

RESEARCH METHODS AND THE BASIC CONCEPTS OF RESEARCH

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Introduction

The inherent quality or characteristics of auto-transcendence gifted man made him a rational being. This singular and unique factor possessed by man distinguishes him from all created realities and made him aware of his environment. Consequently, through this awareness, he struggles to give meaning to his environment by interpretation and of naming phenomenological realities around him.

Research is one tool used by man to achieve his goal, that is, to enquire, to interpret and name realities around him. The term research was derived from the French root “Rechecher” meaning to search, to look for, to examine critically and to look into. In the light of the above, Research according to Ifeakor (2018), is an investigative process of finding reliable solutions to a problem through a systematic selection, collection, analysis and interpretation of data relating to the problem under study. It is all about activities that makes us discover new knowledge about things around us.

However, before embarking or starting any research project, there are terms one must of necessity be familiar with. One of such terms is the Research Method. This is because research method stipulates techniques to be applied by the researcher to undertake the study. It anchors the various processes and procedures to be used to effectively and efficiently carry out such enquiries.

Generally, Research method is defined as the process of carrying out survey, collecting data, and doing analysis. They are strategies or techniques utilized in the collection of data or evidence for analysis in order to uncover new information or create a better understanding of a topic. Put succinctly, Research method means techniques, strategies, processes utilized in data collection or funding evidence for analysis in order to explore new information or create a better understanding of a particular research topic.

Furthermore, Research method is seen as the general framework guiding a research project and different methods are used to tackle different questions. Osegbo, Ifeakor and Enemu (2009) noted that there are different types of research and no simple classification model is generally accepted to researchers. This is because it is often discovered that the researchers differ in objective, scope and sophistication. Moreover, the main object of study involves complex human behavior.

However, as was pointed out in the definition, Research methods entails processes of carrying out survey, collection of data and doing analysis. On the other hand, a concept in research is viewed as words whose understanding are subjective and its measurement or understanding would be difficult. Osegbo et al. (2009), noted that in defining a research problem or the study of a population, there are certain words that are put in usage and whose measurement are

difficult and the understanding may vary from person to person. These words are called Concepts. In order to measure them, they need very often to be converted into indicators and then variables. Concepts such as satisfaction, old, happy, impact and young would vary from person to person and the data collection seem difficult. Consequently, indicators and variables becomes uncompromised.

Based on the introduction above, the approach towards discussing Research Methods and Basic Concepts of Research will discuss the following five sub themes namely;

1. Process of carrying out survey
2. Data collection
3. Methods of data analysis
4. The indicators
5. The variables

While the processes of carrying out survey, data collection and data analysis discusses Research methods, the indicators and variables discusses the Basic concepts of Research.

PROCESS OF CARRYING OUT SURVEY

The use of survey as systematic means of data collection dates back to ancient times and there is a consensus opinion over the meaning of survey research. Nworgu (2015), views survey research as one in which a group of people or items is studied by collecting and analyzing data from only few people or items considered to be representative of the entire group. Such surveys in which a group of people or item is studied is called Sample survey contrary to Census which involves the entire population. In sample survey, the finding is generalized to the entire population. Population is called the sample size. It is also important to underscore that this sample size should be a fair representative of the entire population. Consequently, an appropriate sampling technique or procedure must be adopted. Furthermore, survey research has to take adequate steps to ensure that the instrument for data collection are adequately developed. Survey research uses instruments such as questionnaire, interviews, test and observations etc. these are opinions that may lead to taking either by respondents or the researcher therefore it becomes expedient that the validity and reliability of the developed instrument must be ensured. Both validity and reliability are measures of authenticity of the instrument. While validity measures accuracy of instrument, reliability measures its consistency with set out goals or objectives.

