# The Use of New Technology in Qualitative Research. Introduction to Issue 3(2) of *FQS*

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**Abstract**: As society transforms and is transformed by new technology, so there are new ways in which qualitative researchers collect and analyse data and new forms of data to collect. This paper sets in context the contributions in this issue of *FQS* by examining these developments. The spread of video and photographic technology means that images can be used both as sources of data and as tools for data collection. The digital form much audio and video data now takes makes possible new ways of creating, processing and analysing such data. The parallel growth of the Internet also makes available new ways of collecting qualitative data and new settings in which to collect it. However, such developments raise issues about the way researchers collect, process and publish data and how they produce high quality analyses. Digital technology has also meant that new ways of analysing data through computer assisted qualitative data analysis (CAQDAS) are now possible. There is now a range of such software and, in response to demand, developers are still adding new features and functions that researchers need to understand. The diversity of software means that there is a need for standards for storing and exchanging qualitative data and analyses. 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.

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## 1. Introduction

Perhaps the earliest use of technology in qualitative research was when researchers first used tape recorders in their field studies to record interview sessions. In one sense this was clearly an easier way for researchers to keep a record of events and conversations, but it had two unforeseen consequences. First, it began to shift the effort of work in making a record of sessions from the researcher (who traditionally took handwritten notes) to others, such as secretaries and audio typists. This separation 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. Having a recording and a transcript 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. Second, it allowed different kinds of analysis that could only be undertaken if accurate records of the speech were kept. This made possible a focus on the small scale and minute content and characteristics of speech. It also opened up the possibilities of much larger scale studies and the use of multiple researchers and analysts. [1]

The dual impact of new technology both on what kinds of data can be collected and recorded and on what kinds of analysis it makes possible has continued to the present day. 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. The papers in this issue address both these impacts of the technology: new ways of recording and collecting data, and new ways of undertaking the analysis. Most researchers recognise that in most cases, the use of new technology usually affects both. [2]

## 2. Data Gathering

Audio recording is an analogue technology, as are film and traditional video. There is a long history of their use in many areas of social and psychological research and especially in anthropology. Recent changes in this technology have taken several forms. First it has become cheaper and more widespread. This means that the technology is more available to researchers, but also that the people being researched are more used to being recorded by the technology and even familiar with using it themselves. For example, in the case of video, people are now used to being recorded whether as part of a "holiday video" or as part of the now widespread CCTV (Closed Circuit Television) security systems. They are often familiar with making their own video recordings and with "reading" the wide variety of video material they are presented with. Both the cheapness and ubiquity of the technology mean that there are new opportunities for researchers not only to record settings but also to use the technology to create new data. Naturally, the use of such technology raises issues of interpretation, impact and validity that researchers need to deal with. [3]

There are two examples in this issue. KANSTRUP ([Picture the Practice—Using Photography to Explore Use of Technology Within Teachers Work Practices](#)) discusses the use of a digital camera in research about the use of technology in teachers' work practices. Initially she used the images displayed on a laptop computer as a way of prompting teachers' discussion about their work practice. However, she found that they very quickly ignored the pictures and started more general discussions about their work practices. As KANSTRUP puts it, "the teachers went beyond rather than into the photographs". Consequently, she used printed versions of the photos as the basis of a group discussion amongst the researchers. Whilst this prompted some creative thinking about teachers' front and back stage activities, it raised the important question of whether the researchers' interpretation of the photos was the same as teachers' actual experience. In fact, as KANSTRUP concludes, the photos were better as ways of

raising questions than answering them. In a quite different context, KOCH and ZUMBACH (The Use of Video Analysis Software in Behavior Observation Research: Interaction patterns in task-oriented small groups) discuss the use of the video analysis software, THEME, to identify communicative patterns in two distinct examples of task-oriented small group interaction. They focused on power-related and support-related behaviour as well as verbal and nonverbal patterns in the behaviour. With the software they found two interaction patterns that it would have been hard to detect without the use of the software: a clear example of how the use of the software makes new forms of data and analysis available. [4]

