Practical Research

11th edition

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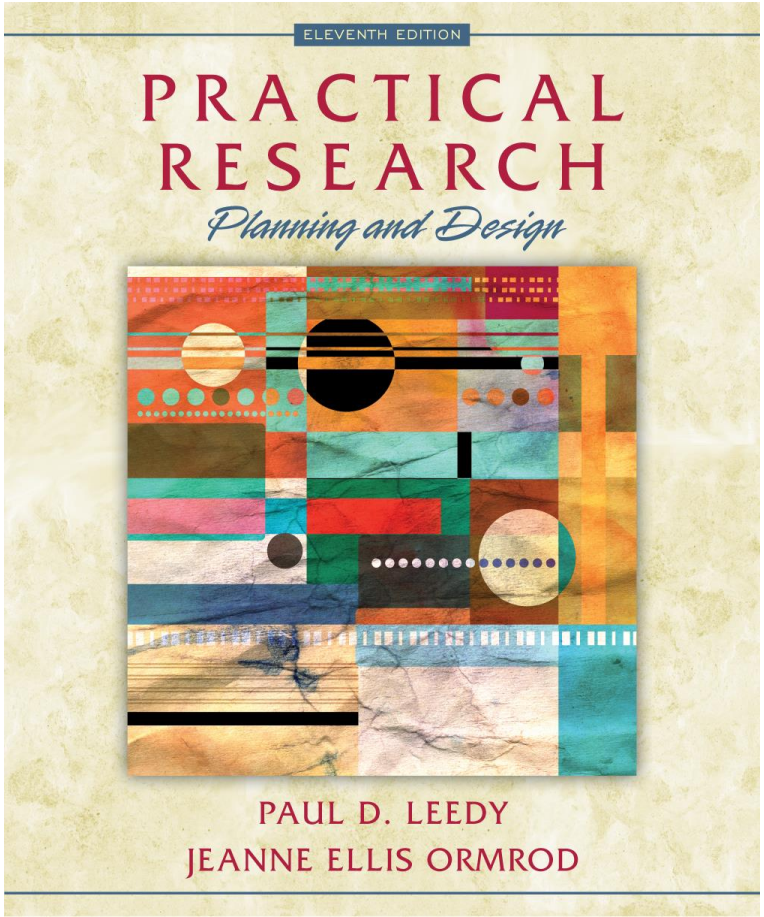


Chapter 4

Planning your Research Project

The Basic Format of the Research Process

1

A question is posed.

In the mind of the researcher, a question arises that has no known resolution.

2

It's a matter of words.

The researcher converts the question to a clearly stated research problem.

3

It's worth a guess!

The researcher poses a temporary hypothesis or series of hypotheses.

4

The search is on!

The researcher searches the literature for ideas that shed light on the problem and for strategies that may help to address it.

5

Data! Hard data! And nothing but the data!

The researcher collects data that potentially relate to the problem.

6

How do the data fit together?

The researcher arranges the data into a logical organizational structure.

7

The data speak!

The researcher analyzes and interprets the data to determine their meaning.

8

It's either ... or ...

Either the data seemingly resolve the research problem or they do not. Either they support the hypotheses or they do not.

- # Qualitative Research

Qualitative Research is primarily **exploratory research**. It is used to gain an understanding of underlying reasons, opinions, and motivations. It provides **insights into the problem or helps to develop ideas or hypotheses for potential quantitative research**. Qualitative Research is also used to uncover trends in thought and opinions, and dive deeper into the problem. **Qualitative data collection methods vary using unstructured or semi-structured techniques. Some common methods include focus groups (group discussions), individual interviews, and participation/observations**. The sample size is typically small, and respondents are selected to fulfil a given quota.

- # Quantitative Research

Quantitative Research is used to quantify the problem by way of generating **numerical data or data that can be transformed into usable statistics**. It is used to quantify attitudes, opinions, behaviors, and other defined variables – and generalize results from a larger sample population. Quantitative Research uses **measurable data to formulate facts and uncover patterns in research. Quantitative data collection methods are much more structured** than Qualitative data collection methods.

