

# The Mechanics of Research

A Supplemental Research Guide  
(Based on Content Formerly Found in *The Tongue and Quill*)

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## *This guide covers*

- Getting started: Planning your research schedule
- The research problem
- Citations, quotations and paraphrases
- Copyrights
- Documenting your research: Endnotes
- Bibliography
- Writing style
- Headings
- Overview of research methods

What is research? You may think it is simply to look something up; you may have experience in research and understand it as a process to investigate a problem thoroughly; you may also find the following definition of research in *Webster's Online Dictionary*:

## **re•search** *n*

1. careful or diligent search
2. studious inquiry or examination; *especially* : investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws
3. the collecting of information about a particular subject

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Research is a structured and systematic way to create knowledge. Research searches for facts with a purpose in mind. The philosopher of science Thomas Kuhn said research is like solving a puzzle: you have to follow specific rules, and the challenge of putting the puzzle together to get a complete picture is what usually motivates the researcher.<sup>1</sup> This guide provides a summary of research issues Air University students will encounter during their professional military education (PME), but will also carry over into their careers beyond Air University. It also provides samples of the endnote citation format used in Air University research papers.

### **Getting Started: Planning Your Research Schedule**

At first research may seem like a tedious and complex process. Actually though, some researchers find that once they begin to pursue a research question they are interested in, they really begin to enjoy the process. Do not let the idea of writing a huge paper keep you from getting started. As Henry Ford said, “Nothing is particularly hard if you divide it into small jobs.”

Here are some tips on getting yourself going:

- Do not wait to get started until you can accomplish all of your research needs at once. Research is a critical task that requires considerable time and effort, so make time to research throughout the course of study. If you keep waiting for the “perfect” time to get started, you may never get anything done at all.
- Create an overall plan for what you want to accomplish and when you want to have each step done. For example, here is a proposed research process broken down into manageable chunks:

<b>Task</b>	<b>Desired Date</b>	<b>Actual Date</b>
Topic selected		
Research question written		
Methodology selected		
Sources and data gathered		
Sources read and data analyzed		
Outline created		
Expand outline to draft all topic sentences		
First draft written		
Second draft written		
Final draft written to include front matter (abstract, preface) and back matter (endnotes, bibliography)		
Seek publication if appropriate		

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Back up your milestones from whatever due dates you are given to allow for a little “slop” time and then reward yourself for any deadlines you meet. (Bribery does work—even if you are bribing yourself.)

- Not all tasks associated with research need to be done in the quiet of a library with an 8-hour stretch of time. Break your research-related tasks down into chunks and work them in when and where you can. For example, you do not necessarily need to devote an entire day to reading articles. Instead, you can carry a few with you to read when you are stuck waiting somewhere.
- If your research involves a survey or an experiment that requires the collection of data involving people, be sure that you get proper approval before you get started. This can take up a bit of time, so the earlier you do this the better.

## **The Research Problem**

Research may start for one of many reasons: someone sees a problem with a business practice, has the desire to innovate and create something new, seeks to understand some natural process, or seeks to know more about an issue in order to make things work better or mitigate a condition. All these and more are reasons to conduct research. Good research starts with selecting a researchable problem.

### **Selecting a Researchable Problem**

Research starts with the selection of the problem. This can be harder than it sounds because not every problem may be researchable. For some problems it can be impossible to collect the data to support it. On the other hand, it is easy to become lost in data that is easy to collect and lose sight of the original question. J.J. Carr lists three laws to help define researchable problems:

1. The problem should be clearly formulated in a single sentence of 25 words or less. (Otherwise you could find yourself working with no direction and go off onto irrelevant tangents.)
2. You should be able to collect useful empirical data with observable and accessible criteria. Wherever possible that data should be numerical.
3. You should be able to directly, or indirectly, observe the events you plan to collect data about.<sup>2</sup>

These three simple rules should be followed as closely as possible whenever a problem is selected. Another challenge in defining a problem is making it “not too big and not too small.” Jacques Barzun and Henry Graff discuss how your subject should, “when clearly presented in a prescribed amount of space, leave no questions unanswered within the presentation, even though many questions could be asked outside it.”<sup>3</sup> Though this can be difficult, following these rules will prevent serious problems later on in the research process.

