
UNIT 14 DATA ANALYSIS

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14.0 INTRODUCTION

Data analysis is defined as the processing of collecting raw data and converting it into information useful for decision-making by users. The data are analysed to answer questions, test hypotheses, prove or disprove theories. The methods cover diverse operations of categorising, segmenting and interpreting evidence or data sets.

The previous unit, i.e. Unit 14 explored and explained basic statistical analysis at length. You should look at this unit alongside Unit 14 because here we try to understand the underlying principles of data analysis.

The process of data analysis by the researcher begins when entire set of the data have been collected. Organising the data correctly can save a lot of time and prevent mistakes. Most researchers choose to use a database or statistical analysis programme so that they can format data to fit their needs in order to organise their data effectively. Each data analysis software has its own requirements for how data are to be entered. A good researcher enters all of the data in the same format and in the same database, as doing otherwise might lead to confusion and difficulty with the statistical analysis later on. Sometimes, there are issues of interoperability between different software. Once the data have been entered, it is crucial that the researcher check the data for accuracy. This can be accomplished by spot-checking a random assortment of participant data groups, but this method is not as effective as re-entering the data a second time and searching for

discrepancies. This method is particularly easy to do when using numerical data because the researcher can simply use the database programme to sum the columns of the spreadsheet and then look for differences in the totals. One of the best method of accuracy checking is to use a specialised computer programme that can cross-check double-entered data for discrepancies (as this method is free from error), though these programmes can be hard to come by and may require extra training to use correctly.

In this unit, we shall focus on the concept of data analysis in research and the process of organising and coding of data for effective analysis. We shall discuss how to distinguish between quantitative and qualitative data analysis and so that you are able to apply appropriate data analysis techniques in your research work.

14.1 LEARNING OUTCOMES

After reading this unit, you should be able to:

- describe the importance of data analysis in research;
- organise data for effective analysis;
- explain the importance of data analysis;
- distinguish between quantitative and qualitative data analysis;
- explain how to handle quantitative data; and
- discuss how to handle qualitative data.

14.2 DIFFERENT RESEARCH PERSPECTIVES

In the previous units, you have read that the field of media and communication research is characterised by a variety of different research perspectives. The hybrid nature of the field of empirical enquiry in research presents a special challenge for interfacing quantitative and qualitative research analysis.

The understanding of the term 'analysis' has tended to divide qualitative and quantitative research traditions. In quantitative media studies, rule governed procedures of segmenting and categorising the components of content, form the basis of interpretation. On the other hand, qualitative studies typically emphasise meaning as a process unfolding in contexts.

The use of the words 'quantitative' or 'qualitative' can refer to a broad approach to the research problem, a methodology for the research and a defined set of research techniques. When we refer to quantification the focus of the research analysis lies on numbers and, in the case of content analysis, on measurable numerical values for 'space' and 'time'. These appear more systematic and replicable. Survey research also relies on greater quantification and greater measurement sophistication. However, this sophistication comes with a price: increasing quantification narrows the types of questions that can be addressed. This means that research depth is sacrificed to get research breadth. Basically, in quantitative data, we get a lot of findings that can be generalised to a larger population; while in qualitative data analysis, we get depth and underlying causes, without being able to generalise to a larger population.

For this reason, there is no commonly accepted definition of the term ‘qualitative’. Qualitative research relies mainly on observations and verbal data that reflect everyday experiences. On the other hand, and consequently, qualitative data have to be analysed differently.

Check Your Progress: 1

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

A. Fill in the blanks:

- 1) is defined as the processing of collecting raw data and converting it into information useful for decision-making by users.
- 2) The data is analysed to answer questions, test. or disprove theories.
- 3) Once the data has been entered, it is crucial that the researcher check the data for.....
- 4) In quantitative media studies, rule governed procedures of and the components of content, form the basis of interpretation.
- 5) Qualitative research relies mainly on and verbal data that reflect everyday experiences.

