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RESEARCH ARTICLE

Role of Statistics in Different Fields

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ABSTRACT:
Statistics plays an important role in every field of human activity. It holds central position in almost every field like Physics, Chemistry, Biology, Mathematics, Botany, Psychology, Astronomy, Industry, Commerce, Trade, Economics, Banking, etc. Application of Statistics is very wide in these fields. In state management or administration, Statistics is very essential for a country. Different policies of the government are based on it. Statistical data are now widely used in taking all administrative decisions. Preparation of federal and provincial government budgets mainly depend upon statistics. The objective of this paper is to throw light on the role of statistics in different fields with special reference to business and economics It also shows some fundamental characteristics about statistical data and some basic concepts of statistics. Statistics do not prove anything. They are simply tools in the hands of the statisticians. In making use of statistics one should be vigilant and cautious. One should use the relevant data and draw conclusions without any bias. Limitations of statistics must also be taken into consideration by the experts while using it. Statistics can be used by the experts only who have special knowledge of statistical methods. Otherwise sensible use of statistics is not possible. It may lead to dangerous consequences. The circumstances and conditions under which conclusions have to be drawn should be necessarily studied. Otherwise without reference the result may prove wrong. Application of statistics by experts minimize the possibility of misuse and it may discover the truth rather than to cover the truth.

KEY WORDS:

INTRODUCTION:

The words 'Statistics' and 'Statistical' are derived from the Latin word status means political state. It was used by the British mainly for administrative and government bodies. Statistics originated from two quite dissimilar fields and they are games of chance and political states. The former is associated with the concept of chance and probability and latter is concerned with collection of data. The theoretical development of the subject has its origin in the mid-seventeenth century and many mathematicians and gamblers of France, Germany and England are credited for its development. Thedevelopment of statistics can be divided into three stages.

1. The primitive stage of the subject also known as the Empirical stage (down to 1600). During this stage numerical facts were utilized by the rulers. These facts helped in administration of government.
2. During the second stage which is known as the comparative stage (1600-1800) statisticians frequently made comparisons between nations for judging their relative strength and prosperity. Some nations also enquired about the social and economic conditions of their people.
3. In the Modern stage (1800 to date), there has been a considerable extension in the field of its applicability. It has now become a useful tool. Statistical methods of analysis are now being increasingly used in Biology, Psychology, Education, Business, Economics and Banking.

Statistics is the study of collection, Organization presentation, analysis and interpretation of data. Statistician Bowley defines statistics as "Numerical statements of facts in any department of inquiry placed in relation to each other". This leads us to the conclusion that all statistics are numerical facts but all numerical facts are not statistics. Bowley has also called statistics he science of counting and the science of average. But strictly speaking it is not a science but scientific method. It is a device of inferring knowledge and not knowledge itself. Statistics is both science as well as art. As science it studies numerical data in a systematic manner and as an art it makes use of the data to solve the problems of real life. Its methods are used in all sciences. It is related to the methods and techniques to collect quantitative information of the facts and findings. The objective of this study is to throw light on the role of statistics in different fields and specially in Business and Economics. It also explains some fundamental characteristics about statistical data and some basic concepts of statistics.

Fundamental Characteristics of statistical data:

1. They are related to each other and comparable.
2. They are aggregates of facts and not a single observation.
3. They are numerically expressed. Qualitative aspects have no statistical sense.
4. A reasonable degree of accuracy is to be kept in view while collecting statistical data.

5. Collection of data in a systematic manner. A plan is to be prepared before collecting data.
6. Statistics deals with group and doesn't study individual.
7. Statistical laws are not exact, they are true only on averages.
8. The data collection by the other person and not invigilator are known as secondary data.
9. The data obtained in the original form are called ungrouped data or raw data.
10. An arrangement of raw numerical data in ascending or descending order of magnitude is called array.
11. Statistics are collected for a pre-determined purpose.
12. Statistics are not affected by any single factor, but are influenced by many factors.
13. Statistics can be collected by enumeration or can be estimated.

Two main statistical methodologies are used in data analysis:

1. Descriptive statistics which includes methods which are used to collect data, to present them in the form of tables, diagrams, etc to describe their characteristics. These methods include measurement of central tendencies (mean, median, mode), measurements of dispersion, etc.

