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Data Analysis and Representation

Analyzing text and multiple forms of data presents a formidable task for qualitative researchers. Deciding how to represent the data in tables, matrices, and narrative form is challenging as well. I feel that it is important in this chapter to first discuss several general procedures for analysis of data before detailing the differences in analysis and representing data by tradition of inquiry.

I begin by summarizing three general approaches to analysis provided by leading authors. I then present a visual model—a data analysis spiral—that I find useful to conceptualize the data analysis process in qualitative research. I use this spiral as a conceptualization to further explore each tradition of inquiry, and I examine specific data analysis procedures within each tradition and compare these procedures. I end with the use of computers in qualitative analysis and assess the use of one program, NUD·IST (non-numerical data indexing, searching, and theorizing), useful in analysis generally and within the traditions specifically.

Questions for Discussion

▼ What are common data analysis strategies used in qualitative research regardless of tradition of inquiry?

▼ How might the overall data analysis be conceptualized in qualitative research?

▼ What are specific data analysis procedures within each tradition of inquiry, and how do they differ?

▼ How can one represent the analysis using a computer program, and how would this representation differ by tradition of inquiry?

THREE ANALYSIS STRATEGIES

Undoubtedly, no consensus exists for the analysis of the forms of qualitative data. But, at the outset, it might be useful to explore common features espoused by several writers. In Table 8.1, I present the general data analysis strategies advanced by three qualitative authors (Bogdan & Biklen, 1992; Huberman & Miles, 1994; Wolcott, 1994b). These three authors advocate many similar processes, as well as a few different processes, in the analytic phase of qualitative research.

They recommend, first, a general review of all information, often in the form of jotting down notes in the margins of text (e.g., observational fieldnotes, interview transcriptions, notes about photographs or videotapes). I personally favor reading through all collected information to obtain a sense of the overall data, a procedure also advocated by Tesch (1990). In addition, writing findings in the form of memos and reflective notes is an initial sorting-out process. One also might begin to write summaries of field notes.

At this point, the researcher might obtain feedback on the initial summaries by taking information back to informants, a procedure to be discussed later as a key verification step in research as well as an analysis step. Also at this point, a researcher looks closely at the words used by participants in the study, such as the metaphors they use, or the researcher translates participants' ideas into metaphors. The process of reducing the data begins. It is followed by creating displays of information such as diagrams, tables, or graphs—means for visualizing the information and representing it by case, by subject, or by theme.

Another important approach to reducing the data is to develop codes or categories and to sort text or visual images into categories. I think about "winnowing" the data here; not all information is used in

TABLE 8.1 General Data Analysis Strategies by Authors

Analytic Strategy	Bogdan & Biklen (1992)	Huberman & Miles (1994)	Wolcott (1994b)
Sketching ideas	Jot down ideas in margins of fieldnotes	Write margin notes in fieldnotes	Highlight certain information in description
Taking notes	Write memos, write observer's comments	Write reflective passages in notes	
Summarize field notes		Draft a summary sheet on fieldnotes	
Getting feedback on ideas	Try out themes on subjects		
Working with words	Play with metaphors, analogies, concepts	Make metaphors	
Display data	Develop diagrams, continua, tables, matrices, and graphs	Make contrasts and comparisons	Display findings in tables, charts, diagrams, and figures; compare cases; compare with a standard
Identify codes	Develop coding categories	Write codes, memos	
Reduce information	Sort material into categories	Note patterns and themes	Identify patterned regularities
Count frequency of codes		Count frequency of codes	
Relating categories		Factoring, noting relations among variables, building a logical chain of evidence	
Use systematic procedures of tradition of inquiry			Follow fieldwork procedures in ethnography
Relate to analytic framework in literature			Contextualize in framework from literature
Redesign study			Propose a redesign of the study

a qualitative study, and some may be discarded (Wolcott, 1994b). Researchers develop a short list of tentative codes (e.g., 12 or so) that match a text segment, regardless of the length of the database. Begin-

ning researchers tend to develop elaborate lists of codes when they review their databases. I proceed differently. I begin with a short list—5 or 6 categories with shorthand labels or codes—and then I expand the categories as I continue to review and re-review my database. Typically, regardless of the size of the database, I do not develop more than 25-30 categories of information, and I find myself working to reduce these to the 5 or 6 that I will use in the end to write my narrative. Those researchers who end up with 100 or 200 categories—and it is easy to find this many in a complex database—struggle to reduce the picture to the 5 or 6 that they must end with for most publications.