14.3 HANDLING QUANTITATIVE DATA

Quantitative research methodologies generate numerical data. Surveys (whether of audiences or content) and experiments are the basic ‘methods’ of the data collection. Once numerical data have been collected, they need to be analysed through statistical techniques. These mathematical techniques are used to describe, organise as well as explore relationships within the data. In epistemological terms, quantitative research is typically grounded in a hypothetico-deductive approach, in which investigators mount hypotheses or predictions about the expected associations or cause-effect relationships between variables. The aim of the quantitative data collection and analysis, then, is to produce findings which lead to the acceptance or rejection of a specified hypothesis. Numerical data analysis through statistical procedures represents a systematic and objective way of determining whether significant patterns of relationships exist among those phenomena that have been measured in data collection.

14.3.1 Organising and Coding Data

Numerical data is collected through survey questionnaires, content coding frames or experimental instruments. These have to be systematically coded and entered into a database for further analysis. This is the process of organising and coding data and is a very crucial part of the analysis process. This is where most inexperienced researchers tend to make mistakes. If there are errors here, they will be reflected in the problems faced while analysing data and will make analysis difficult, if not impossible.

The first stage of organising data is the creation of a coding manual. Often, researchers think that data can be entered directly into a database. While, yes it can be entered, the coding manual anticipates any problems in entering, e.g. when there are multiple answers possible, or when there are double digit replies.

Simply stated, a coding manual is a set of instructions on how the data are to be tabulated, and is an extremely important document when organising data, especially, if there is more than one person entering data onto a coding sheet or database.

You may ask, what does a coding manual look like. A brief design is given below:

Variable	Numerical value	Column
Location	1) Rural 2) Semi-urban 3) Urban 9) No Answer	1
Sex	1) Male 2) Female 3) Transgender 9) No Answer	2
Level of Education	1) Illiterate 2) Upto 8th standard 3) Matriculate 4) High School 5) Graduate and Above 9) No answer	3

Note, how one column is assigned to one variable. And since a single digit cannot exceed 9, 9 is the code given for a ‘no answer’. In case there are more than 9 possible answers to a question, assign two columns, with 99 for a ‘no answer’.

Sometimes, a question may have multiple answers because that is how it has been asked. Then, one column must be assigned for each possible answer.

A sample coding sheet is provided in the Annexure. In a coding sheet, one row is assigned to one respondent. One or two columns (as the need may be) are assigned to a question or variable. Through this process of coding, identification of key variables can be done easily and errors, duplication, and repetition etc. can be addressed. Once the data are coded numerically and entered into a coding sheet and transferred onto a computerised database, data can be checked for accuracy and statistical tests can be performed. The accuracy with which the data transfer takes place and the application of statistical procedures that are appropriate for the particular type of data, are crucial to the entire quantitative research work-errors in the early stages as it can skew or invalidate the final results.

Different software packages have different methods for entering data into columns. For instance, in Excel, it is possible to enter two numbers in one cell separating them as 1, 3. In SPSS, one cell in a column can have only one number. Follow the instructions of the software package in designing your coding manual and in entering your data

14.3.2 Descriptive Statistics

Descriptive statistics has been discussed in detail in Unit 14, we will merely summarise different types of statistics here. Often quantitative data analysis begins by adopting a simple descriptive approach in order to establish some initial patterns in the findings. For instance, a survey of the public opinion about the performance of elected political leaders might first present data in percentages of the number of respondents who agreed or disagreed that the political leaders were competent. In a further analysis, results can be described in terms of gender, age, social class and political affiliations of the respondents. Such results can be visually displayed in a bar chart or summarised in a table. Some of the ways of displaying results are described.

Another type of study might conduct a survey to ask a sample of 1000 respondents to state how many hours are spent on watching television each week. In this case, descriptive statistics can be applied to show how many respondents viewed nothing or less than an hour or between one to two hours and so on. Next, a frequency distribution could be generated showing how the respondents were distributed across different volumes of viewing. Such data can be visually represented in a line graph or bar chart, or a simple table.

