Integrating Qualitative Data Analysis Software into Doctoral Public Administration Education

Alka Sapat
Florida Atlantic University

Lorena Schwartz
Florida Atlantic University

Ann-Margaret Esnard
Georgia State University

Emefa Sewordor
Georgia State University

ABSTRACT

The quality of doctoral research has long been debated in the field of public administration, along with discussions about the need for improved methodological preparation. What is lacking, however, are discussions in public administration pedagogy about conceptual understandings regarding the use of computer-aided qualitative data analysis software (CAQDAS), pedagogical strategies, and student and faculty perspectives and experiences about the use of such software programs. This article attempts to fill this gap by focusing on ways in which CAQDAS can be integrated into doctoral public administration education, the possibilities and limitations of such software, and strategies that faculty and students can use in teaching and employing such software. We also draw on lessons learned from a collaborative research project that used a qualitative data analysis software program.

KEYWORDS

Public administration pedagogy, qualitative research methods, computer-aided qualitative data analysis software

A number of public administration scholars have long been concerned about the quality of doctoral dissertation research in the field (see Cleary, 1992, 2000; McCurdy & Cleary, 1984; Perry & Kraemer, 1986; Stallings & Ferris, 1988; White, 1986a, 1986b). Methodological pluralism has been one of the features of this discussion, along with a call for increasing emphasis on qualitative research methods in public administration doctoral curricula. Recent research on public administration doctoral education shows that this call has been heard to a large extent. Stout (2013, p. 22) found that 51% of public administration doctoral programs offered a specific qualitative methods course in 2004–2005; that number rose to 71% in 2011–2012. While this increase bodes well for doctoral dissertation outcomes, there is still a lacuna of research on course content and ways in which knowledge and new developments in the field of qualitative research are being imparted to students.

This topic is particularly important given that past research has shown that case studies are very popular and that much research is inductive and qualitative in nature (Houston & Delevan, 1990; White, 1986a). As Stout (2013) notes:

> There is a strong preference for qualitative research in public administration, with the case study being a popular approach. This is quite common among practice fields and compelling arguments have been made for the validity and usefulness of case study, as well as other interpretive and critical approaches to naturalistic inquiry. However, the quality of research has been found lacking based on a diverse set of assessments and criteria. To move these research designs from mere description to analysis or diagnosis—to build theory, not just illustrate practice—qualitative research methods need improvement. (p. 21)

Improving qualitative research necessitates that public administration pedagogy stay abreast of key developments. One such key development in the field of qualitative research is the growing availability and use of computer-aided qualitative data analysis software (CAQDAS). Understanding when, why, and how to use such software would help prepare doctoral students for its appropriate use. However, despite the increasing use of CAQDAS by researchers and scholars of public policy and administration, deliberation about doctoral education and training in the use of appropriate qualitative data analysis programs lags behind. Apart from manuals or technical help provided by the producers of these software programs, discussions in public administration pedagogy about how to effectively prepare students to use CAQDAS is lacking.

Also missing are the student perspectives and experiences about the use of such programs and ways in which to learn them. This article attempts to fill this gap by focusing on ways in which CAQDAS can be integrated into doctoral public administration curricula, drawing on extant research on utilizing lessons learned from a collaborative research project. We also incorporate student and faculty perspectives from that research project. At the time that this article was written, two of the co-authors were doctoral students in public administration and public management programs, and they have incorporated their experiences and insights.

The central questions we seek to answer are:

1. In what ways can knowledge of qualitative data analysis software be integrated into doctoral public administration education?
2. What are some strategies that faculty and doctoral students can use to effectively learn and incorporate CAQDAS?

To address these questions, we begin by briefly discussing CAQDAS and summarizing the different types of software available. Since there is considerable debate in the field about its usage, we then address how this debate can be presented to students as part of a structured course. We next discuss strategies for integrating knowledge of CAQDAS into doctoral classrooms and projects, focusing on the perspectives of both the instructor and the student. We conclude with a discussion of methodology and the appropriateness of methodological techniques in public administration doctoral education.

TYPES OF COMPUTER-AIDED QUALITATIVE DATA ANALYSIS SOFTWARE

As Rademaker, Grace, and Curda (2012) note, qualitative research has a long tradition, beginning in fields such as anthropology, with work by scholars such as "Boas, 1858–1942; Malinowski, 1884–1942; Mead, 1901–1978; and others" (p. 2). In contrast, the use of computers to aid traditional data analysis methods such as coding,[1] sorting, taking field notes, and writing memos, is relatively new; some programs were available and accessible to scholars in the 1980s, but options grew by the 1990s.

When CAQDAS was originally introduced to qualitative researchers, Weitzman and Miles (1995) developed a typology of these newly developing software programs to assist researchers in choosing the best program to meet their

research needs. Weitzman and Miles's typology divided the software programs into three main categories: (1) text retrievers/content analyzers that basically provide tools for the analysis of text and language, which include having a built-in thesaurus; (2) code and retrieve programs that let researchers code and retrieve sections of text, identify variables and topics for survey research, assist in identifying themes that fit within a range of issues and fields, and can be integrated into a variety of content analysis tools; and (3) code- based theory builders that allow researchers to apply thematic codes to data, which simplifies the writing and interpretation of that data and allows researchers to reduce that data along thematic lines by merging variables or concepts into higher-order themes (Lewins & Silver, 2009).[2] Today's software has muddled the distinction between the second and third categories (Lewins & Silver, 2009). Many software programs listed as code and retrieve programs are also listed as code-based theory builders. However, a variety of software programs are available in these three categories that serve the purpose of making a researcher's work easier as well as provide a means of showing the researcher's analysis more effectively (Lewins & Silver, 2009). What these software programs do not provide researchers is their "methodological or research framework" (Lewins & Silver, 2009, p. 3). Based on our research, some of the most popular CAQDAS programs (by type) are listed in Table 1.

