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Author(s): Jérémie Séror

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RESEARCH ISSUES

TESOL Quarterly publishes brief commentaries on aspects of qualitative and quantitative research. In this issue, Jérémie Séror discusses the advantages and disadvantages of computer-assisted qualitative data management and analysis tools.

Edited by **PATRICIA A. DUFF**
University of British Columbia

Computers and Qualitative Data Analysis: Paper, Pens, and Highlighters vs. Screen, Mouse, and Keyboard

JÉRÉMIE SÉROR
*University of British Columbia
Vancouver, British Columbia, Canada*

■ Computers have become commonplace in research, whether for writing up results using word processing or for storing interview data. However, researchers still tend to use them for data analysis more often in the quantitative social sciences than in qualitative traditions. Although researchers routinely use software packages such as Statistical Package for the Social Sciences (SPSS) in quantitative research, many qualitative researchers are uncertain about the value of computer-assisted qualitative data analysis software (CAQDAS).

Yet, since CAQDAS first appeared almost 20 years ago, more and more researchers are using it (DeNardo & Levers, 2002; Mangabeira, Lee, & Fielding, 2004; L. Richards, 2002; Weitzman, 2003). Commercialization has helped make a variety of packages more widely available, and more qualitative research methodologists are acknowledging their capabilities (e.g., Berg, 2004; Denzin & Lincoln, 2003; Huberman & Miles, 2002; Merriam, 1998; Silverman, 2004): “All researchers working in the qualitative mode will be clearly helped by some computer software” (Richards, 1995, p. 105); “it significantly enhanced our ability to analyse” (Rich & Patashnick, 2002, p. 259); and “software makes analysis faster and more efficient” (Blank, 2004, p. 188).

However, important debates over the use and value of CAQDAS continue to divide researchers (Bazeley, 2002; Crowley, Harré, & Tagg,

2002; Kelle, 1997; MacMillan & Koenig, 2004; Mangabeira et al., 2004; L. Richards, 2002; Thompson, 2002). This article aims to provide a brief overview of this debate. It first describes CAQDAS's capabilities, and then it explores the software's potential benefits and risks for qualitative researchers.

Because space is limited, I discuss CAQDAS in general rather than specific software packages. Interested readers are encouraged to explore some of the more popular packages, which include N6 (QSR International, 2002b), Atlas.ti (Muhr, 2004), NVivo (QSR International, 2002a), MAXqda (Verbi, 2004), Qualrus (Idea Works, 2002), HyperResearch (ResearchWare, 2004), The Ethnograph (Robbins & Seidel, 1998), Xsight (QSR International, 2004), and the free software EZ-text (Centers for Disease Control and Prevention, 2000). Readers may also want to consult some of the classic texts on the topic (Coffey & Atkinson, 1996; Fielding & Lee, 1991, 1998; Kelle, 1995; Weitzman & Miles, 1995) or the CAQDAS Networking Project's (n.d.) online bibliography. Unlike many authors of the CAQDAS literature, I am neither a developer nor a marketer. Rather, as part of a new generation of second language researchers, I am interested in using computers in new ways to undertake qualitative inquiry and have used QSR N5 and N6 (recent versions of NUD*IST), for example, in my own research.

CAQDAS—HISTORY AND GENERAL OVERVIEW

Qualitative research often requires the analysis of large amounts of relatively unorganized and heterogeneous data (Neuman, 2004). In the majority of cases CAQDAS was developed as an alternative to the traditional pen, paper, and scissors approach to handling complex data (T. Richards, 2002). According to L. Richards (2002), CAQDAS not only does faster, more systematically, and more easily what can be done by hand, but also “[does] more with data” thanks to “a range of techniques and tools that were impossible, unknown or too time-consuming before computers entered the field” (p. 267).

Indeed, from its earliest incarnations, CAQDAS took advantage of the computer's text retrieval and database capabilities. Researchers could search and separate data files into segments that they could tag or code for easy retrieval. Over the years, software became more sophisticated, adding functions that went beyond these simple code-and-retrieve procedures. Current software packages allow researchers to record memos of their developing ideas and to write up the research. The software also enables them to use various formats to visualize the analysis, including indexes, graphical displays, and tables. These formats can be used with sophisticated search tools to compare and link data and codes, and they

can be used with production rules, semantic-graphic networks, and matrices to develop concepts and theory.