2. Inferential statistics includes methods of using information from a sample to draw conclusions about the population or universe.

Individuals are the people or objects included in the study and a variable is the characteristic of the individual to be measured or observed.

Review of Basic Concepts of Statistics:

Here we have some basic concepts of statistics which are almost used in every research work.

Data : Facts, observations and information that come from investigations.

a) Measurement data :

Also called quantitative data.

b) Categorical data:

Also called qualitative data.

Things are grouped according to some common properties and the number of members of the group are recorded.

Variable: The property of an object or event that can take on different values.

a) Discrete Variable:

A variable with a limited number of values.

b) Continuous variable:

A variable that can take on many different values. Any value between the lowest and highest points on the measurement scale.

c) Independent Variable:

It is not dependent on other variables and in cause-and-effect relationship independent variable is the cause and the dependent variable is the effect.

d) Dependent Variable:

It is the variable that is observed and measured in response to the independent variable.

e) Quantitative Variable:

A variable based on categorical data.

f) Quantitative Variable:

A variable based on quantitative data.

Graphs: Display of data used to present frequency distributions so that the shape of the distribution can easily be seen.

Bar Graph :

A form of graph that used bars. The higher the bar, the higher the frequency of occurrence.

Histogram:

A from of bar graph used with interval. Bass in the Histogram touch with the width of the bars defined as the upper and lower limits of the interval.

Box plot :

A graphical representation of dispersion and extreme scores

Scatter plot:

A from of graph that present information from a bivariate distribution.

Measurement of control Tendency: statistical techniques to represent the center of distribution

a) Mean:
it is defined as the average of the distribution it is most common measure of central tendency. The mean is computed by summing up all the scores in the distribution and dividing that sum by the total number of scores

b) Median:
The middle value of a distribution is called median. It divides the distribution in to two equal parts

c) Mode :
Most frequent or common score in the distribution is called mode
Measures of spread : it is measure of variability
a) Range :
it is the simplest measure of variability to compute and understand .The range is the difference between the highest and the lowest score in a distribution.

b) Interquartile range:
The I Q R is defined as the 74^{th} percentile- the 25^{th} percentile. It is easy to compute. But it discard too much data.

c) Variance :
it is based on the deviations of individual scores from the mean. The average of the sum of the squared deviations is called the variance.

d) Standard Deviation :
it is defined as the positive square root of the variance.

Measures of Shapes : statistics can be used to describe how the distribution rises and drops.
a) Symmetric :
Distribution that have same shape on both sides of the center are called symmetric.

b) Skewness :
it refers to the degree of asymmetry in a distribution . A distribution is positively skewed when it has a tail extending out to the right. A negatively skewed distribution as an extended tail pointing to the left.

Population and sample :
These are two basic concepts of statistics, population is the collection of all individuals or items under consideration in a statistical study while sample is that part of the population from which information is to be collected.

