Working with Longitudinal Qualitative Date: Using NVivo as an Analytic Tool

Abstract

The analysis of longitudinal qualitative data has received little critical attention. With the advent of CAQDAS like QSR NVivo, the qualitative researcher has a methodological tool well suited to the task of analysing large amounts of qualitative data which are inter-related in several ways.

This paper will explore the differences a longitudinal methodology implies for qualitative data in terms of the types and volumes of data that are likely to be collected, as well as means of organising and collating such data. The paper will then focus on the particular analytic demands made by a longitudinal research question and the impact a longitudinal perspective upon the analytic methods employed. NVivo will be used as an example of how longitudinal data and its complex inter-relationships can be 'tamed' with NVivo. An analytic structure for working with longitudinal qualitative data will be explored and the particular benefits of NVivo for longitudinal analysis will be discussed.

The paper will argue that software like NVivo makes longitudinal research no longer difficult or onerous but in fact opens new analytic possibilities. Furthermore, such analytic tools permit the researcher to address the longitudinal questions which are often those which are most interesting yet have until recently been relatively intractable.

The paper will be based on the author's research experience as well as a detailed survey of the current literature.

Working with Longitudinal Qualitative Date: Using NVivo as an Analytic Tool

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Paper presented at the 6th International Strategies in Qualitative Research Conference, Durham, 21-23 September 2005.

Introduction

This paper presumes that some form of computer assisted qualitative data analysis software (CAQDAS) is essential for modern longitudinal qualitative data analysis. While some authors suggest that the main advantages of CAQDAS include the saving of time (Adamy, 2000) and the increased efficiency of not overlooking data (Gilbert, 2000; Mahlamaki-Kultanen, 2003; Webb, 1999), others suggest that the hazards of CAQDAS include an increased insensitivity to methodological issues (Dohan & Sánchez-Jankowski, 1998; Este, Sieppert & Barsky, 1998) and a loss of the craft of qualitative analysis (Mangabeira, Lee & Fielding, 2004). This paper accepts that the uses of any CAQDAS tool will have both methodological and analytical consequences (Margerum-Leys, Kupperman & Boyle-Heimann, 1999). Methodological correlates of CAQDAS use pertain to the design of the study and how the data is collected whereas analytical correlates are more active within the stages of analysis and writing (Margerum-Leys et al., 1999).

The initial instances of software were programs that offered a code-and-retrieve facility (Wiley & et al., 1996). QSR's Nud*ist and NVivo have developed both edit-while-you-code and visual coding facilities as well as the ability to display other data sources within the research environment (Richards, 2002). NVivo arguably can claim to be a code based theory building program, in the terms of Wieztman and Miles (in Lee & Esterhuizen, 2000, p.236; Morison & Moir, 1998) while not being a conceptual network builder. Indeed, there are no

claims by NVivo to be a conceptual theory builder (Richards, 2002). There remain significant users' loads in employing CAQDAS. These loads include the required time to learn the software, and the transcription of audio into the computer text files required. While several processes have been suggested to overcome the transcription phase, neither voice recognition nor working with digitized audio (Lee & Esterhuizen, 2000, p.238; Smith & Short, 2001) have become commonplace.

Qualitative analysis requires an intimate knowledge of the data. Repeated and close reading of the texts (Dohan & Sánchez-Jankowski, 1998; Webb, 1999) is an intrinsic part of qualitative analysis. While some authors argue that CAQDAS may limit the reflexivity of the researcher who can loose sight of the fine grained complexity of the data including the loss of the individuality of the participants (Morison & Moir, 1998) this paper presumes that competent researchers are well aware of these issues and take methodological as well as practical steps to avoid these problems. Similarly, this paper presumes that a researcher critically evaluates what software is best suited for the analytic tasks required and chooses those tools in the software that fit the research question and qualitative methodology of the research (Lewis, 2004; MacMillan & Koenig, 2004). While arguing that the proper use of CAQDAS does increase the trustworthiness of research outcomes, such a claim can only be made when the skills of qualitative research and use of the chosen computer software are at appropriate levels (Gilbert, 2000). The following sections of this paper presume those methodological and program specific skills while employing NVivo (QSR International Pty Ltd, 2002) to discuss the analysis of longitudinal qualitative data.

Longitudinal qualitative analysis

What is longitudinal qualitative analysis? Longitudinal qualitative analysis (LQA) is research of a particular kind that explores a longitudinal research question. A longitudinal research question is one that asks questions of a developmental or causal nature. LQA is not done by accident; it is the result of a planned, disciplined approach to a particular research problem with changes over time as one of the key aspects of the research problem. There are then, two distinctive attributes to LQSA, the research question and the research sample.

Longitudinal research question

There are several avenues by which one could arrive at a definition of what is longitudinal research (Saldana, 2003, pp.1-10). One avenue describes longitudinal in terms of the sample. Such a definition would describe longitudinal research as based on samples that allow comparisons over time on a range of variables. Thus one definition of longitudinal qualitative research could be: Qualitative longitudinal research would be qualitative research in which the sample is chosen so that comparisons over time and developments of themes can be made. One difficulty with this approach is that it might be possible to simply repeat a process or research method at a later date with the same group and term this 'longitudinal'. While this might at times be a useful approach to developing rich data, it might not capture the richness that is possible in a fully conceptualised longitudinal study.