Advantages

Good qualitative research involves meticulous data sorting and organization and carefully using ideas generated by the data. CAQDAS's advantages stem from computers' power to complete administrative and archiving tasks (Kelle, 1997). Computers facilitate the mechanical steps in the process of analysis. With a computer, coding and editing the data, writing up and storing memos, and searching text, themes, or models take just a few moves and clicks of a mouse. Some of the most mechanical tasks, such as regrouping an informant's data in one folder or category whenever new data is added, can also be automated. Facilitating these clerical tasks frees up the researcher's valuable time and energy for the analytical tasks (L. Richards, 2002; Weitzman, 2003). CAQDAS also enables researchers to play with the data as they search for new perspectives and insights (DeNardo & Levers, 2002; L. Richards, 2002). For Weitzman (2003), this ability to take more risks and to pursue new ideas and leads without having to worry about the time required to do or undo the exploration is a considerable advantage.

Computers also allow users to more easily modify and build on their analyses than they could using traditional methods. At any moment the researcher can, for example, add new codes or a new concept to the analysis and yet preserve the organizational system's integrity (compare this to changing a coding scheme or adding a subtheme to a set of filing cards). This ability provides what Richards and Richards (1998) call *system closure*, allowing users to easily build on results reiteratively, which facilitates recursive qualitative data analysis.

The computer also creates *project unity*: One computer can hold most aspects of the data analysis and make them all quickly accessible (Weitzman, 2003). Within seconds, the researcher can jump from a key concept in the analysis to the original data to a memo recording the thoughts that helped develop the concept. The computer therefore enhances closeness to the data, helping the researcher create the *thick descriptions* (Geertz, 1973) that are crucial to meaningful accounts of the data (Brent & Slusarz, 2003). Project unity also facilitates moving between various levels of analysis in ways that would be impossible with manual techniques (Mangabeira et al., 2004; Richards & Richards, 1998).

The computer's ability to consolidate the project, when combined with its ability to keep records that trace the steps in analyzing the data, also enables the researcher to share, revisit, replicate, and extend a project. As a result, CAQDAS may enable future qualitative researchers

to work in larger collaborative teams with larger data sets (DeNardo & Levers, 2002; Mangabeira et al., 2004), and it may help them to evaluate the trustworthiness of research results (Westphal, 2000).

Researchers can also use CAQDAS in mixed-method research designs (Bazeley, 1999, 2002; Richards & Richards, 1998). CAQDAS's ability to closely integrate data sets, thanks in particular to functions that allow the researcher to import and export tabular results from quantitative analysis packages, greatly facilitates the integration of qualitative and quantitative work (Bazeley, 2002). For example, CAQDAS enables a researcher to quickly identify a recurring theme in interview data as coming from "young female teachers in their 20s with 4 years or less of ESL training."

Cautions and Limitations

Despite CAQDAS's advantages, it does have some limitations. First, at a basic but important level, not everyone is comfortable working with computers. This "tactile-digital divide" (Gilbert, 2002, p. 216) seriously limits CAQDAS's usefulness in qualitative research. Particularly challenging is the necessity to translate the analytical process into a language or format that a computer software program can use. When CAQDAS could only analyze simple, carefully prepared text files, before it could work with colored text in different fonts or with nontextual data, many researchers preferred the more intuitive, simpler process of using pen and paper for analysis. To this day, although computer software and hardware have become more user friendly and CAQDAS has become much easier to use, some researchers may yet prefer the feel of more traditional methods.

Moreover, learning to use the software and to analyze on screen requires a serious time investment (Brent & Slusarz, 2003; MacMillan & Koenig, 2004; Mangabeira et al., 2004; Thompson, 2002). The problem is compounded by the fact that relatively few people can actually use the software well, making it difficult for novices to find someone to ask for help. The situation is improving, however; communities of users are growing and the Internet is providing forums where novice users can ask experienced users for advice. Although the time (and financial) investment may be worth it in the end, researchers with limited time or smaller projects must consider whether using CAQDAS is cost- and time-effective.