One of the most recent developments in video and audio has been the rapid introduction of digital technology. Not only has this made the technology cheaper and more widely used, but also it has made possible new ways of manipulating and analysing the data collected. This can be seen particularly in digital video where there is now some excellent software that can be used to display, examine and edit digital video recording in ways that are much easier (and cheaper) than non-digital video. SECRIST, DE KOEYER, BELL, and FOGEL (New Tools for Understanding Infant Development in Qualitative Research) in their paper in this issue explain how Adobe Premiere, software usually used in the creative professions to edit video, was used to create, quickly and reliably, sequences about infant development. The software makes it possible to rearrange, present, and navigate through video in ways that were not possible before. Whereas previously research involved the arduous creation of written sequence narratives, now using the software, the researcher could select video clips of only those behaviours of interest and quickly inspect the relevant behaviours and come to analytical conclusions. [5]

The development of information technology and particularly the growth of the Internet has created not only new ways in which researchers can analyse their data, but also created whole new areas from which data can be collected and ways in which it can be collected. The former include discussion lists, text forums, personal Web pages and videoconferences. The latter include usage logs, text content logs as well as digitised recordings. [6]

At its most basic, the Internet, and e-mail in particular, offers a new way of carrying out the traditional, qualitative, face-to-face interview. The advantages and disadvantages of this and the issues it raises for research are discussed by BAMPTON and COWTON (The E-Interview). As they point out, one key advantage here is that there is no need for transcription. Moreover, the e-interview might enable research about new social groupings, given that constraints of time, travel and financial resources do not apply. However, problems of how to establish and preserve rapport are created and the authors explore the issues that arise from the physical remoteness between interviewer and interviewee and the absence of cues and tacit signs provided by body language. As they point out, researchers need to be aware of the speed at which they should reply and at which they can expect replies from respondents. However, given the necessarily extended duration of e-interviews, there is no

reason why several respondents cannot be interviewed at the same time. At the moment too, as they point out, researchers need to be aware of the biased samples that might result from surveying only those with good e-mail access. HOLGE-HAZELTON (The Internet—A New Field for Qualitative Inquiry?) makes similar points based on her research about diabetes sufferers. She employed a free association interview method adapted from psychoanalytic therapy and communicated with respondents using e-mail. Despite dealing with highly personal and emotionally charged topics, she found that compared with her earlier, face-to-face interviews, there was a lack of inhibition and rapport was easily established. However, she did note some gender differences. Women generally gave quicker and more emotionally detailed responses. Some authors have pointed to the anonymous and disembodied nature of electronic communication, however, HOLGE-HAZELTON found that her respondents often overcame that by the mutual exchange of personal and demographic details including pictures of themselves. [7]

KÖRSCHEN, POHL, SCHMITZ and SCHULTE (New Techniques in Qualitative Conversation Analysis: Computer-based Transcription of Videoconference) in this issue, discuss the parallel questions that arise when applying a conversational approach to videoconferences. In particular, they point out that conventional forms of transcription fail to take into account the issue of time delays between sites and the visual information that is also exchanged. For that reason, they suggest, current multimedia transcription approaches need to be modified to take into account the specifics of videoconference data and to make them accessible to qualitative data analysis. They suggest a computer-mediated process of transcription can be used. [8]

E-mail and videoconferencing clearly involve forms of communication that do not exactly mirror the oral forms found in the traditional interviews and conversations. In this issue, MOSS and SHANK (Using Qualitative Processes in Computer Technology Research) consider the broader impact of the Internet on such communications. They suggest that computer mediated interaction should be considered as neither oral nor written language, but as a post-literate transformation of language itself. In particular they suggest that this transformation can only be properly studied using qualitative methodologies. They examine this in the context of an online educational environment and conclude that online discourse is significantly different from others in terms of temporality, the influence of community and reflexivity. For them, online discourses allow modes of communications that foster learning in ways that cannot be done in face-to-face environments. [9]

### 3. Computer Assisted Qualitative Data Analysis (CAQDAS)

It is clear that the introduction of new technology has both expanded the ways in which qualitative researchers can collect data and also the settings and situations from which data can be collected. The other major impact of technology on qualitative work discussed in this issue has been on how the analysis is done. Computer assisted qualitative data analysis software (CAQDAS), a term introduced by FIELDING and LEE as the name of their networking project (http:// caqdas.soc.surrey.ac.uk/) refers to the wide range of software now available that supports a variety of analytic styles in qualitative work (LEE & FIELDING 1995). [10]

