Communication Research

Tutorial

Unit I Communication Research
1. Communication research: Meaning & Concept

Communication studies or **communication sciences** is an academic discipline that deals with processes of human communication. There are three types of communication: *verbal*, involving listening to a person to understand the meaning of a message; *written*, in which a message is read; and *nonverbal* communication involving observing a person and inferring meaning.[1] The discipline encompasses a range of topics, from face-to-face conversation to mass media outlets such as television broadcasting.

Communication studies, in line with Cultural Studies, also examines how messages are interpreted through the political, cultural, economic, semiotic, hermeneutic, and social dimensions of their contexts. Communication studies, in line with Political Economics, also examines how the politics of ownership structures effects content. Statistics, as a quantitative approach to communication science, has also been incorporated into research on communication science in order to help substantiate claims.

Communication science began in earnest when students of Wilbur Schramm—the founder of the Institute for Communications Research at the University of Illinois—namely David Berlo, came to Michigan State University and founded the first General Communication Arts department in the early 1950s. Though there are other communication sciences departments elsewhere, Michigan State was the first department in the US that was dedicated solely to the study of communication sciences using a quantitative approach. It is still one of Michigan State's strongest programs and nationally ranked in the study of human communication.

2. Communication research: Role and function

1) Surveillance of the Environment: An important function of the media is to keep up a surveillance of all the happenings in the world and provide information to the human society. The media has the responsibility of providing news and cover a wide variety of issues that is of some service to the society. Media help maintain social order by providing instructions on what has to be done in times of crisis, thereby reducing confusion among the masses.
Example: In times of natural disasters, war, health scares, etc., it is the role of the media to create awareness by providing information on what is happening and of ways in which the disaster can be faced.

2) Correlation of parts of Society: This function relates to how the media's selection of certain news and its interpretation affects how society understands and responds to it. People's attitudes towards political issues, events, public policy, etc. are influenced to an extent by how the media frames and presents the issue in their discussions and presentations.
Example: The media's reporting on the war in Vietnam played a role in changing the mindsets of Americans who started opposing sending soldiers to fight a losing war. Hitler used the media in his propaganda war against the Jews.

3) Cultural Transmission: This refers to the ability of the media to teach the various norms, rules and values that exist in a society and ensure its transfer from one generation to the next. Television programmes by and large reflects the society in which they are broadcast and promote the understanding of a society's cultural heritage. Children's television programmes are designed to showcase good behaviors and moral standards which children can learn by watching.
Example: Shows like Lassie, Full House, Seventh Heaven and the Brady Bunch promoted family values.

4) Entertainment: This popular function of the mass media refers to the ability of the media to help relax people and create a means of escape from the stress of everyday life. The entertainment function of mass media has both positive and negative effects. The low quality of content is often criticized but the other benefits like helping people experience new events, stimulating emotions and helping people pass their leisure time show how important this function is.

3. Scope and importance of communication research

Communication studies integrates aspects of both social sciences and the humanities. Much of the work being done in the field is academic in nature. As a social science, the discipline often overlaps with sociology, psychology, anthropology, biology, political science, economics, and public policy, amongst others.From a humanities perspective, communication is concerned with rhetoric and persuasion (traditional graduate programs in communication studies trace their history to the rhetoricians of Ancient Greece).

A focus on research development sets communication studies apart from general communication degrees. Many of the students that chose the field do so in order to pursue doctoral level ambitions. Requirements for undergraduate degrees focus on preparing students to ask questions concerning the nature of communication in society and the development of communication as a specific field.

In the United States, the National Communication Association (NCA) recognizes nine distinct but often overlapping sub-disciplines within the broader communication discipline: technology, critical-cultural, health, intercultural, interpersonal-small group, mass communication, organizational, political rhetorical, and environmental communication. Students take courses in these subject areas. Other programs and courses often integrated in communication programs include journalism, film criticism, theatre, public relations, political science (e.g., political campaign strategies, public speaking, effects of media on elections), as well as radio, television, and film production. More recently, computer-mediated communication and the implications of new media for communication have drawn new research and courses.

4. Method of Communication and media research

Media theories provide the framework for approaching questions about media effects ranging from as simple as how 10-year-old boys react to cereal advertisements to as broad as how Internet use affects literacy. Once researchers visualize a project and determine a theoretical framework, they must choose actual research methods. Contemporary research methods are greatly varied and can range from analyzing old newspapers to performing controlled experiments.

Content Analysis

Content analysis is a research technique that involves analyzing the content of various forms of media. Through content analysis, researchers hope to understand both the people who created the content and the people who consumed it. A typical content analysis project does not require elaborate experiments. Instead, it simply requires access to the appropriate media to analyze, making this type of research an easier and inexpensive alternative to other forms of research involving complex surveys or human subjects. Content analysis studies require researchers to define what types of media to study. For example, researchers studying violence in the media would need to decide which types of media to analyze, such as television, and the types of formats to examine, such as children’s cartoons. The researchers would then

need to define the terms used in the study; media violence can be classified according to the characters involved in the violence (strangers, family members, or racial groups), the type of violence (self-inflicted, slapstick, or against others), or the context of the violence (revenge, random, or duty-related). These are just a few of the ways that media violence could be studied with content-analysis techniques (Berger, 1998).

Archival Research

Any study that analyzes older media must employ archival research, which is a type of research that focuses on reviewing historical documents such as old newspapers and past publications. Old local newspapers are often available on microfilm at local libraries or at the newspaper offices. University libraries generally provide access to archives of national publications such as *The New York Times* or *Time*; publications can also increasingly be found in online databases or on websites.

Older radio programs are available for free or by paid download through a number of online sources. Many television programs and films have also been made available for free download, or for rent or sale through online distributors. Performing an online search for a particular title will reveal the options available.

Resources such as the Internet Archive (www.archive.org) work to archive a number of media sources. One important role of the Internet Archive is website archiving. Internet archives are invaluable for a study of online media because they store websites that have been deleted or changed. These archives have made it possible for Internet content analyses that would have otherwise been impossible.

Surveys

Surveys are ubiquitous in modern life. Questionaires record data on anything from political preferences to personal hygiene habits. Media surveys generally take one of the following two forms.

