PART II

The Research Process

Surgeons Rely on Video Game Skills

A research study conducted by Beth Israel Medical Center and the National Institute on Media and the Family, released in April 2004, reported that video game skills translate into surgical prowess. Doctors who spent at least three hours a week playing video games made about 37 percent fewer mistakes in laparoscopic surgery than doctors who did not play games. They were also significantly faster and more efficient in surgery than their non-game-playing peers. As study coauthor Paul J. Lynch comments, “The study heralds the arrival of Generation X into medicine.”

Researchers are now considering ways to implement the findings of their study. Dr. James Rosser, one of the researchers, is developing a training course called “Top Gun” in which surgical trainees “warm up” with a video game, honing their coordination, agility, and accuracy, before entering the operating room. In laparoscopic surgery, surgeons use a tiny camera and instruments controlled by joysticks and a video monitor to perform minimally intrusive surgery on body parts ranging from gallbladders to knees. The process is very delicate. As Dr. Rosser describes, “It’s like tying your shoelaces with 3-foot-long chopsticks” (Dobnik). ◆

7
Thinking Critically about the Research Process

Major decisions in the workplace typically are based on careful research, with the findings recorded in a written report. Managers spend an estimated 17 percent of their time searching for information (Davenport 157).

Research is a deliberate form of inquiry, a process of problem solving in which certain procedures follow a recognizable sequence (Figure 7.1). But research is not simply a numbered set of procedures. The procedural stages depend on the many decisions that accompany any legitimate inquiry (Figure 7.2).[1]

ASKING THE RIGHT QUESTIONS

The answers you uncover will depend on the questions you ask. Assume, for instance, that you are faced with the following scenario:

Defining and Refining a Research Question

> You are the public health manager for a small, New England town in which high-tension power lines run within one hundred feet of the elementary school. Parents are concerned about danger from electromagnetic radiation (EMR) emitted by these power lines in energy waves known as electromagnetic fields (EMFs). Town officials ask you to research the issue and prepare a report to be distributed at the next town meeting in six weeks.

First, you need to identify your exact question or questions. Initially, the main question might be: *Do the power lines pose any real danger to our children?* After phone calls around town and discussions at the coffee shop, you discover that townspeople actually have three main questions: *What are electromagnetic fields? Do they endanger our children? If so, then what can be done?*

To answer these questions, you need to consider a range of subordinate questions, like those in the Figure 7.3 tree chart. Any one of the questions could serve as topic of a worthwhile research report on such a complicated issue. As research progresses, this chart will grow. For instance, after some preliminary reading, you learn that electromagnetic fields radiate not only from power lines but from *all* electrical equipment, and even from the Earth itself. So you face this additional question: *Do power lines present the greatest hazard as a source of EMFs?*

You now wonder whether the greater hazard comes from power lines or from other EMF sources. Critical thinking, in short, has helped you define and refine the essential questions.

EXPLORING A BALANCE OF VIEWS

Instead of settling for the most comforting or convenient answer, pursue the *best* answer. Even "expert" testimony may not be enough, because experts can disagree or be mistaken. To answer fairly and accurately, consider a balance of perspectives from up-to-date and reputable sources (Figure 7.4).

Let's say you've chosen this question: *Do electromagnetic fields from various sources endanger our children?* Now you can consider sources to consult (journals, interviews, reports, Internet sites, database searches, and so on). Figure 7.5 illustrates some likely sources for information on the EMF topic.

NOTE *Recognize the difference between "balance" (sampling a full range of opinions) and "accuracy" (getting at the facts). Government or industry spokespersons, for example, might present a more positive view (or "spin") than the facts warrant. Not every source is equal, nor should we report points of view as if they were equal (Trafford 137).*

ACHIEVING ADEQUATE DEPTH IN YOUR SEARCH[2]

Balanced research examines a broad *range* of evidence; thorough research examines that evidence in sufficient *depth*. Different types of secondary information occupy different levels of detail and dependability (Figure 7.6).