WOLCOTT in his discussion of qualitative analysis makes a distinction between analysis that is data management, in other words, that is concerned with the more effective handling of data, and analytic procedures, where features and relationships are revealed (WOLCOTT 1994). It is the common experience of researchers carrying out qualitative analysis that such work requires careful and complex management of large amounts of texts, codes, memos, notes and so on. The prerequisite of really effective qualitative analysis, it could be said, is efficient, consistent and systematic data management. The early programs focussed on data management and those most available now provide considerable assistance in these activities. The use of such text retriever and textbase manager programs, and related facilities such as simple searching in CAQDAS, is relatively uncontentious. In fact many of these aspects of data management do not need dedicated CAQDAS and much can be achieved with the use of other commonly available software such as word processors and databases. Such possibilities are examined by NIDERÖST (Computer-Aided Qualitative Data Analysis with Word) in this issue. This paper explains how data have to be set up for analysis and how the table function and "search & replace" command in Word can be used for basic sorting and retrieving tasks. An analysis according to data attributes (or variables) like age, gender, profession, etc. is also possible. There is a clear advantage in that the software is widely available and most of its functions are familiar to qualitative researchers. MEYER, GRUPPE and FRANZ (Microsoft Access for the Analysis of Open-ended Responses in Questionnaires and Interviews) in this issue provide a similar example, in this case using a database program to analyse open-ended answers from a survey. The paper describes the process of entering data into Access and explains how to set-up and manage code lists and undertake data retrieval. [11]

These authors clearly demonstrate that it is possible to use word processors and databases to assist in the analysis of qualitative data. This is particularly the case when undertaking initial, broad-brush examination of the data and when generating simple counts. However, to go beyond this requires a level of sophistication with the word processors and databases that most qualitative analysts don't have, or have time for. And qualitative analysts do seem to want to go further. One of the arguments used by developers to support the "effectiveness" of CAQDAS is based on the programs' origins—many were designed by qualitative researchers themselves who claim to know the "real" needs of analysts. This argument has been increasingly reinforced by the

development, over time, of new program features. The second generation of CAQDAS, for example, introduced facilities for coding text and for manipulating, searching and reporting on the text thus coded. Such code and retrieve software is now at the heart of the most commonly used programs and has extended the use of the software into areas much closer to the analytic heart of qualitative research. In so doing it has brought to the fore contested issues about how far the software can actually assist with analysis rather than just with data management. For example, there are those who remain sceptical about the use of software for the more analytic aspects of qualitative research. An example is the paper in this issue by THOMPSON ([Reporting the Results of Computer Assisted Analysis of Qualitative Research Data](#)) where he makes a distinction between the mechanical and conceptual aspects of analysis similar to WOLCOTT's distinction of data management and analysis. The mechanical aspects refers to all the activities that underpin qualitative data analysis, such as marking up selected text with codes, generating reports, searching the text for key terms, usages and so on. These can be time consuming, tedious and error prone and it is these tasks that the computer can assist well with. However, 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 machine, he suggests. [12]

Some programs have functions that go well beyond manipulating, searching and reporting on coded text. They assist with analytic procedures by providing a variety of facilities to help the analyst examine features and relationships in the texts. Such programs are often referred to as theory builders or model builders, not because on their own they can build theory, but because they contain various tools that assist researchers to develop theoretical ideas and test hypotheses. Such features are characteristic of what MANGABEIRA refers to as the third generation of CAQDAS development (MANGABEIRA 1995). Some programs have also extended the forms of work supported beyond the lone researcher examining plain text. For instance, some support rich text, diagrams and the incorporation of images, movies and other multimedia data. Others have facilities that enable the exchange of data and analyses between researchers working together collaboratively. Some papers in this issue examine the new possibilities here. ZELGER and OBERTRANPACHER ([Processing of Verbal Data and Knowledge Representation by GABEK/WinRelan](#)) show how, using the software they have produced, not only can the range of data available be coded in the traditional fashion, but new presentations (e.g. in a visual, tree-based form) can be produced and a degree of reflexivity can be incorporated into the analysis. Their method, the holistic processing of complexity (GABEK) based on the philosophical concept of comprehension and explanation, is designed to cope with the large, diverse and often controversial data created in areas such as conflict studies, organisations, innovation studies and sociology. The approach is multi-stage. After initial coding, data are assessed, rated and organised into a conceptual structure, i.e. mindmaps based on the underlying verbal data and linguistic Gestalt. Furthermore, causal assumptions can be examined in the form of a complex cause-effect graph that facilitates the analysis of controversial issues and fosters comparative analyses. [13]

