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Introduction

Renata Tesch

It is now 25 years since the first software program was announced that would help researchers analyze text. It seems hard to believe that a quarter of a century ago, when most people would have been hard pressed to explain what a computer was and would have found the idea of ever owning one ludicrous, someone already had figured out that a computer might be useful for researchers who wanted to do things other than manipulate numbers. Of course, small personal computers did not yet exist at the time. The program was huge, worked only on a mainframe computer, and did a fair amount of counting. It was called "The General Inquirer." While it was not what we would consider a "qualitative" analysis program today, it did work exclusively with text. The developers at MIT had designed it for traditional content analysis, and a very sophisticated analysis at that. It took an entire book to describe what the General Inquirer could do (Stone et al., 1966). Although all but forgotten today, the program presented a truly amazing breakthrough in technical support for researchers in the social sciences.

Today, any qualitative researcher not using a computer at least for word processing is considered an oddity. Most researchers are also aware that programs for qualitative analysis exist, and ever greater numbers are using them. After the creation of The General Inquirer about 15 years passed before new programs were developed in academic settings specifically for research using narrative text. The pioneers among us, however, began ingeniously adapting commercially available software to their needs. In 1981, a special issue of *Sociological Methods & Research* (Heise, 1981) showed how that was done.

In the meantime, some qualitative researchers had learned to program or found someone in the newly created "computer departments" who

Address correspondence to: Renata Tesch, Ph.D., 73425 Hilltop Road, Desert Hot Springs, CA 92240.

could, and they used their own research projects to experiment with electronic manipulation of textual data. Semi-quantitative content analysis was soon transcended, and some of the earliest programs incorporate extremely sophisticated qualitative analysis principles. Special credit must be granted to Kriss Drass (LISPQUAL, 1980) and Anne Shelly (Qualog, 1983; programmer E. Sibert) for launching the trend that has made us independent from commercial software companies that neither know what the qualitative researcher needs nor consider the market profitable enough to bother. The efforts of these and a few other scholars (Sproull & Sproull, Gerson, Seidel, for instance) showed not only that it was possible to design programs that did exactly what a qualitative researcher would want them to do, but that this software could be used without anxiety attacks by the average qualitative researcher. The publication of a special issue of *Qualitative Sociology* in 1984 helped to get that message across.

Since 1984 the literature on computers in qualitative research has increased at a steadily accelerating rate. Presentations of research work done with the help of an analysis program appear at every conference at which researchers gather, not only in sociology, but in education, nursing, evaluation, anthropology and other social sciences. A number of scholars have developed new programs, and workshops are being offered to help researchers use them, or to become acquainted with the range of programs available. There even is a bi-annual international conference for people specifically interested in "computers and qualitative research" (for information about the next upcoming conference contact the editor of this issue). The editors of the 1984 issue (Conrad & Reinharz), who had collected the "state of the art knowledge concerning computers and qualitative data" at the time, were well aware that the articles in that issue were "only the beginning" (p. 13). It is time for *Qualitative Sociology* to address again the same topic, to check the "state of the art" today, and to answer some of the questions that were raised by the first special issue.

While Conrad and Reinharz in 1984 paid equal attention to commercially available programs and those that were developed in academic settings, it would be quite impossible to do so today. Both kinds of programs have proliferated. Uncounted numbers of researchers use software produced by commercial companies, such as word processors, data based managers, text retrievers, outliners, or graphic programs, to store and manipulate their data, or to organize and illustrate their results. We know that thousands are working with dedicated qualitative research programs (more than 3000 have purchased The Ethnograph alone), of which there are now so many that they could not all be described in one journal issue, even briefly. In the appendix of Part 2 of this special issue you will find a list of academic programs that the editor was aware of at the time of

publication. Thus the 1984 prediction by Conrad and Reinharz "that personal computers will be functional both for the individual research project and for the field as a whole and therefore will be widely adopted" (page 6) has come true. The consequence is that we no longer can portray "the state of the art." Fortunately, a few books are available that offer help in this respect (also listed in the appendix). The editorial job for us at this time no longer is to interest qualitative researchers in computers by showing what can be done, but to help them find their way around in the world of academic computer applications and call their attention to the newer developments.

In this introduction, I will first attempt to facilitate an overview by dividing programs that have been developed specifically for qualitative research into major groups. (Although one of the papers in this issue deals with commercial software, i.e., with software produced by a software company for the general user, the remainder of the issue is devoted exclusively to programs created by researchers themselves or in academic computing departments, which I will refer to as "academic" programs.) For those readers who have only recently begun to be interested in computers, a brief description of the currently most commonly used programs will follow. This will lead us to the question of how the new programs that are being presented in this issue differ from the "old" ones. I will conclude with trying to answer some of the questions posed by Conrad and Reinharz in 1984, and with discussing a number of issues that I believe we need to raise today.