A descriptive survey aims to find the current state of things, such as public opinion or consumer preferences. In media, descriptive surveys establish television and radio ratings by finding the number of people who watch or listen to particular programs. An analytical survey, however, does more than simply document a current situation. Instead, it attempts to find out why a particular situation exists. Researchers pose questions or hypotheses about media, and then conduct analytical surveys to answer these questions. Analytical surveys can determine the relationship between different forms of media consumption and the lifestyles and habits of media consumers.

Surveys can employ either open-ended or closed-ended questions. Open-ended questions require the participant to generate answers in their own words, while closed-ended questions force the participant to select an answer from a list. Although open-ended questions allow for a greater variety of answers, the results of closed-ended questions are easier to tabulate. Although surveys are useful in media studies, effective use requires keeping their limitations in mind.

Social Role Analysis

As part of child rearing, parents teach their children about social roles. When parents prepare children to attend school for example, they explain the basics of school rules and what is expected of a student to help the youngsters understand the role of students. Like the role of a character in a play, this role carries specific expectations that differentiate school from home. Adults often play a number of different roles as they navigate between their responsibilities as parents, employees, friends, and citizens. Any individual may play a number of roles depending on his or her specific life choices.

Social role analysis of the media involves examining various individuals in the media and analyzing the type of role that each plays. Role analysis research can consider the roles of men, women, children, members of a racial minority, or members of any other social group in specific types of media. For example, if the role children play in cartoons is consistently different from the role they play in sitcoms, then certain conclusions might be drawn about both of these formats. Analyzing roles used in media allows researchers to gain a better understanding of the messages that the mass media sends (Berger, 1998).

Depth Interviews

The depth interview is an anthropological research tool that is also useful in media studies. Depth interviews take surveys one step further by allowing researchers to directly ask a study participant specific questions to gain a fuller understanding of the participant's perceptions and experiences. Depth interviews have been used in research projects that follow newspaper reporters to find out their reasons for reporting certain stories and in projects that attempt to understand the motivations for reading romance novels. Depth interviews can provide a deeper understanding of the media consumption habits of particular groups of people (Priest, 2010).

Rhetorical Analysis

Rhetorical analysis involves examining the styles used in media and attempting to understand the kinds of messages those styles convey. Media styles include form, presentation, composition, use of metaphors, and reasoning structure. Rhetorical analysis reveals the messages not apparent in a strict reading of content. Studies involving rhetorical analysis have focused on media such as advertising to better understand the roles of style and rhetorical devices in media messages (Gunter, 2000).

Focus Groups

Like depth interviews, focus groups allow researchers to better understand public responses to media. Unlike a depth interview, however, a focus group allows the participants to establish a group dynamic that more closely resembles that of normal media consumption. In media studies, researchers can employ focus groups to judge the reactions of a group to specific media styles and to content. This can be a valuable means of understanding the reasons for consuming specific types of media.

Experiments

Media research studies also sometimes use controlled experiments that expose a test group to an experience involving media and measure the effects of that experience. Researchers then compare these measurements to those of a control group that had key elements of the experience removed. For example, researchers may show one group of children a program with three incidents of cartoon violence and another control group of similar children the same program without the violent incidents. Researchers then ask the children from both groups the same sets of questions, and the results are compared.

Participant Observation

In participant observation, researchers try to become part of the group they are studying. Although this technique is typically associated with anthropological studies in which a researcher lives with members of a particular culture to gain a deeper understanding of their values and lives, it is also used in media research. Media consumption often takes place in groups. Families or friends gather to watch favorite programs, children may watch Saturday morning cartoons with a group of their peers, and adults may host viewing parties for televised sporting events or awards shows. These groups reveal insights into the role of media in the lives of the public. A researcher might join a group that watches football

together and stay with the group for an entire season. By becoming a part of the group, the researcher becomes part of the experiment and can reveal important influences of media on culture (Priest).

Researchers have studied online role-playing games, such as *World of Warcraft*, in this manner. These games reveal an interesting aspect of group dynamics: Although participants are not in physical proximity, they function as a group within the game. Researchers are able to study these games by playing them. In the book *Digital Culture, Play, and Identity: A World of Warcraft Reader*, a group of researchers discussed the results of their participant observation studies. The studies reveal the surprising depth of culture and unwritten rules that exist in the *World of Warcraft*universe and give important interpretations of why players pursue the game with such dedication (Corneliussen & Rettberg, 2008).

Unit II Research: Process & Design
1. Research Process – the steps involved

Step 1: Identify the Problem
The first step in the process is to identify a problem or develop a research question. The research problem may be something the agency identifies as a problem, some knowledge or information that is needed by the agency, or the desire to identify a recreation trend nationally. In the example in table 2.4, the problem that the agency has identified is childhood obesity, which is a local problem and concern within the community. This serves as the focus of the study.

Step 2: Review the Literature
Now that the problem has been identified, the researcher must learn more about the topic under investigation. To do this, the researcher must review the literature related to the research problem. This step provides foundational knowledge about the problem area. The review of literature also educates the researcher about what studies have been conducted in the past, how these studies were conducted, and the conclusions in the problem area. In the obesity study, the review of literature enables the programmer to discover horrifying statistics related to the long-term effects of childhood obesity in terms of health issues, death rates, and projected medical costs. In addition, the programmer finds several articles and information from the Centers for Disease Control and Prevention that describe the benefits of walking 10,000 steps a day. The information discovered during this step helps the programmer fully understand the magnitude of the problem, recognize the future consequences of obesity, and identify a strategy to combat obesity (i.e., walking).

Step 3: Clarify the Problem

Many times the initial problem identified in the first step of the process is too large or broad in scope. In step 3 of the process, the researcher clarifies the problem and narrows the scope of the study. This can only be done after the literature has been reviewed. The knowledge gained through the review of literature guides the researcher in clarifying and narrowing the research project. In the example, the programmer has identified childhood obesity as the problem and the purpose of the study. This topic is very broad and could be studied based on genetics, family environment, diet, exercise, self-confidence, leisure activities, or health issues. All of these areas cannot be investigated in a single study; therefore, the problem and purpose of the study must be more clearly defined. The programmer has decided that the purpose of the study is to determine if walking 10,000 steps a day for three days a week will improve the individual's health. This purpose is more narrowly focused and researchable than the original problem.