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Ideally, the problem you select to research will be one that interests you. The longer the research paper you will be writing, the more important this is. If you are writing a 5-page paper you can usually slog through almost any topic, but if this is your doctorate dissertation it better be something you feel passionate enough about to attack daily for a year or more.

### **What is NOT an appropriate research problem?**

1. A ruse for achieving self-enlightenment.
2. Problems where the sole purpose is comparing two sets of data.
3. Problems seeking correlation between two sets of data merely to show a relationship between them.
4. Problems requiring only a simple “yes” or “no” answer.

**SOURCE:** Paul D. Leedy and Jeanne Ellis Ormrod, *Practical Research: Planning and Design*, 10th ed. (New York: Pearson, 2013), 28-9.

### **Stating the Research Question**

Once students identify their research problem, the next step is to articulate it concisely and clearly in a research question.

1. **Name your topic:** I am studying ...
2. **Imply your question:** Because I want to find out/show you who/how/why ...
3. **State the rationale** for the question and the project  
(In order to understand/explain how/why/what ...)

Once you have your focus narrowed, and you know just what you want to study, it is time to begin the hunt for what others have written on the same or similar subjects.

### **Reviewing the Related Literature**

Once you have your research question solidified, start your literature review as soon as possible. One reason to search the related literature right away is to make sure that someone else has not already researched the same topic. Keep in mind that if someone has already done the study you would like to do, you can still check their conclusions to see if they have recommended an area of further research. Also, check the date of their study. If it was quite some time ago, replicating their study with a few new twists just might expose some interesting conclusions. There are several other reasons to conduct a thorough literature review:

- It will increase your confidence in your topic....
- It can provide you with new ideas and approaches....
- It can inform you about other researchers whom you may wish to contact....

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- It can show you how others have handled methodological and design issues....
- It can reveal previously unknown sources of data....
- It can introduce you to new research tools and techniques tested by other researchers....
- It can reveal methods of dealing with problem situations....
- It can help you interpret and make sense of your findings....<sup>4</sup>

One major way to save time is to **record all your source data properly from the start**. There are several ways to gather your data as you review the related literature. You can use old-fashioned pen, ink and note cards. You could take a laptop along and type up your notes or you can purchase or photocopy everything. Note cards are convenient in that you can arrange your thoughts in order as you get ready to write. You can also do the same thing with computer notes by printing out your notes, cutting them into strips and then arranging them as you see fit. Just make sure that each line, or paragraph, has a source and page number before you start to cut up your notes pages. One big benefit of typing your notes on a computer is that you can copy and paste quotes right from your notes to your paper. If you can afford it, it is very useful to photocopy or purchase copies of your sources. This is especially true if you plan to do further research on the same topic. Being able to refer back to the original source for more information can be very helpful.

### **Read the Original**

Wherever possible, you should try to read original works instead of someone's interpretation of another work. One rule is that if three others have cited the same source, you should probably hunt it down and read the original work yourself.

**SOURCE:** Leedy and Ormrod, *Practical Research*, 78.

No matter how you capture your source data, be sure to include the details of where you got them. This is especially important if you are using sources from several different libraries and need to track one back down again. Another important thing to remember if you are typing or writing notes is to distinguish clearly between what is a direct quote, what is a paraphrase, and what are your own words and thoughts. If you do not indicate the difference now, while you initially type them in, you will forget and then run the risk of committing plagiarism.<sup>5</sup>

## **Citations, Quotations, and Paraphrases**

In the staff environment, we frequently reuse previously prepared data to save time and avoid "reinventing the wheel," but we rarely need to cite the source of such data. In the academic world, however, reusing another's work without giving that person credit and deliberately trying to pass it off as your own is *plagiarism* and can get you into a heap of trouble.

