

Nvivo and Technological Innovations in Research: Trends, Approaches, Limitations, and Implications for Qualitative Research

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Abstract

Research by scholars in the arts and humanities and even other faculties within the academia has taken a sharp turn since the 21st century as a result of the introduction of technological innovations in research approaches. Some of these innovations are the analytical and data organisation tools that have been designed for both qualitative and quantitative research. The knowledge of these is relatively known amongst academics in arts and humanities in Nigeria. For example, NVivo is one of these notable softwares that have been developed for qualitative and descriptive research. While many see NVivo as an analytical tool for descriptive and qualitative research, others see it as a software only for data organisation and management. This paper will dwell less on the methods and approaches to using NVivo for qualitative research but seek more to assess the significance and limitations of using NVivo for qualitative research in the Arts and Humanities. It will examine the implications NVivo has on the quality of research and on the researcher (in terms of bias, authenticity and attitude). This study will aid both junior and senior scholars to understand NVivo as one of the tools for qualitative research, its significance, limitations and usability. Furthermore, knowledge of this will provide another viable option for us to explore as we prepare for qualitative and descriptive researches in the Arts and Humanities.

Keywords: Qualitative research, NVivo, Arts, Humanities, Technology, Innovations, Data, Analysis, Management.

Introduction

It is instructive to examine how numerous current advances in technology have provided researchers with tools and applications designed to increase efficiency and improve workflow while conducting a qualitative research. Qualitative data collection offers the strength of

exploring ambivalence and investigating the reasons for views, but not necessarily their prevalence in wider society. The inherent value of a qualitative method, such as focus groups, therefore lies in its ability to uncover new information. This contrasts with a quantitative approach to simply 'measuring' public opinion

on a topic about which participants may have little prior knowledge (Catherine & Emma, 2015). Quantitative research tells us how many times or how often a phenomenon behaves in a certain way. However, in an attempt to expand or deepen our understanding of how things came to be the way they are in our societies, qualitative research has no substitute (Hancock, 2007).

In recent years, there has been an increase in number of qualitative studies carried out by scholars in the arts and humanities. Qualitative research usually produces large amounts of verbal and textual data in the form of recordings, transcripts and field notes. The systematic and rigorous preparation and analysis of qualitative data is usually time consuming and labour intensive (Pope, *et al.*, 2000). To lessen this burden, it is important that researchers in the arts and humanities become aware of the possibilities of using Computer Assisted Qualitative Data Analysis Software (CAQDAS) including but not limited to NVivo. Even though CAQDAS have been widely available for more than a decade, their use is still relatively limited. The dawn of modern technological innovations in qualitative research has eased these pains and have provided scholars with amazing tools that can hasten the entire research process – especially data acquisition, collation, interpretation and presentation. NVivo, one of the most prevalent CAQDAS software, is the major focus of this paper. The guide to using this software and its inner

workings will not be discussed here, rather the assessment of the significance and limitations of using NVivo for qualitative research, its implications on the quality of research and on the researcher (in terms of bias, authenticity and attitude) is the crux of this paper. Does the usage of CAQDAS make the researcher lazy? Can it be applied to all aspects of qualitative research? What are its implications on the research and on the researcher? These will be answered in this paper.

NVivo is the leading tool for qualitative analysis. Qualitative data is difficult to gather and process. Qualitative researchers use interviews, focus groups, documents even multimedia files to gather their data. NVivo is designed to handle all of these data sources and is effective in all qualitative methodologies. And NVivo helps in the management, coding, analysis and visualisation of qualitative data (Paré, 2009). It is a powerful platform that supports text, video, audio, picture data, PDF, surveys, bibliographic libraries from Endnote and the like, internet data from Facebook, Twitter, LinkedIn, YouTube and Survey Monkey, and notes taken using Evernote and OneNote. NVivo supports a range of “inductive and deductive methods to analyse qualitative data such as thematic and content analysis, within and cross-case analysis, discourse, conversational and narrative analysis, grounded theory, analytical induction, and qualitative research synthesis” (Paré, 2009: 4).

