

Fundamentals of quantitative research

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Abstract

The main purpose of this article is to introduce some important fundamental concepts of quantitative research to readers especially novice researchers. It comprises types of research, definitions of quantitative research, different types and assumptions of quantitative research, when to use and not to use quantitative methods, advantages, common approaches and samples of quantitative research, and common misconceptions. Besides, a set of criteria for evaluating quantitative research proposal is provided. The main focus is on the assumptions underlying the quantitative research and some of the misconceptions that many researchers have when they are conducting a research study.

Types of Research

It is not easy to say how many types of research there are because different researchers or educators may use different criteria to classify research types. Generally speaking, research can be classified into 3 main groups based on the application of the research study, its objectives in undertaking the research and how the information is sought. Each group can be subdivided into different types as follows: (Kumar, 1996)

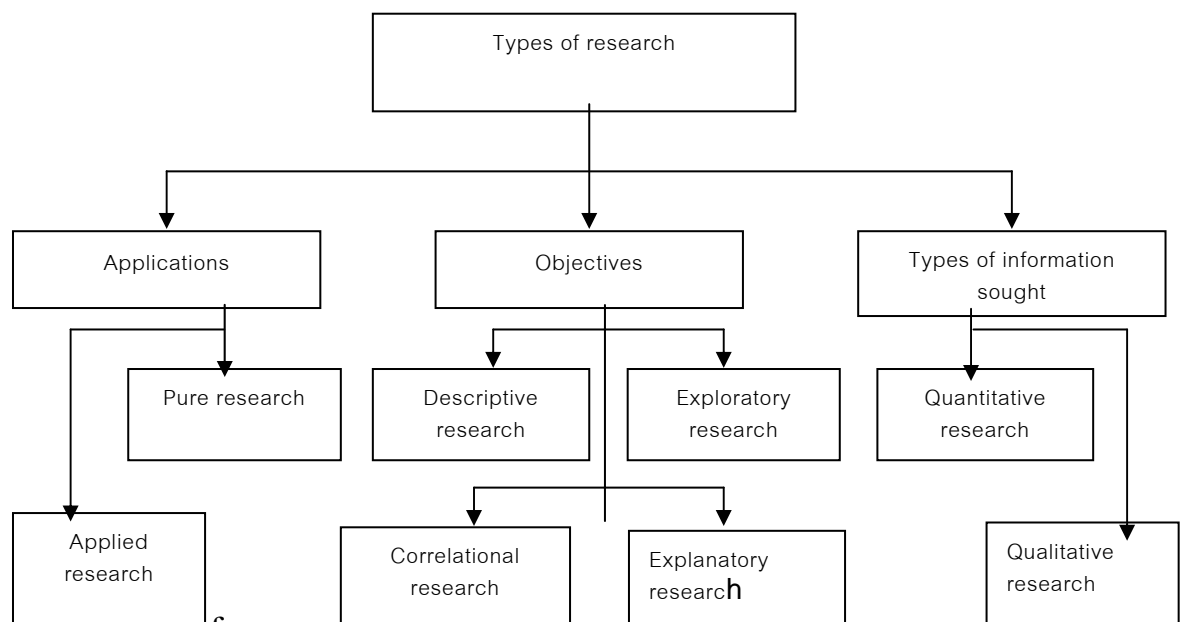


Figure 1. Types of research

Research can also be classified according to the time when the data are collected for investigation. Therefore, it can be divided into 3 main groups: historical research, present research and futuristic

research. Each group can be subdivided into many types. This paper will mainly focus on quantitative research.

What is quantitative research?

Different researchers and educators give different definitions to "quantitative research." Here are some of them:

Quantitative research is the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect. It is used in a wide variety of natural and social sciences, including physics, biology, psychology, sociology and geology (Wikipedia Encyclopedia, 2005).