## Citations

When and where do you document sources? The rule is simple: **If the ideas and information in what you have written are not “common knowledge” or do not represent your own work, you must document where and from whom the “borrowed” ideas and information came.** As a writer, when you quote an authority word for word, paraphrase someone’s thoughts or use someone’s ideas, model, diagram, research results, etc., you need to do so at that point in the text. This is referred to as *citation*. Citation refers to one of several types of systems writers use to document their sources. The signals for citation may be footnotes, in-line notes or endnotes. Whatever the system, the purpose is to flag material for which the writer is indebted and to identify the source. The sum of all citations in a paper, together with the bibliography, is the documentation system of the paper. Citation, if done properly, fulfills a writer’s responsibility for maintaining academic integrity. So, to keep yourself out of a literary (and perhaps legal) jam—give credit where credit is due and cite those sources! Each community has its own standards for citations. This section relies on the *Air University Style and Author Guide*, which can be accessed at [www.au.af.mil/au/awc/awcgate/style/styleguide.pdf](http://www.au.af.mil/au/awc/awcgate/style/styleguide.pdf).

### Plagiarism—HOW TO AVOID IT

- Be aware of where your eyes are when you type and/or write: source or your page?
- Realize when you rely heavily on a source: re-writing what you see?
- Compare your work with sources: same words/phrases as in source?
- Take good notes, note page references: check your work later

**SOURCE:** Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, *The Craft of Research*, 3rd ed. (Chicago: The University of Chicago Press, 2008), 191-5.

## Quotations

A quotation (also called a direct quotation) occurs when a writer is indebted to a source not only for the source’s ideas or facts but also for the wording of those ideas. When you are using a portion of a source word-for-word you must indicate so by using either quotation marks or a block quote. For shorter quotations, keep them in the text and simply enclose the words you are using from another source in double quotation marks (see the example below). Different style-guides have different criteria for how long a quote needs to be before you pull it out of the text and create a “block quotation.” According to the *Air University Style and Author Guide*, you should use a block quotation, “for passages easily set apart from the text, eight or more typed lines, or exceeding one paragraph. Indent from both sides and single-space. Do not use quotation marks to enclose the block quotation, and do not indent its paragraphs. Use double quotation marks to enclose a direct quotation within a block quotation. Skip a line between paragraphs. The block quotation should reflect the paragraphing of the original.”<sup>6</sup> If you are using quite a bit from a copyrighted work, the copyright holder must grant you written permission to do so. The *Air University Style and Author Guide* also offers the following advice on direct quotations:

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1. You may change single quotation marks to double quotation marks and vice versa, if necessary.
2. You may change the initial letter to a capital or lowercase letter.
3. You may omit the final period or change it to a comma, and you may omit punctuation marks where you insert ellipsis points.
4. You should usually omit original note-reference marks in a short quotation from a scholarly work. You may insert note references of your own within quotations.
5. You may correct an obvious typographical error in a passage quoted from a modern source, but you should usually preserve idiosyncratic spellings in a passage from an older work or manuscript source unless doing so would impair clarity. You should inform the reader of any such alterations, usually in a note.<sup>7</sup>

It is good to set the stage for every quote you use and then provide closure after each quote by showing how it relates back to the main point of your paper. Quotes just hanging there, without any stage setting or closure, can make your paper sound choppy and disjointed. What you want is a product that flows seamlessly between what the experts say (quotes) and the conclusions and creative recommendations you can draw from what they say.

### **Paraphrase**

A paraphrase is a restatement of a text, passage, or work, giving the meaning in another form. It is not simply changing a couple of words or putting them in a different order. A paraphrase falls into a gray area between summary and quotation. Where a summary uses only the source's content, but not its words, a paraphrase uses the source's content stated in words and sentence structure that may be similar to—but not exactly like—the source's. If you do paraphrase, always cite the source (and the appropriate page numbers).

There is no simple answer to the problem of deciding how many words you may use from a source before you are required to show you are quoting. A complete sentence taken from the source would certainly have to be treated as a quotation. However, even a single word might have to be quoted, especially if it is a new technical word introduced or developed by the source. *The Air University Style and Author Guide* says, "Ideally, you should introduce your paraphrase so that the reader has no question at all about where your own commentary ends and where your paraphrase begins."<sup>8</sup>

Most of all, you must ensure that you make your research report consists of much more than just a string of quotes and paraphrases from other sources. For example, it would be very inappropriate to put a citation mark next to a chapter heading to indicate that everything in an entire chapter of your research paper came from another source. (Yes, someone has tried to do that!) If you have that much from a single source, and if it really is key to understanding your research, then you can put it word-for-word in an appendix and cite the source there. Remember that research is not just a compilation and regurgitation of others' thoughts—your own thoughts need to be evident too.