As another technique, Huberman and Miles (1994) suggest that investigators make preliminary "counts" of data and determine how frequently codes appear in the database. Finally, researchers relate categories and develop analytic frameworks, procedures found in grounded theory research (Corbin & Strauss, 1990). Such comparisons and contrasts may lead to the redesign of a study or to the generation of a new framework.

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THE DATA ANALYSIS SPIRAL

Data analysis is not off-the-shelf; rather, it is custom-built, revised, and "choreographed" (Huberman & Miles, 1994). Qualitative researchers "learn by doing" (Dey, 1993, p. 6). This leads critics to claim that qualitative research is largely intuitive, soft, and relativistic or that qualitative data analysts fall back on the three "I's"—"insight, intuition, and impression" (Dey, 1995, p. 78). Undeniably, qualitative researchers preserve the unusual and serendipitous, and writers craft each study differently, using analytic procedures that evolve in the field. But given this perspective, I believe that the analysis process conforms to a general contour.

The contour is best represented in a spiral image, a data analysis spiral. As shown in Figure 8.1, to analyze qualitative data, the researcher engages in the process of moving in analytic circles rather than using a fixed linear approach. One enters with data of text or images (e.g., photographs, videotapes) and exits with an account or a narrative. In between, the researcher touches on several facets of analysis and circles around and around.
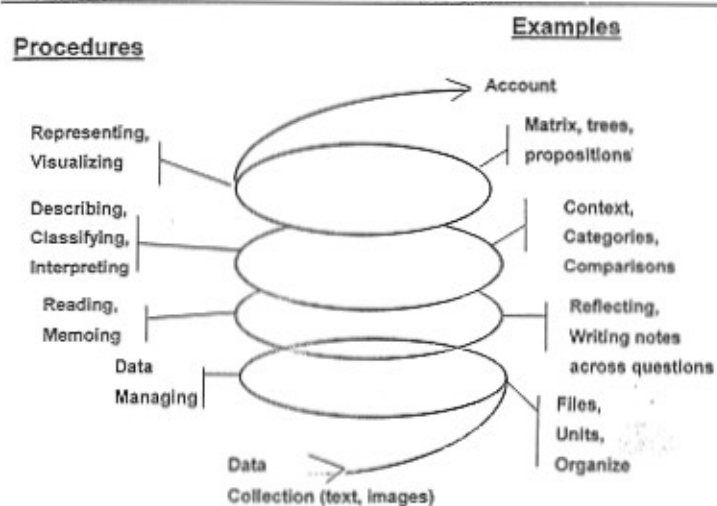
Figure 8.1 The Data Analysis Spiral

Data management, the first loop in the spiral, begins the process. At an early stage in the analysis process, researchers organize their data into file folders, index cards, or computer files. Besides organizing files, researchers convert their files to appropriate text units (e.g., a word, a sentence, an entire story) for analysis either by hand or by computer. Materials must be easily located in large databases of text (or images). As Patton (1980) says,

> The data generated by qualitative methods are voluminous. I have found no way of preparing students for the sheer massive volumes of information with which they will find themselves confronted when data collection has ended. Sitting down to make sense out of pages of interviews and whole files of field notes can be overwhelming. (p. 297)

Computer programs help with this phase of analysis, and their role in this process will be addressed later.