Another avenue of definition would be based on the time frame of analysis. This sense of longitudinal would focus on the analysis that attempts to construct developmental aspects of themes. The argument in this sense is that the analysis would focus on developmental aspects of the data, bring to light aspects that might highlight developmental processes and be alive to changes in participants' and the context's changes over time. Such an analytic definition of longitudinal could be: a study where the methods of analysis attempt to explore developmental aspects of the context and field under study.

This 'analytic definition' is beguilingly simple and attractive. It might be found wanting in the sense that a later analysis of historical data, or even a meta-analysis, might be termed longitudinal. While not wanting to preclude historical or meta-analyses, such a definition overlooks aspects of the ways the data where collected and the original intents of that data collection.

It is proposed that a more adequate definition of longitudinal arises from the research question itself. This author comes from the school of thought that the research question is the major determinant of the research process. It is the research question, what one wants to know, that comes first and foremost, and methodology, sample and methods are subsequent decisions made in the light of the major question in hand.

It is argued that the most appropriate definition of longitudinal comes from the research question itself. What sort of research question is longitudinal? There are several types of research questions which are longitudinal. The first type of research question is that which asks about developmental issues. Such

questions are about changes that occur over time or about aspects of the human person or social context that change over time. Another type of question relates to causality. Causality, or causation as it is sometimes termed, in essence is an attempt to rationalise the world of perception: Why did this happen? What forces brought this about? Causal questions go far beyond the descriptive and seek explanations of events that may also have predictive power in similar circumstances. Many causal hypotheses involve developmental processes, and the passage of time between initial necessary events and their consequences are central to many arguments about the nature of causality.

If a researcher is contemplating a longitudinal research question, then the issues of sample and methods of analysis, indeed the choice of methodology itself, will be chosen to best align the required data to answer the question with the limitations and opportunities of the research context. This does not imply that methodologies, issues of samples and other 'standards' of research methods texts are not important, because indeed they are important. It is simply to assert the primacy of the initial impetus of the research, the research question, and to focus rightfully on providing the best means to answer the research question that the circumstances will allow.

It is proposed that a working definition of longitudinal qualitative research includes both developmental and causal aspects and that the definition focuses on the research question:

> Longitudinal qualitative research is conducted when a research question investigating a development over time or causal perspective is conducted in a qualitative methodology.

There is a further, practical advantage of accessibility in this working definition of longitudinal qualitative research. This definition makes no claims for special analytic techniques, nor a higher order of qualitative skills either in data collection or analysis. Hence, this definition has the admirable quality of enabling qualitative researchers to consider themselves capable of pursuing longitudinal studies if and when such a research question presents itself to their interests.

Longitudinal sampling

Longitudinal sampling has been conducted through surveys for some time. The household panel surveys of many countries have investigated social changes in a quantitative methodology (Rose, 2000).

Table 1 Longitudinal sampling strategies

Sample Type	Features	Advantages	Disadvantages
Repeated cross-sectional samples	Same questions asked of different samples over time.	Samples easy to obtain. Comparisons relatively easy.	Since participants change with each sample there is no connection established between any observed changes and time.
Panel study (different styles of panels explored below)	Same individuals are interviewed repeatedly over time.	Unit of analysis is generally the individual.	
Indefinite life panel without replacement	Once a group of participants are enlisted, the group participants are re-contacted for each iteration of the research.	Analysis by individual straight forward. Increasing levels of trust and self-revelation. Increased participant ownership.	Attrition as participants drop out for a variety of reasons. May be difficult to get participants to commit to time consuming and potentially intrusive process.
Indefinite life panel with replacement	As above	As participants retire replacements are introduced either from a pre-established pool or recruited using similar sample choice frameworks. Sample size maintained.	Gradual diminution of the original members so that the evolving sample may be different in unknown ways.

Sample Type	Features	Advantages	Disadvantages
Rotating panel	Sample strategies calls for the research to last longer than average participation. Participants might be included for 3 or 4 iterations and then replaced according to the same sample choices as original sample selection.	Overcomes some aspects of participant fatigue of the process. Can ensure that sample size does not decline to unhelpful sizes. Ensures that 'group-think' does not impede data collection.	Loss of most advantages of the indefinite life panel. Recruitment of participants is ongoing. Discontinuities may develop when replacement cycle brings in new members.
Overlapping panel	Use of several rotating panel structures so that groups are out of phase in their replacement cycles.	As with rotating panel studies, and, May help to resolve discontinuities on participant replacement cycles. Ease of introducing new research team into newer cohorts.	Sample efficiency is a question since size is effectively increased yet covering similar ground.

(after Rose, 2000, pp.7-15)

Several other sampling decisions are required in panel studies. The length of the panel is the amount of time that the panel will be in existence. The longer the time the panel exists the more likely the benefits will accrue; increased trust and self-revelation, as well as the risks of member loss due to external factors as well as fatigue, boredom and fear of disclosure. The number of waves of the panel refers to the number of times that the panel will be sampled as a group. Increasing the number of waves is likely to increase panel attrition by increasing participant burden (Kalton & Citro, 2000).

What is longitudinal qualitative analysis?