14.3.3 Summary Statistics

Data can be further analysed in terms of summary statistics. Summary statistics measure two basic aspects of the distribution of 'scores' or measurements in a data set: central tendency and dispersion, or variability. A central tendency measure indicates which out of a range of scores is the 'typical' one. This typical score in turn can be defined in three different ways:

- a) The mode is the most frequently occurring in a range of scores. For example, if in a set of ten scores, five score '4', three score '2', and two score '1', the mode is 4.
- b) The median score is the midpoint in a range of scores. In the following set of scores the median is "7": 2 4 5 6 (7) 9 10 11 12. The score '7' lies at the exact half-way point in this distribution of scores. In other cases where there is an even number of scores and therefore no exact mid-point, the median must be calculated by averaging between the two centre scores: 4 5 7 8 9 11 12 13. Here, the median is 8.5 or the average of '8' and '9'.
- c) The mean score is the average of the total range of scores. In the previous example the eight scores totalled 62, which divided by 8, gives a mean score of 7.75.

14.3.4 Descriptive Measures

Other fundamental descriptive measures are range, variance and standard deviation.

Range, which is the simplest expression of dispersion, is the difference between the highest and the lowest scores in a particular distribution.

Variance provides a mathematical index of the degree to which scores deviate from the mean score, and tend to be expressed not in terms of the original scores, but as squared deviations from the mean. To compute the variance, one subtracts

the mean of a distribution from each score and then squares the result. These squared scores are then summed and divided by the number of original scores minus one. Variance is a powerful and widely applied measure.

Standard Deviation is a statistical procedure that enables us to see by how much the members of a group differ from the mean value for the group. A low standard deviation means that most of the members of the group are very close to the average, while a high standard deviation score means that the numbers are spread out. Unit 14 has explained the procedure of arriving at a standard deviation at length.

14.4 TESTING HYPOTHESES

Much quantitative research goes beyond the simple description of data and their distributions. The search for connections or correlations to understand the underlying causes of behaviour is an important part of any data analysis. For this, the researcher may have framed specific questions or hypotheses. The data have to be tested to either validate or disprove the hypotheses framed at the beginning of the research. In hypothesis testing, the researcher is interested in establishing whether two or more variables are associated, or whether the scores obtained in two or more groups are different - and if so, whether such association is in a 'significant' manner. Significance means simply that the association of the variables must not happen by chance, or the laws of probability alone. When a relationship is highly significant, it means that such an association would not have happened in the normal course of things, and that there is an important association between the variables.

When deciding whether to accept or reject a hypothesis, the researcher must examine the statistical significance of the results. The starting point is to set up a null hypothesis, or a hypothesis which asserts that any statistical differences or relationships that emerge within the data are entirely due to chance fluctuations or random error. The research hypothesis puts up an alternative viewpoint- that the statistical relationships or differences are not due to chance, but represent real phenomena that can be explained theoretically in the research.

The essential characteristic of quantitative research is that it reduces phenomena to numerical codes. Numerical measurement, however, can occur at more than one level, and the understanding of different levels of measurement is crucial, both to the correct use of statistical methods of data analysis and to the proper interpretation of data.

Within mass communication research, hypothesis testing is done using tests of association and tests of significance. The term "association" is closely related to the term 'correlation'. A commonly used test of significance is the chi-square test for independence. Also called the Pearson's chi-square test or the chi-square test of association, this test is used to discover if there is a relationship between two categorical variables. Very simply, the test may show us if there is a relationship between the sex of a respondent and the amount of television s/he watches, or his/her social media habits.

Tests of significance are also used in mass communication to tell us how strong a relationship between two variables is. The types of tests of significance commonly used are-T Test, the f-test and analysis of variance (ANOVA).

Essentially these tests tell us about the significance of difference between the mean of a small sample and hypothetical mean of population (expressed in terms of standard error).

At this stage, it is not necessary for you to know the formulae to perform these tests and arrive at some scores. You can programme the software you are using which in sum will calculate the scores for you, give you the score, the P value, and the significance level. What is important for you is to know how to read the scores and interpret them.

The first step is to determine if the association is significant. The second step is to determine which variables have the most impact. To do this, compare the p-value to the significance level on a chart available in any book on basic statistics. For a chi square test, if the significance level is less than .05, you can conclude that an association between the variables exists. Different tests have different significance levels. You should either look up a book on basic statistics, or consult a statistician to get an accurate picture.