## Copyrights

**What is a copyright?** A copyright is the exclusive legal right granted under Title 17, US Code, to the author of an original published or unpublished work (literary, dramatic, musical, artistic and certain other intellectual works) to copy and send copies (paper or electronic), to make derivative works and to perform or display certain types of works publicly.

***NOTE: Research papers or any other written material produced as part of your official government duties are not subject to copyright protection, and are the property of the United States Government.***

**What are your rights and limitations?** Ownership of the copyright is distinct from ownership of the material object (book, periodical, photograph, record, video or audio recording, music, etc.) in which the work is included. The owner is the boss—the head honcho who allows (or not) the work to be performed or displayed publicly. Be careful to not trespass on someone else’s property or step on anyone’s toes. However, there are exceptions that allow the use of the owner’s work without requesting permission or obtaining a license. Find your organization’s expert to keep you out of hot water ... or jail!

**Can you make changes?** Writers can certainly make *minor* style changes, but the changes, individually or cumulatively, should not significantly change the quote’s context or meaning. Only make these minor changes so that the quote fits smoothly into the syntax and typography style of the product.

## Documenting Your Research: Endnotes

The Air University standard for citing sources is endnotes. Below is a short primer on how to use endnotes; you can consult the *Air University Style and Author Guide* for more information about citations. In situations where the *Air University Style and Author Guide* does not provide examples, consult the latest edition of *The Chicago Manual of Style*.

**Endnotes:** Endnotes belong at the end of each chapter or at the very end of a larger manuscript. Endnote numbers may run consecutively from beginning to end of the manuscript, or they may begin again with each new chapter. The typed format for endnotes included at the very end of the manuscript differs slightly in that chapter numbers could be included too.

The computer can automatically set up your endnote formatting in the same way it does footnotes. In Word, when you select “References” and see the “Footnotes” menu, you should select “Insert Endnote.” You can also specify where you want the endnotes to go, at the end of the section or the entire document. If your endnotes are not going where you want them to go, you may need to insert (or remove) a section break. For example, sometimes they will appear after your bibliography, which is incorrect. In this case, put a section break before the bibliography. If you are creating endnotes manually, start on the page where you want your endnotes to appear and center the word “Notes” 1 inch from the top of the page or double-spaced

below any text on the same page. Triple-space between the heading and the first text entry. Number each entry and arrange in numbered sequence as superscript numbers in text. Single-space within each entry as well as between entries. Indent each numbered entry one-half inch from left margin with subsequent lines flush left. When including chapter numbers, center “Chapter #” on the third line below “Notes” and begin the list two-line spaces underneath.

## **Bibliography**

A bibliography is an accurate list of all sources used to prepare your research manuscript. This means there could be sources in your bibliography that do not appear in your endnotes. On the other hand, everything you have cited in your notes should definitely be in the bibliography. One way to prepare your bibliography is to copy all your endnotes and/or footnotes into the bibliography section once you are complete your paper, and then put them in alphabetical order. However, you still are not done. Take a close look at the differences in some style guides between the endnote and/or footnote format and the bibliography format. For example, these are the differences for citing the same source according to the *AU Style Guide*:

**Bibliography entry:** Leedy, Paul D., and Jeanne Ellis Ormrod. *Practical Research: Planning and Design*. 10th ed. New York: Pearson, 2013.

**Endnote entry:** Paul D. Leedy and Jeanne Ellis Ormrod, *Practical Research: Planning and Design*, 10th ed. (New York: Pearson, 2013), 28-9.

The difference is minor, but important. One time-saver is to cite your sources in the correct format from the very start of your literature review. The last thing you want to do, after spending lots of time on the text of your paper, is to have to go back to hunt down information that would have been easy to collect the first time you looked at the data. This means you should not just photocopy articles and stash them away hoping all of the information you want will be on the photocopied page. Make sure the volume number, journal title, page numbers, author, etc., are all included. Usually you need to look at the very front of some journals to find the volume number. This can be very easy to overlook, so if you have a comprehensive and structured process to capture all the pertinent details on every source you use, you will save yourself lots of trouble as you tie up the loose ends of your research.