IRION (Collection, Presentation and Analysis of Multimedia Data with Computer), discusses the issues that arise when qualitative researchers analyse more than just textual data. There are several questions about how audio, video and text data integrated together may be collected and analysed and the paper examines these. It also discusses the impact on computer-assisted analysis of such "multimedia" data and suggests that special methods of transcription may limit the analytic approach. There is therefore a need for new ways of approaching the analysis of such data. IRION suggests the application of modular software tools and illustrates his proposal with an example. [14]

BOURDON (The Integration of Qualitative Data Analysis Software in Research Strategies: Resistances and Possibilities) discusses how the software can be used to underpin 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 loose 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. [15]

The expanding dissemination of CAQDAS along with the maintenance of a range of different software with different facilities and approaches means there are also issues concerned with how researchers learn to use the programs and which programs they learn. Two papers in this issue, those by BONG (Debunking Myths in Qualitative Data Analysis) and by THOMPSON, discuss researchers' first use of the software (ATLAS.ti and HyperQual2 respectively). They examine some of the issues researchers need to consider when selecting software and the analytic approach they are going to take. They also discuss some of the support facilities available to those new to the software, such as training courses and on-line discussion lists. CARVAJAL (The Artisan's Tools. Critical Issues when Teaching and Learning CAQDAS) examines factors that influence the construction of training courses for those new to qualitative analysis and new to CAQDAS. He identifies many of the misconceptions that learners have about the software, for example, that it will do the analysis for them and that they will learn about qualitative data analysis by learning the software. He argues for an approach to training that focuses initially on the aspects of qualitative analysis that researchers need to understand before they use the software, and that then examines several different programs. For example, in one of his classes, he introduced learners to EZ-Text, winMAX 99, NUD.IST 4, and ATLAS.ti 4.2 so they could appreciate the different facilities they offer. When starting to use the software, he suggests it is very important that learners should be able to analyse their own data set, as it is easier for them to understand how the research questions that arise from it can be addressed when using the software. [16]

## 4. Scepticism About the Use of CAQDAS

It is perhaps revealing about the way qualitative researchers think about themselves and their work that, as FIELDING points out, the introduction and use of non-CAQDAS technology has prompted little comment compared with the intense debates about CAQDAS (FIELDING 2002, p.161). Concerns about the limitations of CAQDAS and its impact on the kinds of analysis that can be undertaken and their quality are reflected in several of the papers in this issue. [17]

In their recent book, FIELDING and LEE 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 (FIELDING & LEE 1998). 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 recontextualisation of data. Another complaint, as many users and commentators, including several in this issue, have suggested, is that some software seems too influenced by grounded theory. This approach, developed by GLASER and STRAUSS (1967), has become very popular amongst both qualitative researchers and software developers. The worry is that this may push analysis in one direction rather than another, that some aspects of the analysis might be an artefact of the technology used. 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 (such as hyperlinking) to analyse their data. That grounded theory has become a kind of paradigm in qualitative analysis and that coding alone is analysis are two "myths" of qualitative data analysis that BONG, in this issue, seeks to debunk. [18]

On the other hand, there are those who remain sceptical about the overall philosophical position represented by the use of software for qualitative data analysis. An example is the paper in this edition by ROBERTS and WILSON ([ICT and the Research Process: Issues Around the Compatibility of Technology with Qualitative Data Analysis](#)). They argue that the central activity of qualitative analysis is the interpretation of the various shades of meaning found in conversational and linguistic material. Computers, founded as they are on a digital and quantitative view of the world, are limited in how far they can help with such an interpretation. For ROBERTS and WILSON, there is no clear distinction between understanding and interpretation on the one hand and analysis on the other. Since, with general agreement, there are limits to a computer understanding or interpretation of texts, so too, they argue, our analysis is little assisted by software outside purely mechanical tasks such as data management. For them,

creating and applying codes is not analysis. Not everyone will agree with such views, least of all those following a grounded theory or template approach, but they are ones that are often expressed by qualitative analysts coming from a background in narrative or discourse analysis who often reject absolutist, deductive and positivistic approaches. A similar case for the importance of the interpretation of meaning is made by MOSS and SHANK in this issue, when they argue for analysis by "close reading", a quasi-literary approach, rather than by coding. This, they suggest, is because it is important to discover embedded patterns and not to miss infrequent but significant instances of insight. [19]