Check Your Progress: 2

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

A. Fill in the blanks:

- 1) In epistemological terms, quantitative research is typically grounded in a approach.
- 2) The aim of the quantitative data collection and analysis, then, is to produce findings which lead to the..... or..... of a specified hypothesis.
- 3) The.....is the most frequently occurring in a range of scores.
- 4) The median score is the.....in a range of scores.
- 5)is the difference between the highest and the lowest scores in a particular distribution.

14.5 QUALITATIVE DATA ANALYSIS

Qualitative studies are different as they draw their strength not from numbers but from answering the questions 'why' and 'how'. A quantitative study will provide vast amounts of data for analysis, while a qualitative study will enable in depth analysis.

Qualitative data comes in a variety of forms such as field notes made while observing in the field, interview transcripts, documents, diaries and journals. Also, during the course of the study the researcher accumulates a large volume of data. To organise, analyse and make sense of this data poses special challenges to the researcher.

Unlike the quantitative approach, where the data analysis does not begin until all the numbers are collected, data analysis in qualitative research is a continuous process and is done as early as from the time of collection of data and throughout the project.

Another important dimension of difference between the qualitative and the quantitative method is that while in quantitative analysis hypotheses are developed prior to the study, in qualitative analysis researchers use an inductive method. The data collected in this method are grouped into appropriate and meaningful categories; explanations emerge from the data.

Organising the data

The researcher is the main instrument in qualitative data collection and analysis and therefore must prepare before beginning the task of investigation. Some social scientists describe this preparation as *epoche*, the process by which the researcher tries to become aware of and remove, as far as possible, prejudices, viewpoints, or assumptions that might interfere with the analysis. *Epoche* helps the researcher put aside personal viewpoints so that the phenomenon under study may be seen for itself.

To facilitate working with large amounts of data generated by qualitative analysis, the researcher generally first organises the information along a temporal dimension. This means that the data are arranged in a chronological order according to the sequence of events that have occurred during the process of data collection. Further, each piece of information is coded identifying the source and multiple copies of notes and all other documents are gathered.

Working with vast amounts of data can be very difficult and time consuming. And today, there are a number of software applications which help you to collate and organise the data collected. However, the process, whether done by hand or through the use of software remains more or less the same, and it needs to be understood.

Let us take this process further step by step.

Identify the main themes: Carefully go through all the descriptive responses given by respondents to each question and understand the meaning they communicate. Once these are understood, broad categories or themes can be developed so that data can be classified and responses analysed. From these responses the researcher develops the broad themes that reflect these meanings. These themes become the basis for analysing the text of unstructured interviews.

Assign some codes to the main themes: If the researcher wants to count the number of times a theme has occurred in an interview, s/he needs to select a few responses to an open-ended question and identify the main themes. S/he continues to identify these themes from the same question till a saturation point is reached. Write these themes and assign a code to each of them, using numbers or keywords.

Classify responses under the main themes: Go through all the responses and fit them into the main themes identified.

Integrate themes and responses into the findings: Link the qualitative responses with quantitative measures - either validating the number or developing an understanding of why people responded in a particular way. While discussing the main themes that emerged from their study, some researchers use quotations to keep the feel of the response. Such quotations, especially from case studies add depth to the understanding of the problem. The themes must connect to the objectives and research questions in the report.

It is important to note that, in qualitative research, hypotheses are not tested. It entirely depends on the way the qualitative data are analysed and reported

Check Your Progress: 3

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

A. Fill in the blanks:

- 1) The three aspects of qualitative empirical research are, and
- 2) In quantitative analysis, hypotheses are developed.....to the study.
- 3) In qualitative research data analysis is a..... process.
- 4)is the process by which the researcher tries to remove or at least become aware of prejudices.
- 5) To facilitate working with large amounts of data, the researcher generally first organises the information along..... a dimension.

14.6 DRAWING CONCLUSION THROUGH DATA ANALYSIS

Qualitative data can be analysed through different techniques. The two popular techniques are: the constant comparative technique and the analytical induction technique.

14.6.1 Constant Comparative Technique

This process involves the following four steps:

- Comparatively assigning incidents to categories
- Elaborating and refining categories
- Searching for relationships and themes among categories
- Simplifying and integrating data into a coherent theoretical structure.

