

# Quantitative and qualitative research education essay



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For the research work, the basic RESEARCH QUESTION is factors effecting production planning and control with reference to performance measurement

To address all such questions the methodology used is Qualitative and I make use of Quantitative methods to analyse the statistical data, which to be collected during research work.

## **QUANTITATIVE AND QUALITATIVE RESEARCH**

I am conducting two approaches to investigations my research work i-e.

Qualitative & Quantitative In the former, we use words to describe the outcomes and in the latter, we use numbers.

## **QUALITATIVE RESEARCH**

The main methods employed in qualitative research are:

- Observation
- Interviews
- Sampling
- Written materials
- Questionnaires
- Validity
- Ethics

## **QUALITATIVE ANALYSIS**

- Primary analysis
- Category and concept formation
- The generation of theory

## **OBSERVATION**

In seeking to explore the natural scene, the qualitative researcher aims to be as unobtrusive as possible, so that neither research presence nor methods disturb the situation. This is why participant observation is one of the favoured approaches.

### **Participant observation**

- Blends in with natural activity,
- Access to the same places, people and events as the subjects,
- Documents relevant to the role, including confidential reports and records,
- Use of mechanical aids, such as tape recorders and cameras,
- First-hand experience of the role and thus heightens understanding of it,
- Worthwhile contribution to the life of the institution

The strengths of systematic observation are:

- It is relatively free of observer bias.
- It can establish frequencies, and is strong on objective measures
- Reliability can be strong.
- Generalise-ability, Once I have devised my instrument, large samples can be covered.
- It is precise, There is no 'hanging around' or 'muddling through'.
- It provides a structure for the research topic

## **INTERVIEWS**

A great deal of qualitative material comes from talking with people whether it be through formal Interviews or Casual conversations.

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It is essential for the researcher:

- To develop empathy with interviewees and win their confidence;
- To be unobtrusive, in order not to impose one's own influence on the interviewee.

The best technique for this is the unstructured interview.

There are a number of techniques researchers use in the natural course of the conversation to aid clarity, depth and validity. Here are some:

- Check on apparent contradictions
- Search for opinions
- Ask for clarification
- Ask for explanations, pose alternatives
- Seek comparisons
- Pursue the logic of an argument
- Ask for further information
- Aim for comprehensiveness
- Put things in a different way
- Express incredulity or astonishment
- Summarise occasionally and ask for corroboration
- Ask hypothetical questions
- Play devil's advocate

The researcher engages in 'active' listening, which shows the interviewee that close attention is being paid to what they say; and also tries to keep the interviewee focused on the subject, as unobtrusively as possible. Both kinds of interview might be used in the same research.

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## **SAMPLING**

Where qualitative research is seeking to generalise about general issues, representative or 'naturalistic' sampling is desirable. This covers places, times and persons.

Representative sampling cannot always be achieved in qualitative research because of

- The initially largely exploratory nature of the research
- Problems of negotiating access
- The sheer weight of work and problems of gathering and processing data using only one set of eyes and ears

## **WRITTEN MATERIALS**

Documents are a useful source of data in qualitative research, but they have to be treated with care. The most widely used are official documents, personal documents, and questionnaires.

Official documents include registers, timetables, minutes of meetings, planning papers, lesson plans and notes, confidential documents on pupils, school handbooks, newspapers and journals, files and statistics, notice boards, exhibitions, official letters, textbooks, work cards, photographs.

Personal documents are diaries, creative writing exercises, pupils' 'rough' books, graffiti, personal letters and notes.

If these have already been created, they are part of the 'natural' situation, and can tell the researcher a great deal about pupil and teacher behaviour, culture and perspectives.

In studies that I have been connected with I have found out a great deal from these kind of documents.

Diaries frequently used in qualitative research. Their very nature speaks to the features outlined in the first section above. They are 'natural', they contain personal meanings and understandings, and they are processual.

The researcher needs to know the basis and motivation on which they were compiled.

They are particularly strong, therefore, where used in conjunction with other methods.

## **QUESTIONNAIRES**

Questionnaires are not among the most prominent methods in qualitative research, because they commonly require subjects to respond to a stimulus, and thus they are not acting naturally.

Interaction among techniques in this way is typical of qualitative research.

In order to accord with the features of qualitative research outlined above, one would need to take into account the questions of:-

- Access.

Questionnaires in qualitative research often contain a mixture of the two.

- The need to identify the context in which replies are being given
- The need for checks, balances, extensions and modifications

**Validity**

Some qualitative researchers are not concerned about validity as it is commonly understood, preferring to aim for 'understanding', which might be achieved. Whichever approach one adopts, however, validity or rigour in qualitative research commonly depends on:

**Modest measures**

The less the researcher disturbs the scene, the longer spent in it, and the deeper the penetration of the research, the more the representation of it might claimed to be authentic.

**Respondent Validation**

If we are aiming to understand the meanings and perspectives of those being studied, how better to judge if our understandings are accurate and full than by giving our accounts back to those involved and asking them to judge?