Following the organization and conversion of the data, researchers continue analysis by getting a sense of the whole database. Agar (1980), for example, suggests that researchers "read the transcripts in their entirety several times. Immerse yourself in the details, trying to get a sense of the interview as a whole before breaking it into parts"

(p. 103). Writing memos in the margins of fieldnotes or transcripts or under photographs helps in this initial process of exploring a database. These memos are short phrases, ideas, or key concepts that occur to the reader.

With the data in our gunman case study (Asmussen & Creswell, 1995), we scanned all of our databases to identify major organizing ideas. Looking over our fieldnotes from observations, interview data, physical trace evidence, and audio and visual images, we disregarded predetermined questions to "hear" what interviewees said. We reflected on the larger thoughts presented in the data and formed initial categories. These categories were few in number (about 10), and we looked for multiple forms of evidence to support each. Moreover, we found evidence that portrayed multiple perspectives about each category.

This process I have described consists of moving from the reading and memoing loop into the spiral to the describing, classifying, and interpreting loop. In this loop, category formation represents the heart of qualitative data analysis. Here researchers describe in detail, develop themes or dimensions through some classification system, and provide an interpretation in light of their own views or views of perspectives in the literature. Authors employ descriptive detail, classification, or interpretation or some combination of these analysis procedures. Detailed description means that authors describe what they see. This detail is provided in situ, that is, within the context of the setting of the person, place, or event. Description becomes a good place to start in a qualitative study (after reading and managing data), and it plays a central role in ethnographic studies.

Classifying pertains to taking the text or qualitative information apart, looking for categories, themes, or dimensions of information. As a popular form of analysis, classification involves identifying five or six general themes. These themes, in turn, I view as a "family" of themes with children, or subthemes, and grandchildren represented by segments of data. It is difficult, especially in a large database, to reduce the information down into five or six "families," but my process involves winnowing the data, reducing them to a small, manageable set of themes to write into my final narrative.

Interpretation involves making sense of the data, the "lessons learned" as described by Lincoln and Guba (1985). Several forms exist,
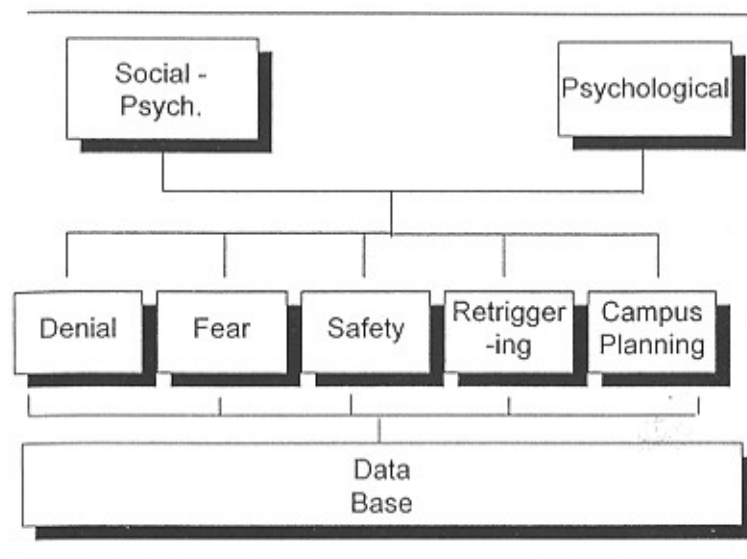
Figure 8.2   Layers of Analysis in Gunman Case (Asmussen & Creswell, 1995)

such as interpretation based on hunches, insights, and intuition. It also might be an interpretation within a social science construct or idea or a combination of personal views as *contrasted* with a social science construct or idea. At this point in their analyses, researchers step back and form larger meanings of what is going on in the situations or sites.