In addition, according to Cohen (1980), quantitative research is defined as social research that employs empirical methods and empirical statements. He states that an empirical statement is defined as a descriptive statement about what "is" the case in the "real world" rather than what "ought" to be the case. Typically, empirical statements are expressed in numerical terms. Another factor in quantitative research is that empirical evaluations are applied. Empirical evaluations are defined as a form that seeks to determine the degree to which a specific program or policy empirically fulfills or does not fulfill a particular standard or norm.

Moreover, Creswell (1994) has given a very concise definition of quantitative research as a type of research that is 'explaining phenomena by collecting numerical data that are analyzed using mathematically based methods (in particular statistics).'

Let's study this definition step by step. The first element is *explaining phenomena*. This is a key element of all research, be it quantitative or qualitative. When we set out to do some research, we are always looking to explain something. In education this could be questions, for example, 'Does constructivism work for teaching English in a Thai context?', or 'What factors influence student achievement in learning English as a foreign language?'

The specificity of quantitative research lies in the next part of the definition. In quantitative research we collect *numerical data*. This is closely connected to the final part of the definition: analysis *using mathematically-based methods*. In order to be able to use mathematically based methods our data have to be in numerical form. This is not the case for qualitative research. Qualitative data are not necessarily or usually numerical, and therefore cannot be analyzed using statistics.

The last part of the definition refers to the use of *mathematically based methods*, in particular *statistics*, to analyze the data. This is what

people usually think about when they think of quantitative research, and is often seen as the most important part of quantitative studies. This is a bit of a misconception. While it is important to use the right data analysis tools, it is even more important to use the right research design and data collection instruments. However, the use of statistics to analyze the data is the element that puts a lot of people off doing quantitative research, because the mathematics underlying the methods seem complicated and frightening.

Therefore, because quantitative research is essentially about collecting numerical data to explain a particular phenomenon, particular questions seem immediately suited to being answered using quantitative methods. For example,

- How many students learning Experiential English I get A's in the first semester?
- What percentage of the students learning Experiential English I has negative attitudes towards the course?
- On average, is there any significant difference between the general English proficiency of the students learning Foundation English and Experiential English courses?

These are all questions we can look at quantitatively, as the data we need to collect are already available to us in numerical form. However, there are many phenomena we might want to look at, but which don't seem to produce any quantitative data. In fact, relatively few phenomena in education actually occur in the form of 'naturally' quantitative data.

Luckily, we are far less limited than what might appear above. Many data that do not naturally appear in quantitative form can be collected in a quantitative way. We do this by designing research instruments aimed specifically at converting phenomena that don't naturally exist in quantitative form into quantitative data, which we can analyze statistically. Examples of this are attitudes and beliefs. We might want to collect data on students' attitudes to their school and their teachers. These attitudes obviously do not naturally exist in quantitative form. However, we can develop a questionnaire that asks pupils to rate a number of statements (for example, 'I think school is boring') as either agree strongly, agree, disagree or disagree strongly, and give the answers a number (e.g. 1 for disagree strongly, 4 for agree strongly). Now we have quantitative data on pupil attitudes to school. In the same way, we can collect data on a wide number of phenomena, and make them quantitative through data collection instruments like questionnaires or tests. We will later look at how we can develop instruments for this particular purpose.

The number of phenomena we can study in this way is almost unlimited, making quantitative research quite flexible. However, not all phenomena are best studied using quantitative methods. While quantitative methods have some notable advantages, they also have disadvantages. This means that some phenomena are better studied using qualitative methods.

In short, quantitative research generally focuses on measuring social reality. Quantitative research and/or questions are searching for quantities in something and to establish research numerically. Quantitative researchers view the world as reality that can be objectively determined so rigid guides in the process of data collection and analysis are very important.