**Building a Bibliography.** Hopefully, you will be building your entire research report from a research paper template that lays everything out for you. In the event you are building all of this manually, here are some ideas to get you started.

- Use bond paper for printing and center “*Bibliography*” 1 inch from top edge.
- Triple space between the heading and your first entry; single-space within each entry and double space between entries.
- Begin each entry at the left margin and indent subsequent lines five spaces.
- Arrange entries alphabetically, listing author’s name in reverse order (last name, first name, middle initial). When no author is named and a title is used, omit initial articles—

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*a*, *an*, and *the*—use the first major word of the title to alphabetize. If the title begins with a number, alphabetize as though the number is spelled out (76 Trombones would be alphabetized by the letter *s*).

- When you list two or more works by the same author, do not repeat the author’s name. Use a line three dashes long for all entries after the first. List the works for the same author alphabetically by title.
- Items that involve a coauthor follow the works written by the first author alone.
- Set off titles of magazine articles in quotes and italicize the name of the periodical in which the article appeared. Follow with a volume number (may be the month and year) and date of issue in parentheses with page(s).
- Italicize a published report title just as a book title. Also, if there is no author, show the agency responsible for the report. Continue as you would for a book. If an organization is the author, alphabetize by organization name.
- While the *AU Style Guide* says it is not necessary to include interviews in a bibliography, it can add to the credibility of your paper.<sup>9</sup> You should make sure you have the interviewee’s signed consent and they have checked over their parts of your text. List an interview with the names of the interviewee and the interviewer (“author” is used for the name of the author of the book or article in which the interview is listed), the place and date of the interview and, if possible, where it is stored.
- Appropriately cite any emails you receive that includes pertinent information.<sup>10</sup>

The *Air University Style and Author Guide* has page after page of examples, so if you are in doubt about how to cite something, be sure to check there or with another style guide.

## **Writing Style**

For some reason some people think that research papers must be written at a level that is above the complexity of day-to-day writing. This is not so. Here is an example of an abstract with clear writing:

“We had some fun with a stacking rings toy and learned something about how the perceptions of adults are different from those of babies.”<sup>11</sup>

Compare that abstract with this one, which has been a bit “beefed-up.”

“The stacking properties of toroids that reflect radiation in the 1.8 to 2.8 eV energy range is investigated. Preliminary results indicate that in the optimal configuration the toroids are oriented vertically with those reflecting lower energy photons having larger gravitational potential energies for toroids of equal mass. The ambiguousness of this solution is tested by experiments performed by a

relatively inexperienced researcher ( $t = 0.9167$  yr). These experiments indicate that alternate solutions can be found.”<sup>12</sup>

They both say the same thing; one just says it much more clearly. Please do not think of your research report as an opportunity to throw together as many multisyllabic words as you can possibly think of. Remember, you will have to read this over a few times yourself.

## **Headings**

One way to help your paper appear organized is through effective use of headings. In order to make sure you are consistent with your main points, the size and style of your headings and should follow what the introduction says the paper is going to cover and clearly indicate which of the issues are the most important. One of the ways to do this is to match up your outline with the appropriate heading levels.

### **Level One – Centered, bold, 16 point font**

#### **Level Two – Centered, bold, 14 point font**

#### **Level Three – Flush Left, Bold, 12 point font**

**Level Four – Flush Left, Bold, 12 point font.** The heading is followed immediately by text.

If possible, do not “stack headings” with one immediately following another, instead make sure some text separates your headings.<sup>13</sup> Now that you know how to capture your sources, ideas and thoughts—one last consideration is what methodology you use to collect, process and analyze your data.

## **Overview of Research Methods**

What is methodology? One good way to start is by describing what methodology is *not*. Methodology is not a running dialogue of how you did your research; methodology simply provides a structured way of gathering and analyzing your data.

There are as many different ways to group the research methods together as there are research methods themselves, but most of them fall into two main categories: qualitative and quantitative. Some research will even use a mix of the two so do not confine yourself to just one category. One of the major differences between these different research methods is how much control the researcher has over the situation. This section will briefly survey a few of these methods, beginning with the ones where the researcher has little control and working up to experiments where the researcher has a great deal of control.