Characteristics of a Research Proposal

- Straightforward document containing only necessary information
- Conventional prose, economy of words, precision of expression
- Clearly organized
- Usually follows convention

Research Design

- Is a general strategy for solving a research problem
- Provides the overall structure for the procedures the researcher follows, the data the researcher collects, and the data analyses the researcher conducts
- Research Design – Research planning

Categories of Research Problems

- People: problems related to children, adults, families, communities, cultural groups, employees, etc.
- Things: problems related to animal and vegetable life, viruses and bacteria, inanimate objects, matter, stars, galaxies, etc.
- Records: problems related to newspapers, journals, letters, minutes, legal documents, census reports, etc.
- Thoughts & Ideas: problems related to concepts, theories, perceptions, opinions, beliefs, issues, etc.
- Dynamics & Energy: problems related to human interactions, metabolism, quantum mechanics, wave mechanics, etc.

Research Planning v. Research Methodology

- Research Planning: the general approach to planning a research study; may be similar across disciplines

- Research Methodology: the techniques one uses to collect and analyze data; may be specific to a particular academic discipline

4 General Criteria for a Research Project

- Universality: the research project should be one that might be carried out by any competent person. The researcher is a catalyst who collects, organizes, and reports what the collected data seem to indicate
- Replication: the research should be *repeatable*; any other competent person should be able to take the problem and, collecting data under the same circumstances and within the same parameters you have used, achieve results comparable to yours
- Control (**measurability**): the researcher must isolate, or *control*, factors that are central to the research problem; control is important for replication and consistency within the research design (Temperature pressure highly controllable; human behavior hard to control or measure)
- Measurement: the data should be able to be measured in some way

Data

- The rerm *data* is plural (singular is ***datum (Piece of information)***) and comes from the Latin verb ***dare***, which means "to give"
- Meaning less ***Piece of information are analyzed to yield information***

The Nature and Role of Data in Research

- Data are not absolute reality but manifestations of reality (book highlights)
- Data are transient and ever changing (book highlights)
- Data is primary or secondary (**researchers knowledge is like layers of truth**)
  - *Primary data* is the layer closest to the truth
  - *Secondary data* are derived, not from the truth, but from primary data

Details in next slide

- Data must meet certain criteria to be admitted to study; any data not meeting the criteria are excluded from the study **Book highlights**