Different Types of Quantitative Research

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. Each type has its own typical characteristics. Let's take survey research as an example:

Survey research uses scientific sampling and questionnaire design to measure characteristics of the population with statistical precision. It seeks to provide answers to such questions as "How many people feel a certain way?" and "How often do they do a certain behavior?" Survey research enables management to make comparisons between groups. It provides estimates from a sample that can be related to the entire population with a degree of certainty (e.g., 57% of the population +/- 3% will answer the question this way 95% of the time). Survey research requires that respondents are "randomly" sampled - that means that each person in the population has a known probability of being sampled. There are defined techniques, such as random digit dialing and sampling procedures to ensure a scientific sample. In developing a survey, you would normally work with a statistician to build a statistically valid sampling plan, a researcher to develop a survey instrument and research objectives, and a reputable field service that has the capacity to conduct large scale interview projects. It is important to work with experts because the quality of the survey can be affected by the research instrument.

Assumptions: realism, subjectivism and the 'paradigm wars'

As we have defined quantitative research, let's compare it with qualitative research, against which it is usually contrasted. While quantitative research is based on numerical data analyzed statistically, qualitative research uses non-numerical data. Qualitative research is actually an umbrella term encompassing a wide range of methods, such

as interviews, case studies, ethnographic research and discourse analysis, to name just a few.

The difference between quantitative and qualitative research is often seen as quite fundamental, leading people to talk about 'paradigm wars' in which quantitative and qualitative research are seen as belligerent and incompatible factions. Many researchers define themselves as either quantitative or qualitative. Where does this idea come from?

This idea is linked to what is seen as the different underlying philosophies and worldviews of researchers in the two 'paradigms' (also called 'epistemologies' or sometimes 'assumptions'). According to this view, two fundamentally different worldviews underlie quantitative and qualitative research. The quantitative view is described as being 'realist' or sometimes 'positivist', while the worldview underlying qualitative research is viewed as being 'subjectivist'.

What does this mean? Realists take the view that what research does is to uncover an existing reality. 'The truth is out there' and it is the job of the researcher to use objective research methods to uncover that truth. This means that the researcher needs to be as detached from the research as possible, and use methods that maximize objectivity and minimize the involvement of the researcher in the research. This is best done using methods taken largely from the natural sciences and then transposed to social sciences. Positivism is the most extreme form of this worldview. According to positivism, the world works according to fixed laws of cause and effect.

However, the view that there is a true reality that we can measure completely objectively is problematic. We are all part of the world we are observing, and cannot completely detach ourselves from what we are researching. Historical research has shown that what is studied and what findings are produced are influenced by the beliefs of the people doing the research and the political/social climate at the time the research is done.

If one looks at research from a quantitative versus qualitative perspective, qualitative researchers are subjectivists. In contrast to the realist view that the truth is out there and can be objectively measured and found through research, subjectivists point to the role of human subjectivity in the process of research. Reality is not 'out there' to be objectively and dispassionately observed by us, but is at least in part constructed by us and by our observations. There is no pre-existing objective reality that can be observed. The process of our observing reality changes and transforms it, and; therefore, subjectivists are relativistic. All truth can only be relative and is never definitive as the positivists claim.

Besides, they are different in some other dimensions as shown in the Table below: (Creswell, 1994)

Table 1 Quantitative and Qualitative Paradigm Assumptions

Assumptions	Questions	Quantitative	Qualitative
Ontological Assumption	What is the nature of reality?	Reality is objective and singular apart from the researcher.	Reality is subjective and multiple as seen by participants in a study.
Epistemological Assumption	What is the relationship of the researcher to that researched?	Researcher is independent from that being researched.	Researcher interacts with that being researched.
Axiological Assumption	What is the role of values?	Value-free and unbiased	Value-laden and biased
Rhetorical Assumption	What is the language of research?	Formal, Based on set definitions, Impersonal voice, and Use of accepted quantitative words	Informal, Evolving decisions, Personal voice, and Accepted qualitative words
Methodological Assumption	What is the process of research?	Deductive process, Cause and effect, Static design -categories isolated before study, Generalizations leading to prediction, explanation, and understanding, and Accurate and reliable through validity and reliability	Inductive process, Mutual simultaneous shaping of factors, Emerging design -categories identified during research process, Context-bound, Patterns, theories developed for understanding, and Accurate and reliable through verification

If you look at the extreme forms of the two views we have set out here, it would seem that quantitative and qualitative research methods are pretty incompatible. These extremes are, however, a gross simplification of the views of both quantitative and qualitative researchers, and very few people in either 'camp' subscribe to them. A qualitative method is an umbrella term for a large number of different research methods (such as participant observation, interviews, case studies, ethnographic research) which are quite different. They are used by researchers with quite different worldviews, some of which clearly lie towards the realistic end of the spectrum. To ascribe radical subjectivist views to all qualitative researchers is a fallacy.