Step 4: Clearly Define Terms and Concepts

Terms and concepts are words or phrases used in the purpose statement of the study or the description of the study. These items need to be specifically defined as they apply to the study. Terms or concepts often have different definitions depending on who is reading the study. To minimize confusion about what the terms and phrases mean, the researcher must specifically define them for the study. In the obesity study, the concept of "individual's health" can be defined in hundreds of ways, such as physical, mental, emotional, or spiritual health. For this study, the individual's health is defined as physical health. The concept of physical health may also be defined and measured in many ways. In this case, the programmer decides to more narrowly define "individual health" to refer to the areas of weight, percentage of body fat, and cholesterol. By defining the terms or concepts more narrowly, the scope of the study is more manageable for the programmer, making it easier to collect the necessary data for the study. This also makes the concepts more understandable to the reader.

Step 5: Define the Population

Research projects can focus on a specific group of people, facilities, park development, employee evaluations, programs, financial status, marketing efforts, or the integration of technology into the operations. For example, if a researcher wants to examine a specific group of people in the community, the study could examine a specific age group, males or females, people living in a specific geographic area, or a specific ethnic group. Literally thousands of options are available to the researcher to specifically identify the group to study. The research problem and the purpose of the study assist the researcher in identifying the group to involve in the study. In research terms, the group to involve in the study is always called the population. Defining the population assists the researcher in several ways. First, it narrows the scope of the study from a very large population to one that is manageable. Second, the population identifies the group that the researcher's efforts will be focused on within the study. This helps ensure that the researcher stays on the right path during the study. Finally, by defining the population, the researcher identifies the group that the results will apply to at the conclusion of the study. In the example in table 2.4, the programmer has identified the population of the study as children ages 10 to 12 years. This narrower population makes the study more manageable in terms of time and resources.

Step 6: Develop the Instrumentation Plan

The plan for the study is referred to as the instrumentation plan. The instrumentation plan serves as the road map for the entire study, specifying who will participate in the

study; how, when, and where data will be collected; and the content of the program. This plan is composed of numerous decisions and considerations that are addressed in chapter 8 of this text. In the obesity study, the researcher has decided to have the children participate in a walking program for six months. The group of participants is called the sample, which is a smaller group selected from the population specified for the study. The study cannot possibly include every 10- to 12-year-old child in the community, so a smaller group is used to represent the population. The researcher develops the plan for the walking program, indicating what data will be collected, when and how the data will be collected, who will collect the data, and how the data will be analyzed. The instrumentation plan specifies all the steps that must be completed for the study. This ensures that the programmer has carefully thought through all these decisions and that she provides a step-by-step plan to be followed in the study.

Step 7: Collect Data

Once the instrumentation plan is completed, the actual study begins with the collection of data. The collection of data is a critical step in providing the information needed to answer the research question. Every study includes the collection of some type of data—whether it is from the literature or from subjects—to answer the research question. Data can be collected in the form of words on a survey, with a questionnaire, through observations, or from the literature. In the obesity study, the programmers will be collecting data on the defined variables: weight, percentage of body fat, cholesterol levels, and the number of days the person walked a total of 10,000 steps during the class.

The researcher collects these data at the first session and at the last session of the program. These two sets of data are necessary to determine the effect of the walking program on weight, body fat, and cholesterol level. Once the data are collected on the variables, the researcher is ready to move to the final step of the process, which is the data analysis.

Step 8: Analyze the Data

All the time, effort, and resources dedicated to steps 1 through 7 of the research process culminate in this final step. The researcher finally has data to analyze so that the research question can be answered. In the instrumentation plan, the researcher specified how the data will be analyzed. The researcher now analyzes the data according to the plan. The results of this analysis are then reviewed and summarized in a manner directly related to the research questions. In the obesity study, the researcher compares the measurements of weight, percentage of body fat, and cholesterol that were taken at the first meeting of the subjects to the measurements of the same variables at the final program session. These two sets of data will be analyzed to determine if there was a difference between the first measurement and the second measurement for each individual in the program. Then, the data will be analyzed to determine if the differences are statistically significant. If the differences are statistically significant, the study validates the theory that was the focus of the study. The results of the study also provide valuable information about one strategy to combat childhood obesity in the community.

As you have probably concluded, conducting studies using the eight steps of the scientific research process requires you to dedicate time and effort to the planning process. You cannot conduct a study using the scientific research process when time is limited or the study is done at the last minute. Researchers who do this conduct studies that result in either false conclusions or conclusions that are not of any value to the organization.

2. Research Design – Meaning and different types

A **research design** is the set of methods and procedures used in collecting and analysing measures of the variables specified in the research problem. The design of a study defines the study type (descriptive, correlation, semi- experimental, experimental, review, meta-analytic) and sub-type (e.g., descriptive-longitudinal case study, research problem, Hypothesis | hypotheses independent and dependent variables, Design of experiments| experimental design, and, if applicable, data collection methods and a statistical analysis plan. Research design is the framework that has been created to find

There are many ways to classify research designs, but sometimes the distinction is artificial and other times different designs are combined. Nonetheless, the list below offers a number of useful distinctions between possible research designs. A research design is an arrangement of conditions or collections.

- Descriptive (e.g., case-study, naturalistic observation, survey)
- Correlational (e.g., case-control study, observational study)
- Semi-experimental (e.g., field experiment, quasi-experiment)
- Experimental (experiment with random assignment)
- Review (literature review, systematic review)
- Meta-analytic (meta-analysis)

Sometimes a distinction is made between "fixed" and "flexible" designs. In some cases, these types coincide with quantitative and qualitative research designs respectively, though this need not be the case. In fixed designs, the design of the study is fixed before the main stage of data collection takes place. Fixed designs are normally theory-driven; otherwise, it is impossible to know in advance which variables need to be controlled and measured. Often, these variables are measured quantitatively. Flexible designs allow for more freedom during the data collection process. One reason for using a flexible research design can be that the variable of interest is not quantitatively measurable, such as culture. In other cases, theory might not be available before one starts the research.