Respondent validation may not always be appropriate or desirable.

**ETHICS**

The main ethical debates in qualitative research revolve around the tensions between secret and open research, and between the public's right to know and the subject's right to privacy.

Participant observation has, on occasions, been likened to 'spying' or 'voyeurism'.

There is a temptation, too, for some researchers to negotiate access into an institution, carry out observations that he or she requires, persuade subjects to ‘spill the beans’, and then ‘cut and run’.

In practical terms, this means, for example, not harming the institution or the persons one is researching, if possible leaving them in a better rather than a worse condition, protecting their identities in disseminating the research.

Respondent validation can be seen to have an ethical dimension.

## **QUALITATIVE ANALYSIS**

In qualitative research, analysis frequently takes place at the same time as data collection.

In order to make sense of the data, much may have to be jettisoned – which means a lot of time and work might have been wasted, as well as a lower quality product.

Analysis, therefore, begins almost immediately, with ‘primary analysis’.

Later on, after more data collection in interaction with primary analysis, a second stage occurs with ‘category and concept formation’.

The research might stop at this point, depending on the aims, or it might proceed to a third stage, the ‘generation of theory’.

I shall consider each of these.



**Primary analysis**

As interview transcripts are made, or fieldnotes of observation compiled, or documents assembled, the researcher continuously examines the data, perhaps highlighting certain points in the text or writing comments in the margins.

These might identify what seem to be important points, and note contradictions and inconsistencies, any common themes that seem to be emerging, references to related literature, comparisons and contrasts with other data and so on..

**Methodology**

How did I come across the idea?

As I'm building up numbers of interviews, that is I interview the same person lots of times, I've noticed that they repeat their account of certain incidents, usually fairly important ones in their lives.

The other salient factor is that the account is given in the same words each time, with remarkably little variation.

In addition, this kind of repeating of tales is elicited most often when there has been a gap in my interviewing of a few weeks, so the narrative has gone cold.

They cannot immediately recall exactly what they told me before.

Then I got the repetition of incidents, and the repetition of phrases

**Explanations and ideas**

It might simply be that the repetition of incidents is due to lapses in memory, especially as people are getting older, that would not be surprising. But there is a problem there, because it fails to explain

Why these incidents should be repeated in exactly the same phraseology?

Why doesn't the lapse of memory extend to that too?

Why is it that it is only certain things, certain incidents that get repeated?

**Category and concept formation**

Most qualitative researchers arrive at a point where their data has to be organised in some kind of systematic way, if only for analytic purposes.

It may be helpful to summarise data in some way, tabulate them on a chart, or construct figures, or sketch diagrams. Such distillation helps one to encapsulate more of the material in a glance.

**The generation of theory**

Many qualitative studies do not go beyond the construction of models and typologies.

This ordered, descriptive detail is a perfectly legitimate pursuit.

As we have seen, it takes considerable work, skill and insight to achieve this level of description, and the results are valuable.

But we might want to go on from asking 'what' and 'how' questions to 'why' questions.

What we saw in the second stage of analysis above was ‘ how’ but we would like to know ‘ why.’

### **Types of theory**

It is useful to see theories on two dimensions. The first is Glaser and Strauss’s (1967) distinction between substantive and formal theory.

The former is theory that applies to a particular case; formal theory is at a higher level of abstraction and applies to a generality of cases.

The second dimension is that of micro-macro. Qualitative research lends itself more readily to micro research, which is concerned with activity within classrooms and schools, interaction between people, local situations, case studies.

### **Comparative analysis**

The development of theory proceeds typically through comparative analysis.

As we saw earlier, instances are compared across a range of situations, over a period of time, among a number of people and through a variety of methods.

Comparisons are being made all the time – in checking data, testing an idea, bringing out the distinctive elements of a category, establishing generalities within a group.

Any of these could spark off ideas about ‘ why’, which would bring more comparisons to test and refine that idea.

As soon as one begins to identify significant events or words, and goes on to develop categories and concepts, one is building up essential components of theory.

Consulting the literature is an integral part of theory development, and the main way of making comparisons outside the study.

Another important factor is time. The deeper the involvement longer the association, the wider the field of contacts and knowledge

## **QUANTITATIVE RESEARCH**

As part of my research, I am looking at certain characteristics (variables) and endeavouring to show something interesting about how they distributed within Production Planning and Control.

A variable needs measured for the purpose of quantitative analysis. Using the data that I have collected then I can make use of

Descriptive statistics including

- Averages,
- Frequencies,
- Cumulative distributions,
- Percentages,
- Variance and standard deviations,
- Associations and correlations

Variables can be displayed graphically by tables, bar or pie charts for instance.

This may be all the statistics I need and I can make deductions from my descriptions. In fact, univariate (one variable) analysis can only be descriptive.

However, descriptive statistics used to describe a significant relationship between two variables (bivariate data) or more variables (multivariate).

Infer significant generalisable relationships between variables. The tests employed designed to find out whether or not my data is due to chance or because something interesting is going on.

