

QUANTITATIVE RESEARCH METHODS A SYNOPSIS APPROACH

Oberiri Destiny Apuke

Department of Mass Communication, Taraba State University, P.M.B 1167, Jalingo, Nigeria.
Email: apukedestiny@gmail.com

Abstract

The aim of this study is to explicate the quantitative methodology. The study established that quantitative research deals with quantifying and analyzing variables in order to get results. It involves the utilization and analysis of numerical data using specific statistical techniques to answer questions like *who, how much, what, where, when, how many, and how*. It also describes the methods of explaining an issue or phenomenon through gathering data in numerical form. The study further reveals that quantitative methods can be categorized into; survey research, correlational research, experimental research and causal-comparative research.

Keywords: Quantitative methodology, research, analysis, numerical, phenomenon

Introduction/Background to the study

In understanding the quantitative methodology, it is pertinent to give an overview of what research is all about. Thus, research deal with the search for knowledge. Since research deals with academic activity it, it is pertinent to define it in a more technical way. Therefore, Kothari, (2004) describes research as “a scientific and systematic search for pertinent information on a specific topic”. Research also involves creativity that is carried in a systematic way in order to improve knowledge which consists of human knowledge, culture, and society, (OECD 2002). This implies that research is utilized to investigate facts, reconfirm the results of previous experiments, provide solutions for existing or new issues, support theories, as well as propound new theories. Furthermore, research involves knowledge building, carrying out experiments to find out the cause and effect of something as well as to provide the basis for further studies.

On the other hand, people most times mistake research to be information gathering, putting down of facts as well as thoroughly searching for a subject matter, it is more to that, it involves the collection, analyzing, and interpreting of data in order to get a thorough understanding of an event, happening, fact, or situation (Leedy & Ormrod, 2001). In this case, research is said to be systematic because it follows certain guidelines such as thoroughly defining an objective, analysis of data and communicating findings. These guidelines acquaint researchers on what should be included and removed in their research as well as the manner in which research should be carried out. In addition, Fischler (nd) sees “research as a process of steps used to collect and analyze information in order to increase our understanding of a topic or issue”.

Moreso, research deals with at least one question to one phenomenon, this implies that research originates as a result of answering a question about a phenomenon. For example, what is the perception of women towards journalism as a career? (Williams, 2005) Therefore, the research investigates such issues by critically collecting data, analyzing and discussing results in order to get inference or draw conclusions. Questions of research could be: **Descriptive:** How many women work at the EUL health center? How many hours a week do EUL secretaries spend at their desks? Or

Inferential: Does having masters in communication help students speak well? Does having multiple partners cause HIV/AIDS.

Problems with Research

According to Fischler, (ND) the problems of research include:

- Contradictory or vague findings
- Questionable data
- Unclear statements about the intent of the study
- Lack of full disclosure of the data collection procedure
- Inarticulate rendering of the research problem.

Basic steps of most research

- 1) Developing a research question
- 2) Conducting of thorough literature review
- 3) Re-define research question
- 4) Design research methodology/study
- 5) Create research proposal
- 6) Apply for funding
- 7) Apply for ethics approval
- 8) Collect and analyze data
- 9) Draw conclusions and relate findings

Although research involves a series of steps, this project will concentrate on the quantitative research methods, exploring its types and relationship with qualitative research.

Quantitative Research

(Leedy & Ormrod 2001; Williams, 2011) describe the research methodology as the holistic steps a researcher employ in embarking on a research work (p. 14). Therefore, a quantitative research method deals with quantifying and analysis variables in order to get results. It involves the utilization and analysis of numerical data using specific statistical techniques to answer questions like *who, how much, what, where, when, how many, and how*. Expatiating on this definition, Aliaga, and Gunderson (2002), describes quantitative research methods as the explaining of an issue or phenomenon through gathering data in numerical form and analyzing with the aid of mathematical methods; in particular statistics. Going by the above definition, it could be deduced that the first thing a research tackles or deals with is explaining of an issue, be it qualitative or quantitative, when we embarked on a research we are always on their verge of explaining a given phenomenon which could be, How many Nigerian actresses' dress nude? How many communication students in EUL speak well?.