In educational research and social sciences, survey has a wide range of usage. Very often, researchers make global and incomplete statement on this usage (Nwankwo, 2006). Ifeakor (2018) maintained that almost all the studies are survey in nature hence she outlines the following common survey research types namely; Developmental survey, Descriptive survey, Evaluation, Correlational survey and Historical survey.

i . Developmental survey:

This seeks to ascertain how some dimensions, variables or characteristics of a given population change with time. (Nworgu, 2006). Ifeakor (2018) views developmental survey as studies that concerns itself with identifying the changes, the rate of change, the causal factors, its characteristics and the magnitude of the impact in the variables under study. Developmental survey studies can take two forms namely;

- a. Longitudinal survey studies
- b. Cross-sectional survey studies
- Longitudinal development studies entails studying a sample size over a period of time and collecting data from such samples at interval of time. the period of study and the

interval for the collection of data depends on the researcher. An example is studying an infant for a period 8 years to discover particular traits with respect to his feeding habits.

- Cross-sectional developmental survey: this aspect of survey studies persons of different characteristics at the same time. According to Osegbo et al. (2009), cross-sectional survey studies person of different characteristics or quality (age) at only one point in time to discover their individual traits. For example, a range 20, 30, 40, 50 and 60 old men could be studied at one time to discover their aptitude to computer learning.

ii. Descriptive survey:

this is the type of survey whereby the researcher collects data from a large sample drawn from a given population and goes further to describe certain features of the sample which are of interest to the researcher. Descriptive survey according to Osegbo et al. (2009) does not concern in itself with the relationship among variables. According to them, descriptive survey concerns itself with the description of facts as they are and it does not test hypothesis. Ifeakor (2018) classified this type of survey into two namely; analytical descriptive and descriptive survey study.

Concerning descriptive study, the variables being studied for any sample are never compared for the various strata of the sample which in most cases are dependent variables for the study (Osegbo, Ifeakor, and Enemuo, 2009). Usually, descriptive survey does not make use of hypothesis. This is because they tend to explain the phenomena as it happened.

Analytic survey on the other hand as survey studies in which the variables being studied for any sample are compared for the various identified strata of the sample through the use of hypothesis.

In composing sample size for descriptive survey, simply random sampling technique is used while analytic survey uses stratified random sampling.

iii. Correlational survey studies:

correlational studies are often termed predictive studies because they are studies which seek to establish relationship between two or more variables. It usually indicates both magnitude and direction of such studies. They employ special statistical tool known as correlation co-efficient or regression analysis for data. Commonly used among them are the Pearson product moment correlation coefficient, spearman rank order correlation co-efficient and the Kendall's co-efficient of concordance (Nworgu, 2015). It is important to highlight here that correlation studies do not express causation rather they are predictive. Talking about causation, it means that neither of the two samples caused the other but both sample could depend on a third factor as causal to them. A good example is the relationship between the performance of agricultural science and biology by a student. What it entails is that performance in biology cannot be said to affect proficiency in agricultural science or vice versa, rather, both may depend on a third factor which is hard work.

iv. Evaluation survey:

this type of survey involves studies carried out in an event or any issue in order to make judgement about the value or worth of the same issue.

v. Need assessment survey:

Are those studies that focus on identification of needs or gaps in human services or utilities. According to Ifeakor (2018), need assessment survey involves the following operations, collecting of data from respondents on desired state of issue being studied, collecting data from the same respondents on what is on ground, and analyzing the two sets of data to identify the gaps or areas of needs.

vi. Historical research design:

This is the systematic collection and evaluation of data to describe, explain and thereby understand actions or events that occurred in the past (Ifeakor 2018). Generally, data for historical studies are obtained from primary and secondary sources. Primary sources are firsthand information while secondary sources are accounts from those who heard from eye witness.

DATA COLLECTION

This encompasses both the method and the instrument for data collection. With respect to the method of collecting data, the researcher is encouraged to co-opt assistance that will help in this regard. These co-opted assistants are briefed/instructed on the expectation and they help in administering and collection of the instrument. It is important that the researcher uses assistants to make the work less cumbersome.

