Using NVivo to Answer the Challenges of Qualitative Research in Professional Communication: Benefits and Best Practices

Tutorial

—Feature by
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Abstract—*Recent updates in qualitative data-analysis software have provided the qualitative researcher in professional communication with powerful tools to assist in the research process. In this tutorial, we provide a brief overview of what software choices are available and discuss features of NVivo, one prominent choice. We then use our experiences with the software to discuss how it enhances three specific dimensions of our research: efficiency, multiplicity, and transparency. We end with a compilation of best practices for using the software.*

Index Terms—*CAQDAS, NVivo, qualitative data-analysis software, qualitative research.*

Your research seems to be complete: You have conducted three focus groups with senior citizens in your community and 15 interviews with health-care providers, recorded extensive ethnographic observations, and compiled notes on dozens of websites, journal articles, and other texts. With all of these data, you are quite certain that you have collected enough information to report some recommendations to the community organization that intends to develop a new health-awareness campaign in response to your findings. You probably have enough data to start drafting a couple of articles as well: at least one for the professional communication journals but possibly another one, coauthored with your collaborators from other units in the university, for an interdisciplinary journal.

But even with all of the data you have gathered, you still feel unprepared to face the next steps in the research project; you know your data have rich stories to tell, but you are not yet certain how to weave those stories together from the disparate sources of data and, more important, how to convey them to the various audiences who are waiting to hear them. Part of the problem is that these audiences are so different from each other: The community organization will want concrete recommendations for action, whereas the reviewers at the academic journals will want extensive detail on the methods you used to collect that data and the theoretical frameworks you used to analyze it. But even this seemingly simple distinction between practical and theoretical aspects of your study is complicated by the fact that you intend to write on different aspects of your research results for the different disciplines represented in your team of research collaborators.

This fictional scenario is meant to illustrate a point that seasoned researchers in professional communication have likely already learned for themselves: Professional communication research requires variability and flexibility. It pulls from a variety of methodologies, sources, contexts, and theories. Levi-Strauss's term BRICOLAGE has been used to characterize this aspect of professional communication research [1]: The qualitative researcher-as-bricoleur must be able to combine interviews, case studies, focus groups, artifact analyses, and self-introspection when interpreting the dynamics of a particular communicative act. Beyond that, the professional communication bricoleur often takes an interdisciplinary approach to the interpretation and reporting of research results, pulling concepts and insights from a diverse set of academic areas that can include sociology, rhetoric, professional communication, feminism, and many others.

As research methods become an increasingly important subject in professional communication,

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qualitative researchers are being presented with more sophisticated advice on how to solve the various problems that arise from their bricoleur status. The methodological and theoretical pluralism of research is often touted as one of our field's strengths [1]–[6]. However, it also poses challenges—challenges that can be compounded by the expanding availability of digital media as both research sources and research tools. In the most recent texts especially, the growing prevalence of digital texts and multimedia is often presented as the motivation for this advice, and computer- and internet-based solutions are suggested as ways to solve our research problems [2], [5], [7], [8]. Interestingly, however, specific advice on using computer technology to carry out the basic tasks of qualitative research has not changed much in recent years. For the most part, recent research methods texts recommend adapting programs, such as Microsoft Word or Microsoft Excel, to make them suitable to the tasks of storing, coding, and analyzing qualitative data [9, p. 218]. Two of our field's most recent books on research methods have suggested that qualitative-analysis software, often termed computer-assisted qualitative data-analysis software (CAQDAS), is playing an increasingly important role in storing, managing, and analyzing qualitative data [2], [8]. But after briefly mentioning the specialized software, even these two texts fall back to pen and paper, Microsoft Word, or Microsoft Excel when they offer specific instruction on storing, coding, and analyzing qualitative data. So far, the major research methods texts in professional communication have not offered specific advice on the benefits of CAQDAS, nor have they established best practices for using the software.

This tutorial attempts to pick up where other texts leave off. By offering an overview of the main features of one particular type of CAQDAS, NVivo, and discussing how this software altered our data collection and analysis in two particular qualitative research projects, we examine more explicitly than previous texts have done how a CAQDAS product like NVivo might be used to address the kinds of research problems illustrated in the scenario presented above. In particular, we focus on three different, yet interrelated, ways in which CAQDAS can help solve the kinds of problems that qualitative researchers in professional communication typically encounter: increasing efficiency of data analysis, facilitating multiplicity in research methodologies, and enabling transparency of the process as a whole.

Since it attempts to fill some of these gaps in the previous literature, we hope this tutorial, which synthesizes the techniques and best practices we have discovered through using NVivo in our own work, will be useful to instructors who teach research methods courses in professional communication, students in such courses, and professional communication researchers in industry and university settings. We intend for the tutorial to serve as a starting place for professional communicators in these categories, whether they are planning to conduct a series of focus groups with potential users of a new software product, looking for a way to analyze a large number of digital texts, preparing to conduct and analyze interviews for a dissertation, or designing another type of study that requires storage, analysis, and synthesis of qualitative data.

The tutorial is structured around four basic questions that new or potential users of NVivo in professional communication research might ask: (1) What is CAQDAS, and which options are available? (2) What are the basic features and functions of NVivo that need to be understood before beginning to use it? (3) What benefits can be gained by using NVivo in professional communication research? and (4) What are the best practices and/or potential pitfalls that a user should know about before beginning an NVivo project?

The tutorial's main goal is not to offer step-by-step instructions for basic functions in NVivo; that information is available elsewhere, and a journal article such as this does not allow enough space to adequately cover all of the basic software functions anyway. However, we have included an Appendix that provides a walk-through showing how NVivo can be used to solve one of the problems faced by the researcher in our opening scenario: the problem of analyzing data from a multitude of data types. The information presented here is based on a combination of a literature review of texts from other disciplines and observations from our own use of NVivo software. Specifically, each coauthor has used NVivo extensively on a research project in the last year. The first author has used NVivo in an Institutional Review Board (IRB)-approved study of the rhetoric involved in the grant-application process of the National Science Foundation (NSF). The NSF project was based on 19 interviews and two focus groups with applicants, reviewers, and employees of the NSF. It also involved extensive analysis of NSF-published documents and applications shared by those who had been

interviewed. The second author has used NVivo in an IRB-approved, interdisciplinary focus-group study aimed at understanding infant-feeding practices in the author's local area.

WHAT IS CAQDAS, AND WHICH OPTIONS ARE AVAILABLE?

Whereas researchers are accustomed to using software to statistically analyze quantitative data, we remain hesitant to use it for qualitative data [10]–[19], possibly because many of us still do not know exactly what CAQDAS is. All prominent CAQDAS programs are designed to serve as aids for analyzing data, such as textual documents, transcripts, photographs, audio, and video through both a "code and retrieve" system and advanced search functions. Code and retrieve allows the researcher to manually code snippets of the data according to their common themes. That coding can then be retrieved and viewed separately from the original data. CAQDAS becomes particularly transformative, however, with its ability to process and query the coding in a number of different ways. Various features, from key-word searches to searches based on complex data relations, enable the researcher to view a number of related yet disparate elements of the data with little effort. The quick yet powerful collation of different data sources facilitates comparison and analysis of those elements. These features give the researcher the ability to understand complex relations among the research data through a relatively simple process. Similar to the way in which quantitative software automates routine statistical calculations, CAQDAS automates the routine and mechanical aspects of qualitative research, enabling researchers to spend more time on the interpretive, creative dimensions of their work.