After the data have been prepared for analysis, the researcher places each unit of analysis into a set of provisional categories. As each new unit is examined, it is compared to the other units previously assigned to that category to see whether its placement is appropriate. If some units of analysis do not fit into any pre-existing category, new classifications may be created. Units that fit into more than one category should be noted and placed into a new category by finding similarities among units that fit into a category.

The researcher may write rules or propositions that attempt to describe the underlying meaning that defines a category and they may also be revised throughout the study. This helps the researcher to focus and crystallise the study and explore the theoretical dimensions of the emerging category system.

In the next stage, the researcher may examine the propositional statements and look for meaningful connections. Finally, the researcher writes or summarises the research findings and integrates them into a coherent explanation of the phenomenon in relation to the objectives of the study.

14.6.2 Analytical Induction Strategy

This method blends hypothesis construction and data analysis. In this strategy, the topic of research is defined and the hypotheses are developed. The hypotheses may be refined or reformulated until they can be adequately tested. The researcher uses the analytical induction approach in explaining a phenomenon.

Let us try to understand this with the help of an example. Suppose a researcher is interested in explaining why people watch home-shopping channels. The answer to this may be obvious that people do so in order to buy products. The researcher may not be satisfied but decides to use this as an initial hypothesis. S/he further looks out for a heavy viewer of these channels. During the course of the interview, the respondent may say that the primary reason for watching the channels is to find new and unique products. With this input, the researcher can reformulate the hypothesis. Another viewer may answer this differently by emphasising that s/he uses the prices advertised on the channel to compare before shopping. The hypothesis is further redefined. As the researcher goes further ahead s/he finds cases that do not add to the already existing reasons and hence cannot fit into the revised hypothesis. This method can be exhausting and it can be difficult for the researcher to determine the exact stopping point.

Then what should be done? This is a tricky question for which there is no simple answer. One way, especially when researching an event such as a riot, is to limit one's findings to the main objectives of the research, and to clearly state that this is being done. Another way is to define the limitations or scope of the research early on in the designing phase itself so that it is easy to see what can be included and what cannot. And finally, if there is a time limit on the study (especially if funded by a donor) or as time to submit the draft of the thesis, the time limit will itself indicate when to stop. Do remember, that all research is finite in time - it does not go on endlessly and the researcher has to determine when it is best to stop.

14.6.3 Generalising about Generalisation

The literature and the theory of science recognise two different conceptions of 'generalisation'. Empirical or statistical generalisation refers to the capacity of quantitative methodologies to apply to predefined (hypothetically deduced) categories to a representative set of empirical instances, thus supporting external validity. Theoretical or analytical generalisation refers to the articulation of new concepts or categories, typically in qualitative inquiry, that conceive empirical instances in a more consistent and insightful manner, giving priority to internal validity. Both these aspects are relevant for assessment of findings and insights of both qualitative and quantitative studies.

14.6.4 Converging Practices and Approaches

In recent decades a number of research scholars have outlined ways of combining and mixing quantitative and qualitative methodologies. Three principal forms have emerged as possible methods of combining qualitative and quantitative methodologies. These are facilitation, triangulation and complementarity.

Facilitation: The most common practice traditionally has been to treat qualitative and quantitative approaches as relatively separate steps in research. Facilitation

aims at facilitating in-depth analyses of respondents by formulating interpretive categories. For example, in survey research, analytical strategies are arrived at and that are conceptually precise and meaningful to the respondents. The mapping of a social life of respondents may be facilitated by subsequently drawing up interpretive categories after analysing the members in-depth.

Triangulation: It is a strategy for gaining several perspectives on the same phenomenon. It can be carried out through several data types, several investigators, and several methodologies. For example, experimental and observational approaches can be combined and analysed for interpretation of a phenomenon.

Complementarity: Here, different analytical categories and procedures may be appropriate for capturing particular aspects of the same empirical domain, or for addressing two different domains with a bearing on the same research question. In the final stage, two categorically different sets of findings can be joined with reference to a common theoretical framework.