3. Sampling – Selecting a sample, types of sampling – Probability and Non- Probability

In statistics, quality assurance, and survey methodology, **sampling** is the selection of a subset (a statistical sample) of individuals from within a statistical population to estimate characteristics of the whole population. Two advantages of sampling are that the cost is lower and data collection is faster than measuring the entire population.

Each observation measures one or more properties (such as weight, location, colour) of observable bodies distinguished as independent objects or individuals. In survey sampling,

weights can be applied to the data to adjust for the sample design, particularly stratified sampling.Results from probability theory and statistical theory are employed to guide the practice. In business and medical research, sampling is widely used for gathering information about a population. Acceptance sampling is used to determine if a production lot of material meets the governing specifications.

The sampling process comprises several stages:

- Defining the population of concern
- Specifying a sampling frame, a set of items or events possible to measure
- Specifying a sampling method for selecting items or events from the frame
- Determining the sample size
- Implementing the sampling plan
- Sampling and data collecting

A **probability sample** is a sample in which every unit in the population has a chance (greater than zero) of being selected in the sample, and this probability can be accurately determined. The combination of these traits makes it possible to produce unbiased estimates of population totals, by weighting sampled units according to their probability of selection.

Example: We want to estimate the total income of adults living in a given street. We visit each household in that street, identify all adults living there, and randomly select one adult from each household. (For example, we can allocate each person a random number, generated from a uniform distribution between 0 and 1, and select the person with the highest number in each household). We then interview the selected person and find their income.

People living on their own are certain to be selected, so we simply add their income to our estimate of the total. But a person living in a household of two adults has only a one-in-two chance of selection. To reflect this, when we come to such a household, we would count the selected person's income twice towards the total. (The person who is *selected from that household can be loosely viewed as also representing the person who* isn't*selected.)*

In the above example, not everybody has the same probability of selection; what makes it a probability sample is the fact that each person's probability is known. When every element in the population *does* have the same probability of selection, this is known as an 'equal probability of selection' (EPS) design. Such designs are also referred to as 'self-weighting' because all sampled units are given the same weight.

Probability sampling includes: Simple Random Sampling, Systematic Sampling, Stratified Sampling, Probability Proportional to Size Sampling, and Cluster or Multistage Sampling. These various ways of probability sampling have two things in common:

1. Every element has a known nonzero probability of being sampled and
2. involves random selection at some point.

Nonprobability sampling

Nonprobability sampling is any sampling method where some elements of the population have *no* chance of selection (these are sometimes referred to as 'out of coverage'/' undercovered'), or where the probability of selection can't be accurately determined. It involves the selection of elements based on assumptions regarding the population of interest, which forms the criteria for selection. Hence, because the selection of elements is nonrandom, nonprobability sampling does not allow the estimation of sampling errors. These conditions give rise to exclusion bias, placing limits on how much information a sample can provide about the population. Information about the relationship between sample and population is limited, making it difficult to extrapolate from the sample to the population.

Example: We visit every household in a given street, and interview the first person to answer the door. In any household with more than one occupant, this is a nonprobability sample, because some people are more likely to answer the door (e.g. an unemployed person who spends most of their time at home is more likely to answer than an employed housemate who might be at work when the interviewer calls) and it's not practical to calculate these probabilities.

Nonprobability sampling methods include convenience sampling, quota sampling and purposive sampling. In addition, nonresponse effects may turn *any* probability design into a nonprobability design if the characteristics of nonresponse are not well understood, since nonresponse effectively modifies each element's probability of being sampled.

Simple random sampling

In a simple random sample (SRS) of a given size, all such subsets of the frame are given an equal probability. Each element of the frame thus has an equal probability of selection: the frame is not subdivided or partitioned. Furthermore, any given *pair* of elements has the same chance of selection as any other such pair (and similarly for triples, and so on). This minimizes bias and simplifies analysis of results. In particular, the variance between individual results within the sample is a good indicator of variance in the overall population, which makes it relatively easy to estimate the accuracy of results.

SRS can be vulnerable to sampling error because the randomness of the selection may result in a sample that doesn't reflect the makeup of the population. For instance, a simple random sample of ten people from a given country will *on average* produce five men and five

women, but any given trial is likely to overrepresent one sex and underrepresent the other. Systematic and stratified techniques attempt to overcome this problem by "using information about the population" to choose a more "representative" sample.

SRS may also be cumbersome and tedious when sampling from an unusually large target population. In some cases, investigators are interested in "research questions specific" to subgroups of the population. For example, researchers might be interested in examining whether cognitive ability as a predictor of job performance is equally applicable across racial groups. SRS cannot accommodate the needs of researchers in this situation because it does not provide subsamples of the population. "Stratified sampling" addresses this weakness of SRS.

Systematic sampling

Systematic sampling (also known as interval sampling) relies on arranging the study population according to some ordering scheme and then selecting elements at regular intervals through that ordered list. Systematic sampling involves a random start and then proceeds with the selection of every *k*th element from then onwards. In this case, *k*=(population size/sample size). It is important that the starting point is not automatically the first in the list, but is instead randomly chosen from within the first to the *k*th element in the list. A simple example would be to select every 10th name from the telephone directory (an 'every 10th' sample, also referred to as 'sampling with a skip of 10').

As long as the starting point is randomized, systematic sampling is a type of probability sampling. It is easy to implement and the stratification induced can make it efficient, *if* the variable by which the list is ordered is correlated with the variable of interest. 'Every 10th' sampling is especially useful for efficient sampling from databases.

For example, suppose we wish to sample people from a long street that starts in a poor area (house No. 1) and ends in an expensive district (house No. 1000). A simple random selection of addresses from this street could easily end up with too many from the high end and too few from the low end (or vice versa), leading to an unrepresentative sample. Selecting (e.g.) every 10th street number along the street ensures that the sample is spread evenly along the length of the street, representing all of these districts. (Note that if we always start at house #1 and end at #991, the sample is slightly biased towards the low end; by randomly selecting the start between #1 and #10, this bias is eliminated.