Instruments for data collection

Research instruments are tools or devices used in measuring, recording and obtaining data. Since data collection is an important step in a research process. It is important to examine different instruments used for data collection. Such instruments include;

- Questionnaire
- Observation
- Rating scale
- Interview technique
- Interest inventories
- Check list
- Historical sources

Questionnaire: this is defined as a series of questions or statements presented in a written form to a student or group of students to which they are expected to answer in writing. They are usually set of questions that are related to the purpose of study. the questionnaire is the most widely used method of data collection in research and used for obtaining factual information from the respondents about the past, present and future events. Questionnaires can also be designed to elicit information from respondents about themselves, other people or objects and events around them. They are very often grouped into two major parts namely;

- i. Descriptive part
- ii. Analytic part

The descriptive part of the questionnaire seeks information about the nature and characteristics of the respondents such as age, gender, school, nationality, class, qualification etc. The Analytic part is concerned with relevant details pertaining to the problem under investigation.

Observation technique: this is a direct method of obtaining information about an individual's behavior, object, event or situation. It gives firsthand information about the behavior under study. There are two types of observations namely;

- i. Participant observation
- ii. Non participant observation

Participant technique observation is a technique where the observer is part of the setting in which the observation is taking place e.g. a teacher conducting a study with her school children in the class directly participating in the study.

The Non participant technique occurs in a setting in which the observer is not where the observation is taking place. Observation technique has the following characteristics namely;

- It must be carefully planned and systematically conducted

- It should also be properly conducted and well recorded
- It must be done by competent person/s

Check list: this consist of a prepared list of statement relating to behavior traits and performance in some areas. Each of the statement is examined to indicate the presence or absence of the desirable quality. a check list is attended to by a “Yes” or “No” judgement.

Example; All Adolescents experiences storm usually a definite instruction is placed in front of items under study.

Rating scale: this is an instrument that contains sets of characteristics to be judged and some type of scale for indicating the extent to which the traits are present in a variable under study. The presence of such characteristics in indicating using any of the following scales such as numerical rating scale, graphical rating scale and descriptive rating scale.

Interview: this is a one to one or face to face interpersonal role in which the interviewer sits in conversation with the interviewee in order to elicit responses that will allow the researcher obtain information about the person’s knowledge, values, attitudes, experiences and belief with respect to the topic of study. Interviews allows the researcher to obtain firsthand information and could either be structured or unstructured interviews.

Interest inventories: this consist of series of probing questions relating to an individual’s area of interest. The questions in interest inventories are designed in such a way that they elicit the students interest. Scores are assigned to such questions with higher scores on inventory of interest. Thus, a lower score shows lack of interest while a higher scores indicates particular area of interest.

Historical sources: historical sources of data collection are data expunged from documents, records documents, records, oral testimonies and relics. Ifeakor (2018) grouped them into primary and secondary sources. While primary sources are firsthand information. Secondary sources refer to accounts of witnesses. It is imperative to state that secondary sources are susceptible to distortion and may not be authentic.

Method of data analysis

Preamble to this sub theme is first and foremost the understanding that very often the data generated are bulky. Agu (2014) noted that most research work involve large volume of data which could be cumbersome to analyze may lead to waste of time and encourage personal bias. To get results devoid of the above, Ifeakor (2018) reiterated the need for the researcher to use the SPSS (statistical package for the social science software). All that the analyst should do is to issue executable instruction and command based on the variables to study. (Agu, 2014).

Furthermore, Uzoagulu (2011) articulated the following points to aid effective presentation of data. Accordingly, Uzoagulu noted that presentation and analysis of data should follow sequentially. Secondly, that the research questions and hypothesis should be stated before the data are presented. Thirdly, data answering the research questions and testing the hypothesis must be presented in a table. Fourthly, every table must be fully explained and dealt with before moving further to other stage of the study, it also encourage a brief explanation on the table and finally the tables must be numbered.