ACADEMIC SOFTWARE

As mentioned earlier, qualitative researchers began quite early to take matters in their own hands and create the programs they needed. The first such program was designed for traditional content analysis (Stone et al.), another for the construction of grounded theory (Shelly & Sibert), a third for linguistically-oriented research (Drass), and still another for ethnography (Seidel). The question immediately arises: Why not one qualitative analysis program that can be adapted to all qualitative data handling procedures? Are the needs sufficiently different in the various qualitative approaches so each must have its own program? The answer is "yes and no." Even within sociology scholars who would consider their research qualitative may base their work on such diverse methodologies as symbolic interactionism, event structure analysis, or ethnoscience. If we take into account the approaches in other social sciences, the number of research "traditions" (Jacob, 1987) may quickly pass 25. Although different names frequently

are attached to research methods with quite similar data handling principles, the range of procedures still is large. A single program would become much too unwieldy if it were to handle all of them. However, within that range some approaches are analytically more similar than others, and can be grouped together (see Tesch, 1990). Although the overall research purpose is certainly not the same, the analysis task for an ethnographer, a phenomenologist, and someone who does a case study, for example, is to identify within the data relevant passages (or "segments") of text, to interpret them, and to organize them in such a way that comparisons can be made across various data documents. Comparison helps to discern meaning, identify commonalities, or discover what is typical or essential. On the other hand, a researcher who wishes to generate a theory or test a qualitative hypothesis has the need to search for concepts in the data, to define them, and to link them.

As academic programs were developed, it became clear quite quickly that some of them, too, were more similar to each other than to the rest of them. Naturally, rigid lines cannot be drawn between groups of programs, and (just as is the case with commercial programs), different reviewers decide on different classifications. Here is the grouping I have found most useful.

Academic programs may be intended for

- descriptive/interpretive research
- theory-building research
- traditional content analysis or cultural analysis

In the following, each group will be described briefly. With a few exceptions, all programs mentioned in my introduction are available for personal computers, either for the MS-DOS environment, or for the Macintosh, as indicated. All programs referred to in the articles of this issue are for personal computers.

Programs For Descriptive/interpretive Analysis

By "descriptive/interpretive" analysis I refer to research procedures where the main intent is to gain deeper or more accurate insight in what a phenomenon is like; the researcher wishes to understand the phenomenon better. This goal is often referred to as the discovery of the "meaning" of the phenomenon. Better understanding is often achieved by identifying major themes or essential constituents, by translating into metaphors or typical stories, or by discerning patterns or types. These latter

are "regularities" whose discovery might lead to the formulation of what could be called qualitative hypotheses. The transition to theory-building analysis is fluid, but for the sake of program description it is helpful to make a clear distinction.

Occasionally the programs in this group have been mistaken for data base managers, because just like DBMs they can retrieve data chunks in organized ways. But there is a fundamental difference: academic programs for descriptive/interpretive analysis work with chunks of text (usually called "segments") that can be defined flexibly at any time, but once defined remain permanently connected to a code that represents a category of the researcher's system for organizing his/her data. In data base managers, data segments are either defined rigidly at the time of data entry, or have to be redefined every time a search for a code (in DMBs called "key word") is conducted. These commercial programs have been used widely by qualitative researchers. They are most appropriate when data are structured, for instance as open-ended responses to a standardized questionnaire. But creative people have also found many other ways of adapting DBMs to their specific needs (some DMBs come with their own programming language to facilitate such customization). An especially interesting challenge is created by a set of data that contains both non-narrative and unstructured material. Our first article, **A QUALITATIVE INFORMATION SYSTEM FOR DATA MANAGEMENT by Winer and Carrière** is an example of such ingenuity. The authors describe a research project in which they combined a text retriever (for the Macintosh) with a relational data base manager (also for the Macintosh), while reconceptualizing their data as an information system, a term they borrowed from management science. They define it as "a system which has as its goal the conservation of a **representation** of the research reality . . ., so that it is possible to consult it, during and after the research, in order to respond to queries." The paper is especially timely as we begin to get used to the term "mixed-method" research (see Greene, 1989), and shows how scholarly description can take on interesting new forms in qualitative research.