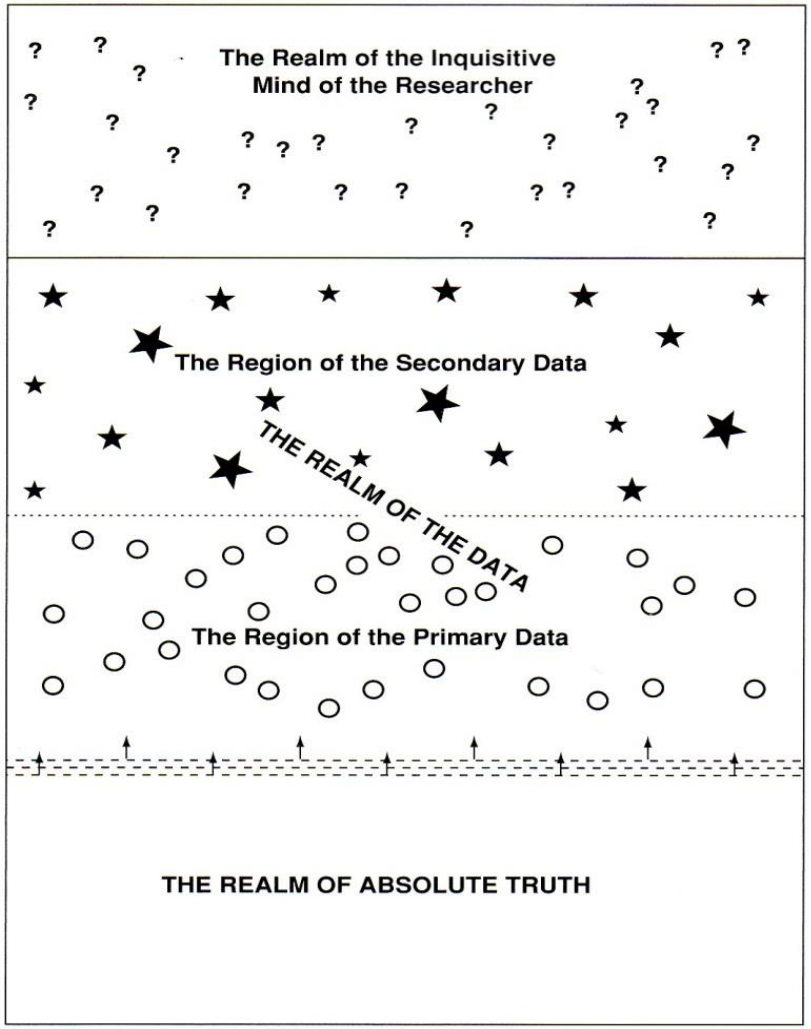
Primary vs Secondary Data

https://www.quora.com/What-are-examples-of-primary-data-and-secondary-data

- A **primary source** provides direct or firsthand evidence about an event, object, person, or work of art. Primary sources include historical and legal documents, eyewitness accounts, **results of experiments**, statistical data, pieces of creative writing, **audio** and video recordings, speeches, and art objects

- There are tons of **secondary data** examples out there. It's basically any dataset that can be used by researchers who didn't actually collect the data. For example, the US Census data is common secondary dataset used. Many researchers use this dataset instead of going out and collecting the data themselves because it saves an incredible amount of time

Relation between Data and Truth



The Barriers of the Human Senses, Skills in Reading and Writing, Channels of Communication, etc.

The Impenetrable Barrier Beyond Which Lies the Absolute Truth and Through Which the Light of Truth Shines to Illuminate the Data

Planning for Data Collection

Answers to the following questions would ensure correct data collection

1. What data are needed?

Answers to the following questions: To resolve the problem, what data are mandatory? What is their nature? Are they historical documents? Interview excerpts? Questionnaire responses? Observations? Measurements made before and after an experimental intervention

2. Where are the data located?

Give XPS , nanohub examples

Planning for Data Collection

Answers to the following questions would ensure correct data collection

3. How will the data be obtained?

With privacy laws, confidentiality agreements, and so on, **obtaining the information you need might not be as easy as you think**

4. How will the data be interpreted?

- Will you be able to get data that might adequately provide a solution to the problem? And if so, might they reasonably lend themselves to interpretations that shed light on the problem? **If the answer to either of these questions is *no,* you muse obviously rethink the nature of your problem**
- If, instead, both answers are *yes,* a next important step is to consider how you might best ***measure*** what you observe

Identifying Appropriate Measurement Instruments

- We **pin down data by measuring it** in some way
- Measurement instruments provide **a basis on which the entire research effort rests**
- A research effort employing faulty measurement tools is of little value in solving the problem under investigation
- In planning the research project, the nature of the measurement instruments should be clearly identified
- Instrumentation **should be described in explicit, concrete terms**
- Instruments should have a **reasonable degree of validity and reliability (calibration)**

Measurement as a Tool of Research

Measurement: limiting the data of any phenomenon — substantial or insubstantial — so that those data may be interpreted and, ultimately, compared to a particular qualitative or quantitative standard

* ***Substantial measurements*** = those things being measured that have physical substance temperature, volume, enthalpy
* ***Insubstantial measurements*** = exist only as concepts, ideas, opinions, feelings, or other intangible entities **performance of a company etc (book example self do)**

Four Scales of Measurement:

- Nominal
- Ordinal
- Interval
- Ratio

Nominal Scale of Measurement

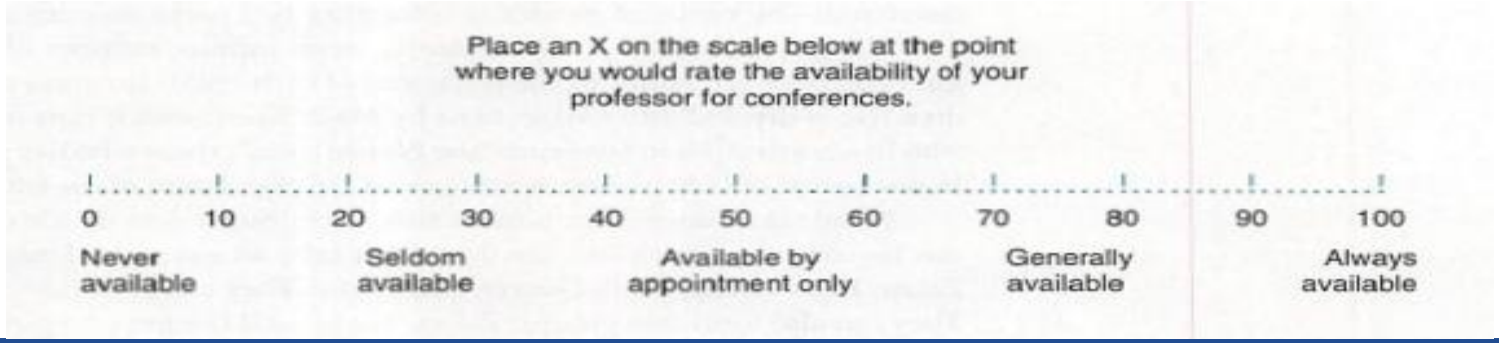
- Measures data by assigning names
- Things can be measured nominally in an infinite number of ways
- Simplistic
- Divides data into discrete categories
- Statistical procedures = mode, percentage, chi-square test
- **Example: levels of happiness of girl or boy children in humpty dumpty 1, 0, -1 etc**