In the final phase of the spiral, researchers present the data, a packaging of what was found in text, tabular, or figure form. For example, creating a visual image of the information, a researcher may present a "comparison" table (see Spradley, 1980) or a matrix—for example, a 2 × 2 table that compares men and women in terms of one of the themes or categories in the study (see Miles & Huberman, 1994). The cells contain text, not numbers. A hierarchical tree diagram represents another form of presentation. This shows different levels of abstraction, with the boxes in the top of the tree representing the most abstract information and those at the bottom representing the least abstract themes. Figure 8.2 illustrates the levels of abstraction that we used in the gunman case (Asmussen & Creswell, 1995). Although I

have presented this figure at conferences, we did not include it in the published journal article version of the study. This illustration shows inductive analysis that begins with the raw data consisting of multiple sources of information and then broadens to several specific themes (e.g., safety, denial) and on to the most general themes represented by the two perspectives of social-psychological and psychological factors.

Hypotheses or propositions that specify the relationship among categories of information also represent information. In grounded theory, for example, investigators advance propositions that interrelate the causes of a phenomenon with its context and strategies. Finally, authors present metaphors to analyze the data, literary devices in which something borrowed from one domain applies to another (Hammersley & Atkinson, 1995). Qualitative writers may compose entire studies shaped by analyses of metaphors.

ANALYSIS WITHIN TRADITIONS OF INQUIRY

Beyond these general spiral analysis processes, I can now relate the procedures to each of the five traditions of inquiry and highlight specific differences in analysis and representing data. My organizing framework for this discussion is found in Table 8.2. I address each tradition and discuss specific analysis and representing characteristics. At the end of this discussion, I return to significant differences and similarities among the five traditions.

Biography

Denzin (1989b) suggests that a researcher begin analysis by identifying an objective set of experiences in the subject's life. Having the individual journal a sketch of his or her life may be a good beginning point for analysis. In this sketch, the researcher looks for life-course stages or experiences (e.g., childhood, marriage, employment) to develop a **chronology** of the individual's life. Stories and epiphanies will emerge from the individual's journal or from interviews. The researcher looks in the database (typically interviews or documents) for concrete, contextual biographical materials. An interviewer

prompts a subject to expand on various sections of the stories and asks the interviewee to theorize about his or her life. These theories may relate to career models, processes in the life course, models of the social world, relational models of biography, and natural history models of the life course. Then, narrative segments and categories within the interview-story are isolated by the researcher, and larger *patterns* and *meanings* are determined.

Finally, the individual's biography is reconstructed, and the researcher identifies factors that have shaped the life. This leads to the writing of an analytic abstraction of the case that highlights (a) the processes in the individual's life, (b) the different theories that relate to these life experiences, and (c) the unique and general features of the life.

In the life history of Vonnie Lee (Angrosino, 1994), the reader finds many of these forms of analysis in the **chronology** of the bus trip, the specific **stories** such as the logo on the bus, and the theorizing (at least by the author) about the meaning of the bus trip as a metaphor for Vonnie Lee's experiences in life as an individual with mental retardation.

Phenomenology

I see the biographical approach by Denzin (1989b) as a general template for analysis in contrast to the detailed, specific approaches to phenomenological analysis advanced by Moustakas (1994). Moustakas reviews two approaches, but I see his second approach, called a modification of the Stevick-Colaizzi-Keen method, being used frequently in phenomenological studies. The steps are as follows:

▼ *The researcher begins with a full description of his or her own experience of the phenomenon.*

▼ *The researcher then finds statements (in the interviews) about how individuals are experiencing the topic, lists out these significant statements (**horizonalization** of the data) and treats each statement as having equal worth, and works to develop a list of nonrepetitive, nonoverlapping statements.*

