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Original Research Paper

Quadrilateral Figure Method: An Innovation in Probability Sampling Method

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ABSTRACT

Background: Need is mother of searches we all accept that. Research in area is expected be creative and innovative. Researcher realizes need of one another fast and scientific Random Sampling Method, therefore researcher present here Quadrilateral Figure Method (Q.F.M.). This is an essential innovation in Probability Sampling Methods. Conclusion: The Quadrilateral Figure Method (Q.F.M.) is very useful, very easy to use and also more representative, impartial, accurate and unbiased. This method demands low time, low expense and low hard work than other types of Simple Random Probability Sampling Methods.

Keywords: *Sub types of Sampling Method, Quadrilateral Figure Method.*

The concept of sampling is very old. A cook tends to examine some grains of boiled rice from the cooking pot for confirmation of condition of rice; Doctors or Physician get 10-20 ml. blood of patient for diagnose related disease, these are some examples of sampling. Sampling is the Statistical Method of obtaining representative data or observations from a group.

What is Sampling?

Sampling is the act, process, or technique of selecting a suitable sample, or a representative part of a population for the purpose of determining parameters or characteristics of the whole population.

Definition of Sampling:

"Sampling Method is the processor method of drawing a definite number of individuals, cases or observation from a particular universe, selecting part of a total group for investigation" (Fairchild Dictionary).

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What is a Sample?

Sample is accurate than Census. Sample is a smaller representation of a large whole. A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster, 1985). When dealing with people, it can be defined as a set of respondents (people) selected from a larger population for the purpose of a survey.

Definition of Sample:

"A statistical sample is a miniature picture or cross section of the entire group or aggregate from which the sample is taken."(Young, Paulin V.)

What is Population?

A population is a group of individuals' persons, objects, or items from which samples are taken for measurement for example a population of presidents or professors, books or students. Some types and examples are Population as follows:

Homogeneous: Some grains of boiled Rice, Handful of wheat from sack.
Heterogeneous: Different I.Q. students.
Finite: Research students in Aurangabad Division, Books of Govt. Library.
Infinite: Stars of the sky, Constellations.
Real: Real things who perceived by our knowledge (sense) organs.
***Hypothetical population*:** Guess or think about the reasons of the results of test.

Definition of Population:

D'Amato (1976): "A population is any complete collection of objects or thing, a sample is any subtotal portion of a population."

ABOUT QUADRILATERAL FIGURE METHOD (Q.F.M.)

This is one of the important exposition and innovation in sampling field. This diagram has made with support of Quadrilateral and numbers therefore "Quadrilateral Figure Method" (Q.F.M.) this name situated and mentioned by Researcher (presenter). The shape of this diagram has look as mobile chip or simcard chip.

Theory of Probability:

This theory deals with the possible outcomes of an event. It must be possible to list every outcome that can occur and we must be able to state the expected relative frequencies of these outcomes. It is the method of assigning relative frequencies to each of the possible outcomes. If the outcomes of an experiment are equally likely, then the probability of an event is the ratio of the number of outcomes favorable to the event to the total number of outcomes.

METHODOLOGY

Aim of the Research Article (Research paper):-

To present 'Quadrilateral Figure Method ' as an innovation in Simple Random Probability Sampling Method clearly with other sampling methods.

Objectives:-

1) To help the Researchers, Students and Readers to understand clearly the type of sampling and sampling related factors.
2) To help other Researchers, Students and Readers to understand the steps or procedures of various criteria base sub types of simple probability sampling methods.
3) To present Quadrilateral Figure Method front of all and to help the other Researchers, Students and Readers to understand the procedure and importance of Innovative Quadrilateral Figure Method (Q.F.M.).