It would be a daunting task to discuss all the technologies that could be adopted by qualitative researchers, instead, I will describe technologies that can be used by qualitative researchers to enhance and improve the experience of conducting qualitative research in order to help researchers envision how such tools can increase our efficiency, enhance our interpretations, and further the reach of our scholarship (See Table 1). Please note that there is no guarantee on the ongoing availability or utility of any specific tool. And because numerous programs offer similar utility, “readers are encouraged to spend some time researching any programs before incorporating them into their qualitative research routines” (Moylan, *et al.*, 2015: 36).

This paper is descriptive in nature. The data for this study has been collected from different documentary sources relating to the use of CAQDAS, mainly NVivo, for qualitative research, including published journal articles, books, and the internet.

Technological Trends in Qualitative Research

The dawn of CAQDAS was marked by the development of a program called Non-numerical Unstructured Data Indexing Searching and Theorizing (NUD*IST), which was specifically designed for qualitative data management in 1980's. NVivo, one of the current popular qualitative data management programs, has its roots in the NUD*IST (Adongo, *et al.*, 2014). NVivo is a CAQDAS program

produced by QSR International. It has been designed for qualitative researchers working with very rich text-based and/or multimedia information, where deep levels of analysis on small or large volumes of data are required. NVivo is used predominantly by academic, government, health and commercial researchers across a diverse range of fields. NVivo is intended to help users organize and analyse non-numerical or unstructured data, that is, qualitative research data. The software allows users to classify, sort and arrange information; examine relationships in the data; and combine analysis with linking, shaping, searching and modelling.

The strength of NVivo lies in its high compatibility to research designs. The software is not methodological-specific, it works well with wide range of qualitative research designs and data analysis methods such as discourse analysis, grounded theory, conversation analysis, ethnography, literature reviews, phenomenology, and mixed methods. For instance, F. C. Zamanwe (2015), Adongo *et al.* (2014), Catherine (2016) all used NVivo to manage data for their respective different study designs. Particularly, in his own work, Zamanwe reflects on his own experience of using NVivo and aimed to provide evidence-based implications of using qualitative data analysis software, so as to keep fellow health researchers well-informed, and consequently allow them to make informed decisions on whether to use CAQDAS or not.

A basic overview of the NVivo system can be placed in four modules and includes: setting up a project and organising data in NVivo; preparing text and multimedia sources, managing a literature review, coding and analysing data; seeking patterns and identifying relationships, and presenting findings using graphic displays. NVivo helps to analyse qualitative data based on specific methods such as thematic analysis, grounded theory, or content analysis (Zamanwe, 2015).

So far, many softwares have been developed to aid in qualitative research work. They include HyperResearch, ATLAS.ti, CI-SAID, NUD*IST, N Vivo, QUALRUS, MaxQDA, QDA Miner, the Ethnograph, Leximancer and Transana (See Table 1 as illustrated by Sapat, et al. (2017) for examples of qualitative software programs and where to obtain them). This is why Sotiriadou, et al. (2014) opines that as the use and availability of qualitative software analysis tools increase, so does ambiguity regarding the choice of the most appropriate software in qualitative research. Researchers may base their decision on aspects such as the type and size of data set, their competence and skills in data interpretation and the level of engagement with data analysis they plan on undertaking.

Brief Method of Analysis using NVivo

Analysis is started with the creation of a new project in NVivo and then source folders within the new project –

say for transcripts and audio files. Upload your transcripts and audio files where available in the required formats. After all necessary files are transferred, the next step is coding. Coding here, according to Richards (2005), is the process of putting together extracts across documents that are related to each other into basins called nodes. If, for instance, one's analysis is driven by grounded theory principles, the first two transcripts and audio files can be read and listened to in detail respectively and interesting excerpts will then be coded to free nodes which are created in the process to house relevant excerpts or text from the transcripts. In NVivo, imported audio-file takes the form of an audio wave, which can be listened to and divided up into audio excerpts. A recommended practice is the audio coding process described by Wainwright and Russell (See Wainwright and Russell, 2010). After audio files are listened to and relevant audio excerpts are coded to new and or existing nodes, tree nodes can then be created from these nodes and coding to these nodes may continue with the rest of the documents. Contents of the nodes can be constantly reviewed by simply double clicking them. It is advised to turn on 'Coding stripes' to help manage the coding process by providing some insights on like where the densest parts or coding are and so, in line with the research objective, node classifications containing defined attributes for all respondents should be created. When this is done, nodes associated with each source are created

with the relevant details. Apart from coding to nodes, one is also able to connect ideas emerging from two or more sources using 'see also links'. There are memos in NVivo which can be created for documenting thoughts, doubts and insights that emerges as one goes through the data. Annotations can be created for both audio files and transcripts but they are particularly important when coding audio files because they were also acting as reminder or clarifications of audio excerpts. When the analysis process reaches an advanced stage, a broader picture and or a visual representation of the data and progress of the work then becomes a necessary prerequisite for development and testing of the theory. At this level, reports, queries, charts and models can then be created for presentation purposes.