### **Research Methods**

#### **I. Qualitative Research Methods**

- A. The Historical Method
- B. General Qualitative Methods
  1. Case Study
  2. Ethnography
  3. Phenomenological Study
  4. Grounded Theory Study
  5. Content Analysis
- II. Quantitative Research Methods
  - A. Non-experimental Methods
    1. Descriptive Survey
    2. Analytical Survey
  - B. Experimental Method

## **Qualitative Research Methods**

Qualitative research tends to focus on studying things that occur in natural settings.<sup>14</sup> Qualitative methods fall into two main categories: one is the historical method and the other is a general category that includes case studies, ethnography, phenomenological study, grounded theory study and content analysis.

### **The Historical Method**

The historical method is one of the most commonly used research methods, and it is the only one available for studying the past. It “considers the currents and countercurrents of present and past events, with the hop of discerning patterns that tie them all together.”<sup>15</sup> Historical research is *much* more than listing events in chronological order, or restating historical data in a new and different format. This concept can be lost on students who mistakenly view research as nothing more than a beefed-up book report. The key element in the historical method’s search for meaning requires the researcher to interpret what may have appeared to be simply chance. This method pulls together both things that are commonly known by the well-educated, in addition to any special information that may be relevant to the historical question being studied. In order to help provide stronger conclusions, primary sources should be used as much as possible to increase the validity of the data. Unfortunately, in the historical research design, the researcher has absolutely no control over the collection of the data, the subjects, or even anything that happened at the time the events took place. This can make it hard to be sure all of the needed data has been found, if the data on hand is accurate, and if or how much of the data has been distorted or destroyed.

The researcher using the historical method does not need to look at history only from a time dimension, but can also look at it from the dimension of where things happened.<sup>16</sup> By arranging

historical data in different ways, such as on timelines, charts, or a map, one can gain new insights into the meaning of the data.

Historical research does not restrict itself to just the study of events and people from the past. This methodology is also useful for exploring the origin, development and influence of ideas and concepts.<sup>17</sup> This is where the power of the historical research methodology lies. The ideas and concepts explored through this methodology could have as strong an influence on their ages as the rise or fall of a nation or civilization and would be powerful lessons to pull from history to help carry us into the future.<sup>18</sup>

### **General Qualitative Methods**

In addition to the historical method, there are several other qualitative methods such as case studies, ethnographic studies, phenomenological studies, grounded theory studies, and content analysis studies.

**Case Study.** Case studies seek to understand a person or a situation in depth.<sup>19</sup> For example, someone could study in great detail the transition of a unit from one aircraft to another. You could do this by focusing on just one case, or make an even stronger analysis by looking at multiple cases and making comparisons between them. This is a good method to use if little is known about a situation or if you want to look at how things change over time.<sup>20</sup> Unfortunately, this method is not strong when it comes to being able to generalize the results.

**Ethnography.** Ethnographies are broader than case studies since they study entire groups in depth, particularly groups that share a common culture.<sup>21</sup> For example, instead of looking at one unit transitioning from one aircraft to another, a researcher could use this method to study the entire fighter pilot community. In this method, the researcher studies the group in their natural setting over a period of months, possibly even years, “with an intent to identify cultural norms, beliefs, social structures and other cultural patterns.”<sup>22</sup> Cultural anthropologists pioneered this method, but it is just as applicable in today’s organizational cultures.

**Phenomenological Study.** A phenomenological study attempts to “understand people’s perceptions, perspectives and understandings of a particular situation” by looking at several different views of the same situation to better understand the experience of that situation make generalizations about it.<sup>23</sup> This research method depends heavily on interviews. For example, the individuals who transitioned from one aircraft to another could be interviewed to see what the change meant for them.

