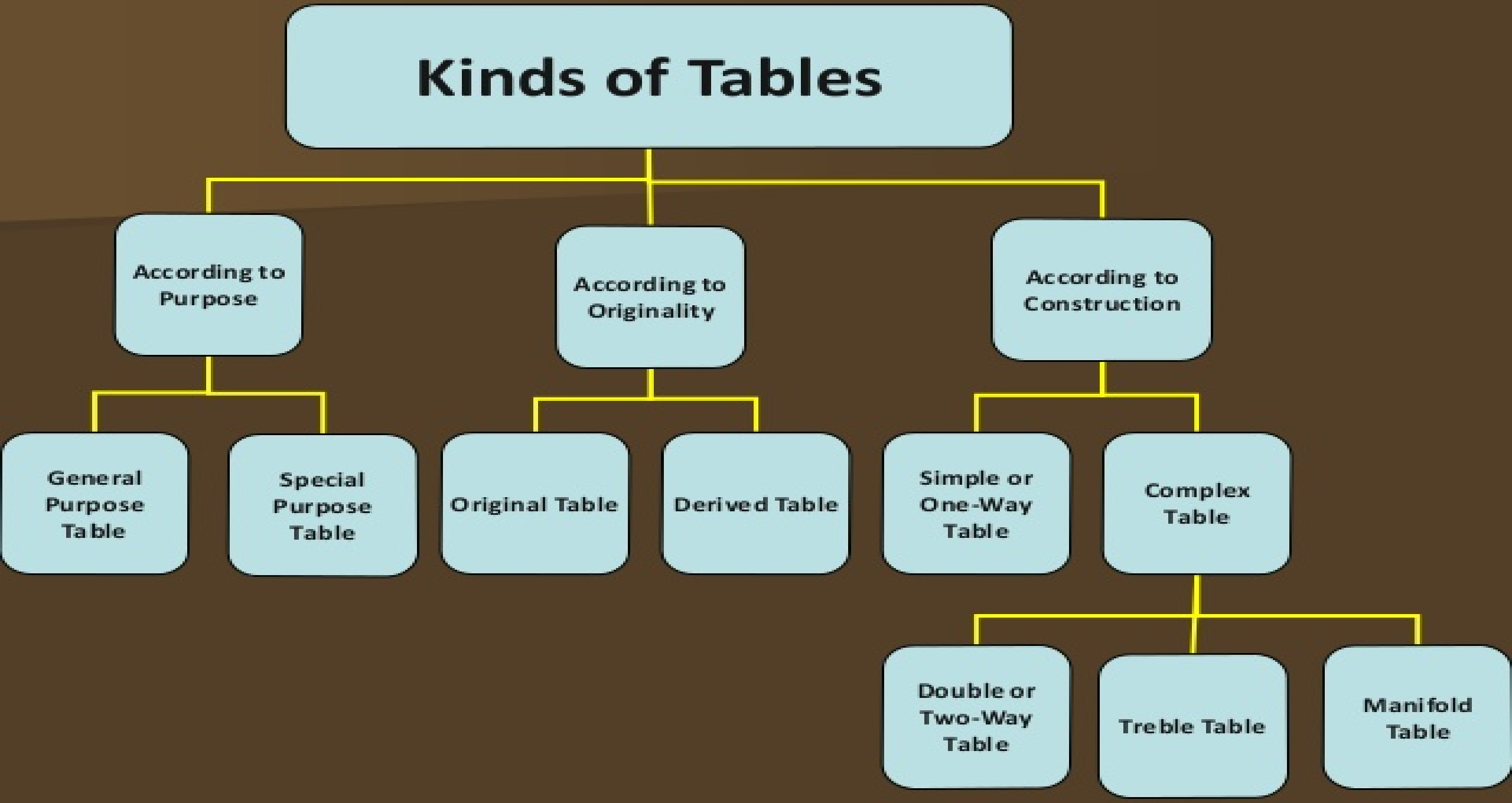
Footnote :

Source Note :

Types of Tables

There are three basis of classifying tables.

I. Purpose of a table
II. Originality of a table
III. Construction of a table.


Kinds of Tables
According to Purpose
According to Originality
According to Construction
General Purpose Table
Special Purpose Table
Original Table
Derived Table
Simple or One-Way Table
Complex Table
Double or Two-Way Table
Treble Table
Manifold Table

I. According to Purpose

- **General Purpose Table:** General purpose table is that table which is of general use. It is does not serve any specific purpose or specific problem under consideration.

- **Special Purpose Table:** Special Purpose table is that table which is prepared with some specific purpose in mind.

II. According to Originality

- **Original Table:** An original table is that in which data are presented in the same form and manner in which they are collected.

- **Derived Table:** A derived table is that in which data are not presented in the form or manner in which these are collected. Instead the data are first converted into ratios or percentage and then presented.

III. According to Construction

- Simple Table
- Complex Tables

a. Double or Two-Way Table
b. Three-Way Table
c. Manifold (or Higher Order) Table

Simple Table

In a simple table (also known as one-way table), data are presented based on only one characteristic. Table 1.1 illustrates the concept.

Table 1.1 Faculty-wise Library Users

Faculties	Number of Users
Science	50
Commerce	70
Arts	90
Total	**210**

Complex Tables

- In a complex table (also known as a manifold table) data are presented according to two or more characteristics simultaneously. The complex tables are two-way or three-way tables according to whether two or three characteristics are presented simultaneously.

    a. Double or Two-Way Table
    b. Three-Way Table
    c. Manifold (or Higher Order) Table

Double or Two-Way Table

In such a table, the variable under study is further subdivided into two groups according to two inter-related characteristics. The two-way table is shown in **Table 1.2**.

Table 1.2 Faculty-wise Library Users

Faculties	Numbers of User		Total
	Girls	Boys	
Science	20	30	50
Commerce	30	40	70
Arts	35	55	90
Total	85	125	210

Three-Way Table

In such a table, the variable under study is divided according to three interrelated characteristics. The Three-Way Table is shown in Table 1.3.

Table 1.3 Faculty-wise Library Users

Faculties	Numbers of User						Total (1)+(2)
	Girls			Boys			
	I Sem	II Sem	Total (1)	I Sem	II Sem	Total (2)	
Science	15	20	35	20	30	50	85
Commerce	35	30	65	45	40	85	150
Arts	25	35	60	35	55	90	150
Total	75	85	160	100	125	225	385

Manifold (or Higher Order) Table

Such tables provide information about a large no of interrelated characteristics in the data set. Manifold (or Higher Order) Table is shown in Table 1.4.

Table 1.4 Faculty-wise Library Users

Faculties	Numbers of User										Total (1)+(2)
	B.A Ist					B.A IInd					
	Boys		Girls			Boys		Girls			
	I Sem	II Sem	I Sem	II Sem	Total (1)	I Sem	II Sem	I Sem	II Sem	Total (2)	
Science	15	34	20	54	123	20	45	30	27	122	245
Commerce	35	23	30	34	122	45	37	40	29	151	273
Arts	25	56	35	22	138	35	34	55	36	160	298

CONCLUSION

With the help of above discussion we can say that table are help us to represent the data in the form of rows and columns and make it useful for the purposes.