NVivo is one of the leading CAQDAS products currently available. (NVivo is a product of QSR International, an Australian company [20].) Given the relatively small market size, it understandably has few competitors. Among those, NVivo, in our eyes, provides the best balance between ease of use and power. ATLAS.ti, a prominent competitor, is more robust than NVivo when handling multimedia, in addition to providing better support of PDF documents [21]. However, informal comments suggest that NVivo is easier to learn than ATLAS.ti [22], [23]. Arguably equal in reputation with ATLAS.ti is MAXQDA [24]. The software is cheaper than NVivo and reportedly easier to learn, but it does not handle as wide a

range of data formats and is less powerful when searching through data [22]. NVivo, ATLAS.ti, and MAXQDA are the three primary brands of CAQDAS that are available, although other options do exist. One is QDA Miner (Provalis Research) [25]; although this software has been judged to be less powerful than the major choices, it provides better mixed-methods support through integration with Simstat (a statistical-analysis tool) and Wordstat (a quantitative content-analysis tool) [26]. An open-source option offered by Digital Records for E-Social Science is Digital Replay System (DRS); true to most open-source programs, it is free but limited in functionality compared to NVivo, ATLAS.ti, and MAXQDA [22]. All of our examples in this paper focus on NVivo, but the basic concepts and recommendations should apply equally well to other brands of CAQDAS (see http://caqdas.soc.surrey.ac.uk/ for a more extensive review of software choices). Table I provides a breakdown of the purchase prices and distinguishing features of NVivo, ATLAS.ti, and MAXQDA. The distinguishing features are based on the authors' personal understanding of the programs and reviews available at http://caqdas.soc.surrey.ac.uk/ Resources/QUICworkingpapers.html. Prices represent full-license purchases as of November 29, 2010. However, cheaper leasing options are available for each. The main strengths are based on the authors' personal understanding of the programs and reviews available at http://caqdas.soc.surrey.ac.uk/Support/ Choosingsoftware/softwareoptions.html.

Despite its recent emergence in popularity, NVivo is far from a new product. It dates back to 1979, when a computer programmer began designing the software to aid his wife with a qualitative research project. Although the programmer was generally motivated by his wife's frustration with trying to manage numerous piles of paper documents, the single most important motivating event reportedly involved their two-year-old eating a piece of paper with a quotation written on it—data they never recovered [27]. Many researchers may be familiar with NUD*IST, the predecessor to the current NVivo and one of the first major CAQDAS programs. QSR released NVivo 1 in 1999 to address some fundamental limitations with the ways in which NUD*IST was programmed [28]. With NVivo 7 (released in 2006), the two lines were merged [27]. NVivo 8 builds on version 7's comingling of NUD*IST and NVivo and is fundamentally more robust than its predecessors, primarily in the handling of

TABLE I
OVERVIEW OF THE THREE MAIN CAQDAS PROGRAMS

	Academic Price US$	Commercial Price US$	Distinguishing Features
NVivo	650	2,275	• Interface similar to Microsoft Outlook • Advanced querying functions • Powerful source data and coding organization
ATLAS.ti	598	1,800	• Advanced multimedia support • Native PDF support (looks like the original) • Google Earth is embedded
MAXQDA	570	1,400	• Interface is clean and intuitive • Good use of color for separating project elements • Integrates qualitative analysis well with quantitative analysis features

Note: Prices accurate as of November 29, 2010.

multimedia and document types. NVivo 9, the latest version, adds support for spreadsheets and other quantitative data, integration with other software such as EndNote and Zotero, and additional functions for analyzing data through tools like word trees and cluster analysis [29]. One question we have often been asked is about the value we see in upgrading to version 9 for those who already have NVivo 8 (a question generally motivated by the cost involved). The improved collaborative functions and support for quantitative data are advantageous enough, in our eyes, to justify an upgrade to version 9 for those running earlier versions.

WHAT ARE THE BASIC FEATURES AND FUNCTIONS OF NVIVO THAT NEED TO BE UNDERSTOOD BEFORE BEGINNING TO USE IT?

In this section, we discuss the main features of NVivo and briefly explain some of the ways each feature can be particularly useful in professional communication research. In the Appendix, we provide instructions on how a researcher might use the features discussed here to solve one of the problems that the researcher faced in our opening scenario. Readers should also consult NVivo's online help for detailed step-by-step instructions on the features discussed here.

Sources One of the keys to strong qualitative analysis is the effective management of vast arrays of data. The foundation of an NVivo project is the result of this research—the sources. NVivo categorizes sources in three ways: internals, externals, and memos. (Fig. 1 shows the sources for one of our projects.)

Internal sources are computer files that NVivo has imported and can analyze directly. NVivo supports most word-processed documents, including Word documents, rich text format, plain text, and PDF.
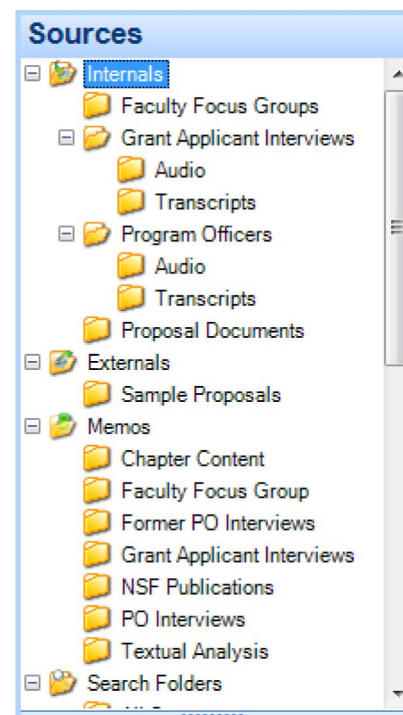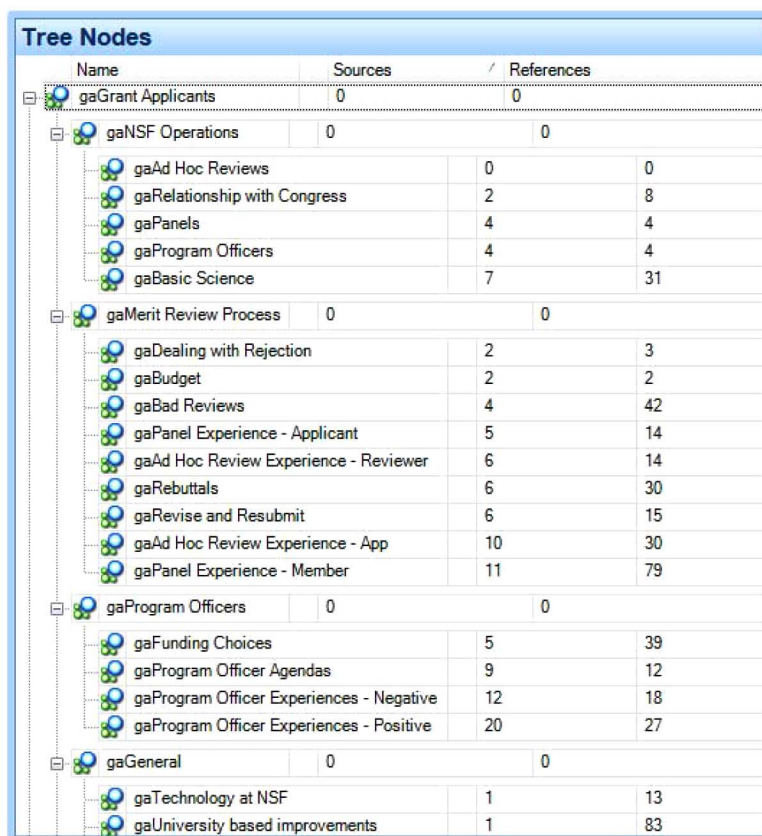

Fig. 1. Data sources for the NSF project imported into NVivo.