Longitudinal qualitative analysis is that qualitative analysis which is conducted in order to examine developmental or causal relationships. LQA is focused primarily on questions of change over time. LQA is usually focused on the individual, although that individual might be a corporate body to whom the participants belong. LQA is not the preserve any one qualitative methodology: LQA within phenomenology, ethnography and grounded theory are all to be found in the literature. What distinguishes Longitudinal Qualitative Analysis is firstly the research question is that which is longitudinal in its intention, secondly that the sample is consistent with longitudinal requirements and thirdly that the means of analysis explicitly addresses changes over time for individuals in such a manner as to describe meaningful relationships between the changes and the maturation or change of time in itself. In this sense, time is one of the objects of study in longitudinal research since observed changes and proposed explanations of change are based on the passage and experience of time.

In order to accomplish LQA there are several challenges that may be encountered. These challenges include: organizing the data in meaningful ways; describing possible changes in the ways the data were collected; describing changes to the personnel involved in the data collection; describing changes to the data collection focus and instruments over time; accounting for possible variations in the time period or interval of data collection; and lastly the volume of data to be collected. A further challenge is the dilemma of what to publish and whether to publish incrementally as the data are collected and analyse data in successive waves. The ethical concerns of collecting longitudinal data are beyond the boundaries of this paper are mentioned here for the sake of completeness and that one does not loose sight of ethical concerns. The ethical issues of LQA are dealt with in other places.

It is intended to address and describe approaches to manage the challenges of LQA by reference to NVivo's tools and discuss strategies of LQA using LQA as an example. The author is aware that NVivo is not the only CAQDAS which might be suitable for the analysis of LQD (Lewis, 2004).

The data set that will be used to illustrate the main points of this discussion comes from a longitudinal study conducted by the author over a couple of years. The participants were secondary school teachers talking about their experiences as well regarded professionals: the project was called "Excellent Teachers". The intention was to interview a small cohort (is became 19 participants) each school term (four times per year)

over a full academic year in order to include the presumed cyclic nature of a teacher's experiences. All names are pseudonyms. Teachers were recruited from four schools after the principal had nominated each of the teachers to the researcher as an 'excellent teacher' (Vallance, 2003). Each file represents a single interview with one participant, and is named with that person's pseudonym.

Organising the data

There are several aspects to organising the data. The easiest aspect is the labelling of the files. A simple convention is to use the participant's pseudonym and then add a sequence number for the order of interviews conducted with that participant. Hence the second interview with Alice might be labelled Alice#2. Additionally, NVivo's document attributes are used to further identify the file. Possible identifies would include interviewer, date and sequence of the interview (Table 2).

Table 2 Attributes and values for the data files

Attribute	**possible values**
Interviewer	Each person of the data collection team be named
Interview Date	Calendar date of the interview
Interview Sequence	A number one to x incremented for each interview; to identify the waves of the data collection

The interviewer who conducts the interview is worthwhile identifying in a longitudinal study. It may be that certain points or themes emerge particularly from one or other interviewers, or contra-wise not emerge form one or other interviewers' work. Identifying these files will allow a retrospective investigation of interviewer performance over the project. The calendar date of the interview is always worth recording. This date may well become significant in the wider context during analysis, and serves as a useful marker of time. Many researchers would also include an attribute 'Transcription Date' as another useful time stamp on the development of the data. The sequence of the interview records information that is already include din the naming of the file. However, as an attribute, interview sequence is now sensitive to analytic processes and can be sorted, searched and retrieved.

It would seem to be good counsel to use attributes and their values for any data is pertinent to the research question and analysis that could be represented in a table format of one row per person and each column identifying data that is unambiguously assigned to the person. So the example LQR also recorded participant gender, the pseudonym of the school in which they taught and their main teaching subject (Fig. 1).