TABLE 8.2 Data Analysis and Representation by Research Traditions

Data Analysis and Representation	Biography	Phenomenology	Grounded Theory Study	Ethnography	Case Study
Data managing	• Create and organize files for data	• Create and organize files for data	• Create and organize files for data	• Create and organize files for data	• Create and organize files for data
Reading, memoing	• Read through text, make margin notes, form initial codes	• Read through text, make margin notes, form initial codes	• Read through text, make margin notes, form initial codes	• Read through text, make margin notes, form initial codes	• Read through text, make margin notes, form initial codes
Describing	• Describe objective set of experiences—chronology of life	• Describe the meaning of the experience for researcher		• Describe the social setting, actors, events; draw picture of setting	• Describe the case and its context
Classifying	• Identify stories • Locate epiphanies • Identify contextual materials for life	• Find and list statements of meaning for individuals • Group statements into meaning units	• Engage in axial coding—causal condition, context, intervening conditions, strategies, consequences • Engage in open coding—categories, properties, dimensionalize properties	• Analyze data for themes and patterned regularities	• Use categorical aggregation • Establish patterns of categories
Interpreting	• Theorize toward developing patterns and meanings	• Develop a textural description, "What happened" • Develop a structural description, "How" the phenomenon was experienced • Develop an overall description of the experience, the "essence"	• Engage in selective coding and development of stories • Develop a conditional matrix	• Interpret and make sense of the findings	• Use direct interpretation • Develop naturalistic generalizations
Representing, visualizing	• Present narration focusing on processes, theories, and unique and general features of the life	• Present narration of the "essence" of the experience; use tables or figures of statements and meaning units	• Present a visual model or theory • Present propositions	• Present narrative presentation augmented by tables, figures, and sketches	• Present narrative augmented by tables, and figures

▼ *These statements are then grouped into "meaning units," the researcher lists these units, and he or she writes a description of the "textures" (**textural description**) of the experience—what happened—including verbatim examples.*

▼ *The researcher next reflects on his or her own description and uses **imaginative variation or structural description**, seeking all possible meanings and divergent perspectives, varying the frames of reference about the phenomenon, and constructing a description of how the phenomenon was experienced.*

▼ *The researcher then constructs an overall description of the meaning and the **essence** of the experience.*

▼ *This process is followed first for the researcher's account of the experience and then for that of each participant. After this, a "composite" description is written.*

In the nursing-patient caring interaction study by Riemen (1986), the researcher presents significant statements of caring and noncaring interactions for both males and females. Furthermore, Riemen formulates meaning statements from these significant statements and presents them in tables as well. Finally, Riemen advances two "exhaustive" descriptions for the **essence** of the experience—two short paragraphs—and sets them apart by enclosing them in tables.

Grounded Theory

Similar to phenomenology, grounded theory uses set procedures for analysis. It consists of **open**, **axial**, and **selective coding** as advanced by Corbin and Strauss (1990). Grounded theory provides a procedure for developing categories of information (**open coding**), interconnecting the categories (**axial coding**), building a "story" that connects the categories (**selective coding**), and ending with a discursive set of theoretical **propositions** (Strauss & Corbin, 1990).

In the **open coding** phase, the researcher examines the text (e.g., transcripts, fieldnotes, documents) for salient categories of information supported by the text. Using the **constant comparative** approach, the researcher attempts to "**saturate**" the categories—to look for in-

stances that represent the **category** and to continue looking (and interviewing) until the new information obtained does not further provide insight into the category. These categories are composed of subcategories, called **properties**, representing multiple perspectives about the categories. Properties, in turn, are **dimensionalized** and presented on a continuum. Overall, this is the process of reducing the database to a small set of themes or categories that characterize the process or action being explored in the grounded theory study.

Once an initial set of categories is developed, the researcher identifies a *single* **category** as the **central phenomenon** of interest and begins exploring the interrelationship of categories, called **axial coding—causal conditions** that influence the central phenomenon, the **strategies** for addressing the phenomenon, the **context** and **intervening conditions** that shape the strategies, and the **consequences** of undertaking the strategies. In this phase of analysis, the researcher creates a **coding paradigm**, or a theoretical model that visually portrays the interrelationship of these axial coding categories of information. A theory is built or generated. At the broadest level of analysis, the researcher can create a **conditional matrix**. This matrix is an analytical aid—a diagram—that helps the researcher visualize the wide range of conditions and **consequences** related to the **central phenomenon** (Strauss & Corbin, 1990). Seldom have I found this broad level of analysis in grounded theory studies.