APPROPRIATE APPLICATIONS OF QUALITATIVE SOFTWARE: SHOULD CAQDAS BE USED?

To integrate qualitative software into doctoral student education, one of the first issues to consider is its appropriate place and value for pedagogy and research. For qualitative researchers, the technological debate has long existed over issues related to recording interviews with tape recorders during field studies (Fielding & Lee, 1998; Gibbs, Friese, & Mangabeira, 2002; Weitzman & Miles, 1995) and the use of manual or computer-assisted methods for recording interviews (Welsh, 2002). These recordings distanced the researcher from the data because instead of a researcher making handwritten notes during interviews, a typist or secretary was transcribing the recordings (Gibbs et al., 2002). However, the verbatim transcript gave the researcher the ability to think about and analyze the data more closely, to determine whether it supported his/her various analytic interpretations of the data. In addition, these verbatim transcripts provided an accurate record of interviews, which opened the door to other types of data analyses that required an accurate record to be kept (Gibbs et al., 2002).

The growth of qualitative software programs led to further debate among qualitative scholars about the advantages and disadvantages of using CAQDAS (Hutchison, Johnston, & Breckon, 2010; John & Johnson, 2000; Johnston, 2006; Richards, 1998; Richards & Richards, 1995; Weitzman, 2000). Some feared that CAQDAS would lead researchers to undertake analysis without comprehending the broader implications of techniques (Richards, 1998; Weitzman, 2000). Other concerns related to losing "closeness to the data" and not being able to maintain knowledge about the content (Fielding & Lee, 1998; Mangabeira, 1996; Richards, 1998; Weitzman & Miles, 1995). Overall, scholars worried that CAQDAS would become so automated and technical that it would not be able to reflect the researcher's interpretation of the human stories that were of primary concern (Kelle, 1995).

Nevertheless, there was growing recognition that CAQDAS is just one tool in a qualitative researcher's toolbox and that essential tasks by researchers, such as the ability to work through the data and develop evolving analyses, were still needed (Baugh, Hallcom, & Harris, 2010). As noted by Gibbs et al. (2002),

> the use of new technology still raises issues like what should be analyzed, how it should be analyzed and in what ways the knowledge and understanding gained are different and more or less well founded than those gained in more traditional ways. (n.p.)

TABLE 1.
Examples of Qualitative Software Programs

Software (year developed)	Brief description	Website
Text Retrievers/Content Analyzers		
TAMS Analyzer, or Text Analysis Markup System for Macintosh systems (Mac OSX) (2002)	• Allows researchers to assign ethnographic codes to data • Selected text can then be extracted, analyzed, and sorted through; data can be recoded, run, and refined, allowing researchers to generate reports about the coded data	https://www.sourceforge.net/projects/tamsys
Code and Retrieve Software		
Event Structure Analysis (ESA) and Ethno 2 (1988)	• Used in the analysis of sequential events to see how these events are logically connected using diagram testing • A composition analysis provides how people, things, and actions are linked by the events	http://www.indiana.edu/~socpsy/ESA
Theory-building Software		
AQUAD (1987)	• Looks for segments and allows researchers to label segments in texts, audios, photos, or videos • Researchers can write memos or insert annotations that link texts, audios, photos, or videos and word analysis to selected criteria • Segments can be retrieved and tables constructed using criteria	http://www.aquad.de/en
ATLAS.ti (1993)	• Popular software used for performing grounded theory and content analysis by letting researchers graphically examine the hierarchical and relational connections between the researcher's codes, documents, and memos • Has several options for attaching memos and comments to selected text segments, documents, and codes	http://www.atlasti.com/de
Dedoose (NA) (Web-based tool)	• Allows researchers to upload text, video, or audio • Color-coded highlighting and various user-defined categories • Imports and integrates qualitative and quantitative data from Word or Excel files and other formats • Provides for interrater reliability testing; Dedoose is only available through a monthly/annual subscription	http://www.dedoose.com
Hyper Research v. 2.6 (1997)	• Allows for the coding of any piece of data—text, image, audio, video, or PDF—and for automatic coding using keywords • Memos can be simultaneously created with codes and be included in reports or saved as separate documents • Allows researchers to summarize codes quantitatively or through models and allows complex descriptions of code relationships • Researchers can analyze and create reports based on selected codes so that subset studies can be created from the data saved in the program	http://www.researchware.com

TABLE 1.
Examples of Qualitative Software Programs (continued)

Software (year developed)	Brief description	Website
Theory-building Software (continued)		
MAXqda (1989)	• Allows researchers to import data from focus groups, interviews, online surveys, audio and video files, or social media • Material can be organized in groups and then linked to each other and shared among team members for comment • Coding can be done by dragging and dropping or done automatically • Extended transcription functions to adapt speed/sound volume • Project files can be exported into Excel/Word/images/other formats	http://www.maxqda.com
NVivo (1999) (Originally called NUD*IST)	• Helps organize and analyze non-numerical or unstructured data from a multitude of formats (rich text, video, Word, PDF, spreadsheets, Web, and social media) for detailed qualitative analysis and modeling • Search engine and query functions allow researchers to test theories, identify trends, and cross-examine information • Allows for network and organizational analysis, evidence-based research, discourse analysis, grounded theory, ethnography, phenomenology, and mixed methods research • Data can be exported and imported with applications like Excel, Word, SPSS, Survey Monkey, and EndNote	http://www.qsrinternational.com/nvivo-product
QDA Miner (2005)	• Offers on-screen annotation of texts and images; code splitting, merging, searching and replacing, or virtual grouping of codes • Allows memos/hyperlinks to other coded segments, files/websites • Geotagging and time-tagging geographic and time information to text segments or graphic areas, to create dynamic maps • Ability to analyze relationships both qualitatively and quantitatively by using numerical or categorical properties • The merging of multi-user input and checking interrater agreement through Free Marginal, Scott's pi, and Krippendorff's alpha, and creating a report and log of entries by multiple coders • Creation of a command log with an audit trail for transparency	https://www.provalisresearch.com/products/qualitative-data-analysis-software
Qualrus (2002)	• Can analyze text, web pages, images, audio and video sources • Uses intelligent coding advice that learns a researcher's coding tendencies; these code suggestions provide more reliability • Claims more reliable analysis by providing an objective standard to minimize individual coder differences and coding drift • Can code descriptions and values and attach memos to code segments. Frequencies and comparisons of occurrences of codes possible. • Reporting functions to incorporate all summaries and displays	http://www.qualrus.com