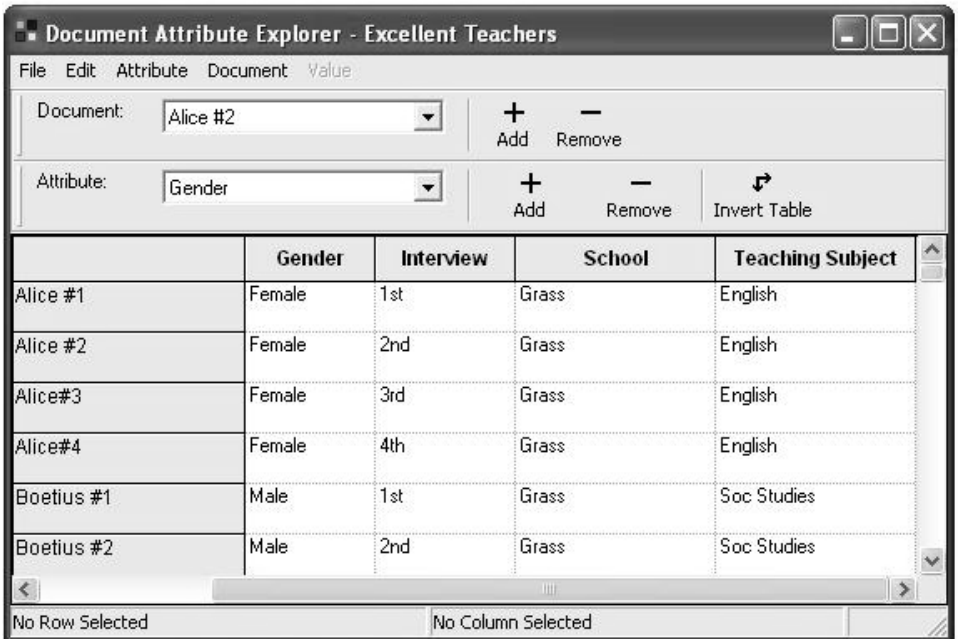
The volume of data

It is tempting to argue that with current large and relatively inexpensive disk drives, flash drives (thumb drives) of 1Gb readily available and smaller capacity removable drives cheaper, that space considerations are relatively small and of little consequence. While text files that NVivo imports from rtf or html files are compactly represented and stored, enthusiastic use of pictures, sounds and movie files soon increases the demands of disk space. While a complete project of 80 coded files each of nearly an hour-long interview takes up just under 10Mb is disk space in NVivo one audio file of 4 minutes can require the same space, depending on the sampling rate used to record the sound. It would seem to be wise to store all the files related to the one project within that project folder. NVivo establishes a unique folder with the same name as the project. Under the folder of the project, NVivo creates a folder called "All Users" and within All Users exists several folders, two of which can be used to store data files.

"External DataBites" [c:\....\NVivoprojectname\All Users\External DataBites] is a logical place to store sound, picture and other files that are linked to data files.

"Source Documents" [c:\....\NVivoprojectname\All Users\ Source Documents] is a logical place to store all the original text files (rtf or html source files) that form the text of the data. Storing these files will increase the size of the project but has the great advantage that all backup processes, including NVivo's own backup, will keep these files associated with the project. The added advantage is that subsequent file movements and even disk 'house-keeping' will not lead to broken links as might happen if files are stored elsewhere and subsequently moved or deleted.

Figure 1 Attributes in a longitudinal study



There are a few more 'house-keeping' tasks that will enrich the analytic potential for the project. These include adding the various interview schedules as files within the project, creating files that outline the focus and intention of each wave of the research and documents that record changes in the composition and structure of the research team. These files are pertinent to establish the development of the research and its analysis and are usefully kept within the project itself. It is likely that each participant will also have an associated memo file so that changes in each person's circumstances and commitment to the research project can be recorded. Once these files are created, they can be linked, whether these files are memos or ordinary data files, to specific text files. So, it might be advantageous to link a file that contains the interview schedule employed for interview 2 to all the second interviews in the project. All files, including memo files, can be coded within NVivo.

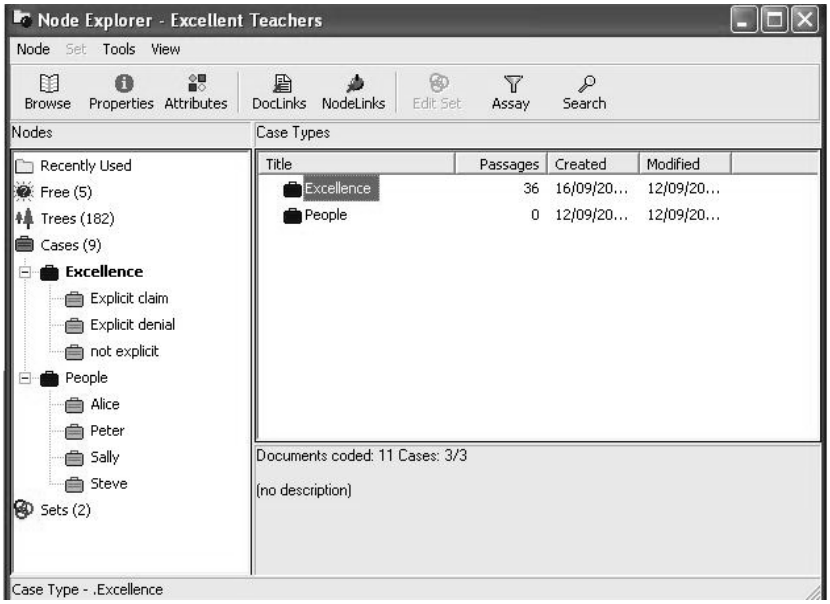
Sets, attributes and cases

NVivo offers a number of tools which facilitate Longitudinal Qualitative Analysis. These tools include attributes (already introduced above) sets and cases. This short section attempts to explain how this author has used these tools in Longitudinal Qualitative Analysis.

Attributes primarily are used to describe documents, although there is no logical reason why attributes cannot be used to describe nodes. Attributes are assigned to any item of data that pertains to the whole file or participant and that is not likely to change over the course of the research project. The type of data that is contained in attributes and their values is the sort of data that might form a table in the researcher's mind to record specific, research question relevant data. This commonly can include gender, socio-economic status, place of work, occupation, and marital status. Sets are used by this author to make ad hoc or temporary collections of data. If there is interest in forming a group, either of documents (participants) or nodes (coded data), to investigate a particular idea, this situation calls for the use of sets. One advantage of sets over attributes is that sets do not require their component members to be mutually exclusive, so a participant can belong to multiple sets whereas within attributes, each document must be assigned a particular value and cannot be assigned more than one value at the same time. Thus sets make very convenient filters for searches and can be used within the search tool to scope searches. While cases can group nodes together, this author has routinely used sets to achieve collections of nodes. Since sets can be accessed either through the NVivo Project Pad or through the Search Tool, sets have been more usually used to collect data together.

