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# Using software to analyse qualitative data

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While quantitative analysis software eg. SPSS (Statistical Package for the Social Sciences) have been in vogue amongst researchers for some time, qualitative analysis software has taken a lot longer to acquire an audience. However, the use of software for the purpose of qualitative analysis can provide tangible benefits. Appropriate software can shorten analysis timeframes, can provide more thorough and rigorous coding and interpretation, and provide researchers with enhanced data management. This chapter examines qualitative data analysis; illuminating some of the difficulties and moves to a discussion on the often contentious use of analytical software. Evidence within the chapter points to the clear advantages that qualitative data analysis software can provide users. One such product – QSR NVivo – is discussed with an expansion on the benefits that this product offers qualitative researchers. The reader is also taken by the hand for a brief practical overview of the program. The chapter concludes with a quick look at what the future has on offer for researchers contemplating the use of this software.

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# Using Software to Analyse Qualitative Data

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## **Abstract**

While quantitative analysis software eg. SPSS (Statistical Package for the Social Sciences) have been in vogue amongst researchers for some time, qualitative analysis software has taken a lot longer to acquire an audience. However, the use of software for the purpose of qualitative analysis can provide tangible benefits. Appropriate software can shorten analysis timeframes, can provide more thorough and rigorous coding and interpretation, and provide researchers with enhanced data management. This chapter examines qualitative data analysis; illuminating some of the difficulties and moves to a discussion on the often contentious use of analytical software. Evidence within the chapter points to the clear advantages that qualitative data analysis software can provide users. One such product – QSR NVivo – is discussed with an expansion on the benefits that this product offers qualitative researchers. The reader is also taken by the hand for a brief practical overview of the program. The chapter concludes with a quick look at what the future has on offer for researchers contemplating the use of this software.

## Introduction

Analysing qualitative data is often seen as a demanding, repetitive and arduous task (Basit, 2003, 143). Although predominately a mechanical exercise, it requires an ability of the researcher to be dynamic, intuitive and creative, to be able to think, reason and theorise (Basit, 2003, 143). The goal of qualitative analysis is to deconstruct blocks of data through fragmentation and then have them coalesce into collections of categories which relate conceptually and theoretically, and which make assumptions about the phenomenon being studied. Richards calls this process “decontextualizing and recontextualizing” (2002, p.200) and regards this as the fundamental process of qualitative data analysis. Typically, qualitative research is a one researcher domain. Data are acquired through first hand experience as a result of subjective interpretation. Understandings of phenomena are tempered through experience, bias and knowledge (Ely, Anzul, Friedman, Garner, & Steinmetz, 1991).

In 1979, Miles argued that qualitative analysis was among the most demanding and least examined areas of social research. Basit (2003) finds that this observation remains cogent today. This may be due to the relatively higher levels of time and effort that this research requires. Qualitative research does not allow short cuts (Delamont, 1992) and is a continuous process which is dominant throughout the research activity, from data collection through until conceptualisation (Ely et al., 1991).

Qualitative data analysis uses a process of reduction to manage and classify data. In this process, units of text are first de-contextualised by removing them from their source – with their meaning intact – and then re-contextualised by drawing from them a more robust, context independent, meaning based on an accumulation of evidence. In more detail, de-contextualising is a method which strips textual segments from their source documents. A *textual segment* is defined by Tesch as “a segment of text that is comprehensible by itself and contains one idea, episode, or piece of information” (1990, p.116). Exhibit 1 illustrates a textual segment:

#1 { **Jetstar Asia has announced its launch route structure that will include flying to destinations across six countries over the course of the next few months.** The low-cost carrier will operate services from Singapore to Shanghai, Hong Kong, Taipei, Pattaya, Jakarta, Surabaya and Manila. Flights to three of the cities will start in mid December with the remaining coming online in succession from January 05. Other routes, serviced by future Airbus 320 aircraft will be announced early next year. Celebratory, one-way launch fares starts at \$28 to Pattaya, \$48 to Hong Kong and \$88 to Taipei.

**The launch of Jetstar Asia is expected to kick-off yet another round of fare wars led by established carriers such as Singapore Airlines.** } #5

In this example, the first sentence: Jetstar Asia is a complete and comprehensible, stand-alone unit, full contextual meaning is transported with the segment. The second sentence loses its meaning when separated from its source due to the words “The low-cost carrier”. The third sentence loses its meaning altogether. The fifth sentence also remain in tact and is meaningful. If the fifth sentence were an essential component of the analysis, then it would need to be coupled with the information contained in the earlier sentences.

Exhibit 1. A textual segment

A textual segment, therefore, is a piece of text that when cut from its source retains full contextual meaning. (Tesch, 1990, 117-118). In de-contextualising, textual segments or datum are taken from their source data and are coded. Coding is where similar pieces of datum are tagged with descriptors and bundled into relevant categories for later comparison. Exhibit 2 provides an illustration of this process.