To label all quantitative researchers positivists is equally inaccurate. Quantitative researchers have taken up many criticisms of positivist views, and there are now a variety of epistemologies underlying theory and practice in quantitative research. It is true now to say that very few quantitative researchers nowadays are radical positivists.

Post-positivism, Experiential Realism and Pragmatism

Post-positivists accept the critique of traditional positivism that has been presented by the subjectivists, without going so far as to reject any notion of realism. Post-positivists accept that we cannot observe the world we are part of as totally objective and disinterested outsiders, and accept that the natural sciences do not provide the model for all social research. However, they do believe in the possibility of an objective reality. While we will never be able to totally uncover that reality through our research, post-positivists believe that we should try and approximate that reality as best we can, while realizing that our own subjectivity is shaping that reality. Rather than finding the truth, the post-positivist will try and represent reality as best he or she can.

In contrast to positivists, post-positivists believe that research can never be certain. Rather than focusing on certainty and absolute truth, post-positivist social science focuses on confidence - how much can we rely on our findings? how well do they predict certain outcomes?

A second worldview or epistemology that underlies the work of some quantitative researchers is called *experiential realism*. Experiential realists claim, as do anti-positivists, positions, which we cannot observe the world in a purely objective way, because our perception itself influences what we see and measure. In contrast to subjectivist positions, however, experiential realists believe that there is a limit to subjectivity. Humans are limited in their subjectivity by

the fact that we use a limited number of schemas to formulate our views of the world. This is because our perception is 'embodied'. We don't observe passively, but actively interact with the world through our bodies.

Experiential realists see the use of metaphors as crucial to the way we make sense of the world around us. We use metaphors to understand our world. One of the main metaphors we use to do this is the subject/object schema, which divides the world up into objects (things) and subjects (people). This metaphor has its origins in the fact that in our dealings with the world we find that there is a distinction between an external world consisting of edges, surfaces and textures that are not us, and those things that are us, the actor. As we move around our world, the objects remain invariant.

A lot of researchers, both quantitative and qualitative, take a *pragmatist approach* to research, using different methods depending on the research question they are trying to answer. In some cases, this will lead them to quantitative research, for example when they need to give a quantitative answer to a question or generalize findings to a population, or are looking to test a theory mathematically; in other cases, they will employ qualitative methods. *Sometimes a mixed method approach combining quantitative and qualitative methods will be the most appropriate.*

When do we use quantitative methods?

If we take a pragmatic approach to research methods, first of all we need to find out what kinds of questions are best answered using quantitative as opposed to qualitative methods.

There are six main types of research questions that quantitative research is particularly suited to find an answer to:

1. The first is when we want a quantitative answer. For example, 'If the students have their choice, how many of them choose to study Experiential English I?' or 'How many English teachers in the Language Institute would like to teach Experiential English courses instead of Foundation English courses?' The reason why we need to use quantitative research to answer this kind of question is obvious. Qualitative, non-numerical methods will obviously not provide us with the numerical answer we want.
2. Numerical change can likewise only accurately be studied using quantitative methods. For example, 'Are the numbers of students in our university rising or falling?' or 'Is achievement in English of our students going up or

down?' We would need to do a quantitative study to find out the answer.