Cases are properly case nodes. These collections of nodes share many of the advantages of sets of nodes in that membership does not have to be exclusive, cases are readily formed and re-formed, and can be useful means of comparing and contrasting different epochs of the research continuum. The further advantage of cases is that the term 'case' is already widely understood within qualitative methods.

Figure 2 Cases Nodes within NVivo



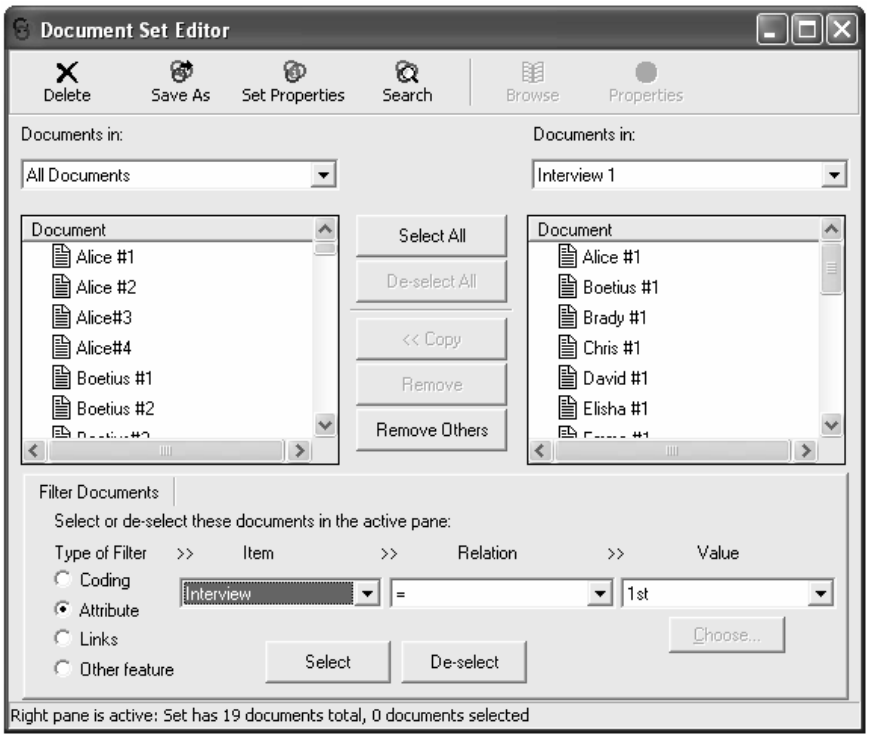
Using NVivo for the analysis of longitudinal data

NVivo has significant facility to assist the analysis of longitudinal qualitative data. These facilities include analysis of the ongoing sample, and examination of changes over time.

Analysis of ongoing samples

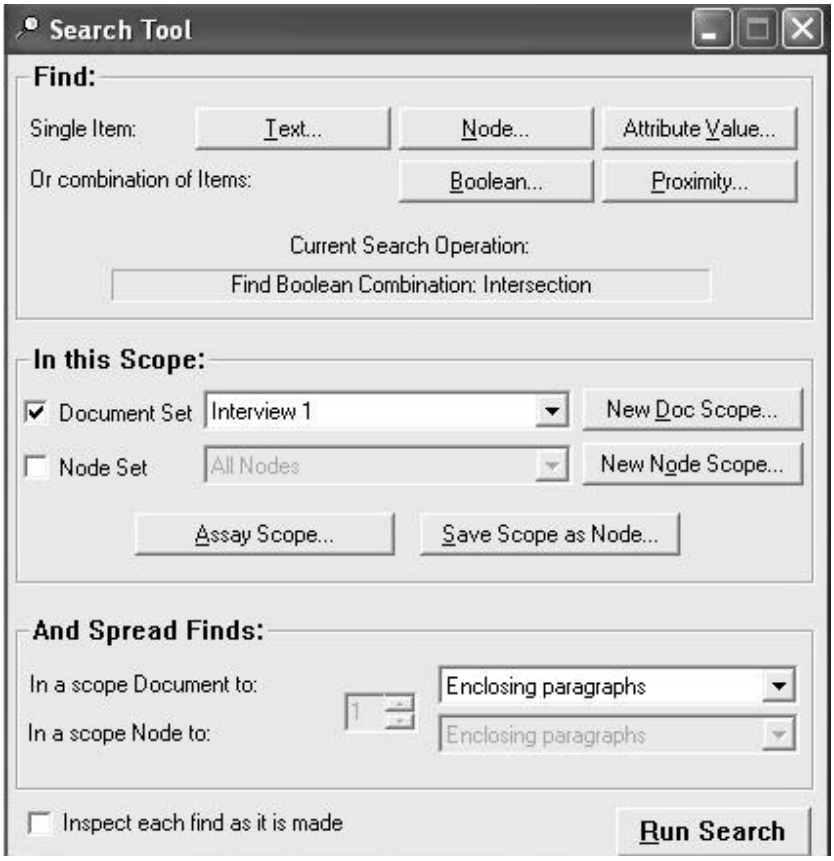
It is common that the research project will want to analyse data as it is collected and even to publish interim results. For projects that have a lifetime of years, ongoing publications may be necessitated by the requirements of sponsors and funding bodies as well as the professional development of the researchers. Assuming that the use of attributes and sets has been implemented as briefly described above, ongoing analysis of data is relatively trouble free. Firstly, the searches one would do are limited to those waves already coded. It is relatively simple to create a set of the first interviews coded and use this set to scope the searches and analysis to be conducted.