A similar caution about the limits of CAQDAS in analysis is made by THOMPSON. He presents an example of analysis with HyperQual2 and attempts to provide a model of how to write about the analytic process. His main argument is that the strength of the analysis depends to a large extent on the well-established strategies used in analysing qualitative research data. Nevertheless, this is a "taken for granted" assumption shared by all of the more experienced CAQDAS users. As summarised above, THOMPSON distinguishes the mechanical and conceptual aspects of analysis and agues that whilst computers can help with the mechanical, only humans can undertake the conceptual. [20]

The evocation of human reasoning as the core of qualitative analysis raises issues regarding representations about technological artefacts. There is an interesting tension between developers' claims about CAQDAS capabilities and the meanings attributed to them by users, in particular settings. While not a sceptic of CAQDAS use, MANGABEIRA (1996) has pointed to ways in which users' explanations about CAQDAS uptake as well as their attributions of what CAQDAS "can do" not only depend on software features and capabilities but are also shaped by collective representations of their "effectiveness", the social organisation of research communities and national intellectual traditions. In a similar vein, other commentators have noted that CAQDAS has become very successful, not always for the best of reasons (FIELDING 2002; SEALE 2002b). 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. [21]

## 5. The Quality of Qualitative Research

Much of the thinking about the quality of research in general originates in ideas derived from the examination of quantitative research. Here there is a strong emphasis on ensuring the validity, reliability and generalizability of results so that we can be sure about the true causes of the effects observed. There has been much debate about whether such ideas can be applied to qualitative data and, if they are applicable, what techniques might be available to qualitative researchers to help ensure the quality of their analysis. [22]

The issues of quality in qualitative research have been tackled in part by recognizing that, in the absence of the techniques available to quantitative researchers, qualitative analysts have to pay more attention to how they write about their data and present their reports. Another response by those undertaking qualitative analysis has been to focus on the possible threats to quality that arise in the process of analysis. There is a variety of such threats, including biased transcription and interpretation, the overemphasis of positive cases, a focus on the exotic or unusual, the ignoring of negative cases, vague definitions of concepts (or codes), inconsistent application of such concepts to the data and unwarranted generalization. As DEY warns,

> "Because the data are voluminous, we have to be selective—and we can select out the data that doesn't suit. Because the data are complex, we have to rely more on imagination, insight and intuition—and we can quickly leap to the wrong conclusions" (DEY 1993, p.222). [23]

It is therefore not surprising that it is easy to produce partial and biased analyses. The use of CAQDAS can make a positive contribution here, not least, as FIELDING points out (2002) because it takes away much of the sheer tedium of qualitative analysis. Using the software it is easier to be exhaustive in analysis and to check for negative cases and there are some techniques for ensuring that text has been coded in consistent and well-defined ways. [24]

Another advantage of using software is that the analysis is structured and its progress can be recorded as it develops. Establishing an audit trial of this kind to show how analytic ideas emerged and to check that they are not subject to the kinds of biases mentioned above can be done using CAQDAS, but rarely is. Often the level of analysis undertaken is disarmingly simple, as SEALE found when he surveyed published papers that mentioned the use of CAQDAS (SEALE 2002b). In many cases the analysis was little more than pattern analysis based on simple code and retrieve even when authors claimed to be using grounded theory. In some cases the research showed little real analytic depth and the analysis tended to be impressionistic and of dubious reliability or validity. There is clearly still a gap between the potential role of CAQDAS in assisting the quality of research and actual practice. [25]

Not everyone agrees that the advantages of CAQDAS in supporting the quality of research are clear-cut. WELSH ([Dealing with Data: Using NVivo in the Qualitative Data Analysis Process](#)) in this issue is clear that it is not possible to eliminate the role of the human researcher in the analytic process. She agrees that using the search tool in CAQDAS can "improve the rigour of the analysis process by validating (or not) some of the researcher's own impressions of the data." However, the software is less useful in addressing issues of validity and reliability in the thematic ideas that emerge during data analysis because of the fluid and creative way the themes emerge. WELSH therefore argues that the analyst should not abandon manual methods of analysis. This may be the only way of examining the thematic ideas and gaining a deep understanding of the data. [26]