3. Quantitative research is useful for conducting audience segmentation. It is done by dividing the population into groups whose members are similar to each other and distinct from other groups. Quantitative research is used to estimate the size of an audience segment as a follow-up step to a qualitative study to quantify results obtained in a qualitative study and to verify data obtained from qualitative study.
4. Quantitative research is also useful to quantify opinions, attitudes and behaviors and find out how the whole population feels about a certain issue. For example, when we want to find out the exact number of people who think a certain way, to set baselines (e.g., to measure consumer attitudes regarding an issue prior to a campaign), and to ensure that the students can share some comments or ideas to a new course.
5. Quantitative research is suitable to explain some phenomena. For instance, 'What factors predict the general English proficiency of the fourth year students?' or 'What factors are related to changes in student English achievement over time?' This kind of question can be studied successfully using quantitative methods, and many statistical techniques have been developed to make us predict scores on one factor or *variable* (e.g. student English proficiency) from scores on one or more other factors or *variables* (e.g. learning habits, motivation, attitude).
6. The final activity for which quantitative research is especially suited is the testing of hypotheses. We might want to explain something, for example whether there is a relationship between students' achievement and their self-esteem and social background.

The types of problem or research outlined in 1 to 4 are called 'descriptive research' because we are only trying to describe a situation while those in 5 and 6 are called 'inferential research' because we are trying to explain something rather than just describe it. The former uses descriptive statistics whereas the latter uses inferential statistics. *However, the ultimate goal of any quantitative research is to generalize the "truth" found in the samples to the population (while the ultimate goal of any qualitative research is to understand a certain phenomenon.)*

When shouldn't we use quantitative methods?

As mentioned above, while quantitative methods are good at answering these four types of questions, there are other types of question that are not well suited to quantitative methods:

1. The first situation where quantitative research will fail is when we want to explore a problem in depth. Quantitative research is good at providing information in breadth from a large number of units. But when we want to explore a problem or concept in depth, quantitative methods are too shallow. To get really under the skin of a phenomenon, we need to go for ethnographic methods, interviews, in-depth case studies and other qualitative techniques.
2. As mentioned earlier, quantitative research is well-suited for the testing of theories and hypotheses. What quantitative methods cannot do very well is to develop hypotheses and theories. The hypotheses to be tested may come from a review of the literature or theory, but can also be developed using exploratory qualitative research.
3. If issues to be studied are particularly complex, an in-depth qualitative study (a case study, for example) is more likely to pick up on this than a quantitative study. This is partly because there is a limit to how many variables can be looked at in any one quantitative study, and partly because in quantitative research it is the researcher who defines the variables to be studied. In qualitative research unexpected variables may emerge.
4. Finally, while quantitative methods are better at looking at cause and effect (causality, as it is known), qualitative methods are more suited to looking at the meaning of particular events or circumstances.

What then do we do if we want to look at both breadth and depth, or at both causality and meaning? In these situations, it is best to use a so-called *a mixed method design* in which we use both quantitative (for example, a questionnaire) and qualitative (for example, a number of case studies) methods. *Mixed method research is a flexible approach where the research design is determined by what we want to find out rather than by any predetermined epistemological position. In mixed method research, qualitative or quantitative components can predominate or both can have equal status.*

Units and Variables

When conducting quantitative research, a researcher should have a clear understanding about the concepts of '*research units and variables*'. When we collect data for quantitative research, we have to collect them from someone or something. The people or things (e.g. schools) we collect data on or from are known as *research units, units or cases*. If we have to draw the data from the samples of population, the samples are also called *sampling units*. They all are the same. We can generalize the findings of our research study to the population from which we draw its sampling units.

The data that we collect from these units are known as *variables*. Variables are any characteristic of the unit we are interested in and want to collect (e.g. gender, age, self-esteem).

The name variable refers to the fact that this data will differ between units. For example, achievement will differ between students and schools; gender will differ between students, and so on. If there are no differences at all between units we want to study we probably aren't going to be able to do any interesting research. For example, studying whether students are human would not yield interesting findings.

What is a hypothesis?