Figure 3 Creating a Set of the First Interviews



Once a set has been created (Fig. 3) it can be used to scope subsequent searches.

Figure 4 Using the Set to Scope a Search



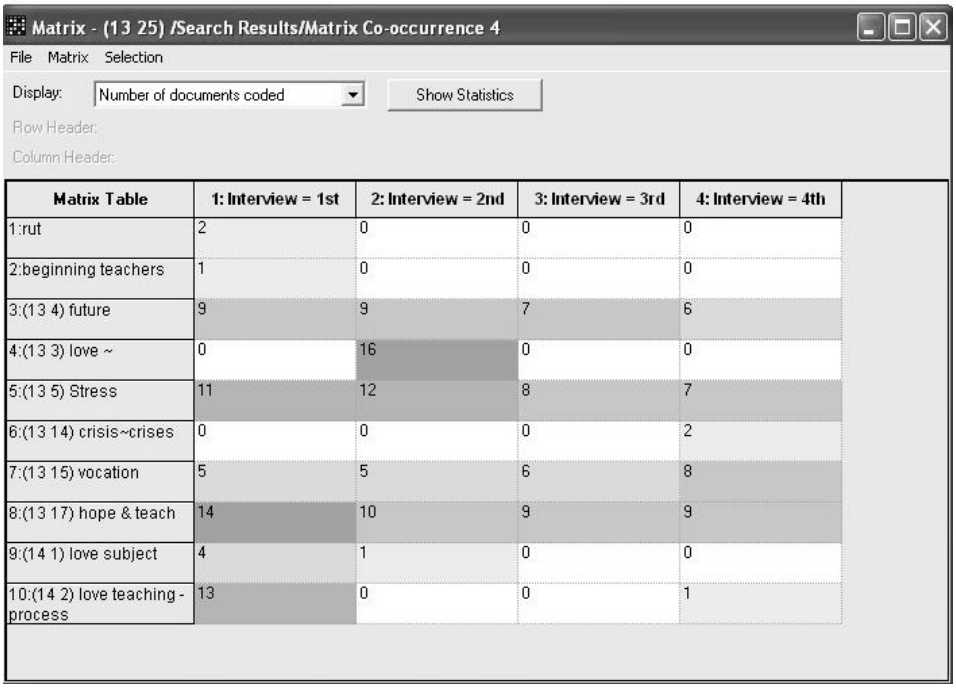
Thus the set of documents of Interview 1 can be used as the field or scope of analysis of the first wave of interviews (Fig. 4). This facility ensures that even as coding and text are present in subsequent interviews, only that data which is in Interview 1 will be retrieved. Hence, each wave of data interviews can be separately investigated, even after later interviews are completed, input and coded.

Matrix searches and outcomes

The Search Tool permits matrix outcomes of search parameters. In the Figure 4 below NVivo has performed a search on a number of nodes across a range of attributes. The attributes chosen were the waves of interviews (interviews 1, 2, 3 and 4) and the screen shows the numbers of documents containing coded text within each interview wave. Hence, the first node “rut” codes two documents in the first wave of interviews and no subsequent documents where the fifth node “stress” has been used to code 11 documents in the first interviews, 12 documents in the second interviews, and 8 and 7 documents in the third and fourth interview waves respectively. While this is interesting in itself, NVivo’s matrix is live and so a double click on any cell in Figure 5 displays the text of the coded data.

It is not claimed that the number of times documents are coded at specific nodes is of much significance (Fig. 5). That the matrix, which can be saved as a matrix node, can be further investigated and the text directly interrogated is considered to be very pertinent to qualitative analysis. This matrix can be converted to a text file and exported for statistical analysis if that was required.

Figure 5 Using the Search Tool to Investigate Changes



Matrix Table	1: Interview = 1st	2: Interview = 2nd	3: Interview = 3rd	4: Interview = 4th
1:rut	2	0	0	0
2:beginning teachers	1	0	0	0
3:(13 4) future	9	9	7	6
4:(13 3) love ~	0	16	0	0
5:(13 5) Stress	11	12	8	7
6:(13 14) crisis~crises	0	0	0	2
7:(13 15) vocation	5	5	6	8
8:(13 17) hope & teach	14	10	9	9
9:(14 1) love subject	4	1	0	0
10:(14 2) love teaching - process	13	0	0	1

Longitudinal analysis

The matrix operation above offers one means of longitudinal analysis. Using such a matrix output, the researcher can start interrogating the text with questions of What? Why? and How changes have occurred? The essence of this sort of analysis is looking at the individuals, the changes [the what] and their constructions [the how] of the forces operating on them [the why] they report over time as well as the researcher's perceptions of what has changed in these participants. It is likely that ideas and clues that emerge when interrogating a matrix such as Figure 4 will be further explored in close reading and searching through sets comprised of the text of individuals i.e. the set of documents for Alice [Alice#1, Alice#2, Alice#3 & Alice#4 in this example].