The next feature in the above definition is that in quantitative research *numeral data* are collected and analyzed using statistical methods. On the other hand, (Leedy & Ormrod 2001; Williams, 2011). State that "Quantitative research involves the collection of data so that information can be quantified and subjected to statistical treatment in order to support or refute alternative knowledge claims" Furthermore, Williams, (2011) remark that quantitative research starts with a statement of a problem, generating of hypothesis or research question, reviewing related literature, and a quantitative analysis of data. Similarly, (Creswell 2003; Williams, 2011) states, quantitative research "employ strategies of inquiry such as experiments and surveys, and collect data on predetermined instruments that yield statistical data" (p. 18). Having known to an extent what quantitative research is all about, it is vital to analyze the difference between quantitative and qualitative research. Table 1: below give a vivid description of the difference between qualitative and quantitative research is all about. Below is a table that differentiates between qualitative and quantitative research.

QUALITATIVE VERSUS QUANTITATIVE RESEARCH

Criteria	Qualitative Research	Quantitative Research
Purpose	To understand & interpret social interactions.	To test hypotheses, look at cause & effect, & make predictions.
Group Studied	Smaller & not randomly selected.	Larger & randomly selected.
Variables	Study of the whole, not variables.	Specific variables studied
Type of Data Collected	Words, images, or objects.	Numbers and statistics.
Form of Data Collected	Qualitative data such as open- ended responses, interviews, participant observations, field notes, & reflections.	Quantitative data based on precise measurements using structured & validated data-collection instruments.
Type of Data Analysis	Identify patterns, features, themes.	Identify statistical relationships.
Objectivity and Subjectivity	Subjectivity is expected.	Objectivity is critical.
Role of Researcher	Researcher & their biases may be known to participants in the study, & participant characteristics may be known to the researcher.	Researcher & their biases are not known to participants in the study, & participant characteristics are deliberately hidden from the researcher (double blind studies).
Results	Particular or specialized findings that is less generalizable.	Generalizable findings that can be applied to other populations.
Scientific Method	Exploratory or bottom-up: the researcher generates a new hypothesis and theory from the data collected.	Confirmatory or top-down: the researcher tests the hypothesis and theory with the data.
View of Human Behavior	Dynamic, situational, social, & personal.	Regular & predictable.
Most Common Research Objectives	Explore, discover, & construct.	Describe, explain, & predict.
Focus	Wide-angle lens; examines the breadth & depth of phenomena.	Narrow-angle lens; tests a specific hypotheses.
Nature of Observation	Study behavior in a natural environment.	Study behavior under controlled conditions; isolate causal effects.
Nature of Reality	Multiple realities; subjective.	Single reality; objective.
Final Report	Narrative report with contextual description & direct quotations from research participants.	Statistical report with correlations, comparisons of means, & statistical significance of findings.

Source: (Johnson, & Christensen, 2008, p. 34; Lichtman, 2006, p 7-8; Xavier University Library, 10/12/12)

The table above vividly shows the difference between qualitative and quantitative methodology. The table shows that the main purpose of qualitative research is to understand and interpret social interactions while quantitative deals with testing of hypothesis, looking at cause and effect as well as making a prediction. Furthermore, (Fraser Health Authority 2011, p 6) see quantitative research as “research based on traditional scientific research which generates numerical data and usually seeks to establish causal relationships (or association) between two or more variables, using statistical methods to test the strength and significance of the relationships”. Buttressing on this, Gelo, et-al. (2008, p.) advocates that “Quantitative and qualitative research approaches clearly differ in terms of how data are collected and analyzed. Quantitative research requires the reduction of phenomena to numerical values in order to carry out the statistical analysis. By contrast, qualitative research involves the collection of data in a non-numerical form, i.e. texts, pictures, videos, etc” In quantitative research, Variables are very essential because it is the phenomenon that is classified and quantified.

Variables in Quantitative Research

“A variable is a property or characteristic of things and people that vary in quality and quantity” (Fraser Health Authority 2011, p 20). A variable is not only something that you measure, but also something that you can manipulate and control for. An independent variable (sometimes called an experimental or predictor variable) is a variable that is being manipulated in an experiment in order to observe the effect this has on a dependent variable (sometimes called an outcome variable). The dependent variable is simply that; a variable that is dependent on an independent variable(s). We discuss these concepts in the example below:

For example

Imagine that a tutor asks 100 students to complete a maths test. The tutor wants to know why some students perform better than others. Whilst the tutor does not know the answer to this, she thinks that it might be because of two reasons:

1. Some students spend more time revising for their test; and
2. Some students are naturally more intelligent than others.