A *hypothesis* is a tentative explanation that accounts for a set of facts and can be tested by further investigation. For example, one hypothesis we might want to test could be that poverty causes low English achievement, or that there is a relationship between students' self-esteem and the amount of time they spend watching television. Quantitative researchers will design studies that allow us to test these hypotheses. We can collect the relevant data and use statistical techniques to decide whether or not to reject or provisionally accept the hypothesis. Accepting a hypothesis is always provisional since new data may cause it to be rejected later on.

Advantages of Quantitative Research

1. Provides estimates of populations at large.
2. Indicates the extensiveness of attitudes held by people.
3. Provides results which can be condensed to statistics.
4. Allows for statistical comparison between various groups.
5. Has precision, is definitive and standardized.
6. Measures level of occurrence, actions, trends, etc.
7. Can answer such questions as "How many?" and "How often?"

Common Approaches to Quantitative Research

1. Surveys
2. Custom surveys
3. Mail/e-mail/Internet surveys
4. Telephone surveys
5. Self-administered questionnaire surveys
6. Omnibus surveys
7. Correlational research
8. Trend analysis
9. Exploratory research
10. Descriptive research
11. Experimental research

Samples of Quantitative Research : Survey Research

Among many types of quantitative research mentioned above, survey research is very popular and it has many types. Survey Research is the systematic gathering of information from respondents for the purpose of understanding and/or predicting some aspects of the behavior of the population of interest. The survey research is concerned with sampling, questionnaire design, questionnaire administration and data analysis.

Types of Surveys

1) In-person Interviews

An in-person interview consists of an interviewer asking the respondent questions in a face-to-face situation. The interview may take place at the respondent's home or a research office.

Pros:

1. Flexibility - personal interviews are the most flexible type of survey. They can be used to administer any type of questionnaire - structured questionnaires with specified but variable question

sequences (skip patterns) and unstructured questionnaires requiring a close rapport between the interviewer and the respondent.

2. If the project involves material testing, personal interviews allow the interviewer to provide or withhold visual cues when appropriate or necessary.

Cons:

1. Takes a long time to code and analyze data.
2. Expensive.

2.) Telephone Interviews

Telephone Interviews involve the presentation of the questionnaire by telephone. Computer-Assisted Telephone Interview systems program a survey questionnaire directly into a computer. The telephone interviewer then reads the questions from a television-type screen and records the answer directly on the terminal keyboard or directly onto the screen with a light pen.

Pros:

1. Flexibility - often the exact set of questions a respondent is to receive will depend on his/her answers to earlier questions. The computer allows for the creation of an "individualized" questionnaire for each respondent based on answers to prior questions.
2. The computer can present different versions of the same questions, rotating the order in which the alternatives offered by the question are presented.
3. "Bad" questions can be changed and new questions can be added with ease and speed.
4. Data analysis is almost instantaneous.

Cons:

1. Inappropriate for studies that require the respondent to react to the actual product, advertising copy, package design or other physical characteristics.
2. The interviewer cannot observe the respondent to further ensure that instructions are understood.

3.) Omnibus Survey

An omnibus survey is a type of telephone survey. Essentially, in this type of survey the conducting agency (survey firm) inserts questions of special interest to individual clients. It can be extremely useful for "pulse taking" (i.e. monitoring opinions and attitudes regarding a certain issue). Often omnibus surveys are conducted once or twice a week. They consist of a minimum of 1,000 interviews ($\frac{1}{2}$ men and $\frac{1}{2}$ women). The survey uses a random digit dialing sample of telephone households. Sample telephone numbers are computer generated. Within each sample household, one adult respondent is randomly selected using a computerized procedure (e.g., based on the "Most Recent Birthday Method" of respondent selection). Usually, interviewing for each omnibus survey is conducted over a five-day period. Up to four attempts are made to a number on various days and at different time periods. Depending on the company used to administer the survey, the response rate is between 30-40 percent.

Pros:

1. Quick turn around - the researcher can have analyzed data within a week.
2. Fairly cheap in comparison to other survey methods.

Cons:

1. Since the response rate is fairly low, even though the sample is drawn randomly, data is not 100% generalizable to the population in question.