However, systematic sampling is especially vulnerable to periodicities in the list. If periodicity is present and the period is a multiple or factor of the interval used, the sample is especially likely to be *un*representative of the overall population, making the scheme less accurate than simple random sampling.

For example, consider a street where the odd-numbered houses are all on the north (expensive) side of the road, and the even-numbered houses are all on the south (cheap) side. Under the sampling scheme given above, it is impossible to get a representative sample; either the houses sampled will *all* be from the odd-numbered, expensive side, or they will *all* be from the even-numbered, cheap side, unless the researcher has previous knowledge of this bias and avoids it by a using a skip which ensures jumping between the two sides (any odd-numbered skip).

Another drawback of systematic sampling is that even in scenarios where it is more accurate than SRS, its theoretical properties make it difficult to *quantify* that accuracy. (In the two examples of systematic sampling that are given above, much of the potential sampling error is due to variation between neighbouring houses – but because this method never selects two neighbouring houses, the sample will not give us any information on that variation.)

As described above, systematic sampling is an EPS method, because all elements have the same probability of selection (in the example given, one in ten). It is *not* 'simple random sampling' because different subsets of the same size have different selection probabilities – e.g. the set {4,14,24,...,994} has a one-in-ten probability of selection, but the set {4,13,24,34,...} has zero probability of selection.

Systematic sampling can also be adapted to a non-EPS approach; for an example, see discussion of PPS samples below.

Stratified sampling

When the population embraces a number of distinct categories, the frame can be organized by these categories into separate "strata." Each stratum is then sampled as an independent sub-population, out of which individual elements can be randomly selected.[3] There are several potential benefits to stratified sampling.

First, dividing the population into distinct, independent strata can enable researchers to draw inferences about specific subgroups that may be lost in a more generalized random sample.

Second, utilizing a stratified sampling method can lead to more efficient statistical estimates (provided that strata are selected based upon relevance to the criterion in question, instead of availability of the samples). Even if a stratified sampling approach does not lead to increased statistical efficiency, such a tactic will not result in less efficiency than would simple random sampling, provided that each stratum is proportional to the group's size in the population.

Third, it is sometimes the case that data are more readily available for individual, pre-existing strata within a population than for the overall population; in such cases, using a stratified sampling approach may be more convenient than aggregating data across groups (though

this may potentially be at odds with the previously noted importance of utilizing criterion-relevant strata).

Finally, since each stratum is treated as an independent population, different sampling approaches can be applied to different strata, potentially enabling researchers to use the approach best suited (or most cost-effective) for each identified subgroup within the population.

There are, however, some potential drawbacks to using stratified sampling. First, identifying strata and implementing such an approach can increase the cost and complexity of sample selection, as well as leading to increased complexity of population estimates. Second, when examining multiple criteria, stratifying variables may be related to some, but not to others, further complicating the design, and potentially reducing the utility of the strata. Finally, in some cases (such as designs with a large number of strata, or those with a specified minimum sample size per group), stratified sampling can potentially require a larger sample than would other methods (although in most cases, the required sample size would be no larger than would be required for simple random sampling).

A stratified sampling approach is most effective when three conditions are met

1. Variability within strata are minimized
2. Variability between strata are maximized
3. The variables upon which the population is stratified are strongly correlated with the desired dependent variable.

Advantages over other sampling methods

1. Focuses on important subpopulations and ignores irrelevant ones.
2. Allows use of different sampling techniques for different subpopulations.
3. Improves the accuracy/efficiency of estimation.
4. Permits greater balancing of statistical power of tests of differences between strata by sampling equal numbers from strata varying widely in size.

Disadvantages

1. Requires selection of relevant stratification variables which can be difficult.
2. Is not useful when there are no homogeneous subgroups.
3. Can be expensive to implement.

4. Hypothesis

A **hypothesis** (plural **hypotheses**) is a proposed explanation for a phenomenon. For a hypothesis to be a scientific hypothesis, the scientific method requires that one can test it. Scientists generally base scientific hypotheses on previous observations that cannot satisfactorily be explained with the available scientific theories. Even though the words "hypothesis" and "theory" are often used synonymously, a scientific hypothesis is not the same as a scientific theory. Aworking hypothesis is a provisionally accepted hypothesis proposed for further research.

A different meaning of the term *hypothesis* is used in formal logic, to denote the antecedent of a proposition; thus in the proposition "If *P*, then *Q*", *P* denotes the hypothesis (or antecedent); *Q* can be called a consequent. *P* is the assumption in a (possibly counterfactual) *What If* question.

The adjective *hypothetical*, meaning "having the nature of a hypothesis", or "being assumed to exist as an immediate consequence of a hypothesis", can refer to any of these meanings of the term "hypothesis".

Unit-III Data Collection

1. Primary and Secondary data

Primary data: Data collected by the investigator himself/ herself for a specific purpose.
Examples: Data collected by a student for his/her thesis or research project.
(In movies) The hero is directly told by the heroine that he is her “ideal man”.

Secondary data: Data collected by someone else for some other purpose (but being utilized by the investigator for another purpose).
Examples: Census data being used to analyze the impact of education on career choice and earning.

2. Observation method

Observation (watching what people do) would seem to be an obvious method of carrying out research in psychology. However, there are different types of observational methods and distinctions need to be made between:

1. Controlled Observations

2. Natural Observations

3. Participant Observations

In addition to the above categories observations can also be either overt/disclosed (the participants know they are being studied) or covert/undisclosed (the research keeps their real identity a secret from the research subjects, acting as a genuine member of the group).

In general observations, are relatively cheap to carry out and few resources are needed by the researcher. However, they can often be very time consuming and longitudinal.

3. Interview method

- Interviews and focus groups are the most common methods of data collection used in qualitative healthcare research
- Interviews can be used to explore the views, experiences, beliefs and motivations of individual participants
- Focus group use group dynamics to generate qualitative data

Qualitative research interviews

There are three fundamental types of research interviews: structured, semi-structured and unstructured. Structured interviews are, essentially, verbally administered questionnaires, in which a list of predetermined questions are asked, with little or no variation and with no scope for follow-up questions to responses that warrant further elaboration. Consequently, they are relatively quick and easy to administer and may

be of particular use if clarification of certain questions are required or if there are likely to be literacy or numeracy problems with the respondents. However, by their very nature, they only allow for limited participant responses and are, therefore, of little use if 'depth' is required.