Other scholars have pointed out that when a researcher is traveling through the "early stages of annotating, coding and linking to more explicitly analytical stages," both traditional qualitative research and CAQDAS are equally critical and demanding (Bulloch & Rivers, 2011, p. 2), no matter one's position on the use of CAQDAS.

Research frequently involves a search for meaning, and researchers often attempt to make meaning from the data collected (Yanow & Schwartz-Shea, 2014). Qualitative research data such as interview transcripts, notes, and summaries may produce a large volume of text, depending on the size of the project. How the researcher decides to handle this text can also determine how "disorganized and messy" that data will become (Lewins, 2001, p. 303). Researchers often choose to use particular methodologies simply to improve efficient data management through the use of various CAQDAS software platforms (Cousins & McIntosh, 2005). Many CAQDAS packages offer similar tools, as illustrated in Table 1, but how they provide those tools varies (Lewins, 2001). Scholars review the data they have collected to determine the best method of using and presenting that data, whether in a peer-reviewed article, at a conference, or for a government agency. These scholars are facing the same questions: what understandings from the data need to be included and what is the best way to present these data? Related issues are concerns about validity, reliability, reflexivity, and the legitimacy of claims, all of which need to be presented and discussed with students in deliberations about the use of CAQDAS. Since these are the key issues that have been raised in extant research with respect to CAQDAS, they are discussed in more detail below.

Validity, Reliability, Trustworthiness, and Rigor

Scholars have debated validity and reliability in qualitative research for many years (Welsh, 2002). Researchers often use CAQDAS for organizing, categorizing, and searching data, especially if a data set involves large amounts of text (MacMillan, 2005). However, critics counter that terms such as *validity* and *reliability* may be misapplied in qualitative research and that more appropriate terms are the *trustworthiness* and *rigor*, as well as quality of the data; but what remains essential to all is that the research is performed in a "thorough and transparent manner" (MacMillan, 2005, n.p.). As noted by Rademaker et al. (2012, p. 3), CAQDAS assists researchers in ensuring that their work is trustworthy and verifiable, not because the software creates rigorous analysis, but because the software is able to organize data in a manner that allows the researcher to link the data to various interpretations and themes. Thus, the methods chosen by a researcher to represent and analyze data are significant. Data management features of CAQDAS typically allow researchers to work with large data sets without diminishing complexities of the data, while still developing applicable analyses. However, some critics note that large data sets may cause researchers to emphasize the scale of their data rather than the robustness of their analysis (Seidel, 1991; Taylor, Lewins, & Gibbs, 2005).

In terms of its advantages, some scholars believe CAQDAS provides a higher amount of trustworthiness, rigor, and validity to data analysis because of its capacity to simplify the coding and analysis of data, which reduces researcher bias (Goble, Austin, Larsen, Kreitzer & Brintnell, 2012, n.p.). The reason researchers often give for using CAQDAS is the ability to provide proof of "the analytic process" through its notes and memo capabilities that are directly linked to the data (Goble et al., 2012, n.p.). These note and memo trails assist in achieving transparency and rigor in researchers' methodological choices and hold them accountable, while still allowing for innovative and effective use of data (Goble et al., 2012, n.p.). Similarly, Ryan (2009) notes that "software programs … enable researchers to make visible their methodological processes for a more 'trustworthy' study" (p. 158). It is assumed that researchers will choose their methodology because of fit with data and because it serves the means necessary to impart knowledge to others in their peer community (Prasad, 2005; Yanow & Schwartz-Shea, 2014).

What is important to stress to students is that the researcher is the ultimate instrument being

used in the research, as she or he has the most influence on the outcome (Miles, Huberman, & Saldaña, 2014). It may also be important to note that whether we use "thick descriptions," as Geertz (1973, 2000) identified, that are rich in context (Miles et al., 2014) or whether we decide to use quantifiable methods that show that there has been a significant correlation between *x* and *y*, we must provide a good, logical rationale for our choice and why our method is the best for the type of information we are seeking to demonstrate. Students need to be cognizant that the goal of research is to obtain a perspective of the context being studied, which can provide a comprehensive, wide-ranging, and consistent review of that material. This allows researchers to capture deeper understandings of the material being studied and in the long run be able to more precisely justify or support their interpretation (Miles et al., 2014).

Reflexivity

Reflexivity is another important issue that needs to be discussed while learning and using qualitative software. As noted by Yannow and Schwartz-Shea (2014), the knowledge that a researcher presents can be instrumental or reflexive. Woods, Macklin, and Lewis (2016) define reflexivity as a "researcher's self-awareness and understanding of what they bring to the research act: their capabilities, knowledge, experience, values, hopes, fears, as well as their epistemological and ontological assumptions" (p. 387). Scholars worry that researchers are choosing how they approach their research design, goals, and even their outcomes based on the types of software that may be available, or that they may prefer, or that they may be able to operate. Thus, reflexivity requires that researchers using CAQDAS acknowledge their awareness that the software has an impact on both their judgment and their actions (p. 387). CAQDAS may lead some researchers to use software to enhance reflexivity; on the other hand, it may also lead researchers to choose manual coding techniques rather than confront the learning curves and other limitations of CAQDAS (p. 397).