The software is particularly innovative for the researcher in its ability to incorporate multimedia with the text-based documents. NVivo can handle most audio files (including WAV, MP3, and WMA), image files (including BMP, GIF, JPEG, and TIFF), and video files (including MPEG, AVI, WMV, MP4, and QT).

NVivo supports a broad range of file formats in its internal sources feature, but there are limitations in what it can import. The software cannot import books and webpages, for example. As a substitute, NVivo provides external sources, a proxy feature where sources that cannot be analyzed directly

Tree Nodes		
Name	Sources	References
gaGrant Applicants	0	0
gaNSF Operations	0	0
gaAd Hoc Reviews	0	0
gaRelationship with Congress	2	8
gaPanels	4	4
gaProgram Officers	4	4
gaBasic Science	7	31
gaMerit Review Process	0	0
gaDealing with Rejection	2	3
gaBudget	2	2
gaBad Reviews	4	42
gaPanel Experience - Applicant	5	14
gaAd Hoc Review Experience - Reviewer	6	14
gaRebuttals	6	30
gaRevise and Resubmit	6	15
gaAd Hoc Review Experience - App	10	30
gaPanel Experience - Member	11	79
gaProgram Officers	0	0
gaFunding Choices	5	39
gaProgram Officer Agendas	9	12
gaProgram Officer Experiences - Negative	12	18
gaProgram Officer Experiences - Positive	20	27
gaGeneral	0	0
gaTechnology at NSF	1	13
gaUniversity based improvements	1	83

Fig. 2.   Tree node structure developed for the NSF project.

can be annotated inside the software and have the resulting annotations coded into its analysis system. The external sources feature then, is something of a catchall that allows for the inclusion of all types of data in the research project.

Like other CAQDAS programs, NVivo provides a "memo" feature. The memo feature is fundamentally a notepad with rich text features. Its inclusion allows researcher observations to be included and coded alongside research data. The "see also link" feature in NVivo allows memos to be directly linked to specific words, lines, or passages in other sources, letting the researcher easily connect personal observations with direct data.

Nodes   Nodes are similar to electronic bins or folders into which the researcher can allocate portions of sources. NVivo defines four types of nodes: free, tree, cases, and relationships. Nodes as bins representing common ideas are filled through coding, a computerized version of the traditional qualitative research method [30]. NVivo's free and tree nodes are two variations on the basic node concept representing a general category of analysis. A free node is a category that has no direct or

logical connection with other categories. Tree nodes, in contrast, are nodes that can be grouped and hierarchically structured. (Fig. 2 shows the tree structure for one of our projects.) This feature of the software is extremely flexible. To facilitate the grounded approach to coding that is typical in our field, NVivo imposes no initial layout for either free or tree nodes, instead allowing researchers to create and adapt the layout to project idiosyncrasies.

The other two types of nodes in NVivo—cases and relationships—are slightly more complicated. Case nodes are NVivo's structure for allowing the researcher to incorporate demographic data about participants. The researcher creates custom categories, such as age, gender, education level, and employment. A case is then created for each participant, with demographic information easily defined. Relationship nodes denote a connection between two sources and/or nodes. Once the researcher has created a relationship, shared content can be coded and viewed.

Queries   Although nodes are a highly advantageous feature of NVivo, queries are what truly set NVivo apart from more traditional qualitative-analysis

	A : Ad Hoc Review Experience... ▽	B : Panel Experience ... ▽	C : gaRevise and Resubmit ▽	D : gaBad Reviews ▽	E : gaDealing with Rejection ▽
1 : gaExperience w NSF ▽	2	1	1	1	0
2 : gaGeneral NSF - Positive ▽	4	0	2	3	1
3 : gaGeneral NSF - Negative ▽	2	4	0	0	3

Fig. 3.   NVivo matrix comparing general experiences with localized ones in the NSF project.

methods. Queries serve as a means to search all of the various content of a project, such as sources and nodes, for specific information. Combined with their ability to find content according to a wide range of criteria, they remove much of the legwork of the analysis of data and allow the researcher to examine numerous dynamics of a project with little effort. NVivo provides a variety of queries: text search, word frequency, coding, and matrices.

Although we did find text search, word frequency, and matrices useful, it was coding queries that helped make NVivo more efficient and powerful than traditional qualitative research methods. Coding queries allow the researcher to search for content based on a number of factors, including where the node information is stored, which source or sources should be included in the search, and which demographic criteria the results should be limited to. Coding queries amplify the analysis process since complex comparisons of project material can be conducted by quickly compiling the relevant material (and only the relevant material) in an intuitive layout. Since this access to specific data is so fast, researchers are able to perform more analysis and compare more intricate aspects of the research from more disparate forms of data.

Matrices are worth mentioning as they add a powerful querying function unique to NVivo. A matrix appears in a table format where rows and columns represent a user's selections from the project's sources and nodes. The table cells link to the source fragments that share coding with the content represented by the table's row and column headers; double clicking the cell pulls up those shared fragments. Matrices are of value to the researcher since they provide a way to compare subgroups based on attribute values across a range of experiences, attitudes, or emotions. They also provide an efficient means to relate one tree of nodes to another. As an example from one of our projects, a matrix may contrast general impressions of the NSF with impressions of the NSF's specific aspects. (See Fig. 3 for an example.)

Sets and Models The sources feature facilitates the beginning of a project through the gathering and collating of data. Nodes and queries facilitate the early, intricate analysis of data. Sets and models are NVivo's means of facilitating the big picture where specific analysis is combined to present a larger interpretation. A set is an on-the-fly grouping of sources, nodes, and query results based on similar content or context. We found sets to be an informal way for us to record, visualize, and reflect on connections we were starting to see among various elements in a project. If sets are quick and dirty, models are slow and beautiful. Models allow for a visual representation of the larger picture, incorporating common flowchart shapes, icons representing project items such as nodes, arrows showing relationships, and shape coloring for grouping and categorization. (Fig. 4 is a screenshot of a model from one of our projects.) In NVivo, these models can be exported as images, which allow them to be placed in Word files and PowerPoint presentations.

WHAT BENEFITS CAN BE GAINED BY USING NVIVO IN PROFESSIONAL COMMUNICATION RESEARCH?

As with any specialized software, a potential user has to decide whether buying the software and taking the time to learn it are sound investments. In this section of the tutorial, we provide information based on our own experiences and relevant secondary literature to help potential users who might be asking these questions about NVivo or other CAQDAS products. Our advice is structured around three categories of benefits that we experienced: efficiency, multiplicity, and transparency.