Designated programs for descriptive/interpretive analysis have the advantage over commercial software that their entire architecture is conducive to qualitative research, since the programmers are researchers themselves. The data base does not need to be "designed," as Winer and Carrière had to do. Data are simply imported into the program from a word processor as the narrative text they are. Menus offer choices among the tasks a qualitative researcher has to do, and screens appear in the succession in which a scholar is most likely to proceed. The programs most commonly used in the United States are (in the approximate order of sales frequency) The **Ethnograph** (MS-DOS), **HyperQual**

(Macintosh), **QUALPRO** (MS-DOS), **Textbase Alpha** (MS-DOS), **TAP** (MS-DOS, being discontinued), **MARTIN** (MS-DOS, Microsoft Windows), and **LTT Ethnoscript** (MS-DOS, dBase III). Descriptions of the analysis principles applied in these programs and their technical functions are available elsewhere (see the appendix), and therefore, no paper in this issue is devoted to a mere presentation of any of them. Before I introduce the reader to the two articles that involve the two most widely used programs, however, I will provide a short overview to the neophyte who has never heard these names before.

The main functions of descriptive/interpretive programs are the marking of text segments and the attachment of codes to each segment, which is usually done in one operation; and the search and retrieval of these segments according to their codes, which is another operation. Programs differ in the way the coding is done (with or without overlap and nesting, multiple codes per segment, one-step or two-step procedures for the entering of codes into the computer, marking segments while other documents appear simultaneously in windows on the screen, etc.), and in the ease with which a search can be set up and the way the results are printed out. As far as these basic functions are concerned, the differences are small, however (with the exception of **MARTIN,** a program in which segments are copied onto "cards" rather than coded. There is no search as such, but a placement of cards, according to their topics, into various "folders" and groups of folders, which can then be opened as needed). This is true even for the programs that are designed for theory-building (described in the next section) which have to begin with the same elementary operations. The important distinctions to be made lie in the functions that go beyond the basics.

I call whatever goes beyond the equivalent of the traditional "cutting-and-pasting" as it was done by hand, the "enhancement" functions of these programs. They include counting the frequency of the occurrence of specified codes, searching for a particular order or sequence in which codes were attached to a text, searching for codes co-occurring within a segment, and selecting automatically particular subsets of files for a code search. Another "enhancement" is the option to attach comments or "memos" to selected segments or to entire data or output files that capture the researcher's thinking during the analysis process.

With these enhancements, most programs can do quite a bit more than collate all pieces of text that fall into the same coding category (usually meaning that they are about the same topic). Frequency counts of codes may give hints as to the emphasis placed by respondents on certain topics, co-occurrences of codes may reveal closeness of code categories or even conceptual linkages between them, comparing segment printouts

from different subsets of data may suggest differences between men and women, or among any other subgroups the researcher has selected. At this point, the boundaries between description and theory-building become fuzzy; under certain circumstances the patterns revealed in the analysis can be quite easily transformed into assertions that are all but undistinguishable from what we would call hypotheses. There is even an option in some programs to become quantitative. They allow the researcher to create matrixes that cross-reference the code frequency counts with individual files or subsets of files. The matrix may then be imported into a statistics package, so that some simple statistical operations can be performed to see whether differences among files or subgroups are "significant."

For many researchers working with the functions of descriptive/interpretive programs has become quite commonplace. It would be interesting (and probably stimulating for fellow researchers) to explore in which creative ways these functions have been used to modify standard analysis procedures or to reconceptualize them. However, finding out about all those inventions would be a huge undertaking. In this issue we offer only one example. **USING COMPUTERS TO DEVELOP CONCEPT MODELS OF SOCIAL SITUATIONS** by **Padilla** shows how a different perspective can be applied to qualitative analysis with surprising outcomes. The author combined the use of **HyperQual**, a word processor, a drawing program, and a software package called "Learning Tool," and concentrated on the production and representation of analysis results. We chose this paper, because it makes a contribution to a development that will be discussed later in this introduction: the trend to pay attention not only to computers as analytic tools, but as instruments for visualizing and communicating research results.

The next paper, **APPLICATION OF QUALITATIVE ANALYSIS SOFTWARE: A VIEW FROM THE FIELD** by **Tallerico** exemplifies another new development: the employment of analysis programs in the teaching of qualitative research methods. In this case, the software package chosen was **The Ethnograph**. Since the author uses the paper to also provide a rare examination of the practical benefits and limitations of descriptive/interpretive programs, rather than giving a purely technical review of their features, this choice was fortunate. The Ethnograph is known by a large number of qualitative researchers, and many readers may enjoy a sense of familiarity when reading the article. We encourage feedback to the editor especially on this paper, not only from additional Ethnograph users, but expressly from researchers who have experience with other analytic programs such as Textbase Alpha, QUALPRO, or HyperQual.