To use CAQDAS program features to enhance a researcher's reflexivity, Woods et al. (2016, p. 397) recommend that researchers document and monitor their processes by doing the following: (1) explaining their logic and tracking their reflexive thought in journals or logs by using timely memos; (2) recording their thoughts relating to their ideas and data; and (3) placing explanations regarding their analytical reasoning in memo sections next to coded text. Students should also note that it is nearly impossible without a great deal of investigation, research, respect, and critical theory to capture the importance of various cultural differences, symbolic meanings, hidden agendas, unspoken words, and unwritten words that a researcher collects in preparation of her or his research (Altheide, 1999). The richness of experience is what makes the review of documents, or films, or interviews of humans so difficult. The method of analysis becomes critical in determining how a researcher will present the data, and

> the challenge for the CAQDAS community…is to contextualise feedback within methodological orientations and translate this into software functionality. If both communities rise to these challenges, it should become clearer that CAQDAS packages can play a significant role in the furthering of social scientific knowledge. (Bulloch & Rivers, 2011, p. 2)

Thus, CAQDAS can support a researcher's reflexive actions, but to bring that about, researchers need to do the following: (1) pay attention to all data, including data that may be "inconvenient or otherwise not come to our attention" (Becker, 1998, p. 85); (2) be hypercritical of their work and themselves (Rubin & Rubin, 1995, p. 227); and (3) consciously decide to use the tools available in these programs, such as memos (Woods et al., 2016, p. 397).

Advantages and Disadvantages of CAQDAS

In addition to the key concerns discussed above, the use of CAQDAS has been seen as useful and has been critiqued in a number of other ways. Given the rich debate that prevails regarding

TABLE 2.
Advantages of Using CAQDAS

Organization and Analysis

Data management & organization	• Assists in recording, storing, sorting, managing, and interpreting data, with features such as indexing all material related to a specific code contained in the data (Carcary, 2011; Fielding, 2000; Leech & Onwuegbuzie, 2007) • Allows researchers to sort and pick relevant material (Leech & Onwuegbuzie, 2007) • Enables graphical representations of data, which helps understand the data, analysis, and interpretation proposed by the researcher (Rademaker et al., 2012)
Tools & features of programs assist in coding, categorizing, analysis, & report writing	• Provides content search tools, linking tools, coding tools, query tools, writing and annotation tools, and mapping and networking tools (Carcary, 2011) • Significantly reduces transcription time by coding data in audio format, which can be ordered into themes or codes (Gibson, Callery, Campbell, Hall, & Richards, 2005) • Hypertext links can be used to navigate between codes and quotations within audio and video links and provide links to audio and video clips in final reports (Gibson et al., 2005) • Provides the ability to work with nontextual data such as pictures, video, and audio and assists in organizing, categorizing, and searching data, especially large data sets (Carcary, 2011) • Can directly import text into CAQDAS programs and export links into written reports, which enables the analysis and write-up of research findings early in the research process; this results in the researcher becoming closer to his or her data (Carcary, 2011)

Quality of the Research

Improves reliability, trustworthiness, & transparency	• May improve trustworthiness and confirmability, as it allows others to see how researchers have linked the data to various interpretations and themes (Rademaker et al., 2012) • Enhances reliability, as other researchers can verify the researcher's interpretations and trace a researcher's logic through her/his work (Carcary, 2011) • Enhances transparency when the researcher's ideas are documented and can be traced back
Reflexivity & rigor	• Enables more rigorous analysis by allowing researchers to try out and broaden coding categories without the fear that original categories will be lost; this allows for a rigorous analysis of the data (Rademaker et al., 2012) • Improves internal validity and reflexivity because CAQDAS assists researchers to continually reflect on their data during the coding process, to determine whether the coding is leading to the intended goals sought by the researcher; this process enhances the adoption of a constant comparative method (Carcary, 2011)
Auditability* & legitimacy	• Enables auditability, which can provide "evidentiary quality" often lacking in manually conducted research (Goble et al., 2012) • Ensures greater rigor and validity because of ability to simplify the coding and analysis of data, which reduces researcher bias (Goble et al., 2012)

**Auditability* is basically *replicability*, as the term is known in quantitative research, and introduces an identifiable process (Goble et al., 2012) that makes it appear more "scientific" and "legitimate."

TABLE 2.
Advantages of Using CAQDAS (continued)

Other Advantages	
Facilitates group research	• Assists diverse scholars to collaborate in research and maintains accountability through group coding; reviewing through a group/team approach allows the team/group to learn and familiarize themselves with data (Rademaker et al., 2012) • Assists multiple authors to understand multiple perspectives (Rademaker et al., 2012); multiple coders can strengthen the trustworthiness of the findings via investigatory triangulation (Leech & Onwuegbuzie, 2007)
Applicability & versatility	• Text can be easily coded into new emergent concepts, categories, or themes (Leech & Onwuegbuzie, 2007, p. 578; MacMillan, 2005); can include social media and Web-based data
Allows for the comparison of large data sets	• Enables researchers to handle large volumes of data associated with meta-analyses or to maintain differently coded versions of a single data set, with a view to comparing and assessing different coding schemes (Fielding, 2000)

the use of CAQDAS, it is important to present students with its advantages and disadvantages for research. Table 2 lists some key advantages of using CAQDAS that have been discussed in extant research, grouped into three categories: organization and analysis, quality of the research, and other advantages.