Qualitative researchers have also found it contentious the ease with which CAQDAS can produce quantitative data and link with statistical analysis programs. There is clearly value in being able to add quantitative parameters to generalisations made in analysis. But some feel that the distinctive nature of qualitative research may be threatened. However, researchers working in applied settings are often under pressure to combine qualitative and quantitative analyses. MEYER, GRUPPE and FRANZ (Microsoft Access for the Analysis of Open-ended Responses in Questionnaires and Interviews) in their use of a database to analyse open-ended answers from a survey suggest that an advantage of their approach is the ability to keep a close relationship between the qualitative data and the quantitative data kept in a statistical package. This too, is a point of some contention amongst qualitative researchers. For some, numbers and statistics have little relevance to qualitative analysis. For them it is the distinctive and novel analysis that qualitative approaches can produce that are important. For many other researchers, often those working in applied and evaluation settings, the ability to link qualitative analysis with quantitative and statistical results and to support their qualitative analytical ideas with numeric evidence is important. [27]

## 6. The Future

As we have discussed above, one of the recent changes in the technology that qualitative researchers deal with is that it is now almost all in a digital format. This is what some have referred to as digital convergence and it means that a range of new approaches both to data collection and to data analysis are now possible. BROWN (Going Digital and Staying Qualitative: Some Alternative Strategies for Digitizing the Qualitative Research Process) in this issue explores the kinds of technology now available, that means that qualitative researchers can now consider collecting, analysing, reporting and archiving materials in a digital format. He examines some of the software available that makes the storage and accessing of such material possible for qualitative researchers. In particular he discusses how by using formats such as HTML and PDF researchers can link together a wide range of materials, both collected data and research notes and a variety of media types. [28]

Such a convergence will no doubt push analysts into realising that new forms of analysis are both possible and necessary. There is already a great interest in the visual aspects of culture and in the importance of embodiment in understanding human actions. The ready availability of audio, video and still images is likely to encourage analysts to examine aspects of this which were hard to record and use as evidence before. Whether analysts will need new CAQDAS or whether they will choose to use tools that are common in, for instance, the creative media, remains to be seen. Already some CAQDAS programs like HyperResearch, ATLAS.ti, CI-SAID and the Qualitative Analyser allow researchers to code images, digitised speech and video. Some, like NVivo and ATLAS.ti allow video segments to be hyperlinked in a limited way. Such programs are close to providing the richness and fine detail available to text coding for the coding of sound and video. Whatever researchers' choice, digital convergence will probably

reinforce the demand from users for universal, standard data formats, so that files can be easily transferred from one software package to another and even from one CAQDAS program to another. Already, several CAQDAS programs allow the import of RTF, AIFF, WAV, PIC, GIF and MPEG files and Tatoe and ATLAS.ti are using XML and HTML as a medium for exporting text data files. [29]

Retaining rich multimedia data, for instance as examples in research reports, raises forcefully ethical issues like anonymity, ownership and confidentiality. The widespread use of tape recorders in research many decades ago did not immediately prompt researchers to publish audio versions of their analyses nor to archive the recordings. In the main, and for good reasons of confidentiality etc. researchers transcribed and published only as text. Though there is now greater interest (and incentive from funding bodies) in archiving qualitative data, there seems little pressure to archive original audio and video recordings. This may be simply because copying, cleaning and anonymising analogue recordings is too time consuming. The move to digital media might help here. Moreover, researchers using archived data seem to want it in as unprocessed a form as possible, so perhaps this will push depositors to archive their original video and audio recordings. [30]

At the same time there are emerging digital standards that might have a positive influence on both the ease with which data can be archived and the ways in which they might be analysed. CARMICHAEL (Extensible Markup Language and Qualitative Data Analysis) in this issue discusses one of the most important developments, XML. This is now a widely accepted and used standard way of marking up text (and by external referencing, other media) that identifies the type of content. Although in appearance XML is very like HTML, the language used for describing Web pages, as CARMICHAEL points out, HTML mixes in descriptions of how to display the data visually, whereas XML does not do this. In XML the focus is on just identifying the type of content leaving unspecified how the data should be displayed. For CARMICHAEL XML not only offers an excellent way of marking up qualitative data in archives but because of the wide availability of tools for processing such text it offers new ways in which researchers can undertake analysis. In particular, as he points out, data, analysis and researchers can all be distributed on a network. At the moment browsers capable of displaying XML text are not well suited for the process of marking up, but as existing CAQDAS programs, and other software, start to import and export in XML format, this situation is likely to change. [31]