This apart, according to Osegbo (2009), data are pieces of qualitative information collected through the use of various instruments as was discovered previously. However, these data on their own do not convey much meaning unless when they are organized and analyzed. The organization and analysis of data could take place following any of the following methods based on the instrument for data collection namely;

1. Graphical presentation of data
2. Measures of central tendency
3. Measures of variability (spread or dispersion)

4. Measure of relationship

Graphical presentation of data:

According to Okoye (2006), statistical information could be presented in graphical forms using any of the following namely;

- a. Pictogram
- b. Bar chart
- c. Pie chart

Pictogram is when the data is presented in pictures using any symbol for example, the score could be pictorially presented using nine symbols.

Bar chart: this is another form of graphical representation done using bars. The bars are drawn in such a manner that the length and width presents the quantity it expresses.

Pie chart: this represents various sectors drawn in a circle divided in such a way that the quantity each sector of the circle represents is proportional to the angle subtend by the circle at its Centre. Generally, the angles are obtained by multiplying the ratio of the total sum and discrete score with 360. The above calculation gives the angle each discrete score occupies.

Measures of central tendency:

This can also be called measure of location. It tends to give a picture of what the center of the distribution looks like. It is simply defined by Okoye (2006) as a measure of typicality. The four most common measures of central tendencies are the Mean, Median and Mode and Quartiles.

The mean is obtained by adding all the scores obtained in the distribution and dividing the sum by the number of scores. The general formula for calculating the mean is;

$$\bar{x} = \frac{\sum x}{N}$$

The mode is defined as the number that occurs most in a frequency distribution table. Okoye (2006) noted that mode of a distribution is the most frequent score or scores with the highest frequency. He also noted that a distribution could have more than one mode. The formulae for calculating the mode of a group of data is given as;

$$\text{Mode} = L_1 + \left\{ \frac{d_1}{d_1 + d_2} \right\} C$$

Where, L_1 is the lower class boundary

d_1 is the difference between modal frequency and frequency of the next lower class.

d_2 is the difference between modal frequency and frequency of the next higher class

C is the size of the modal class.

Median: to obtain the median of any distribution, the scores are first arranged in ascending or descending order of magnitude and then score at the Centre of distribution is the median. When there are more than scores in middle of the distribution the two occurring scores are summed up and divided by two. The median is found using the formula;

$$\text{Median} = L_1 + \left[\frac{\frac{N}{2} - (\sum f)}{fm} \right] C$$

Quartiles are measures very similar to the median except that while the median looks for the central point, the quartile measure divides the scores in the distribution into four equal parts with the first part equal to one quarter of the distribution, the second part equal to the median and the third quarter equivalent to three quarters of the scores.

The general rule for obtaining quartile ranges includes;

$$Q_1 = L_1 + \left[\frac{\frac{N}{4} - (\sum f)}{fq} \right] C$$

$$Q_3 = L_3 + \left[\frac{\frac{3N}{4} - (cf)}{fq} \right] c$$

Measures of variability:

Okoye (2006) stated that the measure of variability is an index in which tells us how far scores are clustered together or how far they are spread out. It can be defined as a measure of scatteredness. According to him, where the variability is high, it means that the scores in the distribution are spread apart but when the scores are low, it means that they are close. Variability can be measured through the following common examples namely; range, semi interquartile range, variance and standard deviation.

Range:

According to Osegbo (2009), the range is the only appropriate measure of variability for nominal data. It is simply the difference between the highest score and the lowest score in a distribution and it is often said to be a crude measure of variability because it is obtained by subtraction between the highest and lowest scores. Examples of range scores include a range of score with the highest score of 86 and lowest score of 52. The range is obtained by simply subtracting 52 from 86 to give 24. If another set of scores falls within the highest limit 79 and lower limit of 64, the range is obtained by subtracting 64 from 79 to have a range of 13. Given the above two ranges, the variability measure will indicate that the scores with range of 13 are more clustered than the range of score with variability of 24. On the contrary scores with range of 24 are more scattered than the distribution whose range is 13.