It is useful to distinguish between three terms frequently used in qualitative analysis. *Themes* are those manifest statements usually of a general nature that are made by the participants themselves. *Themes* may therefore be particular to individuals and are always from the perspective of the participant. The term *pattern* is more usefully applied to describe findings from the point of view of the researcher. The term *topic* or *main point* is applied when summarising the responses of many participants (Luborsky, 1994, pp.194-196). *Topics* pertain to the sample or sub-sample in the study, whereas *patterns* are uniquely the researcher's reflective activity with and upon the data. *Themes* are generally contained within topics. Qualitative research is the business of bringing themes and patterns out of topics which have been discussed and explored with participants.

New possibilities for research

The tools included within NVivo offer some new possibilities for research. Longitudinal qualitative analysis has always been possible without NVivo or any CAQDAS, but NVivo's capabilities offer more potential for longitudinal qualitative analysis. Firstly, NVivo offers the potential to ask new questions, to access data in new ways and to incorporate new data into already existing structures.

New questions

That NVivo facilitates longitudinal qualitative research questions is itself important. For a long time the difficulties of analysing large volumes of text have been an impediment to longitudinal questions. Using the distinction of Luborsky (1994), the topics, patterns and themes of each wave can be resolved. The longitudinal aspect of the analysis commences when the development and changes over time in the topics, patterns and themes are related to the observed and reported changes for the participants. These changes are likely to be recorded in the memos or field notes on each person and interview written by the researcher. Having the data and the memo/field notes together greatly facilitates this inter-analysis.

One type of Longitudinal Qualitative Analysis is essentially descriptive. This type of analysis develops responses to the question 'what has changed for these participants?' Answers to this question will come from an analysis of the text of the interviews and the topics which summarise the participant views, comparing the evolution and discontinuities of topics over successive waves or iterations of the interviews. Such comparisons of topic material will need to be sensitive to the particular interview schedules employed as stimuli and hence will be contextualised by the interview schedules themselves and the field notes of researchers. In many instances, a sub-question will be 'what has changed for this participant?' This question will be used to highlight or exemplify more general changes, or maybe to offer a counter instance to a more general development. This more individualistic question will retrieve theme data and field notes relevant to the individual.

There is another type of longitudinal question: 'what has caused these observed changes?' Data for this question is more likely to be accessed through the themes of the research. It is within themes that participants will address their own constructions of change and their perceptions of the rationality of these changes. Comparing changes in themes for particular individuals with interview field notes may permit the researcher to develop hypotheses relating to why these changes might be occurring. It would be most useful if these hypotheses were tested through direct discussion with participants before the end of the study.

There is a third-order question about change that can also be asked: 'to what extent are these changes general rather than particular?' i.e. are these changes indicators of global issues or are these indicators individualistic? To resolve some responses to this question it is likely that the researcher will turn to a detailed examination of the relationship between patterns, the researcher's perspectives, and the field notes. It is within the pattern thinking and writing that more general changes will emerge and can be further reflected upon.

New ways of accessing data

The resources of NVivo offer a number of possibilities to accumulate data of similar projects. It is important to be sensitive to the original intention and research question of each project: yet it is often the case that researchers find colleagues doing similar types of work with similar questions in possibly different fields. The additional facility produced by QSR for NVivo, Merge, offers the potential to bring different projects together without loss of the coding and analytic work already done. This is an important advance on simply importing the original files since raw files do not contain the value-added analytic work of observing, categorising, and theorising that is embedded in codes, nodes and node memos. Accumulating similar projects increases the potential for meta-analyses and certain types of longitudinal analysis if one accepts the limitations similar to rotating panel samples (Table 1).

Since NVivo will readily import Nud*ist projects, there is a heritage of coded and completed projects potentially available for ongoing analysis. All this is simply a reflection of the last 10 years, since Nud*ist Ver. 3 was released in 1993 (Richards, 2002, p.205). If the growth of activity in qualitative research continues, and the increase in qualitative data is anything like the last decade, then it is likely that there will develop some very fertile collections of data. Much of this data may well be brought into new collections with specific longitudinal questions in mind. It is acknowledged that significant questions of ethics accumulate around any proposal to cumulate data from different projects. However, since much can be done to anonymise this data, it is expected that problems of ethical use can be adequately addressed. Thus inherited data stores may become a new field in qualitative research and open new vistas for longitudinal questions.

One of the new longitudinal research endeavours may be a form of historical research. Instead of looking through records of events might future qualitative researchers investigate the data collections of the past, with their research questions and samples as aspects of the context of the times in order to write a developmental history of social movements, ideas and consciousness? Such activity might be termed a retrospective investigation of emerging questions and would merge the historian's and the qualitative researcher's skill sets into a new synthesis.

Lastly, NVivo offers some tools for data that can themselves assist analysis. The model tool in NVivo has the capacity to develop a number of layers within the model. Each layer can have a collection of objects, whether these are nodes, attributes or files and these objects can be connected in a number of different styles. All these objects are live, i.e. clicking on an object in the model tool like a node opens a browser to that node and the text coded at that node is then accessed. Layers can be built up within a model so that a layer or group of layers can represent a wave of data collection and analysis. Layers can be viewed individually or in selected groupings. One limitation is that once an object is present in a previous layer it cannot be added to a subsequent layer. Thus some layers might present ideas that are common or developmental throughout the project and other layers may be particular to the specific wave of data collection. As a visual tool and

diagrammatic thinking aid, the model tool will assist those researchers who prefer spatial presentations towards a better longitudinal analysis

Conclusion

This paper has attempted to situate the use of CAQDAS within the practice of qualitative analysis. With a focus on longitudinal analysis, this paper has attempted to explore who one particular software program, QSR NVivo, can facilitate longitudinal qualitative analysis.