Role of Statistics in different fields:
Statistics plays an important role in every field of human activity. It holds central position in almost every field like Physics ,Chemistry ,Biology, Mathematics, Botany , Psychology, Astronomy, Industry, Commerce, Trade, Economics, Education, etc. Application of statistics is very wide in such fields. It determines various factors like existing position of per capita income, unemployment, housing, schooling, medical facilities, populations growth, etc in as country.
1) In state management or administration statistics is essential for a country .different policies of the government are based on statistics. In talking administrative decisions, statistics. Data are now widely used. Preparations of federal and provincial government budges mainly depended upon statistics. It helps to estimate the expected expenditure and revenue from different sources. So, statistics of the state.
2) Astronomy is one of the oldest branches of statistical study. It deals with the measurement of masses, sizes, distance, etc. Statistics is very useful in these measurements like movement of the stars, the distance of moon from the earth, etc.
3) Statistics plays an important role in banking. Banks widely use statistics for different purposes. The banks work on the principle that all the people who deposit their money at the the bank do not withdraw that money at the same time.The banks create credit out of there deposits by lending them others on interest. The bankers use statistical approaches.
4) Accounting needs exactness for any decision making purpose. In auditing sampling techniques are commonly used. An auditor determines the sample size of the book to be audited.
5) In the Biological sciences, experiments about the growth of animals under different diets and environments or the crop yields with different seeds, fertilizers and types of soil are designed and analyzed according to statistical principles. The entire theory of heredity is based on statistics.
6) The physical sciences are making increasing use of statistics in the treatment of complex problems of molecular, atomic and nuclear structure.
7) Statistics is the branch of applied mathematics. The large number of statistical methods like probability, averages, dispersion, estimation, etc are used in mathematics and different techniques of pure mathematics like integration, differentiation and algebra are used in statistics. New kinds of data regularly emerging from science and other fields. In order to produce sensible theories and draw accurate conclusions from data cutting edge statistical methods are needed. There methods use advanced mathematical ideas combined with modern computational techniques which require expert knowledge and experience. Skills are required for developing and implementing these methods.
8) In the field of education there are number of challenges in termsof policy planning and statistics are particularly important as these often provide some of the only objective information that administrators use in decision making. Test score trends are commonly used statistics in the field of education. They are used to evaluate the effectiveness of classroom teachers and the validity of the tests themselves as well as the effects of various risk factors on educational outcomes.
Role of Statistics in Business and Economics:

a) Role in Business:

No business, large or small, public or private, can flourish without the help of statistics. Statistical information is needed from the time the business is launched till the time of its exist. All the factors affecting the business are to be quantitatively weighted and statistically analyzed before taking any decision. Production plans in business cannot be formed without quantitative facts. Statistics thus help in planning and formulation of future policies. A businessman can also decide the correct management of financial resources and marketing. Location of the business can also be decided with the help of statistics.

1) Wage levels and wage standards also require the statistical study of different jobs with in the same organization. It is through statistical data that a man representing the workers knows about the working conditions, rates of wages, frequency of lock – outs, monthly earnings and other matters in the industry.

2) Various statistical techniques like Index numbers and analysis of time series help on the study of price behaviour. Correlation and regression help in the estimation of relationships between dependent and one or more independent variables. Relationships are established between market demand and per capita income, inputs and outputs, etc. The technique of sampling can be used in connection with various business surveys with saving in time and money. These techniques are used in checking of accounts statistical quality control is now being used in industry for maintaining the quality standard of products.

3) The need for statistical information in the smooth functioning of an undertaking increases along with its size. The Bigger the concern, the greatest is the need for statistics. In the era of mass production technology, the business executives need all such information for the successful conduct of affairs. For better or worse, the modern business executive is largely dependent on statistical data and methods of analysis for essential information.

4) In the marketing function of an enterprise, statistical methods of analysis are very helpful. It helps in market research, advertisement campaigns and in comparing the sales performances. It also directs attention towards the effective use of advertising funds.

5) Statistical methods are the best tools for cost and budgetary control. Management uses it in the balancing of the activities of one part of a system against those of another. Management secures that supply equals demand and there are no bottlenecks.

6) Facts are also required for the purpose of drawing up the financial plan.

7) In any business, details are needed like 'how much is to be produced' 'how many workers and how much raw material is needed to produce the estimated quantity' and ' what quality, type, size, color or grade of the product is to be manufactured. All these are production plans by the managements. All these cannot be framed without quantitative facts.

8) Statistics helps in planning and formulation of future policies in business.

9) By analyzing consumer preferences through survey, one can select the sales territory in which to concentrate the efforts for obtaining very good results.

10) By using statistical quality control manufacturer can control the average life of his product.

11) Statistics helps to maintain the stock and optimum inventory size. By collecting statistics over a year and determining the probable distribution of demand, optimum inventory levels can be calculated. Statistics is thus a useful tool in the hands of the management.

b) Role in Economics:

The increasing importance of statistics in the study of economic problems has resulted a new branch of study called 'Econometrics'. Statistics has emerged as the centre stage of economics due to growing use of statistics by the economists.

1) In various economic problems like unemployment, rising prices, shrinking exports, poverty, inequality, etc. economists need their magnitude through quantitative expression. Statistics helps in inter – sectoral comparisons and inter – temporal comparisons of the economic problems. Statistics helps to establish cause and effect relationship between different economic variables that help the construction of various economic theories.