Conversely, unstructured interviews do not reflect any preconceived theories or ideas and are performed with little or no organisation.[4] Such an interview may simply start with an opening question such as 'Can you tell me about your experience of visiting the dentist?' and will then progress based, primarily, upon the initial response. Unstructured interviews are usually very time-consuming (often lasting several hours) and can be difficult to manage, and to participate in, as the lack of predetermined interview questions provides little guidance on what to talk about (which many participants find confusing and unhelpful). Their use is, therefore, generally only considered where significant 'depth' is required, or where virtually nothing is known about the subject area (or a different perspective of a known subject area is required).

Semi-structured interviews consist of several key questions that help to define the areas to be explored, but also allows the interviewer or interviewee to diverge in order to pursue an idea or response in more detail.[2] This interview format is used most frequently in healthcare, as it provides participants with some guidance on what to talk about, which many find helpful. The flexibility of this approach, particularly compared to structured interviews, also allows for the discovery or elaboration of information that is important to participants but may not have previously been thought of as pertinent by the research team.

For example, in a recent dental public heath study,[5] school children in Cardiff, UK were interviewed about their food choices and preferences. A key finding that emerged from semi-structured interviews, which was not previously thought to be as highly influential as the data subsequently confirmed, was the significance of peer-pressure in influencing children's food choices and preferences. This finding was also established primarily through follow-up questioning (eg probing interesting responses with follow-up questions, such as 'can you tell me a bit more about that?') and, therefore, may not have emerged in the same way, if at all, if asked as a predetermined question.

The purpose of research interviews

The purpose of the research interview is to explore the views, experiences, beliefs and/or motivations of individuals on specific matters (eg factors that influence their attendance at the dentist). Qualitative methods, such as interviews, are believed to provide a 'deeper' understanding of social phenomena than would be obtained from purely quantitative methods, such as questionnaires.[1] Interviews are, therefore, most appropriate where little is already known about the study phenomenon or where detailed insights are required from individual participants. They are also particularly appropriate for exploring sensitive topics, where participants may not want to talk about such issues in a group environment.

Examples of dental studies that have collected data using interviews are 'Examining the psychosocial process involved in regular dental attendance'[6] and 'Exploring factors governing dentists' treatment philosophies'.[7] Gibson *et al*.[6] provided an improved understanding of

factors that influenced people's regular attendance with their dentist. The study by Kay and Blinkhorn[7] provided a detailed insight into factors that influenced GDPs' decision making in relation to treatment choices. The study found that dentists' clinical decisions about treatments were not necessarily related to pathology or treatment options, as was perhaps initially thought, but also involved discussions with patients, patients' values and dentists' feelings of self esteem and conscience.

There are many similarities between clinical encounters and research interviews, in that both employ similar interpersonal skills, such as questioning, conversing and listening. However, there are also some fundamental differences between the two, such as the purpose of the encounter, reasons for participating, roles of the people involved and how the interview is conducted and recorded.[8]

The primary purpose of clinical encounters is for the dentist to ask the patient questions in order to acquire sufficient information to inform decision making and treatment options. However, the constraints of most consultations are such that any open-ended questioning needs to be brought to a conclusion within a fairly short time.[2] In contrast, the fundamental purpose of the research interview is to listen attentively to what respondents have to say, in order to acquire more knowledge about the study topic.[9] Unlike the clinical encounter, it is not to intentionally offer any form of help or advice, which many researchers have neither the training nor the time for. Research interviewing therefore requires a different approach and a different range of skills.

The interview

When designing an interview schedule it is imperative to ask questions that are likely to yield as much information about the study phenomenon as possible and also be able to address the aims and objectives of the research. In a qualitative interview, good questions should be open-ended (ie, require more than a yes/no answer), neutral, sensitive and understandable.[2] It is usually best to start with questions that participants can answer easily and then proceed to more difficult or sensitive topics.[2] This can help put respondents at ease, build up confidence and rapport and often generates rich data that subsequently develops the interview further.

As in any research, it is often wise to first pilot the interview schedule on several respondents prior to data collection proper.[8] This allows the research team to establish if the schedule is clear, understandable and capable of answering the research questions, and if, therefore, any changes to the interview schedule are required.

The length of interviews varies depending on the topic, researcher and participant. However, on average, healthcare interviews last 20-60 minutes. Interviews can be performed on a one-off or, if change over time is of interest, repeated basis,[4] for example exploring the psychosocial impact of oral trauma on participants and their subsequent experiences of cosmetic dental surgery.

Developing the interview

Before an interview takes place, respondents should be informed about the study details and given assurance about ethical principles, such as anonymity and confidentiality.[2] This gives respondents some idea of

what to expect from the interview, increases the likelihood of honesty and is also a fundamental aspect of the informed consent process.

Wherever possible, interviews should be conducted in areas free from distractions and at times and locations that are most suitable for participants. For many this may be at their own home in the evenings. Whilst researchers may have less control over the home environment, familiarity may help the respondent to relax and result in a more productive interview.[9] Establishing rapport with participants prior to the interview is also important as this can also have a positive effect on the subsequent development of the interview.

When conducting the actual interview it is prudent for the interviewer to familiarise themselves with the interview schedule, so that the process appears more natural and less rehearsed. However, to ensure that the interview is as productive as possible, researchers must possess a repertoire of skills and techniques to ensure that comprehensive and representative data are collected during the interview.[10] One of the most important skills is the ability to listen attentively to what is being said, so that participants are able to recount their experiences as fully as possible, without unnecessary interruptions.

Other important skills include adopting open and emotionally neutral body language, nodding, smiling, looking interested and making encouraging noises (eg, 'Mmmm') during the interview.[2] The strategic use of silence, if used appropriately, can also be highly effective at getting respondents to contemplate their responses, talk more, elaborate or clarify particular issues. Other techniques that can be used to develop the interview further include reflecting on remarks made by participants

(eg, 'Pain?') and probing remarks ('When you said you were afraid of going to the dentist what did you mean?').[9] Where appropriate, it is also wise to seek clarification from respondents if it is unclear what they mean. The use of 'leading' or 'loaded' questions that may unduly influence responses should always be avoided (eg, 'So you think dental surgery waiting rooms are frightening?' rather than 'How do you find the waiting room at the dentists?').