It is likely that your categories and themes will change several times during the course of the project. Whatever route you take, you should focus on your research questions and be prepared to track changes in your interpretations. You need to keep careful notes of these in order to justify eventual 'findings'. Think about how

you will manage your research documentation (e.g. what facilities the program offers), especially if you don't already have a good feel for your data before you load it into a program such as NVivo.

NVivo can be very useful for coding and finding connections. The challenge is to understand how you are putting your data into the system. Depending on your level of organization in your notes and transcripts and pictures, the more NVivo can assist you. Having said that, for thematic analysis it can be handy, but you will need to develop a set of 'codes'. This development and the act of coding sections of the texts in itself can be mind-numbingly taxing and time consuming - and particularly problematic the more team members are involved. If you are working on your own at least you won't have to argue the case every time you think of a new code - but do spend some time at the start thinking about a simple coding framework and keep track of any additions and changes - you might want to go back and re-code items.

Below is a table with examples of trending qualitative software programs and where to obtain them.

Table 1: Examples of Qualitative Software Programs (Sapat, et al., 2017: 4)

| Software | Brief Description | Website |
|--|---|---|
| Text retrievers/Content analysers | | |
| TAMS Analyzer, or Text Analysis Mark-up System for Macintosh | <ul style="list-style-type: none"> •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 | https://www.sourceforge.net/projects/tamsys |

| | | |
|---|--|---|
| systems (Mac OSX) (2002) | coded data | |
| Code and retrieve software | | |
| Event Structure Analysis (ESA) and Ethno 2 (1988) | <ul style="list-style-type: none"> •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) | <ul style="list-style-type: none"> •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) | <p>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</p> <ul style="list-style-type: none"> •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) | <p>Allows researchers to upload text, video, or audio</p> <ul style="list-style-type: none"> •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) | <ul style="list-style-type: none"> • Allows for the coding of any piece of data – text, image, audio, video, or PDF – and for automatic coding using keywords | http://www.researchware.com |

| | | |
|--|--|---|
| | <ul style="list-style-type: none"> • 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 analyse and create reports based on selected codes so that subset studies can be created from the data saved in the program | |
| MAXqda (1989) | <ul style="list-style-type: none"> • Allows researchers to import data from focus groups, inter- views, 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) | <p>Helps organize and analyse 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 modelling</p> <ul style="list-style-type: none"> • 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) | <ul style="list-style-type: none"> • Offers on-screen annotation of texts and images; code splitting, merging, searching and replacing, or virtual grouping of codes | https://www.provalisresearch.com/products/ |

| | | |
|----------------|---|---|
| | <ul style="list-style-type: none"> • 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 analyse 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 | qualitative-data-analysis-software |
| Qualrus (2002) | <ul style="list-style-type: none"> • Can analyse 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 |

Implications of the Quality of Qualitative Research on the Research

The use of Computer Assisted Qualitative Data Analysis Softwares like NVivo has its consequences. There have also been contested issues about how far the software can actually assist with analysis rather than just with data management and this has called up two aspects of research – mechanical and conceptual. Thompson (2002) makes a distinction between the

mechanical and conceptual aspects of data analysis. The mechanical aspects, he says, refers to all the activities that characterise qualitative data analysis, such as marking up selected text with codes, generating reports, searching the text for key terms, usages and so on. These are the kinds of tasks that a CAQDAS can assist with because they can be time consuming, tedious and error prone. However, Thompson suggests that the conceptual aspects of

analysis, that include reading the text, interpreting it, creating coding schemes and identifying fruitful searches and reports, need a human and cannot be done by a CAQDAS. The researcher or analyst can test theories, identify trends and cross-examine information in a multitude of ways using its search engine and query functions. They can make observations in the software and build a body of evidence to support their case or project. It is also possible to manage access and analyse qualitative data and to keep a perspective on all of the data, without losing its richness or the closeness to data that is critical for qualitative research.