Therefore, the tutor decides to investigate the effect of revision time and intelligence on the test performance of the 100 students. As such, the dependent and independent variables for the study are:

Dependent Variable:	Test Mark (measured from 0 to 100)
Independent Variables:	Revision time (measured in hours) Intelligence (measured using IQ score)

Types Of Quantitative Research

According to Sukamolson, (2007) “there are several types of quantitative research. For instance, it can be classified as 1) survey research, 2) correlational research, 3) experimental research and 4) causal-comparative research” In this assignment, the researcher will explain each of the type of research as follows:

Survey

Survey research according to Sukamolson, (2007) encompasses the use of scientific sampling method with a designed questionnaire to measure a given population's characteristics through the utilization of statistical methods. It provides answers like:

How many women can take a bullet for their husband?

More succinctly Sukamolson, (2007) further describe survey as a form of quantitative research that is concerned with ‘sampling questionnaire, questionnaire design, questionnaire administration’ for the sake of gathering information from the group/population under study, and then make analysis to order to better understand their behavior/characteristics. Furthermore, Kerlinger (1973) sees survey research as social scientific research that focuses on people, the vital facts about people, and their beliefs, opinions, attitudes, motivations and behavior. In addition, Kraemer (1991) outline three basic tenets in survey research, namely, survey is used to describe quantitatively a sectional aspect of a given populations which involves studying the relationship, in survey research method, data are obtained from people, and lastly, survey sample a part of population which is later used to generalize the whole population, i.e a section of a population is sampled to represent the whole population characteristics, viewpoint as well as opinion as the case maybe. According to Merriam-Webster Dictionary survey is derived from Anglo-French word ‘surveer’ which means to look over. Further, according to the dictionary, survey means (a) to examine as to condition, situation, or value-appraise; (b) to query (someone) in order to collect data for the analysis of some aspect of a group or area; (c) to determine and delineate the form, extent, and position of (as a tract of land) by taking linear and angular measurements and by applying the principles of geometry and trigonometry; (d) to view or consider comprehensively; and (e) to inspect, scrutinize.

Correlational

A quantitative methodology used to determine whether, and to what degree, a relationship exists between two or more variables within a population (or a sample). The degree of relationships is expressed by correlation coefficients. Coefficients range from +1.00 to -1.00. Higher correlations (coefficients closer to +1.00 or -1.00) indicate stronger relationships. Positive correlations indicate that as the values associated with one variable go up, so do the values associated with the other. e.g., higher grades are associated with higher???. Negative correlations indicate that as the values associated with one variable go up, the values associated with the other go down e.g., higher grades are associated with lower???. Buttressing on this, Leedy & Ormrod (2010) remark that correlation method of research deals with the creating relationship amid two or more variables in the same population. “The first type of correlational design, explanatory design, is conducted when researchers want to explore the extents to which two or more variables co-vary, that is, where changes in one variable are reflected in changes in the other (Creswell, 2008, p. 358). The second type of correlational design, prediction design, is used by researchers when the purpose of the study is to predict certain outcomes in one variable from another variable that serves as the predictor.

Experimental

During the experimental research, the researcher investigates the treatment of an intervention into the study group and then measures the outcomes of the treatment. There are three types of exploratory approaches: pre-experimental, true experimental, and quasi-experimental (Leedy & Ormrod, 2001). The pre-experimental design involves an independent variable that does not vary or a control group that is not randomly selected. Campbell and Stanley (1963) endorsed the true experimental design, which provides a higher degree of control in the experiment and produces a higher degree of validity. The true experimental designs result in a systemic approach to quantitative data collection involving mathematical models in the analyses. Whereas, the quasi-experimental design involves nonrandom selection of study participants. Therefore, control is limited and true experimentation is not possible. Since the variable cannot be controlled, validity may be sacrificed.

The factorial design focuses on two or more categories with the independent variables as compared to the dependent variable (Vogt, 1999). Key, (1997) describes experimental research as a form of research whereby a researcher takes control and maintains the basic elements that might affect the result of an experiment, by so doing; the researcher predicts the outcome of an experiment. While experimental design is the synopsis that guides a researcher while testing his hypothesis in order to reach a tangible conclusion on the relationship concerning an independent variable and a dependent variable. Furthermore, Key, (1997) outline the steps involve in experimental research as follows:

- i. Selecting a sample subjects
- ii. Grouping or pairing of subject matter
- iii. Selecting and constructing as well as validating the instruments that will be used to measure the outcomes
- iv. Conducting a pilot study

- v. Determining the place, time and duration of the experiment.

Experiment deals with the process of supporting, rejecting, or validating a hypothesis in order to get insight into the cause and effect of something when certain factors are being manipulated. For example, someone may carry out a basic experiment to understand the existence of gravity while others basically scientists carries out experiment for years depending on the subject matter to be experimented. Furthermore, Adèr, (2008) states that there are certain things a researcher should ruminate while embarking on an experimental research, that is, considering the suitable way of operationalizing the variables to be measured as well as the appropriate statistical method to be employed to answer the hypothesis or research questions, putting into consideration, the expected outcome of the study as well as how to analyse such outcome, the limitations involve in the study, such as the obtainable participants and their relevance and suitability in the representation of the target population of the study.