Efficiency True to most computerization of paper and pencil tasks, we found NVivo's coding and retrieval of data to be far more efficient than manual processes relying on paper and highlighters or even digital processes based in Microsoft Word or Excel. To code, for example, an interviewee's
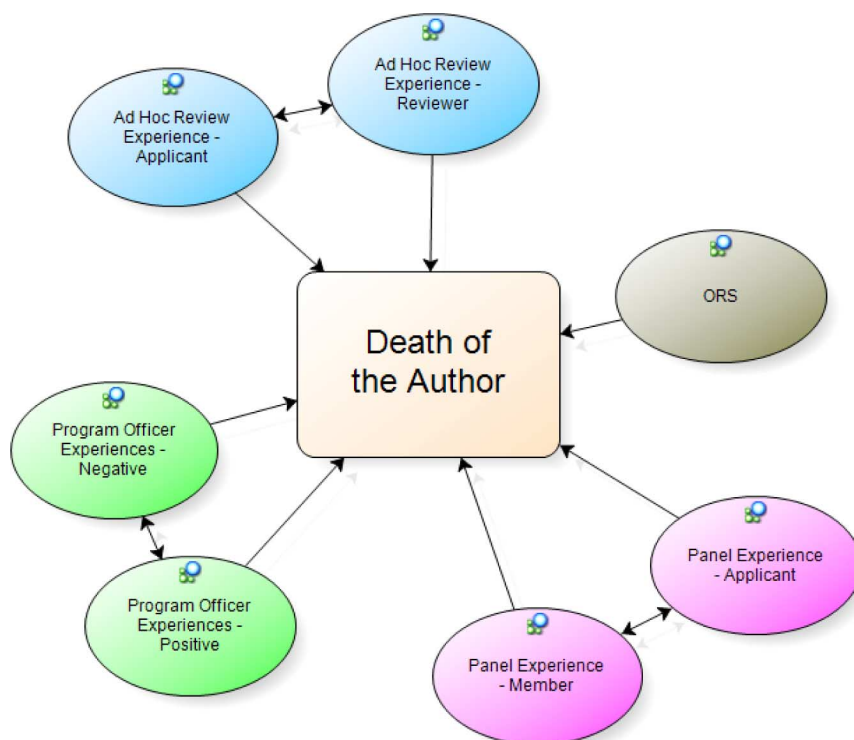
Fig. 4.   NVivo model developed for the NSF project.

comment on her experience with the NSF's online application tool FastLane, the researcher simply had to select the relevant text and drag-and-drop it onto the name of the node in the node list (or the user could select the check box next to that node name in a drop-down list). Consistent with others' experiences, we found ourselves much more likely to code a particular excerpt inside NVivo than if we had done it by hand because of the simplicity and speed [18].

In both projects, we began data analysis by placing our interview/focus group transcripts in NVivo and reading line by line to determine our initial set of nodes. During that process, we used annotations and memos to record our ideas, and we spent a lot of time thinking about how the data related to our research questions and initial theoretical assumptions. The intellectual work involved in these initial acts of careful reading, developing the nodes from the bottom up, and annotating was virtually identical to what we would have done without using specialized software, although it was more efficient because the interface is explicitly designed to facilitate these research activities. By accomplishing these same tasks with NVivo, we also avoided the danger of losing the reference information and gained the benefit of being able to quickly retrieve the original source context if we needed it later.

The automation of routine qualitative research tasks that NVivo enables is akin to the automation of common writing tasks that Microsoft Word enables. As an analogy, one might think about the ability to cut, copy, and paste text in word-processing software such as Microsoft Word. Although it was possible to complete these same tasks with a typewriter, paper, tape, and scissors, it was much more difficult and time consuming, the process was far less robust, and there was a much greater chance of error.

Each coauthor's research project offers its own examples to illustrate NVivo's automation and efficiency. The infant-feeding focus group project, for example, made extensive use of NVivo's auto-coding features. Since NVivo allows sources to be auto-coded by paragraph style, the researcher was able to create a node for each question, and then with only a few mouse clicks, auto-code everything participants said in response to that question (across all nine focus groups) at those question nodes. As another example from this same project, the researcher was able to create a case node for each focus group participant and then use a combination of text-based queries and auto-coding to quickly code everything each participant said to his/her individual case node. Although these same tasks could have been

accomplished in Excel and/or Word, it would have taken much longer to do so.

The NSF project benefited substantially from NVivo's coding query system. For example, the researcher used coding queries to quickly compile a list of all comments made by senior faculty with fewer than three awarded NSF grants who had not reviewed proposals for the NSF and compare that list with a similar one pulled from senior faculty with six or more grants who had also served as reviewers. Such a comparison allowed him to determine the role that the NSF experience played on attitudes toward the NSF review system for seasoned researchers. Compiling these two collections of comments through a coding query took less than a minute. Collating such a list by hand would have taken several hours, and the resulting pieces of paper would have been clumsier to digest than NVivo's relatively intuitive design. This comparison and many more similar to it would not have been practical with more traditional, less byte-driven methods and would have made the NSF project less thorough and insightful.

As these examples illustrate, it was the work that ensued after the initial task of carefully reading the transcripts—the multiple ways to interpret the data, conduct queries to determine relationships, and such—that was most dramatically transformed by the software. In Blakeslee's survey, researchers in our field mentioned lack of institutional support, lack of time, and lack of funding as the top three obstacles they face in attempting to do research [31]. Although Blakeslee's survey sample consisted primarily of academic researchers, similar concerns about resources undoubtedly apply to research in industry settings. Thus, it seems, anything that might save time by making the routine tasks of research more efficient would be especially beneficial to professional communication researchers.

Multiplicity   Several scholars have written on the advantages of CAQDAS in recent years [32]–[39], yet its ability to consolidate multiple types of research material into one convenient location has yet to be thoroughly discussed. In NVivo, a researcher can store multiple types of data and then easily code all of these data forms at the same node. Thus, at a single node that can be opened with two mouse clicks, a researcher can access snippets from focus group transcripts or videos, PDFs of secondary research articles, the researcher's own memos, and so on.

In addition to simple convenience, NVivo's ability to provide a single location for all data sources also made our analysis in both projects more thorough and more complex. For example, simultaneously viewing the different forms of data in the NSF project led to a connection between an exchange in a focus group, comments made by an interviewee, and a portion of a text from Bourdieu and Wacquant's *An Invitation to Reflexive Sociology* [40]—a connection the author may not have made with a manual analysis method. This personal anecdote very much parallels a basic observation Richards made early in the qualitative research software revolution: "Since it [coding and analysis] can be much more thorough, it is likely to be more demanding and more relied on during analysis" [18, p. 268]. The ability to code such a variety of data types to a single system and then query that system basically on demand allowed us to conveniently explore a number of relationships among products of our original research, the research others have conducted, and the theoretical underpinnings of our projects. Again, comparing our experiences with Richards's observations, we concur that "far more material can be handled at a useful level of coding, and access is much easier so coding is likely to be relied on at more stages of analysis" [18, pp. 268–269].

We also found potential for additional insight in the ability to code a node's content into another node. That is, we could open a node to look at its material and, if some of that material fit into a different category as well, we could code it directly into another node. In the NSF project, when the researcher was going through the various nodes to determine how participants' relationships with their home university affected their ability to understand the NSF's application process, he discovered that the university's Office of Research Services played a much larger role in the process than originally thought. To incorporate this insight into his analysis, he created a node for the office, went through certain relevant, already-populated nodes, and directly coded material in those other nodes into the new node for the office. This was much simpler than going back through all of the original material trying to locate that material anew. Without the ability to code one node's material to another node, he most likely would not have taken the time to create the Office of Research Services node and would not have been able to meaningfully incorporate the role of the office into his analysis.