Bourdon (2002) discusses how NVivo and other softwares like it can be used to foster analysis by teams. In particular, he discusses how the use of CAQDAS can be fully integrated into the research process and how this integration can support collaborative teamwork and allow the exploration of analytic dimensions that would be difficult to explore in other ways. Bourdon examines this in some analysis that used NVivo and its Merge facility. The latter allowed separately created computer-based analyses to be merged together. He suggests this is best done using an analysis based on broad themes that can be agreed and exchanged (using the software facilities) amongst a team. Whilst this may lose some of the depth and specificity of the phenomena studied, Bourdon argues that it allows better exploration of differences between cases and facilitates the examination of

multiple perspectives of the research team.

The most used approach used in a CAQDAS is the grounded theory but any approach could also fit. This basically implies that NVivo has little or no influence on the design of the research. In particular, however, the presence of nodes in NVivo makes it more compatible with grounded theory and thematic analysis approaches. Moreover, the nodes provide structure that is simple to work with for creating codes and discovering themes.

In addition, NVivo also ensures easy, effective and efficient coding which makes retrieval easier (Bezeley, 2007). For instance, with NVivo one is able to relate a paragraph from one source to another paragraph in either the same or another source and retrieve it with less effort. This task could have been very tough if it was the traditional method of coding. Also, papers are difficult to manage and in manual coding, the loss of even a single paper could cause serious damage to the project. In NVivo, all the sources are kept together under one roof, which makes the data better managed and preserved. Although, files are located in different places within the same project, the links that are created makes retrieval simple while in the traditional style of coding, a researcher can spend long period of time searching for the missing papers or files rendering the process ineffective and inefficient. Likewise, when using NVivo it is easier to reshape and reorganise coding and

nodes structure quickly (Mclafferty & Farley, 2006). For instance, deleting, copying, moving and combining nodes could be done without affecting the sources by simply clicking a few buttons and this can be done in few minutes. This is not the case under manual analysis in which doing the same means an overhaul of the whole process.

NVivo also helps to improve accuracy of qualitative studies (Bezeley, 2007). For example, where manual searching can take as long as over four hours, NVivo or any other CAQDAS will do this in only a matter of seconds and the results will be more accurate and reliable. And to further ease the process of coding, especially when you have many transcripts, same queries could also be used to identify common words and codes which could be the starting point for coding. However, where one has few transcripts, it will be more appropriate to read all of them thoroughly as using NVivo for them will be less helpful. Additionally, the NVivo program could also generally facilitate accurate and transparent data analysis process (Mclafferty & Farley, 2006). This will enable somebody who may want to understand or follow what was done during the analysis process of any study; this is almost impossible where traditional manual analysis has been used. More so, the materials for manual analysis are best understood by the researcher him/herself and are usually difficult to sort but anyone who knows how to use NVivo can easily browse through a project and

understand how the analysis of the data was done.

One of the biggest mistakes some people make is to confuse the role of NVivo in the qualitative data analysis process. It is pertinent to emphasize that NVivo is a data management tool not a method of analysis. NVivo is great for organising data and helping you to make sense of it during the process of analysis. It is not suitable for every research project, in my opinion, NVivo is only really useful if you have large data sets. For example, 10 interviews that are 5-8 mins long don't necessarily need coding in NVivo, one can do that by hand using a printout of the transcribed data and a highlighter pen, this is a lot more efficient and effective with a lower learning curve. However, if one has about 15-20 interviews that are an hour long, then you do need a CAQDAS tool like NVivo. This will be very instrumental in helping to organise and manage large datasets with a clear coding structure which can help with the creation of themes and the searching of data.

On the Researcher

In the 21st century, the use of new technology still raises issues like what should be analysed, how it should be analysed and in what ways the knowledge and understanding gained are different and more or less well founded than those gained in more traditional ways (Gibbs, *et al.*, 2002). I agree with Gibbs, *et al.*, (2002) that using these technologies meant there was a delegation of the data

management part of the qualitative research process to machines and programs, which had an impact not only on how close to (or distant from) the data the researcher could remain, but also on the relationship between the data and the emerging analytic ideas of the researcher. Using a CAQDAS meant that new ways of thinking about how the analysis developed out of the data and how the analysis was supported by the data became possible. The use of a CAQDAS also made possible different kinds of analysis that could only be undertaken when the researcher is able to survey all the data he can, not minding how bulky they seem (Gibbs, *et al.*, 2002).