While these advantages have led to the growing use of CAQDAS and the introduction of new software (shown in Table 1), there are some scholars who have critiqued this trend (Fielding, 2000; Goble et al., 2012; Rademaker et al., 2012). To assist students and researchers in deciding whether to employ CAQDAS in their research, Table 3 summarizes some disadvantages, grouped into three categories: concerns about coding, ontological and epistemological concerns and applicability, and other disadvantages.

If instructors wish to provide a graphical comparison of these key advantages and disadvantages, they can use Figure 1. However, in understanding these benefits and drawbacks, it is important to point out to students that a simplistic one-to one correspondence and comparison of advantages and disadvantages of using CAQDAS cannot be made.

INTEGRATING CAQDAS INTO PUBLIC ADMINISTRATION DOCTORAL PROGRAMS

If CAQDAS continues to be a key part of qualitative research, it is important that doctoral students in public administration learn to use the software correctly. As noted by Davis and Meyer (2009), a common misperception about qualitative software is that the program will analyze the data for the researcher (as quantitative software might). They point out that since it is the researcher who decides which features and codes to use and when, the researcher cannot be separated from the program; thus, they argue that it is essential to learn the software before using it. We contend that to effectively integrate CAQDAS into doctoral programs, faculty need to consider strategies both within and outside the classroom. We also note that there are strategies that doctoral students themselves could employ and need to consider with respect to qualitative software. With these aims in mind, we categorize two sets of strategies and considerations for effective integration: the first are those that faculty can use within and outside the classroom; the second are those that doctoral students can use in their own dissertation research or in team research projects with faculty and other students.

TABLE 3.
Disadvantages of Using CAQDAS

Concerns About Coding and CAQDAS

Coding vs. interpretation	• Over-metrification; not ideal for exploring narratives or linguistics on its own because essential meanings may not be codeable, as they are too large and encompassing (Fielding, 2000)
The coding trap & distance	• The temptation to code and quantify • Danger of being more process-oriented (focusing too much on coding) rather than outcome-oriented (focusing on theory and whole picture) • CAQDAS program designs—especially the code and retrieve programs—may shape the outcomes of the analytic process to assist researchers perform grounded theory research (Gibson et al., 2005); coding process can become an "electronic filing cabinet" because the capacity to delve into the analysis of the data has been seriously restricted by researchers' limited amount of time to fully analyze data (Fielding, 2000) • Can distance researchers from their data (Goble et al., 2012)

Ontological & Epistemological Concerns and Applicability

Ontological & epistemological concerns	• Richness and complexity of qualitative data may not readily fit software's quantification; can bias meanings (Goble et al., 2012) • Reflection on self-biases and situational awareness is a must in CAQDAS because of the ease of simply clicking and assigning themes and codes to data (Rademaker et al., 2012) • Not needed in hermeneutic phenomenology • The search for shared meaning and intercoder reliability may be seen as antithetical to qualitative and interpretive research processes
Nonapplicability	• Not applicable, according to some, to nonempirical interpretivist research (Fielding, 2000) • Coding as analysis activity does not need to occur in hermeneutic phenomenology but yet forms the basis of many CAQDAS programs • CAQDAS is a tool but it is not a methodology (Goble et al., 2012)
Distance from the data	• Can make some researchers feel overly familiar with the data, making theoretical analysis of the data more difficult; thus, there is a need to be reflexive and critical—not forcing square pegs into round holes (Rademaker et al., 2012) • Software complexity can push users to skimp on careful inspection of data before codes are assigned (Fielding, 2000)

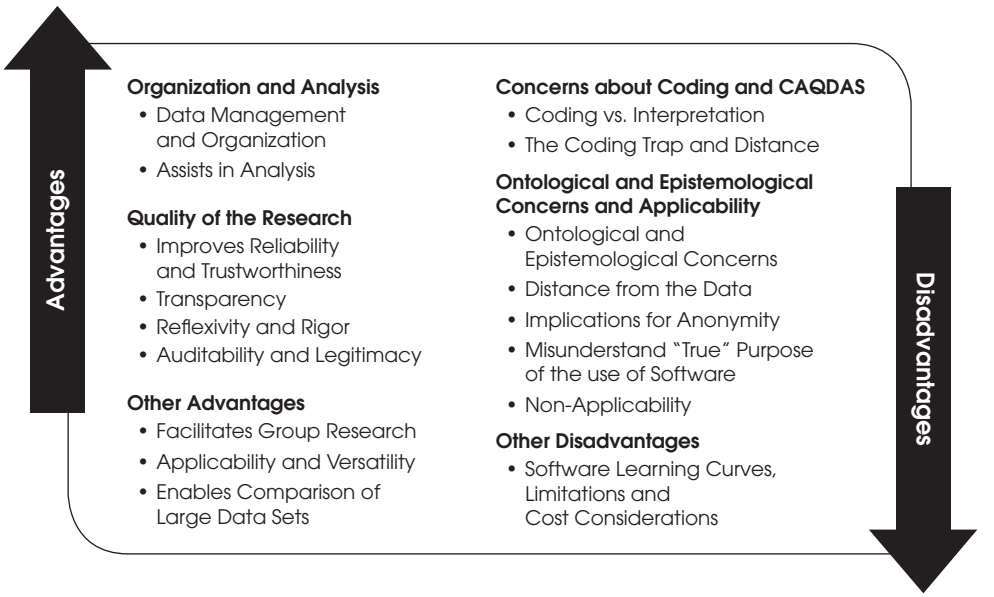
Other Disadvantages

Implications for anonymity	• Using audio links or video links endangers anonymity, and the use of bleeping or editing of audio or visual links to preserve anonymity may interfere with the true meaning of the audio or video clip (Gibson et al., 2005)
Misunderstand "true" purpose of the use of software	• Learning in isolation or not in the context of qualitative methods can make researchers mistakenly view analytic features of packages as "qualitative analysis"; CAQDAS cannot be a substitute for analysis or be used on all qualitative methods (MacMillan, 2005) • Unrealistic expectation about what software can do tends to contribute to the myth that the software program is the method itself (MacMillan, 2005)