1. At the surface level are items from popular media (newspapers, radio, TV, magazines, certain Internet newsgroups, and certain Web sites). Designed for general consumption, this layer of information often contains more journalistic interpretation than factual detail.
2. At the next level are trade, business, and technical publications or Web sites (*Frozen Food World, Publisher's Weekly,* Internet listservs, and so on). Designed for users who range from moderately informed to highly specialized, this layer of information focuses more on practice than on theory, on items considered newsworthy to group members, on issues affecting the field, on public relations, and on viewpoints that tend to reflect a field's particular biases.
3. At a deeper level is the specialized literature (journals from professional associations—academic, medical, legal, engineering). Designed for practicing professionals, this layer of information focuses on theory as well as practice, on descriptions of the latest studies (written by the

researchers themselves and scrutinized by peers for accuracy and objectivity), on debates among scholars and researchers, and on reviews and critiques of prior studies.

Also at this deepest level are government sources (reports by NASA, EPA, FAA, the Defense Department, Congress) and corporate documents available through the Freedom of Information Act (page 143). Designed for anyone willing to investigate its complex resources, this information layer offers facts and highly detailed and (in many instances) *relatively* impartial views.

NOTE *Web pages, of course, offer links to increasingly specific levels of detail. But the actual "depth" and quality of a Web site's information depend on the sponsorship and reliability of that site (page 166).*

How deep is deep enough? This depends on your purpose, your audience, and your topic. But the real story and the hard facts most likely reside at deeper levels. Research on the EMF issue, for example, would need to look beneath popular "headlines" and biased special interests (say, electrical industry or environmental groups), focusing instead on studies by experts.

EVALUATING YOUR FINDINGS

Not all findings have equal value. Some information might be distorted, incomplete, or misleading. Material might be tainted by *source bias*: With an emotional issue involving children, a source might understate or overstate certain facts, depending on whose interests that source represents (say power company, government agency, parent group, or a reporter seeking headlines).

Instead of merely emphasizing findings that support their own biases or assumptions, ethical researchers seek out the most *accurate* answer. Only near the end of your inquiry can you settle on a *definite* conclusion—based on what the facts suggest.

INTERPRETING YOUR FINDINGS

Once you have decided which of your findings seem legitimate, you need to decide what they all mean.

Perhaps you will reach a definite conclusion: For example, "The evidence about EMF dangers seems persuasive enough for us to be concerned and to take the following actions."

Perhaps you will not.

Even the best research can produce contradictory or indefinite conclusions. For instance, critics point out that some EMF studies indicate increased cancer risk while others indicate beneficial health effects. Some scientists claim that stronger EMFs are emitted by natural sources, such as Earth's magnetic field, than by electrical sources (McDonald, "Some Physicists" 5). An accurate conclusion would have to come from your analyzing all views and then deciding that one outweighs the others—or that only time will tell.

NOTE *Never force a simplistic conclusion on a complex issue. Sometimes the best you can offer is an indefinite conclusion: "Although controversy continues over the extent of EMF hazards, we all can take simple precautions to reduce our exposure." A wrong conclusion is far worse than no definite conclusion at all.*

EXERCISES

1. Students in your major want a listing of one or two discipline-specific information sources from different depths of specialization:

   a. the popular press (newspaper, radio, TV, magazines)
   b. trade/business publications (newsletters and trade magazines)
   c. professional literature (journals)
   d. government sources (corporate data, technical reports, etc.)

   Prepare the list (in memo form) and include a one-paragraph description of each source.

2. Select an issue from science or technology (for example, possible health hazards from cellular phones). Survey expert opinions by consulting Web sources such as these:

   - *Ask Jeeves* at <www.askjeeves.com>
   - *Webhelp* at <www.webhelp.com>
   - *AskMe.com* at <www.askme.com>
   - *Scientific American's* "Ask the Experts" link at <www.sciam.com>

   Locate one example of each of the following:

   - a point on which most experts agree
   - a point on which many experts disagree
   - an opinion that seems influenced by financial or political motives
   - an opinion that resides on the radical end of the spectrum

   Report your findings in a memo to share with the class. Be sure to document clearly each source that you are quoting or paraphrasing (see Appendix A).