### **Variables**

- Numerical measurements
- Non-numerical measurements
- Continuous data
- Categorical data
- Nominal data
- Ordinal data

### **Basic Measures**

Mean: is a measure of the central location or average of a set of numbers,

Standard deviation: is the square root of the variance

Variance: is a measure of dispersion (or spread) of a set of data calculated in the following way:

$$s^2 = \frac{\sum (x - \text{mean})^2}{n}$$

$$s = \sqrt{\frac{\sum (x - \text{mean})^2}{n}}$$

n

Median: is the centre or middle number of a data set

Quartiles: divide a distribution of values into four equal parts. The three corresponding values of the variable are denoted by  $q_1$ ,  $q_2$  (equal to the median) and  $q_3$

Range: is a measure of dispersion equal to the difference between the largest and smallest value.

### **Measures of Location and Dispersion**

A distribution is symmetrical if the difference between the mean and the median is zero.

An appropriate pictorial representation of the data, (histogram, stem and leaf diagram etc.) would produce a mirror image about the centre:

A distribution is positively skewed (or skewed to the right) if the mean – median is greater than zero. Such data when represented by a histogram would have a right tail that is longer than the left tail

A distribution is negatively skewed (or skewed to the left) if the mean – median is less than zero. Such data when represented by a histogram would have a left tail that is longer than the right tail

If data skewed then the best measure of location is the median and the best measure of dispersion is the inter-quartile range. If data are symmetrical then the best measure of location is the mean and the best measure of dispersion is the standard deviation or variance.

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**Probability**

This is an important concept in statistics and is an important part of our story.

It is defined in the following way: if an experiment has  $n$  equally likely outcomes and  $q$  of them are the event  $E$ , then the probability of the event  $E$ ,  $P(E)$ , occurring is

$$P(E) = q/n$$

**Testing an hypothesis**

There are two basic concepts to grasp before starting out on testing an hypothesis.

Firstly, the tests are designed to disprove hypotheses. We never set out to prove anything; our aim is to show that an idea is untenable as it leads to an unsatisfactorily small probability.

Secondly, the hypothesis that we are trying to disprove is always chosen to be the one in which there is no change. For example there is no difference between the two population means.

This is referred to as the null hypothesis and is labelled  $H_0$ . The conclusions of a hypothesis test lead either to acceptance of the null hypothesis or its rejection in favour of the alternative hypothesis  $H_1$ .

Hypothesis testing: a hypothesis test or significance test is a rule that decides on the acceptance or rejection of the null hypothesis based on the results of a random sample of the population under consideration.

Step 1: Formulate the practical problem in terms of hypotheses.

Step 2: Calculate a statistic that is a function purely of the data.

Step 3: Choose a critical region.

Step 4: Decide the size of the critical region.

## **Statistical tests**

### **t tests**

In hypothesis testing, the t test is used to test for differences between means when small samples are involved. For larger samples use the z test.

The t test can test

If a sample has been drawn from a Normal population with known mean and variance.

If two paired random samples come from the same Normal population.

Any hypothesis test can be one tailed or two tailed depending on the alternative hypothesis,  $H_1$ .

Consider the null hypothesis,  $H_0: \mu = 3$

A one tailed test is one where  $H_1$  would be of the form  $\mu > 3$ .

A two-tailed test is one where  $H_1$  would be of the form  $\mu \neq 3$ .



**Single sample test**

Let  $X_1, X_2, \dots, X_n$  be a random sample with mean and variance  $s^2$ . To test if this sample comes from a Normal population with known mean  $m$  and unknown variance  $s^2$ ,

$$T = \frac{\bar{X} - \mu}{S / \sqrt{n - 1}}$$

$$S / \sqrt{n - 1}$$

The test statistic used to test the null hypothesis  $H_0$ : the population mean equals  $m$ .

If the test statistic lies in the critical region whose critical values are found from the distribution of  $T_n$ ,  $\alpha$ ,  $H_0$  is rejected in favour of the alternative hypothesis  $H_1$ .  $n$  are the degrees of freedom and for a single sample test  $n = n - 1$ , and  $\alpha$  is the significance level of the test.

**Two unpaired samples**

Let  $X_1, X_2, \dots, X_m$  be a random sample with mean and variance  $s_x^2$  drawn from a Normal population with unknown mean  $m_x$  and unknown variance  $s_x^2$ . Let  $Y_1, Y_2, \dots, Y_n$  be a random sample with mean and variance  $s_y^2$  drawn from a Normal population with unknown mean  $m_y$  and unknown variance  $s_y^2$ . To test the null hypothesis that the two unknown population means are the same we use the test

where, the estimate of the common population standard deviation. The test statistic  $T$  is distributed  $T_n$ , where  $n = (m - 1) + (n - 1)$  for two unpaired samples. If the test statistic lies in the critical region whose critical values are found

from the distribution of  $T_n$ ,  $H_0$  is rejected in favour of the alternative hypothesis  $H_1$ .

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