At the end of the interview it is important to thank participants for their time and ask them if there is anything they would like to add. This gives respondents an opportunity to deal with issues that they have thought about, or think are important but have not been dealt with by the interviewer.[9] This can often lead to the discovery of new, unanticipated information. Respondents should also be debriefed about the study after the interview has finished.

All interviews should be tape recorded and transcribed verbatim afterwards, as this protects against bias and provides a permanent record of what was and was not said.[8] It is often also helpful to make 'field notes' during and immediately after each interview about observations, thoughts and ideas about the interview, as this can help in data analysis process

4. Collection of data through questionnaire

A **questionnaire** is a research instrument consisting of a series of questions (or other types of prompts) for the purpose of gathering information from respondents. The questionnaire was invented by the Statistical Society of London in 1838.

Although questionnaires are often designed for statistical analysis of the responses, this is not always the case.

Questionnaires have advantages over some other types of surveysin that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardized answers that make it simple to compile data. However, such standardized answers may frustrate users. Questionnaires are also sharply limited by the fact that respondents must be able to read the questions and respond to them. Thus, for some demographic groups conducting a survey by questionnaire may not be concrete.

Types

A distinction can be made between questionnaires with questions that measure separate variables, and questionnaires with questions that are aggregated into either a scale or index. Questionnaires with questions that measure separate variables, could for instance include questions on:

- preferences (e.g. political party)
- behaviors (e.g. food consumption)
- facts (e.g. gender)

Questionnaires with questions that are aggregated into either a scale or index, include for instance questions that measure:

- latent traits
- attitudes (e.g. towards immigration)
- an index (e.g. Social Economic Status)

5. Collection of data through schedule

This method of data collection is very much like the collection of data through questionnaire, with little difference which lies in the fact that schedules (proforma containing a set of questions) are being filled in by the enumerators who are specially appointed for the purpose. These enumerators along with schedules, go to respondents, put to them the questions from the proforma in the order the questions are listed and record the replies in the space meant for the same in the proforma. In certain situations, schedules may be handed over to respondents and enumerators may help them in recording their answers to various questions in the said schedules. Enumerators explain the aims and objects of the investigation and also remove the difficulties which any respondent may feel in

understanding the implications of a particular question or the definition or concept of difficult terms.

This method requires the selection of enumerators for filling up schedules or assisting respondents to fill up schedules and as such enumerators should be very carefully selected. The enumerators should be trained to perform their job well and the nature and scope of the investigation should be explained to them thoroughly so that they may well understand the implications of different questions put in the schedule. Enumerators should be intelligent and must possess the capacity of cross examination in order to find out the truth. Above all, they should be honest, sincere, hardworking and should have patience and perseverance.

This method of data collection is very useful in extensive enquiries and can lead to fairly reliable results. It is, however, very expensive and is usually adopted in investigations conducted by governmental agencies or by some big organisations. Population census all over the world is conducted through this method.

Unit-IV Data Analysis and Report Writing

1. Writing research report: parts of a report, steps involved.

Section 1: Cover Sheet (APA format cover sheet) optional, if required.

Section 2: Abstract (a basic summary of the report, including sample, treatment, design, results, and implications) (≤ 150 words) optional, if required.

Section 3: Introduction (1-3 paragraphs)

- Basic introduction
- Supportive statistics (can be from periodicals)
- Statement of Purpose
- Statement of Significance

Section 4: Research question(s) or hypotheses

- An overall research question (optional)
- A quantitative-based (hypotheses)

- A qualitative-based (research questions)

Note: You will generally have more than one, especially if using hypotheses.

Section 5: Review of Literature

Should be organized by subheadings

Should adequately support your study using supporting, related, and/or refuting evidence

Is a synthesis, not a collection of individual summaries

Section 6: Methods

Procedure: Describe data gathering or participant recruitment, including IRB approval

Sample: Describe the sample or dataset, including basic demographics

Setting: Describe the setting, if applicable (generally only in qualitative designs)

Treatment: If applicable, describe, in detail, how you implemented the treatment

Instrument: Describe, in detail, how you implemented the instrument; Describe the reliability and validity associated with the instrument

Data Analysis: Describe type of procedure (t-test, interviews, etc.) and software (if used)

Section 7: Results

Restate Research Question 1 (Quantitative)

Describe results

Restate Research Question 2 (Qualitative)

Describe results

Section 8: Discussion

Restate Overall Research Question

Describe how the results, when taken together, answer the overall question

***Describe how the results confirm or contrast the literature you reviewed

Section 9: Recommendations (if applicable, generally related to practice)

Section 10: Limitations

Discuss, in several sentences, the limitations of this study.

Research Design (overall, then info about the limitations of each separately)

Sample

Instrument/s

Other limitations

Section 11: Conclusion (A brief closing summary)

Section 12: References (APA format)

2. Processing of data –classification & tabulation

Data processing is, generally, "the collection and manipulation of items of data to produce meaningful information."[1] In this sense it can be considered a subset of *information processing*, "the change (processing) of information in any manner detectable by an observer."

The term Data Processing (DP) has also been used to refer to a department within an organization responsible for the operation of data processing applications.

Data processing functions

Data processing may involve various processes, including:

- Validation – Ensuring that supplied data is correct and relevant.
- Sorting – "arranging items in some sequence and/or in different sets."
- Summarization – reducing detail data to its main points.
- Aggregation – combining multiple pieces of data.
- Analysis – the "collection, organization, analysis, interpretation and presentation of data."
- Reporting – list detail or summary data or computed information.
- Classification – separation of data into various categories.

Data classification is the process of sorting and categorizing data into various types, forms or any other distinct class. Data classification enables the separation and classification of data according to data set requirements for various business or personal objectives. It is mainly a data management process.