The specific form for presenting the theory differs. In our study of department chairs, we present it as hypotheses (Creswell & Brown, 1992); in their study of coping strategies of sexually abused women, Morrow and Smith (1995) advance a visual model; and in our study of balance between work and personal life (Creswell & Urbom, 1997), we offer a visual model and three stories.

The grounded theory study of survival and coping from childhood abuse by Morrow and Smith (1995) reflects several of these phases of data analysis. They present results of the **axial coding** by discussing **causal conditions** that influence the **central phenomenon**, threatening or dangerous feelings as well as helplessness, powerlessness, and lack of control. They specify two groups of **strategies** these women used and indicate the narrower **context** in which these strategies occurred as well as the broader **intervening conditions** such as family dynamics and the victim's age. They detail the **consequences** of using the strategies such as coping, healing, and empowerment. They present these categories

in a visual model, called a "theoretical model for surviving and coping with childhood sexual abuse" (p. 27).

Ethnography

For ethnographic research, I recommend the three aspects of data transformation advanced by Wolcott (1994b): **description, analysis**, and **interpretation of the culture-sharing group**. Wolcott (1990b) believes that a good starting point for writing an ethnography is to describe the **culture-sharing group** and setting:

> Description is the foundation upon which qualitative research is built.... Here you become the storyteller, inviting the reader to see through your eyes what you have seen.... Start by presenting a straightforward description of the setting and events. No footnotes, no intrusive analysis—just the facts, carefully presented and interestingly related at an appropriate level of detail. (p. 28)

This **description** may be analyzed by presenting information in chronological order or by using the researcher or narrator order (as seen in Wolcott's [1994a] Principal Selection Committee study). The writer describes through progressively focusing the description or chronicling a "day in the life" of the group or individual. Finally, other techniques involve focusing on a critical or key event, developing a "story" complete with a plot and characters, writing it as a "mystery," examining groups in interaction, following an analytical framework, or showing different perspectives through the views of informants.

Analysis for Wolcott (1994b) is a sorting procedure—"the quantitative side of qualitative research" (p. 26). This involves highlighting specific material introduced in the descriptive phase or displaying findings through tables, charts, diagrams, and figures. The researcher also analyzes through using systematic procedures such as those advanced by Spradley (1979, 1980), who calls for building taxonomies, generating comparison tables, and developing semantic tables. Perhaps the most popular analysis procedure, also mentioned by Wolcott (1994b), is the search for *patterned regularities* in the data. Other forms of analysis consist of comparing the cultural group to others, evaluating the group in terms of standards, and drawing connections be-

tween the **culture-sharing group** and larger theoretical frameworks. Other analysis steps include critiquing the research process and proposing a redesign for the study.

Making an ethnographic **interpretation of the culture-sharing group** is a data transformation step as well. Here the researcher goes beyond the database and probes "what is to be made of them" (Wolcott, 1994b, p. 36). The researcher speculates outrageous, comparative interpretations that raise doubts or questions for the reader. The researcher draws inferences from the data or turns to theory to provide structure for his or her interpretations. The researcher also personalizes the interpretation: "This is what I make of it" or "This is how the research experience affected me" (p. 44). Finally, the investigator forges an interpretation through expressions such as poetry, fiction, or performance.

Wolcott (1994b) includes the ethnography of the Principal Selection Committee in the section on "description" in his book *Transforming Qualitative Data: Description, Analysis, and Interpretation*. In this ethnography, Wolcott details the procedures of this committee as its members interviewed seven candidates. He does not make explicit his steps in analysis, but they can be easily seen. He isolates a single episode, describes the interviews with six of the seven candidates, analyzes and presents three themes (i.e., lack of professional knowledge, an esteem for personal feelings, and a proclivity toward variety-reducing behavior), and reflects or interprets these themes as to their impact on education, change, and the principalship.