The further development of CAQDAS will probably occur in two ways, how the software is used and the forms of analysis it supports. 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 2002). 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 hostility to the software from managers and supervisors (FIELDING & LEE 1998). This might also help explain the limited use of CAQDAS functions in reported research. Most published descriptions of the use of CAQDAS seem to have used the software just for coding and simple retrieval (SEALE 2002b). The underlying logic of coding and retrieval and even of searching for coded segments is little different from manual techniques. To this extent, therefore, most users of CAQDAS have made little conceptual advance over the indexing of typed notes and transcripts by marking them with code words or coloured ink. FIELDING and LEE found the same in their survey of CAQDAS users in the UK (FIELDING & LEE 1998). Most only used the basic features either because working in an applied field they were under pressure from sponsors to produce results quickly or because there was little support in universities for such software and they found it hard to learn the program features. Nevertheless, there is some innovative use of the software to be found. For example, FRIESE used the visual modelling facilities in ATLAS.ti to examine and illustrate the varied and idiosyncratic influences on customer's impulse buying (FRIESE 2000). A contrasting example is the recent analysis of electronic news articles on cancer sufferers by SEALE (2001; 2002a). The data source was electronic (no transcription required!) but needed pre-processing for which he used a custom-written, Visual Basic program. Straightforward coding was done with NVivo but the analysis was supported by the use of a concordance generator. This kind of integrated use of software might be another pointer for the future, though this will depend in part on the ability to import and export data easily. With better support for learning about the software, and recognition by sponsors of the value of deeper analysis, there is hope that a greater range of programs and program facilities will be used. Perhaps then CAQDAS will be treated as a necessary part of proper QDA training and a core activity in almost any qualitative research project. [32]

Most CAQDAS use and most of the popular programs are based around a code and retrieve underpinning, with some search facilities, but the kinds of analysis the programs support is still expanding. Software like ATLAS.ti and NVivo include facilities for visual and hierarchical modelling of concepts and codes. Others take a much more numerical and logical approach to modelling, often built around a hypothesis testing or case-based approach (as opposed to a code-based approach). Examples include HyperRESEARCH, Ethno and AQUAD Five. (For a recent discussion see FIELDING 2002.) Yet another approach beyond the coding model is provided by the work of KOCH and ZUMBACH in this issue, that combines both a numerical and qualitative approach to analysing behaviour. However, there are some forms of qualitative research where there is little use of CAQDAS. This is true of approaches like narrative, conversation analysis, biography and discourse analysis. The most likely reason is that current programs give little support to the special forms of transcription needed and/or they poorly support the chronological dimension. The extension of software functions to include such features is not difficult. As program features are expanded and enhanced in future versions, possibly to a fourth generation of software, we can expect to see some of these approaches incorporated into mainstream programs and their use by researchers. One innovation that seems

likely is the development of functions to assist with coding. At the moment some programs allow automatic coding based on the markup of documents and it is possible to use search facilities (sometimes by incorporating powerful tools such as GREP) to help find text for coding. But in the future this might be further assisted by integration with concordance generators and thesauruses so that the software can search in intelligent ways for similar text and even for negative cases. There is already some software in development in the US (Qualrus) that uses artificial intelligence to examine the way users have already coded text in order to find further text to code. [33]

Most of such innovations are simply ways of helping with analysis that can already be done using manual techniques and analogue machinery. Computer use is simply a way of doing things more easily or with greater confidence and transparency. 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. (Although, interestingly, FIELDING & LEE [1998] found that the average number of interviews or documents CAQDAS users were working with had stayed at around 40.) There is also evidence that CAQDAS users undertake analysis in ways that are different from what researchers did before the software was available. In some cases, it might be argued, this is an artefact of the program design, as for example, when researchers produce a multilevel hierarchy of nodes because the software supports it. However, in other cases the change seems to have arisen because researchers no longer need to keep to habits that were only necessary because they used paper-based transcriptions. For example, most CAQDAS users do not use line numbers in their analysis. In contrast researchers who learned their craft before computers often stick with such old habits, even when using CAQDAS, because they were a necessary feature of paper-based analyses. [34]

We shall know the use of new technology in qualitative research has really arrived when researchers use new forms of data and new types of analysis that hadn't even been thought of in the pencil and paper past. Whether this has happened is contentious, but we think that the papers in this issue provide sufficient evidence to support the view that new technology has allowed the investigation of truly novel data types and the use of new and distinctive forms of analysis. [35]

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