Programs for Theory-Building Analysis

Qualitative researchers who are interested in contributing to theory begin by looking for "concepts" in their data. Concepts could be anything from a single term (example: "rigidity") to a more specific expression (example: "satisfaction with service") to a loosely defined notion such as "ambiguous reactions to the experience." Researchers have called a simple demographic property such as "marital status" a concept, or an abstract construct such as "reasoning power," or an emotion like "sadness." There are no agreed-upon definitions of what constitutes a concept. However, since the publication of Glaser & Strauss's book on grounded theory (Glaser & Strauss, 1967), there is a fairly well established consensus that a synonym for concept is "category" (because it is by placing data chunks into categories and refining the categories by constantly comparing within and across each category that concepts are developed).

The second step is to explore whether there are linkages (or "relationships") between some of these concepts. Although a linkage could be no more than the discovery that category X and category Y almost always appear together in the data, a linkage could also be specific, such as "X is a subcategory of Y", or "X follows Y." These are examples of a "hierarchical" and a "chronological" relationship, respectively. Researchers have defined many more such logical connections, including, of course, the ultimate: causality. Naturally, more than two concepts can be involved, and as most qualitative researchers would argue, in human affairs they almost always are.

The search for linkages is an interpretational, not a mechanical task. It is the researcher who begins to surmise connections between categories, then interrogates the data for their co-occurrence, then interprets the linkage to see what type of relationship it might be, and finally looks for counter-evidence to disconfirm or verify his/her hypothesis. The computer can help only with data examination. But, as the remaining articles in this issue will convince us, here it can be invaluable. In fact, while in descriptive/interpretive analysis the computer mostly saves the researcher from exhaustion, procrastination, and descent into the stupor that causes errors and omissions, in theory-building research even the human being with the greatest tolerance for an endless string of dull and repetitive tasks would eventually run out of time and resources. The scholars who have set out to create programs that facilitate the generation and testing of hypotheses in qualitative research have become quite entranced with the opportunities the computer's speed and tirelessness affords. As they used the computer for their own work, most of them have gone beyond the methodological procedures described in the literature and have added features to their programs that are likely to stimulate other researchers to mine their data for riches they have not yet considered

in their previous work. Unfortunately, these software packages are not well known. This is the reason why all the programs that are currently coming on the international market are presented in detail in this issue. (A Dutch program for MS-DOS, called KWALITAN, is, to the best of my knowledge, not yet available in an English version. Hypersoft, a Macintosh program from Scotland, and another Macintosh program developed in Sweden for assistance with phenomenography, are expected to arrive on the American market in the foreseeable future.)

Each program is described by its creator(s). The articles need little introduction; their basic functions can be deduced from the first two paragraphs in this section. Theory-building programs basically make it possible for the user to identify segments of data that contain or represent specific concepts, then let him/her search through the data for co-occurrences (not within one data segment, but within entire files) that may indicate connections. Beyond that, there is no way to give a nutshell description of each that would not gravely shortchange the program. I could pick out the one or the other feature for emphasis, but that is likely to be misleading if used as a guideline by the reader for deciding whether a paper is worth reading. Therefore, I consider it best to let the programmers speak for themselves. All packages go well beyond the "basics," and some of their features are truly surprising.

We begin with **HYPERRESEARCH: A COMPUTER PROGRAM FOR THE ANALYSIS OF QUALITATIVE DATA WITH AN EMPHASIS ON HYPOTHESIS TESTING AND MULTIMEDIA ANALYSIS** by **Biber, Dupius, & Kinder**. As Macintosh users may have guessed, this is a program for the Macintosh, using HyperCard. Also for the Macintosh is NUDIST, described in **THE NUDIST QUALITATIVE DATA ANALYSIS SYSTEM** by **Richards & Richards**. This package will soon also have a version that runs on IBM-compatible computers equipped with Microsoft Windows 3.0. For the MS-DOS environment there are two further programs, AQUAD and ATLAS/ti. The former is introduced in **COMPUTER ASSISTANCE FOR TESTING HYPOTHESES ABOUT QUALITATIVE DATA: THE SOFTWARE PACKAGE AQUAD 3.0** by **Huber & Garcia**, the latter in **ATLAS/ti: A PROTOTYPE FOR THE SUPPORT OF TEXT INTERPRETATION** by **Muhr**.