Transparency   One of the tensions that has surfaced in professional communication research

is that between qualitative and quantitative methods for data collection, analysis, validation, and presentation. The tensions surrounding these issues often center on questions of transparency. As Charney said in one of the landmark articles in this debate, the "objectivity" enabled by quantitative methods "facilitates public (as well as private) scrutiny of information and the methods used to collect it" [4, p. 577]. In response to Charney's concern, some recent texts encourage qualitative researchers in professional communication to be more explicit in describing their sampling methods, suggesting that this transparency might help our findings achieve greater credibility and visibility among interdisciplinary audiences [3], [41].

Judging from the available literature, using NVivo might enable professional communication researchers to extend this same transparency beyond just sampling to include other parts of the research process, such as data analysis and interpretation [38], [42], [43]. The type of transparency that Charney claims is not available in qualitative research is something that has been touted as one of NVivo's main benefits in social science literature [38], [42]. For instance, prolific journaling in the memo feature of qualitative research software has been used as a means of record keeping, providing a narrative of the development of the project and its insights [42], [43].

Our experience with using NVivo reinforces these suggestions about transparency, particularly if the software is used appropriately and if the researcher keeps careful track of his or her steps along the way. Specifically, in our experience, the ease of access to data and analysis provided in the nodes and queries features enables the researcher to efficiently show others what data were collected and how those data were interpreted. The screenshots included in an earlier section of this paper suggest how researchers can provide readers with visually clean snapshots of their interpretive work. Although snapshots could be provided if the researcher were coding by hand (or using digital means), the process would not be nearly as easy, and the resulting visuals would not be as clean and well suited to the task.

What Are the Best Practices and/or Potential Pitfalls that a User Should Know before Beginning an NVivo Project?

Use It Early; Use It Often   Whereas quantitative software is invoked only when the researcher is ready to "crunch the numbers," NVivo is designed to be

used from the beginning of a qualitative research project. Although its analytic features have received the most attention, qualitative research software can actually aid the researcher in all facets of the process.

Bazeley, in her prominent *Qualitative Data Analysis with NVivo* [27], recommends creating an NVivo project when the topic idea is first entertained and using its various features throughout the project. Following Bazeley's advice, we began our projects by journaling our initial thoughts in memos. We imported our research results into NVivo as we collected them and used its transcription feature to transcribe our interview and focus group recordings. Transcribing audio and video directly into NVivo allowed our transcripts to be easily incorporated with the software's data-analysis features—something much more troublesome with a Word-based transcript. Our analysis of the data was done completely inside the software. We used queries, sets, and models at the outset and throughout the writing process. Capitalizing on all of NVivo's features, we felt, made us more efficient and more thorough. Also, using the software from the beginning of the project was a good strategy for dealing with its steep learning curve; we found it much less intimidating to experiment with various functions early in the process when we only had small amounts of data to deal with. By the time we had accumulated large amounts of data, we were already familiar with the basic interface and functions of the software.

Remember that the Software Does Not Do the Intellectual Work   Social scientists writing about qualitative-analysis software when it first became available were concerned that its automation of research processes would alienate researchers from their data and, thus, interrupt the highly personal researcher-data relationship that has defined qualitative analysis [10]–[14], [16], [17], [19]. One prominently voiced concern in this regard is that the prolific coding allowed by the software's ease and speed might turn the process into a ritualistic act where the researcher continuously codes documents without interpretive introspection [18]. These concerns seem to have diminished, in part, because of recent advances in computer technology and features of qualitative software in particular. Concerns such as these expressed by researchers do not seem to be found in the most recent literature. As Bringer, Johnston, and Brackenridge explained, there was initially some fear that "the computer might distance the researcher from the data too much," but actually the reverse might be true because "the automation

of clerical tasks allows the researcher more time to spend on analysis" [43, p. 250].

Our experiences with NVivo reflect Bringer et al.'s assertion that qualitative research software actually allows the researcher to spend time thinking about the data and looking at the data in different ways rather than fumbling through large stacks of paper or scanning numerous Word files. Although the automated features allow some types of coding to be accomplished much more quickly, these features do not by any means replace the need for careful reading of every line of data. We found that our research produced quality results only if we still spent time considering and analyzing our data. For us, that meant being more willing to change our analytic approach midstream. The ability to create nodes midstream while coding led us to create a number of nodes we did not anticipate, allowing us to analyze the data in ways we would not have otherwise. Also, NVivo makes it just as easy to undo coding as it is to code in the first place. We found that this ability to undo allowed us to take risks and create new nodes that might not amount to anything, letting us try out interpretations and analyses of our data.

NVivo's efficiency should be seen as an opportunity to spend more time with the data rather than as an opportunity to spend less time on the project. Just as a strong statistical program like SPSS cannot make up for poorly gathered numbers, strong CAQDAS cannot make up for poorly gathered material or shallowly considered analysis. Although our use of NVivo allowed us to strengthen our projects, in the end it was, for us, a tool.

Document Carefully and Thoroughly As with quantitative software, researchers must explain how the software was used when they report their results; however, the complexity and variability of NVivo's implementation makes that discussion much more extensive than similar discussions of quantitative software such as SPSS. Achievement of trustworthiness, rigor, credibility, and dependability in our research requires us to provide in our resulting documents a description of how we used the software. This may include details of the journaling process through memos, use of NVivo's transcription features, and the coding and querying process. Especially with the NSF project, the primary report's audience had little knowledge of NVivo, so the software's usage had to be made particularly explicit. The description of NVivo's application in the NSF project uses Bringer's in-depth discussion of her use of the software in her

dissertation as a form of inspiration [43]. Rather than simply state the software that was used or confine the discussion to a single section, Bringer spreads her explanation of NVivo's use throughout her description of methodology—recognizing that she used the software in all aspects of her research. She incorporates her description of the software's benefits in her presentation of those aspects.

For Team Projects, Think Carefully about Collaboration Style from the Beginning NVivo is designed primarily for individual use. Although it is possible for more than one user to collaborate on the same project using NVivo Server 9, the standard NVivo product does not currently allow more than one user to access the same project at the same time. In the infant-feeding focus group project, we found it possible to use the software on a collaborative project, but this required some careful thought and additional work. Since this project was conducted by a research team that included two members from the School of Nursing, the process of coding and analyzing the data was a collaborative effort. Interestingly, in this case, this author was the only team member who had access to NVivo software. One of the more practical upgrades found in version 8 and expanded in version 9 of NVivo is increased power in exporting NVivo elements, such as transcripts, coding summaries, and reports of demographic data to Word and HTML formats; this feature facilitated collaboration with the infant-feeding research team members, even though they did not have access to the software. Of course, it would be ideal if all team members had access to NVivo. The software does have several features that facilitate collaborative research, and it offers several different options to support different styles of collaborating. (See http://www.qsrinternational.com/products_nvivo-server_features-and-benefits.aspx for more information on collaborative features.)

As a best practice, we recommend that researchers using NVivo in collaborative projects make careful decisions from the beginning. In particular, it is important for all team members to have a clear understanding of the model of collaboration that will inform their teamwork; the manner in which the software is used will depend on this choice of a model and will also depend on whether or not the software is available to all team members. So far, in the infant-feeding project, team members have been interpreting the data from two different disciplinary approaches: The author has been examining it as a professional communication researcher, and the other two team members have been approaching

it from the disciplinary perspective of nursing. In taking this approach to the data, we are following a model of "disciplined interdisciplinarity" [3]. If we wanted to take a different approach with more emphasis on discussing and negotiating a set of common themes and codes, we could use NVivo's import function to merge two or more coding schemes and apply the resulting scheme to our body of data. There are also software features that report on interrater reliability if team members are working separately to code the data after agreeing on a common coding scheme.