The History of Sampling: -

Probability and Non- Probability started from the so many years before. Probability started from the study of games of chance. Tossing a dice, playing poker and spinning a roulette wheel are just some examples of random sampling. Games of chance were not studied by mathematicians until the sixteenth and seventeenth centuries. Probability theory as a branch of mathematics arose in the seventeenth century when French gamblers asked Blaise Pascal and Pierre de Fermat, both well known pioneers in mathematics, for help in their gambling. In the eighteenth and nineteenth centuries, careful measurements in astronomy and surveying led to further advances in probability. In the twentieth century probability is used to control the flow of traffic through a highway system, a telephone interchange, or a computer processor. In addition, it is used to find the genetic makeup of individuals or populations, figure out the energy states of subatomic particles, estimate the spread of rumors and predict the rate of return in risky investments. History of sampling discussed by Doherty M. (1994) in his research paper as: Probability-based sampling is a development of the last 60 to 70 years. Around the turn of the century, Kiar, in Norway, was an advocate for sampling. In the early work, purposive methods (i.e. non-probability sampling) predominated, but in 1934 Neyman published a paper which laid the basis of sampling theory, and explained the advantages of random sampling over purposive selection. Doherty stated that over the next 20 or so years, the theory of probability-based sample design was further developed, and the major statistical offices were all won over to probability-based design. The first generation of sampling textbooks appeared around 1950.

Different Methods of Sampling:-

There are different types of sampling Methods. Sample designs are basically of two types viz.. Non-probability sampling and Probability sampling. Probability sampling is based on the concept of 'random selection'. Whereas Non-probability sampling is based on the 'non-random' sampling. The following table exhibits the types and sub types of sample methods as:

Table: 3.1 Types and sub types of sample methods

Probability sampling	Non-probability sampling
1) Simple Random Sampling . 2) Stratified Random Sampling. i) Proportionate Stratified. ii) Disproportionate Stratified. 3) Systematic Sampling: 4) Multistage Sampling. 5) Multiphase Sampling	1) Convenience (Accidental) Sampling 2) Quota Sampling 3) Judgmental Sample (Purposive) 4) Self Selection Sampling 5) Snowball Sampling.

Simple Random Sampling

The simplest form of random sampling that is Simple random sampling. It is the basic sampling technique where you select a group of subjects, a sample, for study from a larger group, a population. Each individual is chosen entirely by chance and each member of the population has an equal chance of (1/100) being included in the sample. Every possible sample of a given size has the same chance of selection. For example- Randomly picking people from a list of people. Some other criteria base sampling method's in Simple Random Probability Sampling method. Procedure and steps of these methods are as follow:

1. Lottery method:

1) Write name and number of unit (from all units) one by one on non transparent single–single slips of blank paper. 2) Fold these papers as and collect in one big box or big bowl. 3) Then mix it up-down. 4) Then close your eyes in front of box and get slips individually one by one as your need.

2. Card or ticket Method:

Same colour, weight, shape, size and non transparent cards are usable in this method. 1) Write name and numbers of unit (as every unit from all units) one by one on cards. 2) Collect all cards in one big drum. 3) Then the drum move minimum 50 times for mixing all cards. 4) Then choose any one card by another person. 5) Follow 3rd and 4th step for every time when you want more sample as your need.

3. Grid Method:

This method especially useful for selection of some field (area) from large geographical field (area). 1) Draw map of related field. 2) Decide how many units will be select. 3) Transparent grid plate keep on map. (This plate available with number blocks as our need) 4) Mark the decided number on map and select fields for research.

4. Regular Marking:

This Method is use in condition of all units is systematic on basis of time place, etc. in population. 1) Write serial of unit in list. 2) Decide how many sample will be select 3) Then choose every fifth or tenth or any other number. Suppose 500 samples available here but need only 100 units so we choose every 5th number unit. 4) Selection starts from any number (for this step Quadrilateral figure method will be useful).

5. Irregular Marking:

1) List the all units. 2) Decide how many samples will be select. 3) Irregularly mark on numbers from second number to second last. 4) Then select all marked units as a sample.

6) Tippet Method:

Professor Tippet (1927) presents this method with the help of Mathematical data. These numbers are serial less and written on so many pages. 1) List the all units. 2) Decide how many units will be select. 3) Select any one number from tippet index and select continuously from number here to as our need. Suppose you want 15 units so you select first to fifteenth serial number in index of Random Number table of Tippet. Tippet suggested some numbers as follow:

2952	6641	3392	9792	……
4167	9524	1545	1396	……
2370	7483	3408	2762	……
0560	5243	1112	6107	……
2754	9143	1405	9025	……

Now Random Numbers Tables are created with the aid of electronic computers This is accomplished by a process of generating the digits 0 through 9 one after the other.