Programs for Traditional Content Analysis or Cultural Analysis

These programs can be understood best as sophisticated expansions of the "search" function that is familiar to all researchers who use a word processor. It was no accident that the earliest program among the academic

ones made use of the basic ability of the computer to recognize a particular series of characters in a text when it finds it. In addition to **The General Inquirer** I know of only three more academic content analysis programs, one produced in Germany (**TextPack**), and two in the US. One of the American packages was developed at Brigham Young University and first called "BYU Concordance." Its distribution was later taken over by the Electronic Text Corporation and the program was renamed **WordCruncher** (MS-DOS). The other package is a fairly new program called **FlexText** (MS-DOS), developed at Iowa State University and marketed by Text Analysis Service Corporation. WordCruncher, unlike The General Inquirer, was actually not developed for content analysis as the sociologist would do it, but for scholars who analyze literature. Its functions are mainly useful to researchers for whom the linguistic aspects of their data are of prime importance. Actually, one could claim that there is another group of academic software for text analysis, called "linguistic programs." We did not include these in this issue, but want interested readers to know that Kathleen Carley at Carnegie Mellon, and Carl Roberts at Iowa State University in Ames, IA, are developing software for linguistic analysis, called **CODEF** and **PLCA**, respectively.

More about WordCruncher and FlexText in a moment. It might be important to mention here that The National Intercollegiate Clearing House used to make small and relatively unpolished programs available to researchers that usually did one content analysis job only, rather than offer a menu of choices. They have ceased to do so. Except for FlexText, I have not heard of other recent additions to this genre of academic packages. The reason, I believe, is that these kinds of programs have the closest resemblance to a type of commercial software which is based on exactly the same computer ability to search for "strings" of characters mentioned above. In the beginning, this function was found only in word processors. A few clever programmers, however, soon speculated that users might want to search through the documents on an entire diskette to find what they were looking for, not only the document currently on the screen. Then all kinds of other useful features were added, and soon so many "search" programs came on the market, that the group received its own name: text retrievers. Many of them do a lot of the jobs a content analyst might want to do, and they are more widely advertised. In fact, as already indicated above, here the distinction between "commercial" and "academic" begins to slip. Both WordCruncher and Flextext are now in the hands of software companies.

WordCruncher, although initially designed for literary analysis, has also been used for traditional content analysis. Many of the tasks are the same. A literary analyst would be interested in, for instance, which words were used in the text, how often they were used, and where they were

used, i.e., in what context. So would the content analyst. WordCruncher's main function is to create an index of words, i.e., it will produce a reference list that tells where specified words are located. In addition, the user can instruct the program to make an alphabetic list of all different words present in a text (excluding, if one wishes, all words that are meaningless for the analysis, such as "and" or "she"). The program will automatically add to this word list the frequency of the occurrence of each word. Frequencies of occurrence can also be compared (for each word separately) across different documents. Often a word is just one way of expressing the concept the researcher is interested in; in that case she/he may make a list of "related words," and WordCruncher will look for all of them. To let the analyst find out more about the usage of a term, the program can create a keyword-in-context list, in which it will print out all occurrences of a word together with the preceding and succeeding 30 characters.

FlexText was created specifically for the content analysis of open responses to interview questions. Since one of the problems for researchers who work with regular text retrievers has been that a specific word, phrase, or word combination has to be contained in the text, and thus many searches have to be conducted for synonyms, FlexText offers the notion of a "concept knowledge base." Although still dealing with verbatim text, the researcher defines and labels "concepts" of interest, then gathers the ways each concept could be expressed by perusing the data, and noting a word or phrase that is representative of the concept (alternatively one can have an alphabetic list generated of all words occurring in the data and select one from there). The marked word or phrase can then be added to the concept's "set of phrases." This is done by having the program create a "concordance" (which is actually a keyword-in-context list) that shows the current and all the remaining places where the word or phrase was found in the data (for one interview question). The user decides whether a particular entry is, indeed, an instance of the concept, and the phrase occurrence is then stored under the concept's label. A search for a particular concept will result in the collation of the text of all (interview) responses in which any of the concept's phrases occur. FlexText offers a variety of statistical treatments, as well, including the option to export a code/respondent matrix for each interview question into the statistical package SPSS-X.