**Grounded Theory Study.** This method is interesting in that it is the reverse of most research methods, which normally begin with a theory and test it with data. A grounded theory study begins with the data and “focuses on a *process* related to a particular topic – including people’s actions and interactions – with the ultimate goal of developing a theory about that process.”<sup>24</sup>

**Content Analysis.** Content analysis searches for patterns in the contents of a body of material such as books, films, newspapers, and many other types of documents and media.<sup>25</sup> This method could be used to determine how much violence appears on TV in any given day, and describe the type of violent acts that appear most frequently. This challenging task of sorting through

mounds of data is now easier with computer programs that can help do this quickly. Many content analyses are “mixed method” projects that incorporate elements of both qualitative and quantitative research.

## **Quantitative Research Methods**

In quantitative research, numbers and statistical analysis play a larger role, and the ability to generalize results is somewhat stronger than most qualitative methods. Quantitative research methods can be divided into two major categories: non-experimental and experimental.

### **Non-experimental Research Methods**

In non-experimental research methods, the researcher only controls the measurement of the item under study. Both the descriptive and analytical survey methods are examples of this kind of research. Of note, “survey” is used here to mean, “to look, or see over or beyond.”

*Due to the lengthy review and approval process required to conduct surveys, AU students should only consider using surveys when absolutely necessary.*

#### **Questionnaires**

The questionnaire should be a “totally impersonal probe” which means the researcher must take several precautions when using this tool including:

1. The language must be unmistakably clear.
2. Questionnaires should be designed to fulfill a specific research objective.
3. Questionnaires succeed as their success is planned.

**The Descriptive Survey Method.** The descriptive survey method uses data obtained through observation. While historical data is used to explore events of the past, survey research *looks at things as they are happening*. A descriptive survey investigates things as they are without interfering with them.

There are three basic forms of surveys: retrospective, current and prospective. A retrospective survey reaches back into the past to find out how things used to be. Retrospective surveys have some problems in that the data may be incomplete or even missing. Current surveys, which are used most often, can measure phenomena such as current attitudes towards specific issues. Prospective surveys measure a population at multiple points over a longer time period. Due to time and cost constraints, prospective surveys are much less common than current surveys. There are several different tools for the actual collection of the data, including questionnaires, interviews and the differential sliding scale checklist or inventory.

<b>Quick Reference Sampling Table</b>	
<b>Total Number in Sub-Population</b>	<b>Number of people to be surveyed</b>
1-5	All
6-7	5
8-9	6
10-12	7
13-16	8
17-20	9
21-30	10
31-49	11
50-99	12
100	14
200	21
500	40
1,000	75
2,000	78
5,000	80
10,000	81
<p><b>SOURCE:</b> David Wilkerson and Jefferson Kellogg, <i>Survey Assessment: A Practical Approach to Supporting Change</i> (Arlington, VA: Coopers and Lybrand, 1994), 14.</p>	

When using any survey method, setting the proper population and using the appropriate, deliberate sampling procedures are essential to produce trustworthy results. Accidental sampling, such as asking questions to the first five folks who walk in each day, makes absolutely no pretense of being representative of a population and makes no attempt to control for personal bias. Quota sampling selects respondents in the same ratios as they are found in the overall population being researched. What is essential is the process of randomization that is used to choose from the overall population. This concept of randomization and the elimination of bias are the two most important elements in successful survey research.

**How do statistics help interpret data?**

1. Indicate the central point of tendency.
2. Indicate the amount of variance in the data.
3. Show the strength or weakness of relationships between multiple variables.

**SOURCE:** Leedy and Ormrod, *Practical Research*, 282.

The biggest difference between the nonexperimental and experimental methods of research is survey research does not include the same highly controlled aspects of experimental research.

**The Experimental Method**

There are many different subsets of the experimental method, but a common characteristic is the level of control the researcher has over both the event and the ability to collect data on the event. An experiment is a contrived event where the effect of a deliberate act is observed. One of the main purposes of experimental research is to determine cause-and-effect relationships. Unfortunately, some study results can be weakened because the artificial nature of their experiments makes the results too different from what might turn out in a natural setting.

One of the most important aspects of the experimental method is effectively planning the design of the experiment—not just how the data will be interpreted, but the entire experimental design.<sup>26</sup> One key concept involves independent and dependent variables. “A variable that the researcher studies as a possible cause of something else – in many cases, this is one that the researcher directly manipulates – is called an **independent variable**. A variable that is potentially influenced by the independent variable – that ‘something else’ just mentioned – is called a **dependent variable**, because it is influenced by and so to some extent *depends* on the independent variable.”<sup>27</sup> If we were testing a new medication to reduce headaches for example, the drug itself would be the independent variable and the headaches, which hopefully will be reduced or eliminated by the drug, would be the dependent variable—the headaches would depend on the medication.