Ordinal Scale of Measurement

- Think in terms of symbols (> or <)
- Allows data to be rank-ordered
- Statistical procedures = median, percentile rank, Spearman's rank-order correlation
- Examples: CGPA, GRE, TOEFL and IELTS results

Interval Scale of Measurement

- Has equal units of measurement
- Zero point established arbitrarily
- Rating scales, such as surveys, assumed to fall on interval scales
- Statistical procedures = means, standard deviations, Pearson product moment correlations



Ratio Scale of Measurement

- Characterized by equal measurement units (similar to an interval scale)
- Has an absolute zero point (0 = total absence of the quality being measured)
- Can express values in terms of multiples and fractional parts
- Ratios are true ratios (e.g., yardstick)
- Relatively rare outside the physical sciences
- **Example: give XPS bonding states as example**

Summary: Four Scales of Measurement

- Nominal scale: One object is different from another.
- Ordinal scale: One object is bigger or better or more of anything than another.
- Interval scale: One object is so many units (e.g. degrees, inches) more than another.
- Ratio scale: One object is so many times as big or bright or tall or heavy as another.

Validity & Reliability of Measurement

- Validity = the extent to which a measurement instrument measures what it is intended to measure.

- Reliability = the consistency with which a measurement instrument yields a certain result when the entity being measured hasn't changed.

Validity of Measurement Instruments

- Face Validity: the extent to which an instrument looks like it's measuring a particular characteristic; relies on subjective judgment.

- Content Validity: the extent to which a measurement instrument is a representative sample of the content area being measured.

- Criterion Validity: the extent to which the results of an assessment correlate with another, related measure.

- Construct Validity: the extent to which an instrument measures a characteristic that cannot be directly observed but is assumed to exist (a construct, such as intelligence).

Ways to Demonstrate the Validity of a Measurement Instrument

- Table of specifications: the researcher constructs a two-dimensional grid listing the specific topics and behaviors that reflect achievement in the domain.

- Multitrait-multimethod approach: two or more different characteristics are each measured using two or more different approaches. The two measures of the same characteristic should be highly related.

- Judgment by a panel of experts: several experts in a particular area are asked to scrutinize an instrument to ascertain its validity for measuring the characteristic in question.

Reliability

- Reliability is the consistency with which a measuring instrument yields a certain result when the entity being measured hasn't changed.
- Instruments designed to measure social and psychological characteristics (insubstantial phenomena) tend to be even less reliable than those designed to measure physical (substantial) phenomena.

Determining the Reliability of a Measurement Instrument

- Interrater reliability: the extent to which two or more individuals evaluating the same product or performance give identical judgments.
- Internal consistency reliability: the extent to which all of the items within a single instrument yield similar results.
- Equivalent forms reliability: the extent to which two different versions of the same instrument yield similar results.
- Test-retest reliability: the extent to which a single instrument yields the same results for the same people on two different occasions.

Quantitative vs. Qualitative Approaches

- Quantitative Research: involves looking at amounts, or quantities, of one or more variables of interest. Researchers attempt to measure variables in some way.

- Qualitative Research: involves looking at characteristics, or qualities, that cannot easily be reduced to numerical values. Researchers attempt to examine nuances and complexities of a particular phenomenon.