CAQDAS also creates perceptions of closeness to and distance from the data that require caution. Fielding and Lee (1998) warn that users may experience a distancing effect because CAQDAS's code-and-retrieve strategies and on-screen textual translations move them away from the original data, particularly if they do not take advantage of functions that allow them to jump back to the data in context. Feeling too close to the

data, however, may present an even greater problem. Always coming face to face with the hard data, some researchers have difficulty abstracting from it and moving on to the conceptual level (Gilbert, 2002; L. Richards, 2002). Some users stay so close to the data that they engage in *coding fetishism* (L. Richards, 2002): They abuse the software's coding facility to literally drown themselves in code and disregard the conceptual work of analysis (see also John & Johnson, 2000).

Some researchers' greatest fear about CAQDAS is that the software's implicit design might influence, or worse, somehow dictate the analytical process (Agar, 1991; Crowley et al., 2002; John & Johnson, 2000; MacMillan & Koenig, 2004; Tesch, 1991). CAQDAS's emphasis on coding, for example, may promote the erroneous belief that coding by itself is qualitative data analysis (Coffey, Holbrook, & Atkinson, 1996; Thompson, 2002). CAQDAS users' tendency to employ a *grounded theory* approach (Glaser & Strauss, 1967) also needs to be critically examined to ensure that the software is not guiding this choice, especially because grounded theory is neither the only nor always the best analytical approach (MacMillan & Koenig, 2004).

Some researchers argue that this fear of the software taking over has been overemphasized and that the researcher's principal role and responsibility as the one who actually does the qualitative analysis has been understated, whether using software or other means (Bong, 2002; Gilbert, 2002; Kelle, 1997; Weitzman, 2003). Weitzman (2003) suggests that it is important in particular to debunk the myth that CAQDAS does the analysis or that it could somehow eliminate the need for strong methodological training.

The lesson to keep in mind, nonetheless, is that no serious discussions about such software can start with the assumption that CAQDAS will automatically improve research. Above all, these cautions and limitations emphasize that researchers using the software need to apply to it the same degree of reflectivity and metacognitive awareness that they apply to qualitative research in general (Gilbert, 2002; Mangabeira et al., 2004).

CONCLUSIONS: PAPER, PENS, AND HIGHLIGHTERS VS. SCREEN, MOUSE, AND KEYBOARD

How important will the contribution of CAQDAS be for future qualitative research? For now, the impact of CAQDAS remains small (L. Richards, 2002), but in the long term it seems unlikely that computer-assisted qualitative data analysis will go away. When used intelligently, these tools can do much more than can be done manually. A variety of software solutions are now available to meet a variety of needs. The newest packages, for example, NVivo 2.0 (QSR International,

2002a) and Atlas.ti 5.0 (Muhr, 2004), are easier to use and offer even more sophisticated ways to analyze data, including the ability to work with nontextual data (pictures, audio samples, and video), the ability to work with and edit documents containing pictures, various fonts, highlighting, boldface, and underlining in rich text format, as well as enhanced features for group collaborations such as merge functions allowing separate projects to be regrouped. Qualrus even uses new computational strategies to suggest codes based on the user's previous coding strategies and patterns found in the data.

Thus, users have the potential and responsibility to determine the place of CAQDAS in qualitative research (Weitzman & Miles, 1995). The key question to ask is not whether to use CAQDAS, or even which package is the best, but rather how can CAQDAS best meet specific researchers' analytical needs? In this regard, CAQDAS will likely have the greatest positive impact for researchers who (a) are well trained in qualitative research, (b) have taken the time to understand how to use the software, and (c) have planned and carefully thought about the type of analysis they want to conduct and have used this information to guide their use of the software (if any is judged necessary).

Qualitative second-language researchers should at the very least keep abreast of developments in this area and contribute to an informed and open debate that focuses not only on fears or promises, but also on empirical reports of how CAQDAS was used in specific research contexts with discussions of both its practical and theoretical implications for qualitative research. Such debates should ensure that these tools' potential is neither exaggerated nor missed, and that they continue to develop under the guidance of research principles. If this objective is met, I look forward with great excitement to the future role and impact of CAQDAS in qualitative research.

THE AUTHOR

J r mie S ror is a doctoral student in the Department of Language and Literacy Education, University of British Columbia, Vancouver, Canada. His research focuses on the socialization of language minority students into academic literacy practices. He uses the computer-assisted qualitative data analysis software N6 (QSR International, 2002b) to work with his qualitative data.

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