3. Assume that as communications director for XYZ, an international corporation, you oversee intercultural training of native U.S. employees who will be working in various company branches worldwide and collaborating routinely with members of different cultures. To enhance employee training, you decide to compile a short list of Web sites that provide up-to-date information on various cultures.

   After reviewing the following sites, provide a brief description of each, and rank the sites in terms of the depth of information each provides on a given culture (say,

Pakistani, Saudi Arabian, and so on). In a memo to all employees, recommend which site(s) to visit for general or specific information and for certain types of information (history, behaviors, values, and so on).

- *Culturegrams* at <www.culturegrams.com/culturegram2000.htm>
- *CIA World Factbook Online* at <www.odci.gov/cia/publications/factbook>
- *U.S. Department of State Electronic Research Collection* at <dosfan.lib.uic.edu>
- *AsiaSource* at <www.asiasource.org>

4. Begin researching for the analytical report (Chapter 24) due at semester's end. Complete these steps. (Your instructor might establish a timetable.)

Phase One: Preliminary Steps

a. Choose a topic of immediate practical importance, something that affects you, your workplace, or your community directly.
b. Identify a specific audience and its intended use of your information. Complete an audience and use profile (page 36).
c. Narrow your topic, and check with your instructor for approval.
d. Make a working bibliography to ensure sufficient primary and secondary sources. Don't delay this step!
e. List the things you already know about your topic.
f. Write a clear statement of purpose and submit it in a proposal memo (page 42) to your instructor.
g. Develop a tree chart of possible questions (as on page 120).
h. Make a working outline.

Phase Two: Collecting Data (Read Chapters 8–10 in preparation for this phase.)

a. In your research, move from general to specific; begin with general works for an overview.
b. Skim your material, looking for high points.
c. Take selective notes. Use notecards or electronic file software.
d. Plan and administer questionnaires, interviews, and inquiries.
e. Whenever possible, conclude your research with direct observation.
f. Evaluate and interpret your findings.
g. Use the checklist on page 194 to reassess your research methods and reasoning.

Phase Three: Organizing Your Data and Writing the Report

a. Revise your working outline as needed.
b. Fully document all sources of information.
c. Write your final draft according to the checklist on page 194.
d. Proofread carefully and add all needed supplements (title page, letter of transmittal, abstract, summary, appendix, glossary).

Due Dates: To Be Assigned by Your Instructor

List of possible topics due:
Final topic due:
Proposal memo due:

Working bibliography and working outline due:
Notecards due:
Copies of questionnaires, interview questions,
and inquiry letters due:
Revised outline due:
First draft of report due:
Final draft with supplements and
documentation due:

TECHNICAL COMMUNICATION IN THE NEWS

FIGURE 7.1 The Procedural Stages of the Research Process

FIGURE 7.2 The Inquiry Stages of the Research Process

[1]My thanks to University of Massachusetts Dartmouth librarian Shaleen Barnes for inspiring this entire chapter.

7.1

Sometimes questions are more important than answers. Learn more at
<www.ablongman.com/
lannonweb>

FIGURE 7.3 How the Right Questions Help Define a Research Problem You cannot begin to solve a problem until you have defined it clearly.

FIGURE 7.4

Effective Research Considers Multiple Perspectives Try to consider all the angles.

FIGURE 7.5 A Range of Essential Viewpoints No single source is likely to offer "the final word." Ethical researchers rely on evidence that represents a fair balance of views.

The depth of a source often determines its quality

[2]My thanks to University of Massachusetts Dartmouth librarian Ross LaBaugh for inspiring this
section.