NVivo also has a silent role which is that the software has the potential to make the researcher more creative. Manual qualitative data analysis is so demanding and when you have, for instance, more than 1000 transcripts, chances that those sources can be read in detail are very low because of the copy-cut-paste burden posed by the traditional manual analysis system. Even when one has only 10 files to work with in this project, NVivo still relieves them of the burden associated with manual coding. In a bigger project, this could provide room for investigators to focus on finding underlying themes, interpretation and theory instead of wasting time with copy-cut-paste manual coding processes.

Furthermore, although it has been argued elsewhere that NVivo does not

take over the analysis process from the researcher, there is still possibility that the NVivo structure could determine rules for specific procedures. For instance, the software already has nodes which often signifies to the researcher to distribute his/her data into those containers. Similarly, while features like queries have been applauded for their contribution during coding (Walsh, 2003), Mclafferty & Farley (2006) argues that these features might serve to distance the researcher from the context of the data. Using query's searches as basis for coding can obviously dilute the thickness of the data and use of manifold synonyms might lead to partial retrieval of information. For instance, Zamanwe (2015) recalls in his study that when he wanted to find out if distance was an important factor to antenatal childcare attendance, he searched for the word 'distance' and got a few results which he coded to a node. But when he went through the transcripts in detail, he realised that "other words like 'the hospital is very far', which also implies distance, were missed by the query search" (p.6). The question then is, should we entrust this responsibility solely to the NVivo? Of course not, since no one is condemning or disregarding the traditional methods of coding and qualitative data analysis, the researcher should integrate the use of CAQDAS to their traditional/manual processes so as to avoid this melee. (Fig. 1)

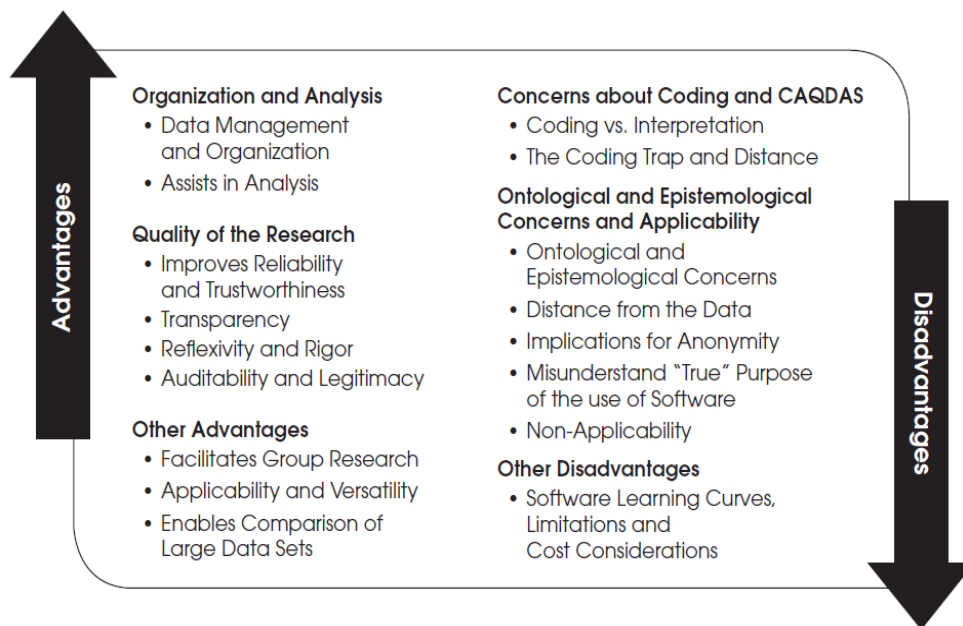


Figure 1: Comparison summary of the use of CAQDAS (Sapat, et al., 2017;11)