TABLE 3.
Disadvantages of Using CAQDAS (continued)

Other Disadvantages (continued)	
Software learning curves, limitations, & costs	• Adds a step to time-consuming processes; use of CAQDAS is not a mainstream interest among methodologists (Fielding, 2000) • Often sees "text" as nothing more than data because of the pressure to provide evidence-based qualitative work • Learning the software, especially interrater reliability features, can be time-consuming • Some software requires special editing to cut audio files into separate files designated in the coding process; also, there is no industry standard for recording technologies and an underdevelopment of audio interfaces for CAQDAS software (Gibson et al., 2005) • Costs range from free (TAMS Analyzer) to up to $215 for student users and up to $1,340 for single-user licenses in university/nonprofit organizations (Center for Research Strategies, 2015)

FIGURE 1.
Comparison Summary of the Use of CAQDAS



Faculty Strategies to Integrate CAQDAS within and outside the Classroom

Strategies to integrate CAQDAS need to be grounded in the broader discussions of qualitative research. We consider some key approaches below.

Pros and Cons of CAQDAS and the Broader Perspective. As discussed above, there are several advantages and disadvantages to using CAQDAS. A good starting point is classroom discussion of the pros and cons of using qualitative software and presentation of the theoretical, conceptual, and methodological discourse around these issues in the field of public administration. What needs to be kept in mind is that qualitative software is a tool and should be used as such rather than letting it dictate the research question or findings. In particular, students need to be reminded that a balance needs to be struck between the inflection/richness/essential meanings conveyed through language and the coding. It is important to emphasize that the "interpretive process" and the decisions regarding research data and methodologies always remain in the researcher's hands (Lewins & Silver, 2009, p. 3).

Overcoming the Tactile-Digital Barrier and Avoiding the Coding Trap. Based on in-depth interviews with qualitative researchers, Gilbert (1999, 2002) notes that there are three levels of distance issues when working with qualitative data. The first is the *tactile-digital divide*, which occurs when people who are used to working with hard copies have to adapt to working on screens instead of paper. One may believe the tactile-digital barrier to have been largely overcome in a generation raised on computers. However, that might not be the case in a number of public administration doctoral programs, which tend to have many nontraditional students who have a great deal of field experience but who may not be as comfortable learning and using new types of software programs. Learning curves may therefore be steep depending on the composition of the class, and instructors should be cognizant of those issues and provide extra help if needed.

Once the tactile-digital barrier is dealt with, a second issue may arise. Due to the power of various qualitative software programs to undertake different types of analysis and their ability to link codes to relevant excerpts, users—particularly novice ones—tend to fall into a code and retrieve cycle or, as discussed above, *the coding trap* (di Gregario, 2003; Gilbert, 1999, 2002; Richards, 2002). This tends to occur when the student feels the compulsive need to code everything, because the software creates the expectation of coding and in many ways eases the process of coding. Gilbert (2002) notes that "participants became highly aware of the tendency to 'get sucked in' to coding" (p. 219). The coding trap tightens when the software user becomes so bogged down in coding that she or he cannot see the proverbial forest from the trees and tends to get too near-sighted and close to the data and coding, forgetting the broader picture and story being told by the data being analyzed. Scholars have long recognized this coding trap as a problem in qualitative research, but it is "worsened" by software that allows for easier coding and retrieval processes. Tactics to overcome this problem include reminders to be aware of the problem of near-sightedness and to make self-conscious efforts to step back from the descent into details (Bogdan & Biklen, 1992; Lofland & Lofland, 1995).

Instructors need to help students get past these barriers in order to move toward what Gilbert (2002) terms the third level, or the *metacognitive shift*. When users gradually adapt to confident software use, they are able to reflect on the process, including upon their own software use; they are able to correct errors; and they tend to make fewer mistakes, such as unmindful transformations of their data. Expertise developed with the software allows users to think more carefully about their work as they gain distance on a metacognitive level. As Johnston (2006) explains, users who do not reach the metacognitive level are like chess players who fail to think two or three moves ahead. Instructors can keep these levels in mind and strive to bring doctoral students to the metacognitive level in their use of qualitative software, by making them aware of these levels and of issues such as the coding trap.

Emphasizing Integration with the Study of Qualitative Research. To enable doctoral students to reach the metacognitive level, it is also important to integrate the use of CAQDAS into the learning of qualitative research itself. As Carvajal (2002) points out, departments often use the short-course approach to training that is described as being hands-on but that typically requires no prerequisite knowledge of qualitative methodology or methods. This leads to participants who typically work on someone else's data, and the focus shifts to technological rather than methodological aspects. Similarly, Johnston (2006) notes that departments often send graduate students for specialist training or bring in specialist trainers to teach specific software packages. She further writes that "it is impossible to teach students how to use the technical aspects of the software without talking about qualitative methods or to discuss the impact that software has had on the way we do qualitative analysis" (p. 382) and that students are also eager to fully understand the software. For these reasons, Johnston advocates fuller integration of qualitative methods and software training as part of a doctoral student's research training program.

The Scaffolding Approach. Integration of CAQDAS and attempts to reach metacognition levels can be helped by the scaffolding approach, which is a pedagogical technique. This technique is part of seven research-based principles for smart teaching recommended by a group of learning researchers at Carnegie Mellon University (Ambrose, Bridges, DiPietro, Lovett, & Norman, 2010). According to that research group, to become self-directed learners, students must learn to understand the demands of the task, assess their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed. *Scaffolding*, a recommended strategy to help metacognition, refers to the process by which instructors provide students with cognitive supports early in their learning and then gradually remove them as students develop greater mastery and sophistication. This technique can be used to help integrate the teaching of CAQDAS both within and outside the classroom.