Content analysis has still another purpose in the branches of sociology that deal with the phenomenon of "culture," such as structural ethnography, ethnoscience, or cognitive ethnography. Here language is viewed as a mirror of the culture in which the text was produced. One favorite way of depicting cultural dynamics is the production of a "grammar," or body of rules. These rules are often discernible in so-called "folktales" which

preserve the traditions of a culture. "To date, work on cultural grammars has not been successfully aided by computers" says one of our authors (Colby). Therefore, this author is in the process of cooperating in the development of a "system for the analysis and generation of eidons." Eidons are "cognitive images or concepts that exist in a postulated cognitive system that has cultural reality." This work is not yet completed, but the reader can obtain a glimpse of it in our last article, **CULTURAL GRAMMARS, COMPUTERS, AND COPING** by **Colby, Mishra, & Milanesi.**

OLD QUESTIONS AND NEW ISSUES

This volume lacks a concluding article that summarizes the current state of affairs in using computers in qualitative research and provides an outlook for the future. Achieving such a feat is becoming increasingly improbable, since it would require up-to-date knowledge of all the various types of qualitative analysis combined with knowledge of the newest developments in computer technology. However, I will attempt to round off the individual presentations with a contemplation of some overarching issues. Let us begin where *Qualitative Sociology* left off last time. Conrad & Reinharz raised a number of tantalizing questions, for which the years that have passed should have brought us closer to the answers.

Considering that in 1984 most researchers were still dependent on the mainframe computers of their universities, one of the first questions that came to mind then was "*What kind of effect on sociological research [will] personal computers have in contrast to that of mainframe computers?*" (p. 4) From our current vantage point, where I am writing this piece on a four-pound notebook computer that far exceeds the capacity of my first desktop, the answer seems ridiculously easy. Of course, PCs have made software accessible to every researcher who wants it, and anyone can use a computer, not only in his/her university office, but also in the field or at home. The greatest effect has been the vastly increased availability of computer technology for qualitative researchers. But Conrad & Reinharz were not thinking only in these mundane terms. They were actually interested in more conceptual matters such as "*Will the personal computer have new functions that were not characteristic of mainframes?*" (p. 4) It does not seem like it. In fact, it still happens that programs are developed first on the mainframe, then rewritten for the PC; and mainframes can do anything that PCs can do and more. However, the answer is not that clear-cut. The conception of the Macintosh introduced a way of interaction between computer and user that was not at all characteristic of mainframes. The Macintosh may not have introduced new functions, but it certainly has

introduced a new mode that makes it much easier to use functions formerly considered rather outlandish, such as creating drawings and hopping around between various texts.

The next major set of questions raised had to do with methodological concerns: *Will the personal computer simply provide a speeded-up version of manual techniques previously used in qualitative analysis, or will it foster innovations, such as introducing systematic procedures in processes that were hitherto not systematic?* (p. 4-5) Taken literally, the issue is methodological innovation. Although many of the programmers have been innovative in their work, I do not see any methodological breakthroughs in the sense that a computer program actually *introduced* systematization. Rather, software ensures that analysis is more complete and error-free. However, in my view, "systematic" comes in degrees, rather than being an either/or proposition, and using a computer for analysis certainly encourages researchers to proceed more systematically. Then again, a scatterbrained or incompetent researcher can still muddle along even with a program, because none of the software packages tell the user how to conduct the analysis. The programs merely make the functions available so that they can be used when needed. On the other hand, the nature of qualitative research is such that it will cease to be "naturalistic" when it ceases to be creative and individualistic. Fortunately, computers don't force anyone to abandon creativity. In fact, I believe they foster it. They certainly allow the researcher to be more playful with his/her data, since it is so much easier to do things over again if the first approach did not work.

Related to the question of systematizing is the one of "codifying" of qualitative research procedures. Conrad & Reinharz speculate that: *With the introduction of personal computers we should become able to codify exactly how we analyze our data.* (p. 6) What they meant by "codifying" was not "standardizing," but rather coming to some kind of shared understanding of, and a large degree of consent about how to analyze qualitative data. We now have a far better idea of how qualitative analysis is done than we had in 1984. One reason is that there are more books available now that describe qualitative analysis (Marshall, 1989; Miles & Huberman, 1984; Straus, 1987). But I believe that the computer programs developed by researchers have made a major contribution as well. They have made known to many novice researchers, for instance, in which ways the program developers thought of performing the process. The problem, of course, is that there are many kinds of qualitative research (see Tesch, 1990), and, as mentioned earlier, they don't all share the same procedures for analysis. Given the manifold goals of researchers who work with text, there will always be a range of procedures. However, while there can be no single "standard," individuality has not gone so far that there are no commonalities. In a

certain sense, the groupings I have undertaken above (descriptive/interpretive, theory-building, and content analysis or cultural analysis) represent such "commonalities," and within these groups conventions are beginning to develop that are becoming shared by ever larger numbers of researchers.