Data classification is a diverse process that involves various methods and criteria for sorting data within a database or repository. This is generally done through a database or business intelligence software that provides the ability to scan,

identify and separate data. Some examples and applications of data classification include:

- Separating customer data based on gender
- Identifying and keeping frequently used data in disk/memory cache
- Data sorting based on content/file type, size and time of data
- Sorting for security reasons by classifying data into restricted, public or private data types

3. Analysis and interpretation of data

Data analysis is a process of inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, in different business, science, and social science domains.

Data mining is a particular data analysis technique that focuses on modeling and knowledge discovery for predictive rather than purely descriptive purposes, while business intelligence covers data analysis that relies heavily on aggregation, focusing on business information.[1] In statistical applications, data analysis can be divided into descriptive statistics, exploratory data analysis (EDA), and confirmatory data analysis (CDA). EDA focuses on discovering new features in the data and CDA on confirming or falsifying existing hypotheses. Predictive analytics focuses on application of statistical models for predictive forecasting or classification, while text analytics applies statistical, linguistic, and structural techniques to extract and classify information from textual sources, a species of unstructured data. All are varieties of data analysis.

Data integration is a precursor to data analysis, and data analysis is closely linked to data visualization and data dissemination. The term *data analysis* is sometimes used as a synonym for data modeling.

The process of data analysis

Analysis refers to breaking a whole into its separate components for individual examination. Data analysis is a process for obtaining raw data and converting it into information useful for decision-making by users. Data is collected and analyzed to answer questions, test hypotheses or disprove theories.

Statistician John Tukey defined data analysis in 1961 as: "Procedures for analyzing data, techniques for interpreting the results of such procedures, ways of planning the gathering of data to make its analysis easier, more precise or more accurate, and all the machinery and results of (mathematical) statistics which apply to analyzing data."

There are several phases that can be distinguished, described below. The phases are iterative, in that feedback from later phases may result in additional work in earlier phases

Exploratory data analysis

Once the data is cleaned, it can be analyzed. Analysts may apply a variety of techniques referred to as exploratory data analysis to begin understanding the messages contained in the data. The process of exploration may result in additional data cleaning or additional requests for data, so these activities may be iterative in nature. Descriptive statistics, such as the average or median, may be generated to help understand the data. Data visualization may also be used to examine the data in graphical format, to obtain additional insight regarding the messages within the data.

Techniques for analyzing quantitative data

Author Jonathan Koomey has recommended a series of best practices for understanding quantitative data. These include:

- Check raw data for anomalies prior to performing your analysis;
- Re-perform important calculations, such as verifying columns of data that are formula driven;
- Confirm main totals are the sum of subtotals;
- Check relationships between numbers that should be related in a predictable way, such as ratios over time;
- Normalize numbers to make comparisons easier, such as analyzing amounts per person or relative to GDP or as an index value relative to a base year;
- Break problems into component parts by analyzing factors that led to the results, such as DuPont analysis of return on equity.

For the variables under examination, analysts typically obtain descriptive statistics for them, such as the mean (average),median, and standard deviation. They may also analyze the distribution of the key variables to see how the individual values cluster around the mean.

The consultants at McKinsey and Company named a technique for breaking a quantitative problem down into its component parts called the MECE principle. Each layer can be broken

down into its components; each of the sub-components must be mutually exclusive of each other and collectively add up to the layer above them. The relationship is referred to as "Mutually Exclusive and Collectively Exhaustive" or MECE. For example, profit by definition can be broken down into total revenue and total cost. In turn, total revenue can be analyzed by its components, such as revenue of divisions A, B, and C (which are mutually exclusive of each other) and should add to the total revenue (collectively exhaustive).

Analysts may use robust statistical measurements to solve certain analytical problems. Hypothesis testing is used when a particular hypothesis about the true state of affairs is made by the analyst and data is gathered to determine whether that state of affairs is true or false. For example, the hypothesis might be that "Unemployment has no effect on inflation", which relates to an economics concept called the Phillips Curve. Hypothesis testing involves considering the likelihood of Type I and type II errors, which relate to whether the data supports accepting or rejecting the hypothesis.

Regression analysis may be used when the analyst is trying to determine the extent to which independent variable X affects dependent variable Y (e.g., "To what extent do changes in the unemployment rate (X) affect the inflation rate (Y)?"). This is an attempt to model or fit an equation line or curve to the data, such that Y is a function of X.

Necessary condition analysis (NCA) may be used when the analyst is trying to determine the extent to which independent variable X allows variable Y (e.g., "To what extent is a certain unemployment rate (X) necessary for a certain inflation rate (Y)?"). Whereas (multiple) regression analysis uses additive logic where each X-variable can produce the outcome and the X's can compensate for each other (they are sufficient but not necessary), necessary condition analysis (NCA) uses necessity logic, where one or more X-variables allow the outcome to exist, but may not produce it (they are necessary but not sufficient). Each single necessary condition must be present and compensation is not possible.

5. Role of computer in communication research

Computers are such normal parts of our lives that we often overlook the transformational effect they have had on society. In scientific and social scientific research, computers opened up new opportunities regarding how data can be processed to yield valuable information and knowledge.

Internet

Before you start research, you often want to quickly learn about possible issues or topics of study by searching available sources of information. Nearly all academic journals are available online, and many are organized into online

databases. Government agencies often have demographic or economic information online you can use in your research.

Information Storage

Computers store vast amounts of information. You can quickly and efficiently organize and search information, making for easier retrieval than paper storage. You can store your raw data in multiple formats. Some researchers conduct their research online, often through the use of surveys.

Computational Tools

Computers began as powerful calculators, and that service is important to research today. Regardless of the amount of data you have, you can do more with it with a computer's help. Statistical programs, modeling programs and spatial mapping tools are all possible because of computers. Researchers can use information in new ways, such as layering different types of maps on one another to discover new patterns in how people use their environment.

Communication

Building knowledge through research requires communication between experts to identify new areas requiring research and debating results. Before computers, this was accomplished through papers and workshops. Now, the world's experts can communicate via email or webchats. Information can be spread by virtual conferences. Knowledge from marginalized groups, such as African scholars, is now more visible.

Mobility

Researchers can take computers anywhere, making it easier to conduct field research and collect data. New areas of research in remote areas or at a community level are opened up by the mobility of computers. Social media sites have become a new medium for interaction and information.