Check Your Progress: 4

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

A. Fill in the blanks:

- 1) The two popular techniques of qualitative data analysis are the..... and technique.
- 2) In the constant comparative technique, the researcher places each unit of analysis into a set of categories.
- 3) The method of analytical induction blends and data analysis.
- 4) Three principal forms of combining qualitative and quantitative methodologies are , and
- 5) is a strategy for gaining several perspectives on the same phenomenon.

14.7 LET US SUM UP

In this unit we have discussed the purpose, importance and significance of data analysis in research. Data analysis is defined as the processing of collecting raw data and converting it into information useful for decision-making by users. The data is analysed to answer questions, test hypotheses or disprove theories. Various methods that are applied in data analysis - the quantitative and the qualitative have been discussed in this chapter.

The understanding of 'analysis' has tended to divide qualitative and quantitative research traditions. In quantitative media studies, rule governed procedures of segmenting and categorising the components of content, form the basis of interpretation. While, qualitative studies typically emphasise meaning as a process unfolding in contexts. Ultimately, it is not an either/or situation. Each tradition has to feed into and supplement each other in order to yield accurate results and logical explanations for phenomena. The way data are gathered and analysed may differ, but in the long run, both aim to understand a situation or solve a problem.

The aim of the quantitative data collection and analysis is to produce findings which lead to the acceptance or rejection of a specified hypothesis. Numerical data analysis through statistical procedures represents a systematic and objective way of determining whether significant patterns of relationships exist among those phenomena that have been measured in data collection. Descriptive and summary statistics and descriptive measures are used to analyse the data.

Qualitative data comes in a variety of forms such as notes made while observing in the field, interview transcripts, documents, diaries and journals. The constant comparative technique and analytical deduction strategy are applied to analyse and draw conclusions from the data.

In recent decades, a growing number of scholars and researchers have suggested and outlined ways of mixing and combining the quantitative and the qualitative methodologies. These combining forms can enrich and reflect in-depth and breadth the status of that knowledge.

With this unit, you have almost come to the end of the research process. The final stage is report writing or the presentation of your research for your peers, the academic community, the funding agency, or simply for your next academic degree. The last unit of this course explains how to write your report effectively.

14.8 KEYWORDS

Arthur Asa Berger, 2011, *Media and Communication Research Methods*, Sage Publications.

Anders Hansen & David Machin, 2013, *Media and Communication Research Methods*, Palgrave Macmillan.

Klaus Bruhn Jensen, 2012, *A Handbook of Media and Communication Research: Qualitative and Quantitative Methodologies*, Routledge, London.

Roger D. Wimmer and Joseph R. Dominic, 2010, *Mass Media Research, An Introduction*, Wadsworth.

14.9 REFERENCES AND FURTHER READINGS

Data analysis: It is the process of collecting raw data and converting it into information useful for decision-making by users.

External validity: The degree to which the results of a study are generalisable to other situations.

Epoche: It is the process by which the researcher tries to remove or at least become aware of prejudices.

Hypothesis: A tentative generalisation about the relationship between two or more variables that predict an outcome.

Internal validity: The properties of a research study are such that the results are based on expected conditions rather than on extraneous variables.

Operationalisation: A definition that specifies patterns of behaviour and procedures to experience or measure a concept.

Summary statistics: Statistics that summarise a great deal of numerical information about a distribution, such as mean, standard deviation.

Skewness: The degree of departure of a curve from the normal distribution (curves can be positively or negatively skewed).

Triangulation: It is a method using a combined quantitative and qualitative approach to solve a problem.

Qualitative research method: A research method that uses flexible questioning.

Quantitative research method: A research method that uses standard questioning.

14.10 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

- 1) Data Analysis
- 2) Hypotheses
- 3) Accuracy
- 4) Categorising, Segmenting
- 5) Observations

Check Your Progress 2

- 1) Hypothetico-deductive
- 2) Acceptance, rejection
- 3) Mode
- 4) Mid-point
- 5) Range

Check Your Progress 3

- 1) Strategy, Tactics, Techniques
- 2) Prior
- 3) Continuous
- 4) Epoche
- 5) Temporal

Check Your Progress 4

- 1) Constant comparative, the analytical induction
- 2) Provisional
- 3) Hypothesis construction
- 4) Facilitation, triangulation and complementarity
- 5) Triangulation

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