Conrad & Reinharz emphasize that *the need to instruct the computer in the operations of data analysis is in itself a rudimentary codification of analysis procedures; and the power of the computer to display the results of each instruction enables us to display the analytic procedures as they were used. When printed, these displays can be used by other investigators who wish to examine how inferences were made about data.* (p. 6) They are quite right. The matter has become more important, however, in questions of trustworthiness or validity than codification. Can the qualitative researcher show how she/he arrived at his/her conclusions in such a way that a reader could follow the thinking process and observe how it was based on the data at hand? I believe that will never be possible to the degree where subjectivity can be uncovered and corrected (which is not a goal in qualitative research anyhow), but qualitative analysis software makes a revisiting of the process much more feasible. In fact, some programs pay special attention to the "audit trail" (notably **NUDIST**), and even encourage the researcher to use it for his/her own enhancement of the analytic process.

The issues that in my opinion are even more exciting than systematization and codification are the ones about methodological advances. Conrad & Reinharz ask: *Will the computer primarily enable us to better reduce the typically large, unwieldy mass of texts gathered for qualitative analysis, or will it actually address the inferential process?* (p. 5) For a long time it did not look like that would be the case. Computers were simply tools, more exotic than scissors and glue, and more reliable and tireless than a human clerk, but nevertheless mere mechanical devices. It is now becoming clearer that this is about the change. In our issue we have the first proofs. Take, for example, **NUDIST**, which allows the user to create totally new categories of analysis without recoding data, but by interpreting the results of complex searches that were set up using the old categories. True, in principle this would still be possible to do by hand, but in practice no one would have the time or patience to actually carry out the prerequisite searches. Even if someone did, the work would be unreliable, since we humans are not equipped with the same capability for accuracy as the computer. We would overlook things. **AQUAD**, likewise, enables the researcher to use techniques that not only go beyond the power of our bare hands, but of our "bare brain" (an expression coined by our author Ray Padilla). The program incorporates an analysis process for the establishment and

verification of causal hypotheses that has been developed and advocated by Charles Ragin (Ragin, 1987). It involves the exploratory search through all data not simply for co-occurrences, but for all possible constellations of factors (called "conditions" by Ragin and "categories" by some of our authors) that seem to be associated with the one factor (called "outcome" by Ragin) that the researcher believes may be the associated effect or result. The availability of such functions in qualitative analysis programs will certainly have an impact on the types of inferences researchers will attempt to draw. However, I fear that quite of bit of time will pass before programs appear that, as Conrad & Reinharz venture to predict, will *actually do some of the "thinking" and analysis for us.* (p. 8)

The issues that Conrad & Reinharz could not have known about in 1984 and that are uppermost on my mind today have to do with the **proliferation of software** for qualitative analysis. What does the steady arrival of new programs mean for the researcher? Is it a blessing or a curse in disguise? Will the trend continue, or has it peaked?

The most obvious result of program proliferation is, of course, that the qualitative researcher now has many choices. The chances that she/he can find just the right software for his/her particular project are greatly increased. As mentioned above, the availability of programs with unexpected functions will also enrich the researcher's thinking about how his/her analysis could be done. But all this presupposes that the researcher not only knows about the existence of the programs, but becomes acquainted with them well enough to decide just which one would be best for what she/he needs to do. Although a couple of other journals in addition to *Qualitative Sociology* have in the past published columns or occasional papers in which software was introduced, both (*The International Journal for Qualitative Studies in Education* and *Evaluation Practice*) have at the moment discontinued this practice. A newsletter devoted to software reviews for qualitative researchers could be of considerable help, but it does not exist. It probably would be financially unrealistic to try to establish one. My own consulting service is becoming quite overburdened with the growing needs of researchers to find out about programs, since it is the only place where researchers can call and say: I need to be able to do the following processes in my analysis; which program has the appropriate features?, rather than having to learn about every new program and assess each in terms of its usefulness. Increasingly, overview-type workshops or presentations are offered at conferences where researchers gather, especially the conferences of the American Evaluation Association and those in Nursing Research. This special issue is meant to provide such an overview with a relatively low expenditure of the researcher's time. (But

even this overview is a snapshot. It is likely to be outdated by the time you read this.)