CONCLUSION

We have found that using the CAQDAS program NVivo has greatly affected our research projects. Its benefits in the areas of efficiency, multiplicity, and transparency have added a depth and a rigor to our projects that we would have been hard-pressed to achieve with a more traditional method. Still, NVivo's steep learning curve posed some challenges early on. Like many, we struggled—and are still struggling—to learn the software. To aid in learning the software, we have repeatedly turned to NVivo's provided online help system, the included sample project, NVivo's technical support staff, and Bazeley's *Qualitative Data Analysis with NVivo* [27]. A combination of the four (along with simply playing with the software) has solved all of the problems we have faced so far.

Returning to the scenario outlined at the beginning of this paper, we hope this tutorial has provided a starting place for professional communication researchers in similar situations who might be considering NVivo or another CAQDAS tool to help them solve the research problems they are facing. As we have tried to illustrate here, NVivo is a highly customizable, flexible tool that can be adapted to meet the varying needs of researchers in professional communication. Although its flexibility and adaptability can be overwhelming to the novice user, our experiences with the software suggest that

the initial difficulties can be overcome as long as a researcher is willing to experiment with the software and discover, sometimes through trial and error, the most effective way to use it in a particular project.

Whereas others encourage researchers to consider a balance between paper- and software-based methods [42] or to use software like NVivo only if the project calls for a detailed analysis of a large volume of data [32], we feel that qualitative research of all kinds benefits from movement to programs such as NVivo. It facilitates coordinated analysis of large amounts of data, but it is also a benefit to the deep introspection found in the theoretical analysis of only a few documents. Its ability to bring together the multiple interpretations of researchers from a variety of disciplines and more clearly represent the research process is a marked advantage to the styles of research routinely performed in professional communication. Although this software is far from cheap and may take a good deal of effort to master, we have found its benefits to be worth its costs.

Those costs in time, effort, and, of course, money, have helped us address some of the basic issues that we have faced as professional communication researchers. It has improved our efficiency in gathering and analyzing our data and thereby improved the quality of the interpretations we produced. It has facilitated the bricolage nature of our research by allowing greater synthesis between the differing types of data we collected. And it has helped to make our qualitative research more transparent to our readers. Especially with the NSF project, in which the main product was a dissertation and, thus, demanded a great deal of transparency for its research methods, the ability to demonstrate not just how the qualitative data were collected but how those data were interpreted added a great deal of validity to the study. Our use of NVivo gave us the ability to better address some of the key challenges in professional communication research: efficiency, multiplicity, and transparency.

APPENDIX

SOLVING A RESEARCH PROBLEM: HANDLING MULTIPLE MEDIA FORMATS WITH NVIVO

In the opening scenario, one aspect of the problem faced by our fictitious researcher was the question

of how to analyze data collected in multiple formats: audio recordings of interviews, video recordings of focus groups, Word transcripts, PDF research articles, and so on. In this Appendix, we use an example from the NSF project data to show
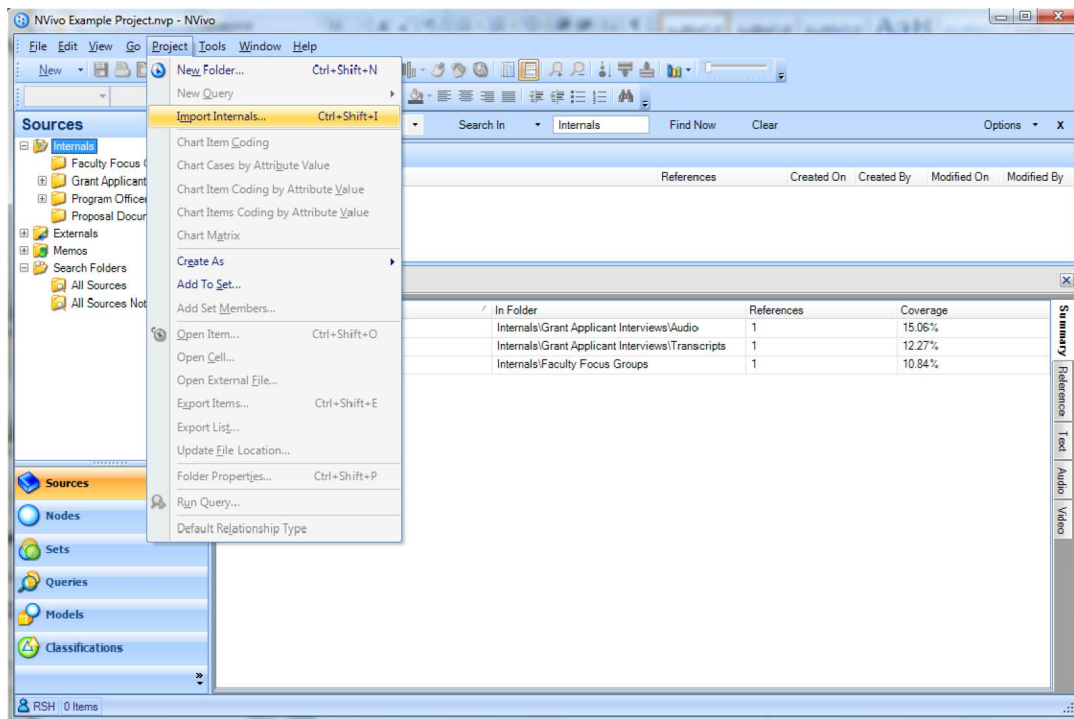
Fig. 5.   Import internal sources into NVivo through the project menu.

how we used some of NVivo's features to address a similar problem. (We demonstrate this process using version 8 of the software. However, version 9 was released by QSR International in the fall of 2010. Some aspects may differ in the latest version.) Specifically, we provide a brief walk-through using NVivo's nodes feature to compile research results stored in audio, video, and text to a single location. The walk-through is designed to demonstrate how NVivo can be used to collate multiple forms of data; the instructions provided here are not intended as a comprehensive help tutorial. For more comprehensive instructions, we recommend NVivo's included help system and Bazeley's *Qualitative Data Analysis with NVivo* [27].

(1) Import the sources you want to analyze into NVivo. This is done by going to the project menu and choosing to "Import Internals." (See Fig. 5.) Most text, audio, video, and image files can be imported. For those that cannot, an external source that describes the data is the best alternative.

(2) Select the particular portion of a data source you want to code to an existing node. These data can then be coded to a node by several means. We prefer dragging and dropping the selected data directly onto the node name. Fig. 6 shows this process with a comment from a focus group. The key combination Ctrl + F2 can also be used. If you want to code to a node that does not yet exist, the key combination Ctrl + F3 will create a new free node. That free node can later be added to a tree node structure if desired. Data that can be coded include fragments of transcripts or PDFs, regions of a photograph, clips of audio recordings, and clips of video recordings. Repeat this coding process for all of the relevant data sources. Note that the same data can be coded to multiple nodes by dragging and dropping or pressing Ctrl + F2 repeatedly.