It is pertinent to note that the extent of influence the use of a computer assisted qualitative data analysis system on one's research is very minimal. Gibbs, et al., (2002) succinctly pointed this out thus: "There has been a tendency for researchers to try to give their proposals some kind of gloss of rigour by suggesting in research bids that the data will be analysed using a CAQDAS program. It is as if the use of software will somehow alone improve the quality of their work. Of course, CAQDAS cannot do that. It is just a tool for analysis, and good qualitative analysis still relies on good analytic work by a careful human researcher, in the same way that good writing is not guaranteed by the use of a word processor". (Gibbs, et al., 2002:10). Also, Welsh (2002) posits that it is impossible to disregard the role of the human

researcher in the analytic process. She agrees that using a CAQDAS "can ease the analysis process by validating (or not) some of the researcher's own biases of the data. However, the software is less useful in addressing issues of validity and authenticity in the theoretical ideas that arise during data analysis because of the creative way the themes emerge" (p.9). Welsh, therefore, opines that the researcher must apply the traditional methods of analysis as this may be the best way of gaining a deep understanding of the data and of examining the thematic ideas therein.

Limitations/Challenges in Qualitative Research

Digital technology has also meant that new ways of analysing data through computer assisted qualitative data

analysis (CAQDAS) are now possible. Nevertheless, there is still much debate about the degree to which CAQDAS can itself produce qualitative analysis or merely assist with its development by human researchers. At the same time there is now evidence of analytic developments made possible by the use of new technology (Gibbs, et al., 2002).

For a long time, electronic data analysis has been associated with quantitative methods. However, Computer Assisted Qualitative Data Analysis Software (CAQDAS) are increasingly being developed. Although the CAQDAS has been there for decades, very few qualitative researchers in the Arts and Humanities report using it. One reason for this, according to Zamanwe (2015), is maybe due to the difficulties that one has to go through to master the software and the misconceptions that are associated with using CAQDAS. While the issue of mastering CAQDAS has received ample attention and tutorial literatures exist everywhere, little has been done to address the misconceptions associated with CAQDAS. Zamanwe reflected on his experience of interacting with NVivo in order to provide evidence-based implications of using the software. In the end, he found that unlike statistical software, the main function of a CAQDAS is not to analyse data but rather to aid the analysis process, which the researcher must always remain in control of. That is, researchers must equally know that no software can analyse qualitative data,

this can only be done by the researcher. CAQDAS are basically data management packages, which support and assist the researcher during qualitative data analysis (Zamanwe, 2015).

On the other hand, it has been put forward that NVivo is capable of accepting every research design but one still wonders if we are not making the software fit into our own research designs. For instance, when thinking about a project, we draw all the stages in our minds, hence there is the possibility of setting NVivo as our analysis tool at the beginning and then choose a design that would fit the software and then claiming that NVivo accept all designs. This is a drawback on the usage of NVivo or other CAQDAS programs. One cannot fully claim that NVivo fitted well into their study if they already had the software in mind when they were designing the project. Two things might be possible and dangerous as it might affect research results; that we force the package to fit our study or force our study to fit the software.

As Fielding notes, in his contribution to a recent collection on qualitative research, CAQDAS is still treated as a kind of optional, add-on extra in qualitative research (Fielding, 2000). It is still not seen as a core part of all qualitative analysis activity. One piece of evidence for this, says Fielding, is the way that books on qualitative research still contain a separate chapter or section dedicated to CAQDAS rather than integrating its use into all discussions of analysis.

Perhaps, in part, this reflects the lack of full recognition for CAQDAS from practitioners. Certainly, some CAQDAS users have had to face hostile reactions to their usage of the software from managers and supervisors (Fielding & Lee, 1998). This might also help explain the limited use of CAQDAS functions in reported research.

Also, the idea behind using NVivo is to make qualitative data analysis easier (Bezeley, 2007). However, this intention is to a larger extent defeated if we consider the tough time that one has to go through in order to learn how to use the software. The learning curve is not only difficult but also time consuming. Although, the software comes with a detailed tutorial on how to use it, the injurious assumption of the tutorial guide is that the researcher has the basic understanding of the computer, which may not always be the case (Zamanwe, 2015). I consider myself to have advanced computer skills yet I struggled to learn the software, imagine then how a researcher with limited computer skills would cope.