7) Quadrilateral Figure Method (Q.F.M.) :- (Presented by Researcher)

1) Write name and number of units in a list or write serial numbers on every answer sheet. 2) Decide how many samples will be select from large population by this formula: population / sample. For example: If population is 90 and your need is 30 sample so 90/30=3. This answer show that units will be choose as every third but this process start after the step no 3. 3) Then come in front of this Q. figure close your eyes and keep your single finger of hand under this figure on any one area of number. 4) Where is your finger select this number as first unit number for starting sampling. 5) If your finger on more than one area of number tries again or in which area your finger is more than other, Select this number as first unit. Then next number start after 5^{th} number (when data within 30 and population above 35) or after 10^{th} number (when data is above 30) Choose every 3^{rd} number to your need. 6) If your finger out of this figure tries again step 2-5 as above mentioned. 7) If in first round your selected samples are not sufficient so you apply second round third round, fourth round or more as your need. 8) But do not repeat same number which are already selected and choose (select) next number from serial list of units.

Diagram and Examples:-

When data is small (upto30) follow figure first in this diagram '0'means repeat once more. When data is large (above 30) follow figure second, in this diagram **'0'means 10.**

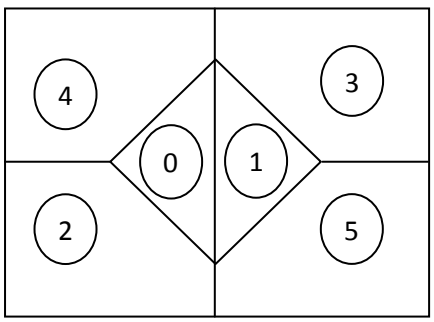

Figure: 1

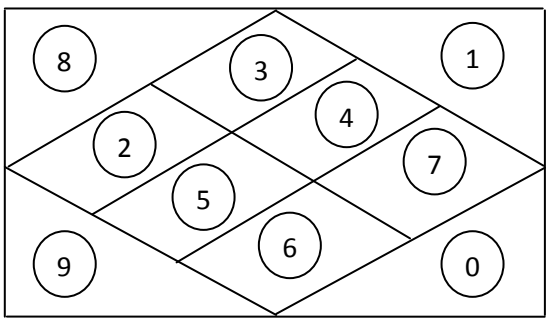

Figure: 2

Examples: -

1) When sample is within 30 and population is 34; means34/30=1.1…it is above one therefore choose every second as above mentioned. When your finger on no.1 so selects units as:

1 **2 3 4 5** * \ / 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34. (Round 1start from *1*.Avoid 2,3,4,5 numbers then selection start from 7th to other numbers. Symbol for Round 1: \ . Round 2: / . Round 3: *.

2) When your population is 45 and your need is 30 samples. So select 45/30=1.5 this is more than one, it means select every 2nd. When your finger on no.5 so selects units as:

1 2 3 4 *5* 6 \ 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45. Avoid 1,2,3,4,26,28,30,32,34,36,38,40,42,44 numbers and select other all numbers.

DISCUSSION

The **Q.F.M.** device is the important innovation in sampling methods. This method is also useful in place of lottery method or ticket method, Regular marking method, irregular marking method and also useable in tippet method (for starting from any number) or in place of tippet method.

Merits: 1) This method demands low time low expense and less hard work than other criteria base sub types of simple random probability sampling method. 2) This method easy to use. 3) This method accurate and unbiased. 4) This method provides more representative data. 5) This method is impartial.

Limitations: 1) List of all units with numbering is essential factor in this method. 2) This method useable for at a time one sampling which is also helpful for its purity and reliability.

CONCLUSION

The Quadrilateral Figure Method (Q.F.M.) is very useful, very easy to use and also more representative, impartial, accurate and unbiased. This method demands low time, low expense and low hard work than other subtypes of Simple Random Probability Sampling Designs.

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Conflict of Interest

There is no conflict of interest.

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