(3) After the nodes have been populated, double clicking one opens it and gives access to all the text fragments, image sections, audio, and video clips that have been coded to that node. The various media are all grouped in tabs on the side of the screen, as seen in Fig. 7. Viewing the multiple data sources alongside each other in this manner makes it more efficient to begin the complex process of analysis while making sure that the initial ideas that sparked the creation of this node do not get lost.
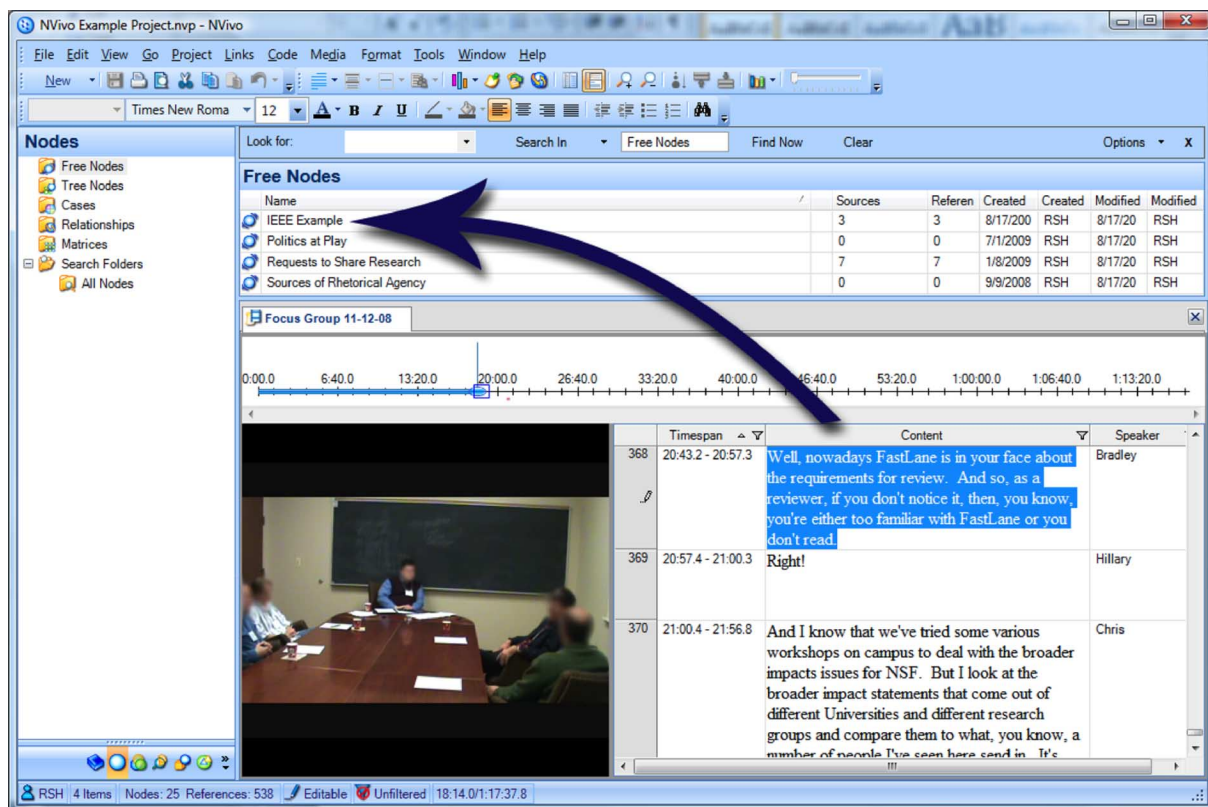
Fig. 6.   Code content to a node by dragging and dropping the content to the node name.
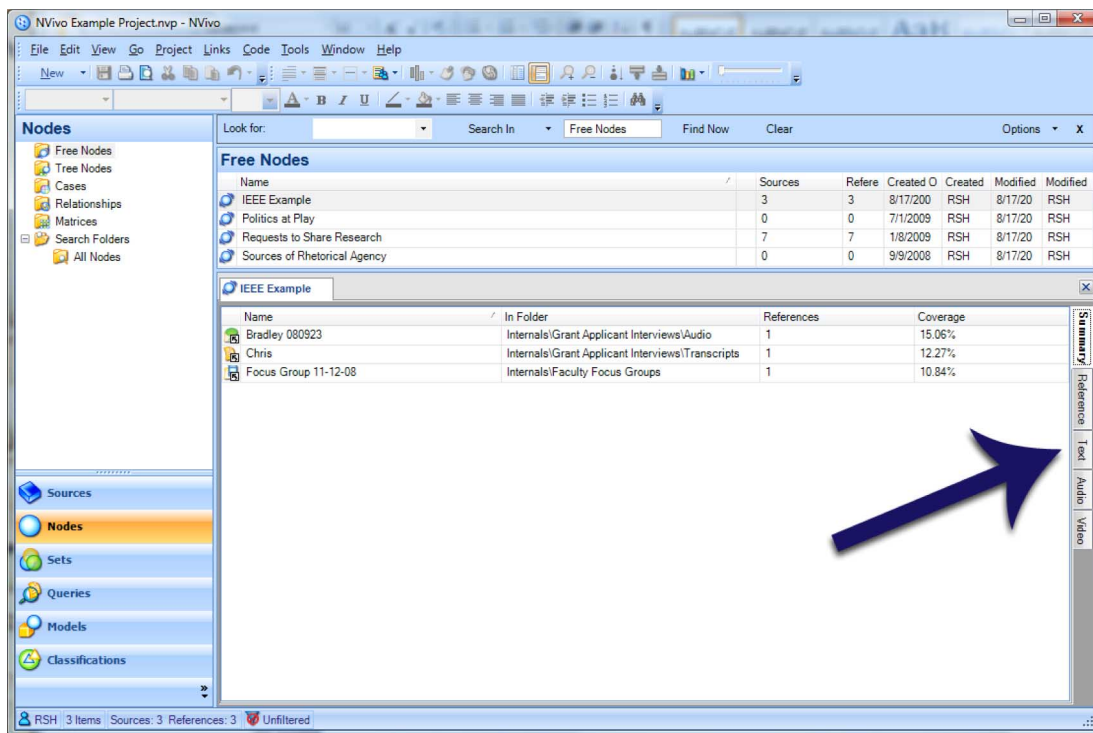

Fig. 7.   View the node's text and multimedia content through tabs at the window's edge.

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REFERENCES

[1] N. W. Coppola and N. Elliot, "Big science or bricolage: An alternative model for research in technical communication," *IEEE Trans. Prof. Commun.*, vol. 48, no. 3, pp. 261–268, Sep., 2005.

[2] A. M. Blakeslee and C. Fleischer, *Becoming a Writing Researcher.* Mahwah, NJ: Erlbaum, 2007.

[3] E. Barton, "Design in observational research on the discourse of medicine: Toward disciplined interdisciplinarity," *J. Bus. Tech. Commun.*, vol. 15, no. 3, pp. 309–332, 2001.

[4] D. Charney, "Empiricism is not a four-letter word," *Coll. Comp. Commun.*, vol. 47, no. 4, pp. 567–593, 1996.

[5] L. Gurak and M. M. Lay, Eds., *Research in Technical Communication.* Westport, CT: Praeger, 2002.

[6] J. Johnson-Eilola and S. A. Selber, Eds., *Central Works in Technical Communication.* New York: Oxford Univ. Press, 2004.