- Quantitative and Qualitative Processes
  - formation of one or more hypotheses
  - review of the related literature
  - collection and analysis of data

Quantitative vs. Qualitative Research

- Characteristics of quantitative and qualitative research

Question	Quantitative	Qualitative
What is the purpose of the research?	• To explain and predict • To confirm and validate • To test theory	• To describe and explain • To explore and interpret • To build theory
What is the nature of the research process?	• Focused • Known variables • Established guidelines • Predetermined methods • Somewhat context-free • Detached view	• Holistic • Unknown variables • Flexible guidelines • Emergent methods • Context-bound • Personal view
What are the data like, and how are they collected?	• Numeric data • Representative, large sample • Standardized instruments	• Textual and/or image-based data • Informative, small sample • Loosely structured or nonstandardized observations and interviews
How are data analyzed to determine their meaning?	• Statistical analysis • Stress on objectivity • Deductive reasoning	• Search for themes and categories • Acknowledgment that analysis is subjective and potentially biased • Inductive reasoning
How are the findings communicated?	• Numbers • Statistics, aggregated data • Formal voice, scientific style	• Words • Narratives, individual quotes • Personal voice, literary style (in some disciplines)

Quantitative vs. Qualitative Research

- Choose quantitative or qualitative research

Use this approach if:	*Quantitative*	*Qualitative*
1. You believe that:	There is an objective reality that can be measured	There are multiple possible realities constructed by different individuals
2. Your audience is:	Familiar with/supportive of quantitative studies	Familiar with/supportive of qualitative studies
3. Your research question is:	Confirmatory, predictive	Exploratory, interpretive
4. The available literature is:	Relatively large	Limited
5. Your research focus:	Covers a lot of breadth	Involves in-depth study
6. Your time available is:	Relatively short	Relatively long
7. Your ability/desire to work with people is:	Medium to low	High
8. Your desire for structure is:	High	Low
9. You have skills in the areas of:	Deductive reasoning and statistics	Inductive reasoning and attention to detail
10. Your writing skills are strong in the areas of:	Technical, scientific writing	Literary, narrative writing

Combining Quantitative and Qualitative Designs

- **Mixed-method design** provides a more complete picture of a particular phenomenon than either approach could do alone

Qualitative or Quantitative? Guidelines

1. Consider your own comfort with the assumptions of the qualitative tradition.
2. Consider the audience for your study.
3. Consider the nature of the research question.
4. Consider the extensiveness of the related literature.
5. Consider the depth of what you wish to discover.
6. Consider the amount of time you have available for conducting the study.
7. Consider the extent to which you are willing to interact with the people in your study.
8. Consider the extent to which you feel comfortable working without much structure.
9. Consider your ability to organize and draw inferences from a large body of information.
10. Consider your writing skill.

Considering the Validity of Your Method

The validity of the research project as a whole means its accuracy, meaningfulness, and credibility.

Researchers should consider two questions:

1. Does the study have sufficient controls to ensure that the conclusions drawn are truly warranted by the data?
2. Can the results obtained reasonably be used to make generalizations about the world beyond that specific research context?

The answers to these two questions address the issues of *internal validity* and *external validity,* respectively.

Internal vs External Validity

- Internal Validity: the extent to which the design and data of a research study allow the researcher to draw accurate conclusions about cause-and-effect and other relationships within the data.

- External Validity: the extent to which the results of a research study apply to situations beyond the study itself; the extent to which conclusions can be generalized.

Strategies to Increase Internal Validity

- Conduct a controlled laboratory study
- Conduct a double-blind experiment
- Use unobtrusive measures
- Use triangulation

Strategies to Increase External Validity

- Conduct the study in a real-life setting.
- Use a representative sample.
- Replicate the study in a different context.

Validity in Qualitative Research

- Use triangulation.
- Spend extensive time in the field.
- Conduct a negative case analysis.
- Use thick description.
- Seek feedback from others.
- Seek respondent validation.

Ethical Issues in Research Assurances

- Honesty with professional colleagues
- Internal Review Board (IRB)
- Protection from harm
- Informed consent
- Right to privacy
- Professional code of ethics

The Value of a Pilot Study

Pilot study: a brief exploratory investigation before the main study

- to try out particular procedures, measurement instruments, or methods of analysis.
- to determine the feasibility of the study.
- to identify what approaches will and will not be effective in solving the overall research problem.