**Research Methods in a Nutshell**

When trying to choose between quantitative and qualitative methods, it is important to take several things into consideration—to include your interests. The “Research Methodology Guidelines” table on the following page gives some good guidelines of what to take into consideration.

<b>Research Methodology Guidelines</b>		
<b>Use this approach if:</b>	<b>Quantitative</b>	<b>Qualitative</b>
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 area(s) of:	Deductive reasoning and statistics	Inductive reasoning and attention to detail
10. Your writing skills are strong in the area of:	Technical, scientific writing	Literary, narrative writing
<b>SOURCE:</b> Leedy and Ormrod, <i>Practical Research</i> , 99.		

College students spend entire semesters studying the intricacies of the various research methods and this guide has only briefly touched on a few of them. For more details, one good reference is Paul J. Leedy and Jeanne Ellis Ormrod's *Practical Research: Planning and Design*.

## Summary

The most important concept to take away from this guide is that research must consist of more than just gathering information and retransmitting it in a slightly different format. Research begins with the formulation of an appropriate research question. The research question, the data, and your interests influence the research methodology. In shorter research papers, you may not be required to state specifically the methodology you used. However, it should be apparent from reading your paper that you are not just presenting information, but are also drawing some new meaning from the information and actually contributing to the body of knowledge.

## Notes

- <sup>1</sup> Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: The University of Chicago Press, 1970), 38.
- <sup>2</sup> J. J. Carr, *The Art of Science: A Practical Guide to Experiments, Observations and Handling Data* (San Diego, CA: HighText Publications, 1992), 85-87.
- <sup>3</sup> Jacques Barzun and Henry F. Graff, *The Modern Researcher* (New York: Harcourt, Brace and World, 1985), 19.
- <sup>4</sup> Paul D. Leedy and Jeanne Ellis Ormrod, *Practical Research: Planning and Design*, 10th ed. (New York: Pearson, 2013), 51.
- <sup>5</sup> Marcia Watkins, *The Walden University Survival Guide* (NY: Love From the Sea Publishers, 1997), 56.
- <sup>6</sup> *Air University Style and Author Guide*, (Maxwell AFB, AL: Air University Press, 2005), 135.
- <sup>7</sup> *Ibid.*, 134.
- <sup>8</sup> *Ibid.*, 138.
- <sup>9</sup> *Ibid.*, 172.
- <sup>10</sup> Goodfellow, Major Gerald V., "Citing an email." E-mail to Marcia Watkins. 1 April 2003.
- <sup>11</sup> Caroline, Eric, and Emily, "How to Write a Clear Research Report," on-line, Internet, 8 October 2002, available from <http://www.radix.net/%7Eforfax/air/clearrep.html>.
- <sup>12</sup> E. Robert Schulman, C. Virginia Cox, and E. Anne Schulman, "How to Write a Scientific Research Report," on-line, Internet, 8 October 2002, available from <http://www.radix.net/%7Eforfax/air/scireport.html>.
- <sup>13</sup> *Air University Style and Author Guide*, 15.
- <sup>14</sup> Leedy and Ormrod, *Practical Research*, 139.
- <sup>15</sup> *Ibid.*, 170.
- <sup>16</sup> *Ibid.*, 171.
- <sup>17</sup> *Ibid.*, 177.
- <sup>18</sup> *Ibid.*, 177-8.
- <sup>19</sup> *Ibid.*, 141.
- <sup>20</sup> *Ibid.*, 141.
- <sup>21</sup> *Ibid.*, 142.
- <sup>22</sup> *Ibid.*, 142-3.
- <sup>23</sup> *Ibid.*, 145.
- <sup>24</sup> *Ibid.*, 146.
- <sup>25</sup> *Ibid.*, 148.
- <sup>26</sup> *Ibid.*, 226.
- <sup>27</sup> *Ibid.*, 40.