Causal-Comparative or Ex Post Facto

Ex post facto implies "from after the fact" (Gay, 1976). In simple terms, in ex-post facto research, the researcher investigates a problem by studying the variables in retrospect. It is research in which the dependent variable is immediately observable and now your main concern is to find out the antecedents that gave rise to this consequence. - In other words, a causal-comparative study is a form of study that tries to identify and determine the cause and effect of the relationship between two or more groups. - The causal-comparative study is a study in which the researcher attempts to determine the cause, or reason, for pre-existing differences in groups of individuals.

Differences and similarities between causal-comparative and correlational studies:

- The causal-comparative study looks at differences between groups while correlational study looks for relationships of variables within a single group.
- Causal-comparative and correlational studies are similar in that both used to examine relationships among variables.
- Causal-comparative includes categorical independent and or dependent variable but the correlational study only includes quantitative variables.
- Causal-comparative research provides better evidence of cause and effect relationships than correlational research.
- Like correlational research, causal-comparative research is sometimes treated as a type of descriptive research since it too describes conditions that already exist.

Types of Causal-Comparative Research Designs

There are two types of causal-comparative research designs

Retrospective causal-comparative research and prospective causal-comparative research. Retrospective causal-comparative research necessitates that a researcher starts investigating a precise problem when the effects have previously happened and the researcher endeavors to determine if one variable might have prejudiced another variable. Prospective causal-comparative research happens once a researcher starts a study beginning with the causes and is resolute to evaluate the effects of a situation. By far, retrospective causal-comparative research designs are considerably more common than prospective causal-comparative designs (Gay et al., 2006). However, people mistakenly consider that causal-comparative research is in some way superior to correlational research. This may be related to people's understanding that correlational research does not permit researchers to determine what variable causes another variable. Rather, correlational research allows researchers to determine the relationship or association between two or more variables. Regardless, it is imperative to recognize that neither correlational nor causal-comparative research produce experimental data (Gay et al., 2006). Instead, both research methods are well-thought-out to be non-experimental methods of data collection (Lodico et al., 2006). Consider the following situations. In which would a researcher be most likely to use a causal-comparative research design?

1. Mr. Ruiz, a school psychologist, would like to know how teachers view the consultation services he provides. How can he improve the process?
2. Miss Cass, a fourth-grade teacher, has noticed that one reading group in her class has made considerable gains in comparison to the other reading groups. Is this due to the new reading strategy that she has implemented?

3. Mrs. Williams, a high school principal, has asked one of the teachers on her staff, Ms. Smith, to begin this academic school year by teaching the freshman in her class study skills. Ms. Williams randomly assigns students to Ms. Smith's class. Ms. Williams plans to collect data to determine whether freshmen who are taught study skills early in their high school career, earn higher grades at the end of their first semester in comparison to their peers who are not taught study skills.
4. Mr. Johnston, a tenth-grade math teacher, has noticed that students who earn lower grades on the homework assignments in his class often share that they spend hours each night on social networking websites. Mr. Johnston wonders what the relationship is between the scores students earn in his class on their homework assignments and the amount of time they spent each week on social networking websites.

If you think the situation proposed in option 2 seemed to be the likely one in which a researcher would use a causal-comparative research design, you are correct! The other situations would most likely require a researcher to employ the following research methods: 1. descriptive research, 3. experimental research, and 4. correlational research. What then are the differences between all the forms of research under the quantitative methodology, below is a succinct difference between different forms of quantitative methodology.

Conclusion

The Paper explicated the quantitative methodology. The study establishes that quantitative research deal with quantifying and analyzing variables in order to get results. It involves the utilization and analysis of numerical data using specific statistical techniques to answer questions like *who, how much, what, where, when, how many, and how*. It is also described as the methods of explaining an issue or phenomenon through gathering data in numerical form. The study further reveals that quantitative methods can be categorized into; survey research, correlational research, experimental research and causal-comparative research. The study established as remarked by Gelo, et-al. (2008, p.) that "Quantitative and qualitative research approaches clearly differ in terms of how data are collected and analyzed. Quantitative research requires the reduction of phenomena to numerical values in order to carry out the statistical analysis. By contrast, qualitative research involves the collection of data in a non-numerical form, i.e. texts, pictures, videos, etc.

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