4.) Self-Administered Questionnaires

Respondents fill out self-administered questionnaires themselves. Self-administered questionnaires are generally distributed through mail. Upon receipt of the questionnaire, the respondent fills it out and returns it via mail to the researcher. The questionnaires can also be distributed by means of magazine and newspaper inserts or they can be left and/or picked up by company personnel. Questionnaires enable the researcher to elicit detailed information from respondents who may not be accessible otherwise (homebound, rural, etc.).

Self-administered questionnaires can be used for pre-testing of program materials. In this case, the questionnaire is mailed to the respondent along with the pretest materials.

Increasingly, the computer is being used for survey administration; respondents are recruited via Internet advertisement, e-mail, or website. Website surveys are particularly advantageous because respondents can answer the questions and submit their responses during a single visit to the website, thus they do not have to take the additional step of mailing

their survey (and run the risk of forgetting to do so). In addition, materials can be scanned into the computer for pre-testing. Regardless of the advantages, it should be noted that sampling bias may occur with computer surveys, thereby forcing the researcher to use caution when drawing conclusions.

Pros:

1. Inexpensive.
2. Does not require interviewer time.
3. Allows respondents to maintain their anonymity and reconsider their responses.

Cons:

1. If mailed, response rate is low.
2. Often requires follow up.
3. May take a long time to receive sufficient responses.
4. Respondents self-select (potential bias).
5. If used for material pretest, exposure to materials is not controlled.
6. May not be appropriate if audience has limited writing skills.

5.) Central Location Intercept Interviews

Central Location Intercept Interviews involve stationing interviewers at a point frequented by individuals from the target audience (e.g., shopping malls). Interviewers stop, or intercept, consumers and interview them using a survey method. Results of intercept interviews are not statistically projectable to the population from which participants are drawn. Like other qualitative research techniques, intercept interviews enable program managers to gain insights into the attitudes, beliefs, motives and behaviors of the target population. Intercept interviews employ a one-on-one interviewing method - a preferred method for assessing the communication value of materials.

A typical central location intercept interview begins with the intercept. Potential respondents are stopped and asked whether they will participate. Then, specific screening questions are asked to see whether they fit the criteria of the target audience. If so, they are taken to the interviewing station (a quiet place), shown the pretest materials and asked questions. The questions included in the intercept protocol help assess comprehension of, individual reaction to and personal relevance of tested materials.

The questionnaire used during intercept interviews is structured containing primarily close-ended questions. Open-ended questions are kept to a minimum.

Pros:

1. Time efficient: can quickly conduct large number of interviews and get a quick turn around (seven days from setting up to receiving the tabulated results).
2. Cheap in comparison to focus group study or in-depth interview.
3. Can test many kinds of materials.

Cons:

1. Interviews are too short (10 min.) to explore consumer attitudes and perceptions in-depth.
2. Cannot probe.
3. Cannot deal with sensitive issues.
4. Samples are restricted to individuals at the location.

Common Misconceptions

There are many common misconceptions among novice researchers about how to conduct quantitative research, and here are some of them.

1. *Do I have to have an epistemology to do research? No, not necessarily.* While you may have strong epistemological and philosophical beliefs that determine what kind of research you want to do, you can also start out wanting to solve a particular problem or wanting to find out about a particular phenomenon. In such a situation you will be able to pragmatically choose what methods which are best suited to solve your research question.
2. *Do data have to be in a quantitative format to do quantitative research? Not necessarily.* If data are not naturally available as numbers, you can try and turn non-quantitative data (like attitudes or opinions) into quantitative data by measuring them numerically (for example, by using a Likert rating scale).
3. *Are qualitative and quantitative research incompatible? Not necessarily.* Qualitative and quantitative research can be usefully combined in mixed methods designs, which often produce a lot of useful information. Also, depending on your research question, you might, in one instance, want to use quantitative and, in another instance, qualitative research.