Unfortunately, the proliferation of programs has brought upon us another problem that is a bit difficult to deal with. Just as there is no codification of methods, there is no agreed-upon terminology in qualitative methodology. In addition, programmers occasionally find that neither the professional vocabulary nor the standard English usage of words is quite adequate to express a concept they feel is especially characteristic of their program. Therefore, they redefine existing terms. Some of their choices are lucky ("coding," as used in The Ethnograph, has become quite a standard way of referring to the abbreviation of a category name), while others are unfortunate. While it is understandable that programmers wish to make sure that they are not misunderstood (and the surest way is to define their own labels), the special vocabulary appearing in user's manuals and on computer screens has also proliferated to the point where something like a "comparative glossary and dictionary" would be needed to compare programs. For the community of qualitative researchers as a whole this problem presents one of communication. If a person using one program would want to explain its functions to a colleague using another, they may easily find themselves talking past each other. This issue becomes especially significant in light of the fact that many teachers of qualitative methodology have begun to use software packages for illustration of procedures. They would shortchange their students if they introduced them to only one; they can easily confuse them if they use more than one or two.

In the future, I hope, things will not be getting worse, but better. The proliferation trend cannot continue at an uncontrollable pace, since the existence of programs is becoming better known. In the past, it could still happen that a researcher spent years on the development of a program she/he believed would be unique, only to discover later that other scholars had had very similar ideas. Creating a program is fun, but making sure that it reliably works, no matter in which of its distant nooks or crannies a future user may press an unexpected key, is nothing but drudgery; not even mentioning the time and cost involved. Therefore, researchers today will be more likely to look around first for an existing program before they decide to embark on their own programming adventure. As users give feedback to the developers for the existing programs, new versions can become more powerful and smoother. (By adding new functions, however, they invariable also become more complex, which is not necessarily a blessing.) As programmers talk to each other (they now meet regularly at a special conference, mentioned at the beginning of this introduction), they might even come to some agreements on consolidating their vocabulary.

Not withstanding the fact that new creations in the world of qualitative analysis programs could continue to have great impact on qualitative methodology, and therefore should by no means be discouraged, the needs for future development involve not primarily *more* programs or *more* power in the ones that we have. For one, it is now much more possible than in early programming days to make a program *appear* simple to the user, even when it is very powerful and complex. Learning time needs to be cut down, and manuals have to become "a breeze." Programmers need to become more aware of the range of qualitative analysis procedures and existing other programs, so that they can describe their own more accurately to the prospective user. One way out of debilitating complexity may be to construct programs in such a way that they come in modules. A first module could contain the basic analytic procedures; additional modules would offer various "enhancement" or "advanced" or "special" functions that the user could buy individually as needed and use with the data already coded in the first module.

There are also needs for totally new technological developments. Earlier I mentioned that researchers are increasingly starting to call on computers for help with recording and displaying their results. Cognitive or semantic structures and linkages among concepts may be graphically represented, thus facilitating the visualization of results. This is by no means a new idea. One of the oldest programs for the development and depiction of structures is ETHNO (described in Tesch, 1990). Presented in this issue, the program ATLAS/ti is actually less a theory-building program (it does not verify linkages), than a mapping program. Several commercial programs are available that could be adapted, such as CMap for the Macintosh and organizational chart makers in the MS-DOS environment. The one academic program I am aware of, COPE (MS-DOS), is in my opinion not yet an effective and satisfying tool. ATLAS/ti comes much closer, but I hope that the strides that have been made in cognitive and information sciences, where concept maps are becoming three-dimensional, will soon carry over to our field, and programmers will provide us with visualization opportunities that greatly surpass our current attempts. One day we may look at research results not only in a journal, but on our computer screens, where we can rotate three-dimensional, multi-colored structures around their axes to examine them from various angles.

Let me conclude with the most urgent item on my wish list, which is also the oldest. While manual data organization for analysis used to be the bottleneck in conducting qualitative studies, the dubious distinction has now shifted to another phase of the process: transcription of interview or other audio material into the electronic medium. We are able today, as shown in this issue, to locate specific data items on audio and video tapes (see

HyperRESEARCH and NUDIST), but if we want to see spoken words on our screen, we still have to type them. Granted that intonation, emotional nuances, and mode of expression all become lost when spoken language is transcribed into word processors, there are many types of qualitative analysis where they are not of prime importance. What we need for those kinds of projects is the direct entering of speech into the computer and translation into writing. Although, of course, large computers have been able for a long time to recognize and translate sound, the technology has not advanced as fast as hoped. Computers still have to be taught painstakingly to recognize a person's way of pronouncing each word, rather than being able to understand English from anyone's mouth. Furthermore, the technology is still far too expensive. My hope is that by the time *Qualitative Sociology* decides to produce the next special issue on the use of computers in qualitative research, we will at least be able to read our data to the computer we have trained to listen to its master's voice, and then go right ahead and work with the text in the analysis programs that will by then almost surely have changed the way we conduct qualitative research.

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