There are three main arguments within this paper. The first argument is for the distinctive nature of LQD and LQR. The distinctive nature arises principally from the research question which is further articulated in the research sampling methods employed. Thus LQR does not happen by accident but as an outcome of explicit design. To this end a specific definition of Longitudinal Qualitative Analysis was described.

The second argument is that NVivo offers valuable tools for the analysis of LQD. Using attributes, sets and cases allows the researcher to efficiently organise both the storage of the data and its ongoing analysis. Within NVivo these two aspects are never far from each other, yet from a procedural point of view might be considered distinct. Several strategies for longitudinal analysis were briefly explored. The distinctions between theme, pattern and topic were useful in order to describe these different analytic strategies.

The third argument is that longitudinal qualitative research is likely to expand and become more popular and common. While the techniques and tools for Longitudinal Qualitative Analysis are increasing in usefulness, so to is the volume ad diversity of data that might be subject to Longitudinal Qualitative Analysis. Indeed, historical data may become one of the richest sources for Longitudinal Qualitative Analysis focused on social changes.

NVivo offers some tolls which expand the analytic capabilities of the researcher and bring new questions into focus. While more needs to be theorised and discussed to describe valid LQR, the potentials are large and rich for those who would like to explore the pastures of Longitudinal Qualitative Analysis.

References

Adamy, P. (2000, Feb. 8-12 2000). *Using Computers To Enhance Action Research.* Paper presented at the Information Technology & Teacher Education Conference, San Diego.

Dohan, D., & Sánchez-Jankowski, M. (1998). Using Computers to Analyze Ethnographic Field Data: Theoretical and Practical Considerations. *Annual Review of Sociology, 24*(1), 477-498.

Este, D., Sieppert, J., & Barsky, A. (1998). Teaching and learning qualitative research with and without qualitative data analysis software. *Journal of Research on Computing in Education, 31*(2), 138-154.

Gilbert, L. S. (2000, April 24-28). *From Print to Pixels: Practitioners' Reflections on the Use of Qualitative Data Analysis Software.* Paper presented at the Annual Meeting American Educational Research Association, New Orleans, LA.

Kalton, G., & Citro, C. F. (2000). Panel surveys: Adding the fourth dimension. In D. Rose (Ed.), *Researching Social and Economic Change* (pp. 36-53). London: Routledge.

Lee, R. M., & Esterhuizen, L. (2000). Computer software and qualitative analysis: trends, issues and resources. *International Journal of Social Research Methodology, 3*(3), 231-243.

Lewis, R. B. (2004). NVivo 2.0 and ATLAS.ti 5.0: A Comparative Review of Two Popular Qualitative Data-Analysis Programs. *Field Methods, 16*(4), 438-469.

Luborsky, M. R. (1994). The Identification and Analysis of Themes and Patterns. In J. F. Gubrium & A. Sankar (Eds.), *Qualitative Methods in Aging Research* (pp. 189-210). Thousand Oaks: Sage Publications.

MacMillan, K., & Koenig, T. (2004). The Wow Factor. *Social Science Computer Review, 22*(2), 179-186.

Mahlamaki-Kultanen, S. (2003, April 21-25). *Learning and Teaching Qualitative Research with Qualitative Data Analysis Software.* Paper presented at the Annual Meeting American Educational Research Association, Chicago, IL.

Mangabeira, W. C., Lee, R. M., & Fielding, N. G. (2004). Computers and Qualitative Research. *Social Science Computer Review, 22*(2), 167-178.

Margerum-Leys, J., Kupperman, J., & Boyle-Heimann, K. (1999, April 19-23). *Analytical and Methodological Issues in the Use of Qualitative Data Analysis Software: A Description of Three Studies.* Paper presented at the Annual Meeting American Educational Research Association, Montreal, Quebec.

Morison, M., & Moir, J. (1998). The role of computer software in the analysis of qualitative data: efficient clerk, research assistant or Trojan horse? *Journal of Advanced Nursing, 28*(1), 106-116.

QSR International Pty Ltd. (2002). NVivo Ver 2. Bundoora, Victoria: QSR International Pty Ltd.

Richards, T. (2002). An intellectual history of NUD*IST and NVivo. *International Journal of Social Research Methodology, 5*(3), 199-214.

Rose, D. (2000). Household panel studies: An overview. In D. Rose (Ed.), *Researching Social and Economic Change* (pp. 3-35). London: Routledge.

Saldana, J. (2003). *Longitudinal qualitative research: analyzing change through time*. Walnut Creek, CA.: Alta Mira Press.

Smith, C., & Short, P. M. (2001). Integrating Technology to Improve the Efficiency of Qualitative Data Analysis—A Note on Methods. *Qualitative Sociology, 24*(3), 401-407.

Vallance, R. J. (2003). Excellent Teachers: Exploring Constructions of Teaching. *Academic Exchange Quarterly* (Summer 2003), 249-256.

Webb, C. (1999). Analysing qualitative data: computerized and other approaches. *Journal of Advanced Nursing, 29*(2), 323-330.

Wiley, S. D., & et al. (1996, April 8-12). *Twenty-first Century Tools for Qualitative Data Analysis.* Paper presented at the Annual Meeting American Educational Research Association, New York, NY.