For instance, instructors can begin by presenting the context surrounding the growth of CAQDAS in qualitative research and deliberating on the issues discussed in the previous section. This can be followed by class exercises and assignments that ask students to research different types of software, present them to the class, and facilitate discussion and questions on their use. Once students are familiar with the context and different types of software available, they can choose either an open-source software or one available to them at the university; and students can be given class exercises to use the software to organize literature, code a short newspaper article or interview excerpt, or start a research diary memo. Other useful in-class exercises that can aid in the learning process are group coding of material to understand issues related to inter-rater coding and reliability. Once students are comfortable doing some of these tasks in class, the instructor can assign short at-home exercises. The in-class and at-home exercises can be linked to a larger project, such as a research paper that asks students to use CAQDAS while investigating a topic of their choice.

CAQDAS can be used in various ways: to facilitate literature reviews (di Gregario, 2000); to code interview data (Seale, 2000); to keep research journals (Johnston, 2006); to undertake analysis of narratives in policy documents and in other forms of qualitative research such as grounded theory approaches (Bringer, Johnston, & Brackenridge, 2006; Hutchison et al., 2010).[3] Students can also use CAQDAS to keep journals and communication memos. As Davidson and Jacobs (2008) explain, coding journals help to keep track of codes and changes in codes, while a journal on methodological and research issues can be used to record steps used and issues that pertain to overall methodological questions. Further, communication memos can be used to place hyperlinks in pertinent text, with memos that can be addressed to an instructor or to a dissertation advisor. These steps can help increase the transparency of research procedures.

A note of caution here is that faculty initiatives to integrate qualitative software in doctoral public administration programs require that faculty themselves become well-versed in the use of the software. Moreover, there needs to be support at the institutional level, either by departments, colleges, or the university. As discussed above, several software programs are available for use, but these range from being open-source to more expensive licensed programs. If the university has adopted a qualitative software program, access is likely to be available to the program or might be purchased for a reduced cost. Institutional support can also take the form of user-group discussions, technical support, and in-person and online discussion networks.

Doctoral Student Strategies and Considerations for Learning CAQDAS

While the number of public administration programs that offer courses in qualitative research methods has increased substantially, 30% of such programs still lack such offerings (Stout, 2013, p. 11). For students whose programs do not offer qualitative methods courses, or who are in programs where such courses are offered but in which there is no exposure to qualitative software, requests could be made for faculty members to introduce or discuss the software. Finding courses in other departments, such as schools of education, public health or nursing, where there is considerable reliance on qualitative research methods, should also be considered. Other potential strategies are for students to take it upon themselves to use the software for a research project and search for faculty members within or outside the department who could serve as a mentor. While limited in scope and problematic for reasons discussed above, free webinars and training videos offered by software manufacturers may serve as cost-free ways to learn how to use the software. Other alternatives are to volunteer or request assignment to a faculty member working on research using qualitative software.

Team Research Projects and Learning by Doing. Other avenues for students and faculty to learn CAQDAS are through research projects that allow for experiential self-learning. Hands-on experience with using qualitative software while conducting research, combined with reflection on the process, can provide opportunities for students to learn how to effectively use CAQDAS.

Here, we document some of our experiences with working on a collaborative multi-institutional project funded by the National Science Foundation (NSF). The purpose of this project was to understand organizational perceptions on collaboration among diaspora organizations and international nongovernmental organizations and involved conducting 78 in-depth semi-structured interviews across five study areas between January 2013 and June 2015. The interviews lasted an average of 45 minutes and emphasized several key themes: the actions of the organizations, resources, partnerships, and challenges, among others. Two doctoral students, from public administration and public management and policy programs, transcribed the interviews, and transcriptions were rechecked for accuracy by the faculty members. The transcripts were uploaded into Dedoose to code and analyze relevant excerpts for several themes (e.g., resources and partnerships).[4] Through a process of deliberation and reflection over numerous project team meetings held over several months, the team developed a coding scheme through both deductive and inductive coding techniques (Miles et al., 2014). We trained the coding team in order to attain an acceptable level of intercoder reliability, prior to engaging in the final coding and analysis. In addition, to ensure consistency, we devised guidelines for the team members to follow during their thematic coding and analysis of the transcripts. As discussed in Box 1, our experiences with this group research project enabled students and faculty participants on our team to explore various CAQDAS features, greatly enhancing learning.

Overall, students gained intimate knowledge of the data by being involved in almost all aspects of the research project, from the institutional review board human subject application, preparation of interview questions, and scheduling of interviews, to transcribing audio recordings

of interviews and coding, all the way through to developing an understanding and appreciation for interpretation of the data and for qualitative research methodology more broadly. We believe that immersing doctoral students in an actual qualitative research project that uses CAQDAS is both an effective and efficient way to teach and learn qualitative research methodology and achieve proficiency with the software. The students gained knowledge and practical skills by being engaged in almost all aspects and phases of the qualitative research project. This learning-by-doing exercise made the students more open to the potential value of qualitative research generally and to CAQDAS specifically in research methodology. Furthermore, the exercise instilled confidence in the students, who now feel adequately equipped to apply these research techniques to their own dissertation research; one student on this team embraced CAQDAS in a mixed methods dissertation unrelated to the NSF-funded team project.

BOX 1.
Main Software Features Used

Memos. The memo feature available in Dedoose was used by team members to input, organize and manage project notes. Team members used memos to record their thoughts throughout the stages of the research process within Dedoose. The memo feature also facilitated sharing of these notes with the rest of the group, both inside and outside of the Dedoose environment. During project meetings, the memos often formed the basis of discussion on such matters as code refinement, excerpting, and intercoder reliability. The memos therefore served as a convenient way to share and reflect on our individual CAQDAS experiences with the rest of the research team, which was important to the students' training in the CAQDAS research process.