2) Economics through their statistical studies come to know that the investment in economy has tended to shrink due to decline in demand then they can suggest the government to adopt such measures that would increase the level of demand in the economy.

3) Construction of economic theories or economic models is not possible without statistical experiments. Economists do forecasting through statistical studies. They can forecast about the likely trend or pattern of the price level in the near future. This helps in future planning.

4) Through statistical studies, the Finance Minister decides to increase or decrease taxation as a main source of governments income. He also considers tax – paying capacity of the people and revenue needs of the government. Tax rates are fixed to get maximum possible revenue with minimum possible discomfort to the people.

5) With the use of statistical methods, the economic equilibrium can be creates by the economists. How the profit of the producer and satisfaction of the consumer can be balanced.

6) With the help of factual data, various economic problems can be solvent under Five Year Plans by making correct policies.

7) Apart from economic policy the development of economic theory has also been facilitated by the use of statistics. Statistics is now being used increasingly not only to develop new economic concepts but also to test the old ones.

8) Statistical approach leads to correct description of the economic problems and indicates solution to tackle the problems.

9) Statistical data and methods of statistical analysis help in proper understanding of the economic problems and the formulation of economic policy.

10) Statistical treatment is needed for the study of economic problems like volume of trade, output of industries, wages, prices, etc.

11) Statistics has very important role in Production, Consumption, and Exchange problems.

a. Statistics of consumption tells us the manner in which people spend their income over various items of expenditure.
b. Statistics of production describe the wealth of a nation.

c. Exchange statistics throws light on the commercial development of a nation.
d. Distribution statistics disclose the economic conditions of the various classes of people. These throw light on the distribution of national income of a country.
12) Statistics are very useful in studying national and international trade.
Very valuable service is rendered by statistics to business and economics and to various other fields.

Distrust of Statistics:
Some people have misgivings about statistics with regard to their reliability and usefulness. They consider statistics as rainbow of lies, tissues of falsehood and can prove anything. For them, statistics are like clay of which you can make God or devil, as you please. Distrust of statistics arises not because there is anything wrong with statistics as a subject matter. It arises because the users of statistics tend to manipulate it according to their needs. Distrust causes because different kinds of statistics can be obtained in respect of a given problem. It cannot be altered to match the pre – determined conclusions. Its presentation may confuse the reader. When statistics are collected in a partial manner, results may prove wrong. Consequently, people lose faith in statistics. Marshall (a great economist of 19th century) had to concede that "Statistics are the straw out of which I, like every other economist, have to make bricks" Statistics is the hub of the wheel of economic studies.

LIMITATIONS:
1. Statistics studies only those facts which can be numerically expressed. It doesn't study qualitative phenomena like justice, honesty, etc.
2. Statistics studies only aggregates of quantitative facts. It doesn't study any particular unit.
3. It is essential that statistics are uniform in quantity to compare date. Data of different qualities and kinds cannot be compared.
4. Statistics can be misused and it is indeed its greatest limitation. It is usually said "Statistics are like clay by which you can make a god or devil, as you please".
5. Statistics can be used only by the experts who have special knowledge of statistical methods. Otherwise sensible use of statistics is not possible. It can lead to dangerous consequences. It is said "Statistical methods are most dangerous tools in the hands of in experts".
6. The circumstances and conditions under which conclusions have to be drawn should be necessarily studied otherwise without reference the results may prove wrong.
7. Most statistical findings are true only as averages and they show only the tendencies. Statistical observations are not absolutely true for all sciences. They are not always valid under all conditions.
8. Statistical data is only approximately and not mathematically correct.

CONCLUSION:
Statistics do not prove anything. They are simply tools in the hands of the statisticians . If a statistician misuses the data then the blame lies on that person and not on the subject. In working use of statistics one should be vigilant and cautions. One should make use of the relevant data and draw conclusions without any bias. Limitations of statistics must also be taken into consideration. Application of statistics by experts minimize the possibility of misuse and it may discover the truth rather than to cover the truth.

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