In their book, Fielding and Lee (1998) examine the history of the development of qualitative research and its support by computers in the light of the experience of those interviewed in their study of researchers using CAQDAS. Amongst the issues they identify is a feeling of being distant from the data. Researchers using paper-based analysis felt they were closer to the words of their respondents or to their

field notes than if they used computers. It was certainly true that some of the early software made it hard to track back from extracted text to the context in the original documents from which it came. But most programs now emphasise their facilities for the review of data. Another limitation is that NVivo and other CADAS seem too influenced by grounded theory. Whilst this was a convincing argument about some of the early versions of current programs, as Fielding and Lee (1998) point out, most software is equally influenced. Besides, as programs have become more sophisticated and flexible, they have become less connected to any one analytic approach. A related danger that some have pointed to is "the over-emphasis on code and retrieve approaches which may militate against analysts who wish to use quite different techniques to analyse their data" (p.55).

Finally, the current version of the NVivo program is quite complex. It is also easy to do lots of things without properly documenting them. Exploratory or grounded theory inquiries pose most challenge - you need to be very disciplined in keeping notes about what you're doing, how you are thinking and why you believe in any particular conclusion. NVivo supplies tools for this but, especially if the researcher is dealing in small data quantities, they can do as well with a word processor and hand-written index cards.

The Future

We are reaching the point where virtually everyone has a cell phone, wireless connectedness allows us to envision the possibility where everyone in our audience can download survey or interview questions and respond right then and there by text, voice or video. Voice recognition has the potential to make keyboards obsolete and open up data gathering possibilities even further (Palys & Atchison, 2009). At the same time, there are emerging digital standards that might have a positive influence on both the ease with which data can be gathered, archived, analysed and presented.

Computer use is simply a way of doing things more easily or with greater confidence and transparency. For example, Okonkwo, Eyisi and Ololo (2015) employed an ethnographic method of data collection through the distribution of questionnaires via Survey Monkey, a web-based data collection software, to elicit useful information from users of social media in Nigeria on their research about the impact of social media on tourism development. Their research can be found in the earlier volume of this journal. The acid test for the deep acceptance of CAQDAS will be when researchers start using facilities in the software to carry out analysis that they couldn't possibly have considered, using traditional, manual techniques. This is already happening to some extent because some researchers are analysing much

larger data sets than they could ever have countenanced before CAQDAS (Gibbs & Friese, 2002).

NVivo (and of course all CAQDAS) now forms important part of qualitative data analysis. Among others, NVivo saves researchers from 'time consuming' transcription and boost the accuracy and speed of the analysis process. The key message to take home is that unlike statistical software, the main function of CAQDAS is not necessarily to analyse data, but rather to aid the analysis process, which the researcher must always remain in control of. The researcher can be likened to an artist who is "a historian, a custodian of the lofty ideals of the past, teacher and social crusader" (Nwachukwu-Agbada, 2016: 38). In other words, researchers must equally know that no software can analyse qualitative data. And just like art "is and was always in service of man" (Achebe, 1975), NVivo and all other CAQDAS are basically data management packages, which are there to support the researcher during the data analysis process.

A case is also made here for the introduction of courses that will teach our students these technological innovations and CAQDAS programs for their research projects since this will aid speedy adoption and familiarisation of these opportunities. As Davidson and Jacobs (2008) put it, because the struggle is on by qualitative researchers "to come to grips with the technological revolution, they are faced with the necessity of learning and teaching qualitative data

analysis software in higher education research courses" (p.1). Doing qualitative research with software does not require a full knowledge of all the tools at once. So long as you know that you will not create future problems, or limit future choices, you can get on with a project and get to know the software as you go.

Finally, the full impact of technological innovations on qualitative research is yet to be seen, at least in the arts and humanities, and the familiarization phase is still going on for most users. Qualitative researchers, therefore, are encouraged to think about their own research projects and processes and identify ways that these could be improved by technology.

Conclusion

As seen above, the possibilities and opportunities created while using a CAQDAS far outweigh the limitations and challenges. And like many technological innovations, these limitations will be addressed as better and upgraded versions of these tools continue to be introduced into the market. This is a revolution and as is the case with any revolution, these technological innovations in qualitative research are already upon us and are fast becoming mainstream. We in this part of the world should not be left behind in its acceptance and usage. This is not to suggest a disregard for our already existing traditional methods of conducting qualitative research, rather, what is encouraged here is a welcoming disposition and

acceptance of these innovations and a gradual but sure integration of Computer Assisted Qualitative Data Analysis System (CAQDAS) programs and other emerging techno-innovations in the planning, execution, interpretation and presentation of qualitative research in the arts and humanities, especially in this 21st century Africa.

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