Interrater Reliability and Training. The training center in Dedoose helps research teams assess intercoder reliability by establishing code application tests for research teams with multiple coders. Code applications across test takers can then be compared to determine the level of agreement. We used the training center several times, in an iterative process, until we achieved a desired acceptable level of reliability among coders, before proceeding to our final stage of coding. In the early stages of coding, we used coding samples to test our initial levels of agreement. Poor results (low intercoder scores) signaled the need for the team to revisit our shared understanding of codes and clarify requirements for code applications, and they suggested further refinement of the coding scheme. Dedoose's training center restrictions, which are necessary for calculating its built-in intercoder statistic (Cohen's kappa and pooled kappa), also led to extensive deliberation and additional research into how to ensure reliability, which furthered our understanding of reliability issues. It also led to debates among our team about some disadvantages and restrictions of the software and added to our understanding of the problems and limitations in using CAQDAS.

Data Management and Filtering. Dedoose's filtering capabilities were instrumental in maintaining perspective while working with a large amount of data (893 pages of text). This was especially helpful in ensuring that the two student researchers on the team did not become overwhelmed by the volume of data, particularly as this was their first experience with qualitative research. We made extensive use of the filtering feature to extract subsets of our coded data, isolate applications of specific codes for further analysis, and facilitate the preparation of an article on a well-defined, bounded theme for journal publication.

Quantifying Qualitative Data. We used the analysis tool to easily generate descriptive statistics from our qualitative data, including counts of applications of specific codes by some variable of interest to give a sense of the distribution of codes in our data set. While this was a useful tool, the team used it with caution, keeping in mind and reminding ourselves of some of the disadvantages of relying too much on frequency analysis, which could dilute the interpretive process we were engaged in.

Note. This project used Dedoose Version 6.1.18, a Web application for managing, analyzing, and presenting qualitative and mixed method research data. See www.dedoose.com.

While students may use these strategies, they should exercise caution. An understanding of the broader goals that the doctoral student wants to achieve should play a major role. First, the student needs to understand how CAQDAS aligns with his or her dissertation and broader research objectives. Second, the student needs to consider learning times, costs, and the feasibility of using CAQDAS for research and how it aligns with broader career goals. For instance, it can be useful to have this skill on a vita for an academic job, but it may not be as useful for the practitioner doctoral student. Third, doctoral students need to consider the epistemological approaches they want to pursue in their dissertations and future research when considering the amount of time they want to invest in learning the software in more depth.

CONCLUSION

The move toward the application of more sophisticated qualitative data analysis software continues, and doctoral programs in public administration need to prepare students for potential use of such software in qualitative methods classes. Regardless of ontological and epistemological orientations, the increased prevalence of CAQDAS behooves at least some discussion of the possibilities and limitations of such software and how it can be used, including discussions of its possible misuse. As noted by Gilbert (2002), reaching metacognition levels—when users achieve a more sophisticated level of expertise with the software—allows the user to gain analytical distance and to avoid the coding trap and undertake more reflective self-monitoring. To achieve this level and enable greater expertise, discussions of the use of CAQDAS need to be integrated more fully into doctoral public administration education. This article discussed several strategies that faculty can use and considerations that both faculty and students need to take into account to help integrate the use of such software into doctoral qualitative research methods courses.

As Stout (2013) notes, "Great advancements in the study and practice of qualitative research methods have been achieved in the last several decades, to which public administration scholars may or may not have availed themselves" (p. 21). While there is a need for more up-to-date research on the state of doctoral education and the content of current qualitative research methods courses in doctoral public administration programs, this article endeavors to present a first step in the discourse on ways to improve the qualitative methodological preparation of doctoral students.

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NOTES

1 As Saldaña (2013) explains, *coding* is when a researcher assigns a "code" to identify meaning to a portion or piece of data—that is, interview transcripts, field notes, journals, drawings, photographs, video, e-mails, etc.—and then proceeds to link that idea or concept through cyclical acts of recoding. Those cyclical acts highlight, and assist researchers to focus on, salient features within the data in order to generate proper "categories, themes, and concepts, grasping meaning, and/or building theory" (p. 8).

2 Coding may allow the user to represent links among codes and to build higher-order classifications and categories or to frame and test theoretical propositions about the data. This is how these programs have become known as code-based theory builders (Lewins & Silver, 2009). Most of these programs enable creation of hierarchical network code trees, but some, like Atlas.ti and HyperResearch, allow for nonhierarchical network code trees as well (Lewins & Silver, 2009).

3 Students should, however, also be made aware of critiques of using CAQDAS for grounded theory, such as those provided by Glaser (2003).

4 Dedoose is a Web application for managing, analyzing, and presenting qualitative and mixed method research data. See www.dedoose.com.

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ABOUT THE AUTHORS

Alka Sapat is a professor at the School of Public Administration, Florida Atlantic University. Her expertise encompasses disaster and crisis management, vulnerability analysis, resilience assessment, environmental policy, and methodology.

Lorena Schwartz is a PhD student in the School of Public Administration at Florida Atlantic University and is currently completing her dissertation. Prior to entering the doctoral program, she was a practicing attorney specializing in family and civil law matters.

Ann-Margaret Esnard is a Distinguished University Professor in the Department of Public Management and Policy at Georgia State University. Her expertise encompasses urban planning, disaster planning, vulnerability assessment, and GIS/spatial analysis.

Emefa Sewordor is a recent graduate of the Department of Public Management and Policy at Georgia State University. Her research interests include program evaluation, public engagement, and policy innovation and diffusion.