[7] H. A. McKee and D. N. DeVoss, Eds., *Digital Writing Research: Technologies, Methodologies, and Ethical Issues.* Creskill, NJ: Hampton Press, 2007.

[8] M. A. Hughes and G. F. Hayhoe, *A Research Primer for Technical Communication.* Mahwah, NJ: Erlbaum, 2007.

[9] S. Blythe, "Coding digital texts and multimedia," in *Digital Writing Research: Technologies, Methodologies, and Ethical Issues*, H. A. McKee and D. N. DeVoss, Eds. Creskill, NJ: Hampton Press, Inc., 2007, pp. 203–228.

[10] M. Catterall and P. Maclaran. (1997). Focus group data and qualitative analysis programs: Coding the moving picture as well as the snapshots. *Sociological Research Online.* [Online]. Available: http://www.socresonline.org.uk/2/1/6.html

[11] D. Dohan and M. Sanchez-Jankowski, "Using computers to analyze ethnographic field data: Theoretical and practical considerations," *Annu. Rev. Sociol.*, vol. 24, no. 2, pp. 477–498, 1998.

[12] P. Evans, "Boundary oscillations: Epistemological and genre transformation during the 'method' of thesis writing," *Int. J. Sociol. Res. Method.*, vol. 3, no. 4, pp. 267–286, 2000.

[13] N. G. Fielding and R. M. Lee, *Using Computers in Qualitative Research.* London, UK: Sage, 1991.

[14] U. Kelle, "Introduction: An overview of computer-aided methods in qualitative research," in *Computer-Aided Qualitative Data Analysis: Theory, Methods, and Practice*, U. Kelle, G. Prein, and K. Bird, Eds. London, UK: Sage, 1995, pp. 1–17.

[15] U. Kelle and H. Laurie, "Computer use in qualitative research and issues of validity," in *Computer-Aided Qualitative Data Analysis: Theory, Methods, and Practice*, U. Kelle, G. Prein, and K. Bird, Eds. London, UK: Sage, 1995, pp. 19–28.

[16] T. Richards and L. Richards, "Using hierarchical categories in qualitative data analysis," in *Computer-Aided Qualitative Data Analysis: Theory, Methods, and Practice*, U. Kelle, G. Prein, and K. Bird, Eds. London, UK: Sage, 1995, pp. 80–95.

[17] L. Richards, "Closeness to data: The changing goals of qualitative data handling," *Qualit. Health Res.*, vol. 8, no. 3, p. 319–328, 1998.

[18] L. Richards, "Qualitative computing—A methods revolution?," *Int. J. Social Res. Method.*, vol. 5, no. 3, pp. 263–276, 2002.

[19] J. Seidel and U. Kelle, "Different functions of coding in the analysis of textual data," in *Computer-Aided Qualitative Data Analysis: Theory, Methods, and Practice*, U. Kelle, G. Prein, and K. Bird, Eds. London, UK: Sage, 1995, pp. 52–61.

[20] QSR International. (n. d.). NVivo 8. [Online]. Available: http://www.qsrinternational.com/products_previous-products_nvivo8.aspx

[21] ATLAS.ti. (n. d.). [Online]. Available: http://www.atlasti.com/index.html

[22] CAQDAS Networking Project Homepage. (2010). [Online]. Available: http://caqdas.soc.surrey.ac.uk

[23] D. Filler. (2007, Feb. 1). Concurring Opinions ≫ Can NVivo qualitative empirical software help manage oceans of research? [Online]. Available: http://www.concurringopinions.com/archives/2007/02/can_nvivo_quali.html

[24] MAXQDA[10]—The Art of Text Analysis. (n. d.). [Online]. Available: http://www.maxqda.com

[25] Provalis Research. (n. d.). QDAMiner 3.2. [Online]. Available: http://www.provalisresearch.com/QDAMiner/QDAMinerDesc.html

[26] Economic & Social Research Council. (n. d.). CAQDAS. [Online]. Available: http://www.restore.ac.uk/lboro/research/software/caqdas.php

[27] P. Bazeley, *Qualitative Data Analysis with NVivo.* Los Angeles, CA: Sage, 2007.

[28] T. Richards, "An intellectual history of NUD*IST and NVivo," *Int. J. Social Res. Method.*, vol. 5, no. 3, pp. 199–214, 2002.

[29] QSR International. (n. d.)NVivo 9. [Online]. Available: http://www.qsrinternational.com/products_nvivo.aspx

[30] T. A. Schwandt, *Qualitative Inquiry: A Dictionary of Terms.* Thousand Oaks, CA: Sage, 1997.

[31] A. M. Blakeslee, "The technical communication research landscape," *J. Bus. Tech. Commun.*, vol. 23, no. 2, pp. 129–173, 2009.

[32] G. W. Auld et al., "Development of a decision tree to determine appropriateness of NVivo in analyzing qualitative data sets," *J. Nutrit. Educ. Behav.*, vol. 39, no. 1, pp. 37–47, 2007.

[33] L. Johnston, "Software and method: Reflections on teaching and using QSR NVivo in doctoral research," *Int. J. Social Res. Method.*, vol. 9, no. 5, pp. 379–391, 2006.

[34] S. Andrew, Y. Salamonson, and E. J. Halcomb, "Integrating mixed methods data analysis using NVivo: An example examining attrition and persistence of nursing students," *Int. J. Multiple Res. Approaches*, vol. 2, no. 1, pp. 36–43, 2008.

[35] K. E. Göransson, A. Ehrenberg, M. Ehnfors, and M. Fonteyn, "An effort to use qualitative data analysis software for analysing think aloud data," *Int. J. Med. Inf.*, vol. 76, pp. S270–S273, 2007.

[36] R. Lakeman, "Qualitative data analysis with NVivo," *J. Psychiatric Mental Health Nurs.*, vol. 15, no. 10, p. 868, 2008.

[37] L. Wong, "Data analysis in qualitative research: A brief guide to using NVivo," *Malaysian Family Physic.*, vol. 3, no. 1, pp. 14–20, 2008.

[38] R. Smyth, "Exploring congruence between Habermasian philosophy, mixed-method research, and managing data using NVivo," *Int. J. Qualit. Meth.*, vol. 5, no. 2, pp. 1–11, 2006.

[39] A. Dean and J. Sharp. (2006). Getting the most from NUD*IST/NVivo. *Electron. J. Bus. Res. Meth.* [Online]. Available: http://www.ejbrm.com/volume4/issue1/p11

[40] P. Bourdieu and L. J. D. Wacquant, *An Invitation to Reflexive Sociology.* Chicago, IL: Univ. Chicago Press, 1992.

[41] A. Koerber and L. McMichael, "Qualitative sampling methods: A primer for technical communicators," *J. Bus. Tech. Commun.*, vol. 22, no. 4, pp. 454–473, 2008.

[42] E. Welsh. (2002, May). Dealing with data: Using NVivo in the qualitative data analysis process. *Forum: Qualit. Social Res.,* vol. 3, no. 2, article 26. [Online]. Available: http://www.qualitative-research.net/index.php/fqs/article/viewArticle/865/1880

[43] J. D. Bringer, L. H. Johnston, and C. H. Brackenridge, "Maximizing transparency in a doctoral thesis: The complexities of writing about the use of QSR*NVIVO within a grounded theory study," *Qualit. Res.*, vol. 4, no. 2, pp. 247–265, 2004.

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