FIGURE 7.6

Effective Research Achieves Adequate Depth

7.2

Find out more about when to skim and
when to drill down at
<www.ablongman.com/
lannonweb>

QUESTIONS FOR EVALUATING A PARTICULAR FINDING

- *Is this information accurate, reliable, and relatively unbiased?*
- *Do the facts verify the claim?*
- *How much of the information is useful?*
- *Is this the whole or the real story?*
- *Does something seem to be missing?*
- *Do I need more information?*

QUESTIONS FOR INTERPRETING YOUR FINDINGS

- *What are my conclusions and do they address my original research question?*
- *Do any findings conflict?*
- *Are other interpretations possible?*
- *Should I reconsider the evidence?*
- *What, if anything, should be done?*

CONSIDER THIS Expert Opinion Is Not Always Reliable

An expert is someone capable of doing the right thing at the right time.
(Holyoak, qtd. in Woodhouse and Nieusma 23).

What We Expect from Experts

Whenever we face uncertainty, we consult experts to help us make informed decisions about complex issues:

- *What should we do about global warming?*

- *Where and how should we store nuclear waste?*
- *How promising is the newly announced "cancer cure"?*
- *What is causing the massive die-off of frogs worldwide?*

How We Confer Expert Status

As information consumers, we confer expert status onto someone who seems to know more than we do—based on credentials, and relevant skills, experience, and knowledge. But researchers point out that "expert status is
. . . in the eye of the beholder"—not necessarily based on a person's knowledge or *analytical skills,* but instead on that person's *linguistic skills:* use of technical language and persuasion strategies (Rifkin and Martin 31–36).

The Limits of Expert Opinion

Even though experts tend to consider themselves neutral, in controversial issues, outside influences often cause neutrality to disappear (Rifkin and Martin 31–33):

- *The expert might have a financial stake in the issue—say an environmental researcher who receives financial support from nuclear power companies. So, even though we might recognize this person's knowledge and skill, we might have cause to mistrust her recommendations or conclusions.*
- *The expert might have an extreme point of view, radically different from mainstream, accepted, scientific opinion—for example, about the risks or benefits of human cloning experiments.*
- *The expert might be venturing in areas beyond his expertise—for example, a real estate lawyer dabbling in copyright law.*
- *The expert can be mistaken—say, a meteorologist predicting the weather.*

A Typical Case of Dueling Experts

For years, scientists and engineers have debated whether Yucca Mountain, Nevada, is an appropriate site for burying high-level nuclear waste deep underground. Some $3 billion worth of technical studies have assessed risks and benefits to health and safety.

Supporting Arguments

- *Storing nuclear waste in one secure facility is safer and cheaper than storing it at the various power plants.*
- *A number of power plants are already running out of storage space.*
- *The Yucca Mountain site is remote, has a dry climate and stable geology, and abuts a desert already contaminated by nuclear-weapons testing over forty years ago.*

Opposing Arguments

- *Some scientists claim that earthquake possibilities have been greatly underestimated, pointing out that tremors occur periodically in this area.*
- *Leaking waste could contaminate ground water.*
- *Some of this material will remain highly dangerous for at least ten thousand years—a period longer than any written language (for warning) or "human-made edifice" has lasted.*

Both sides of the argument are based on *expert* opinion or analysis. In short, "when it comes to Yucca Mountain, scientists do not have the answers" (Gross 134+).

GUIDELINES for Evaluating Expert Information

To use expert information effectively, follow these suggestions:

1. *Look for common ground.* When opinions conflict, consult as many experts as possible and try to identify those areas in which they agree (Detjen 175).
2. *Consider all reasonable opinions.* Science writer Richard Harris notes that "Often [extreme views] are either ignored entirely or given equal weight in a story. Neither solution is satisfying. ... Putting [the opinions] in balance means ... telling ... where an expert lies on the spectrum of opinion. ... The minority opinion isn't necessarily wrong—just ask Galileo" (170).

3. *Be sure the expert's knowledge is relevant in this context.* Don't seek advice about a brain tumor from a podiatrist.
4. *Don't expect certainty.* In complex issues, experts cannot *eliminate* uncertainty; they can only help us cope with it.
5. *Expect special interests to produce their own experts to support their position.*
6. *Learn all you can about the issue before accepting anyone's final judgment.*

7.3
For more on the languages and cultures of expertise visit <www.ablongman.com/lannonweb>
For more exercises, visit <www.ablongman.com/lannon>