Case Study

For a case study, as in ethnography, analysis consists of making a detailed **description** of the case and its setting. If the case presents a chronology of events, then I recommend analyzing the multiple sources of data to determine evidence for each step or phase in the evolution of the case. Moreover, the setting is particularly important. In our gunman case (Asmussen & Creswell, 1995), we analyzed the information to determine how the incident fit into the setting—in our situation, a tranquil, peaceful midwestern community.

In addition, Stake (1995) advocates four forms of data analysis and interpretation in case study research. In **categorical aggregation**, the

researcher seeks a collection of instances from the data, hoping that issue-relevant meanings will emerge. In *direct interpretation*, on the other hand, the case study researcher looks at a single instance and draws meaning from it without looking for multiple instances. It is a process of pulling the data apart and putting them back together in more meaningful ways. Also, the researcher establishes *patterns* and looks for a correspondence between two or more categories. This correspondence might take the form of a table, possibly a 2 × 2 table, showing the relationship between two categories. Finally, the researcher develops *naturalistic generalizations* from analyzing the data, generalizations that people can learn from the case either for themselves or for applying it to a population of cases.

To these analysis steps I would add *description* of the case, a detailed view of aspects about the case—the "facts." In our gunman case study (Asmussen & Creswell, 1995), we describe the events following the incident for 2 weeks, highlighting the major players, the sites, and the activities. We then aggregate the data into about 20 categories (categorical aggregation) and collapse them into 5 patterns. In the final section of the study, we develop generalizations about the case in terms of the patterns and how they compare and contrast with published literature on campus violence.

COMPARING THE FIVE TRADITIONS

Returning to Table 8.2, data analysis and representation have several common and distinctive features among the five traditions. Across all five traditions, the researcher typically begins with creating and organizing files of information. Next, the process of a general reading and memoing of information occurs to develop a sense of the data and to begin the process of making sense of them. Then, all traditions have a phase of description with the exception of grounded theory, in which the investigator seeks to begin building toward a theory of the action or process. Now the analysis procedures begin to depart.

Grounded theory and phenomenology have the most detailed, explicated procedure for data analysis. Ethnography and case studies have analysis procedures that are common, and biography represents the least structured procedure. Also, the terms used in the phase of

classifying show distinct language among these traditions; what is called *open coding* in grounded theory is similar to the first stage of classifying (*statements*) in phenomenology or *categorical aggregation* in case study research. The researcher needs to become familiar with the definition of these terms of analysis and employ them correctly depending on tradition of inquiry. The presentation of the data, in turn, reflects the data analysis steps, and it varies from a narration in biography to tabled statements, meanings, and description in phenomenology, to a visual model or theory in grounded theory.

COMPUTERS, ANALYSIS, AND TRADITIONS

Overall, authors overlook the specific application of computer programs in analysis for traditions of inquiry except for a short discussion by Lonkila (1995) about programs and grounded theory and the suggestion that some programs are best suited for one approach than another (e.g., the program Ethnography was designed for ethnographic studies; NUD·IST, a theory-generation program, was designed for grounded theory).

The link between computer programs to analyze text and traditions of inquiry needs to be established. It is especially important because not all qualitative researchers see such programs as relevant to their needs. I feel, however, that computer programs help in the analysis of qualitative data, especially in understanding a large (e.g., 500 or more pages) text database. For those studies employing especially large databases, such as ethnographies with extensive fieldnotes and interviews, grounded theory studies comprised of 20-30 extensive interviews, or case studies with multiple types of information, computer programs provide an invaluable aid in research. Following are some of these advantages:

- The computer program provides an organized storage "file" system so that the researcher can quickly and easily locate material and store it in one place. This aspect becomes especially important in locating entire cases or cases with specific characteristics.

- The computer program helps a researcher locate material easily, whether this material is an idea, a statement, a phrase, or a word.