Semi interquartile range(Q):

To obtain the semi interquartile range, one must be conversant with the quartile range. Ifeakor (2009) defined it as the difference between the upper quartile and the lower quartile range. To expatiate on the above, Okoye (2006) stated that the inter quartile range is the distance between the third quartile (Q_3) and the first quartile (Q_1). He further stated that half of this distance is used to express variability and it is known as the semi interquartile range. It is generally calculated as

$$Q = \frac{Q_3 - Q_1}{2}$$

Standard deviation:

This is the most common and most frequently used measure of variability. This is because it is applicable to many statistical formulae. Generally, there are many formulae that can be used in computing. Ifeakor (2018) noted that the first step in calculating standard deviation involves finding out how far each score is from the mean. that is, subtracting the mean from each score. According to her, if we square each difference, add up all the squares and divide by the number of scores, we have a measure of variability. If the variance is small, the scores are close together. If the variance is large, the scores are more spread out. The square root of the variance is called the standard deviation and like variance, a small standard of deviation indicates that scores are close together while a large standard of deviation indicates that scores are scattered. (Osegbo et al. 2009).

Measures of relationship

This is also called measures of association. It seeks to establish the relationship existing between two variables. Such relationship may be either positive or negative relationship. It is positive relationship when the magnitude and direction of the two variables under study are in the same arithmetic mode for example (x) variable increase as (y) variable increases. On the contrary, if either of the variables increases as the other decreases, it is said to be a negative

relationship. The extent of relationship or association between the two variables can be obtained using a statistical procedure known as correlation while the index for obtaining its direction and strength is called the correlation coefficient. The range of correlation coefficient varies from -1 to +1.

The following different methods could be used to compile the correlation coefficient of different data among these are the Pearson product moment (r), Spearman rank order (ρ) and Kendall's coefficient of concordance.

Pearson product moment correlation coefficient: according to Nworgu (2015), this is usually represented with a symbol (r) and can only be applied to two sets of data at interval level. Okoye (2006) stated that it can be calculated using two methods namely; the deviation from the mean scores and the raw score method. To calculate Pearson (r) using the deviation method, the formula,

$$(r) = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

Where, $x = (x - \bar{x})$ and $y = (y - \bar{y})$

To calculate Pearson (r) using raw score, the formula is given as

$$(r) = \frac{N \sum xy - \sum x \sum y}{\sqrt{[N \sum x^2 - (\sum x)^2][N \sum y^2 - (\sum y)^2]}}$$

INDICATORS

As stated earlier, words such as satisfaction, impact, appraisal, young, happy, old are concepts whose understanding vary from person to person and very often are incapable of direct measurement such image or concept could be measured through other means which are logically reflective of such concepts. These logical reflectors are called indicators.

VARIABLES

According to Okoye (2006) a variable is a quality or characteristics that changes as we move from one subject to the other. Examples are age, height, scores etc.

A variable is said to be discrete when it can only take a whole number. Discrete variables do not take nature of fraction. Continuous variables on the contrary can take fractional values. Examples are height, weight, temperature etc.

According to Ugwuegede (2006), experimental methods has three major essential elements and they include the independent variable (IV), the dependent variable (DV) and the extraneous variable (EV). While the independent variable is responsible for bringing about the change, the dependent variable measures the outcome of the change and the extraneous variables affect the relationship between the dependent and the independent variables.

CONCLUSION

Concluding this discussion, it is important to emphasize that the goal of any scientific discipline is to be able to provide new and useful information in the form of verifiable data. This could be achieved through research methods whereby survey studies are carried out, instruments are developed, opinions of the respondents are collected and analysis of the respondents are collected and analysis done using the steps discussed above.

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