4. *Is statistics the most important thing about quantitative? Not at all.* While the way in which you analyze your data matters, if you haven't designed your research well and collected the data in a valid and reliable way, you will not get valid results however sophisticated your analyses.
- 5: *Is qualitative research purely subjective? Not necessarily.* While some qualitative researchers might take a strong subjectivist stance, there is a wide variety of qualitative methods that can accommodate a variety of viewpoints.
6. *Can we explain things using quantitative research? To do that, do we need to use qualitative methods? That is not strictly true.* While qualitative research usually provides more depth and less breadth than quantitative research, a well-designed quantitative study will allow us not just to look at what happens, but to provide an explanation of why it happens as well. The key lies in your research design and what variables you can collect.

Table 2 Evaluation Criteria for Quantitative Research Proposal

criteria	yes	no
<p>General Criteria</p> <ol style="list-style-type: none"> 1. Does the title clearly specify the variables or topics to be studied? 2. Does the title cover all important variables or topics? 3. Does the title signify a type of research or a method of study? 4. Is its issue is “researchable”? 5. Is it is a new title or an old one deserving a replication? 6. Is it useful for educational purposes? 7. Does it serve a research policy of the institution? 8. Does it fit the researcher’s ability to conduct such a study? 9. Can it be done within the specified time? 10. Is the amount of money asked for reasonable? 11. Is it ethical? 		
<p>Introduction</p> <ol style="list-style-type: none"> 1. Do the hypotheses state the relationships of the variables clearly? (if any) 2. Are they all derived from related literature? (if any) 3. Are all basic assumptions reasonable? (if any) 4. Are the expected outcomes of the study stated in the application level and reasonable? 5. When necessary, are the variables directly or operationally defined? 		
<p>Related Literature</p> <ol style="list-style-type: none"> 1. Is the review comprehensive? 2. Are all the references cited relevant to the problem under investigation? 3. Are the sources mostly primary, with only a few or no secondary sources? 4. Have the references been critically analyzed and the results of various studies compared and contrasted; i.e., is the review more than a series of abstracts or annotations? 5. Is the review well organized? Does it logically flow in such a way that the most related references to the problem are discussed first and the least related references are discussed last? 6. Does the review conclude with a brief summary of the literature and its implications for the problem investigated? 7. Do the implications discussed form an empirical or theoretical rationale for the hypotheses that follow? 8. Are all related references fairly reviewed? 		
<p>Research Methodology</p> <ol style="list-style-type: none"> 1. Are the size and major characteristics of the population studied described? 2. If a sample is selected, is the method of selecting the sample clearly described? 3. Is the method of sample selection described one that is likely to result in a representative, unbiased sample? 4. Are the size and major characteristics of the sample described? 5. Is the sample size sufficient? 6. Are the instruments appropriate for measuring the intended variables? 7. Is the research design appropriate for the study? 8. Are the steps of data collection logical and feasible? 9. Is the method of data analysis appropriate? 10. If some statistical tests are to be used, are they correctly selected? 		
Total score		

Total score in percentage = _____ %

Level = Very poor, Poor, Moderate, Good, Excellent
Any _____ comments

Summary

In this paper we have discussed what quantitative research is. Quantitative research is about explaining phenomena by collecting quantitative data which are analyzed using mathematically based methods.

The fact that the data have to be quantitative does not mean that they have to be naturally available in quantitative form. Non-quantitative phenomena (such as teacher beliefs) can be turned into quantitative data through our measurement instruments.

Quantitative research is often placed in opposition to qualitative research. This is often turned into a 'paradigm war' which is seen to result from apparently incompatible worldviews underlying the methods. When you look closely at researchers' actual beliefs, it appears that the so-called subjectivist (qualitative) versus realist (quantitative) divide is not that clear-cut.

Many researchers take a pragmatic approach to research and use quantitative methods when they are looking for breadth and they want to test a hypothesis or want to study something quantitative. If they are looking for depth and meaning, they will prefer to use qualitative methods. In many cases, mixed methods approaches will be appropriate.

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