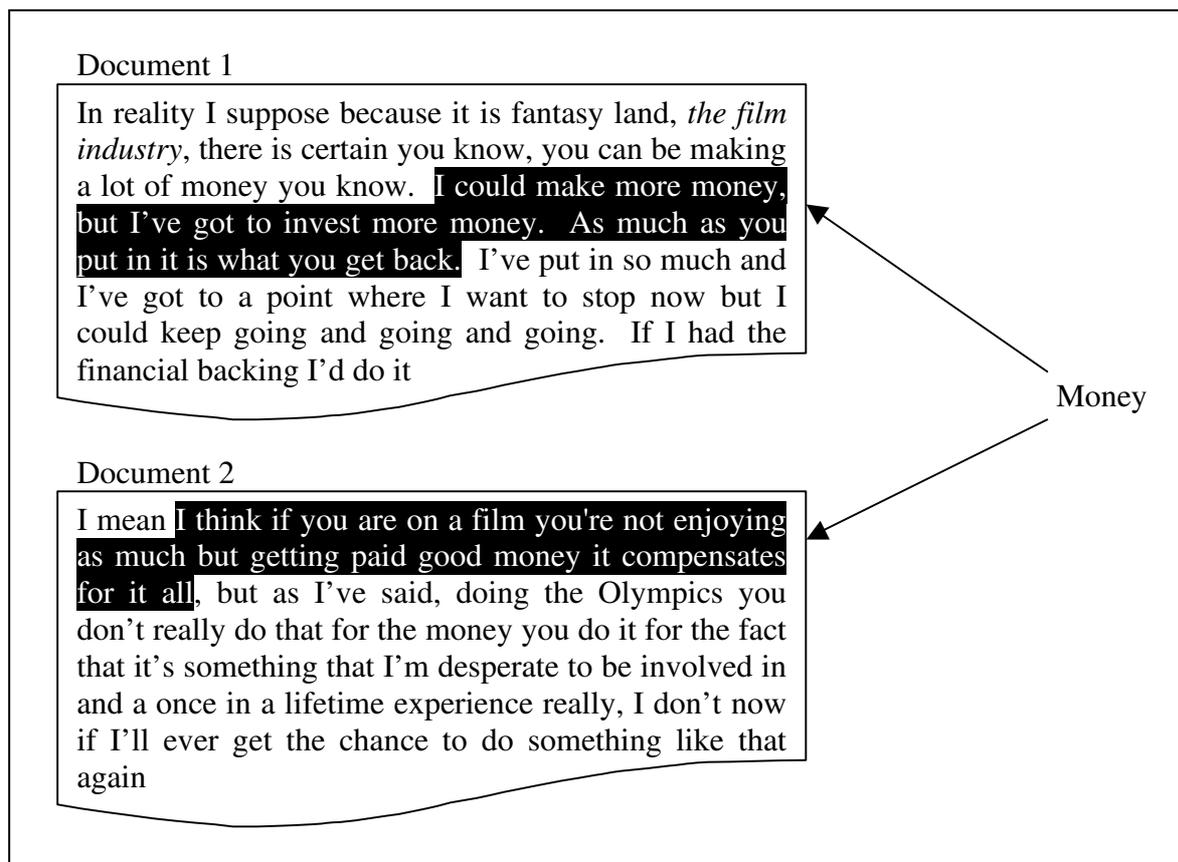


Exhibit 2. Coding

In the example above (Exhibit 2) two textual segments have been cut from their source documents and both have been coded under the category of money.

In qualitative analysis documents are coded and codes are collected into categories until the categories develop some meaning. This meaning is re-contextualising. To continue our example above (Exhibit 2), we may interview several people to discover their attitudes to money, once we have collected these several attitudes, we would be able to discern some meaning through similar or dissimilar patterns and commonalities (Tesch, 1990). This process is quite apparent with Grounded Theory where Glaser and Strauss (1967) epitomise their method of constant comparison. Only through the sequence of gathering, sorting, coding, reclassification and comparison does raw data become useful and interesting. By creating categories and allocating data into them the researcher is able to contrive a

conceptual schema which allows the researcher to ask questions of the data and inquire about the situation under investigation (Basit, 2003, p.144).

The ability of the researcher to code is an important part of analysis (Basit, 2003, p.144; DeNardo & Levers, 2002, p.4). It involves the researcher in two ways, firstly the data must be divided into meaningful textual segments which are logical and which add value to the research, and secondly a tag or label must be attached to the data which is descriptive and sufficiently abstract to encompass other similar, yet unique, datum (Glaser, 1978). Miles and Huberman (1994) discuss two methods of code creation. The first is a method preferred by inductive researchers, this involves coding the data without *a priori* knowledge and labelling the data, at least initially, using the data itself as the descriptor (Glaser & Strauss, 1967). This is often called *in vivo* coding. The other method utilises a preconceived list – a start list – of categories into which the researcher endeavours to fit emerging data. This list may expand or change over time but the start list allows a faster, but less emergent beginning. This method is often used when there is more than one researcher, or where quite a lot is already known about the research.

### **Qualitative Data Analysis Software**

During the final two decades of the last century and more relevantly during these most recent years of the twenty first century researchers have endeavoured to employ tools which would ease the labour intensive burden of qualitative data analysis (L. Richards & Richards, 1986). Computer assisted analysis began with simple text searching tools in the form of word processors which allowed categories to be searched and text to be marked or edited (T. Richards, 2002, 199-200). However, it was not until computer analysis packages were able to decontextualise and recontextualise that they were of any real value to qualitative researchers.

One of the first computer programs to provide real assistance to qualitative researchers was NUD\*IST™ 1.0<sup>1</sup> (Richards 2002). NUD\*IST was touted to do what the acronym suggested it would do: Non-Numerical Unstructured Data by Indexing,

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<sup>1</sup> QSR International Pty Ltd

Searching, and Theorising (L. Richards, 1999, 413). The fundamental purpose of NUD\*IST was to provide functions which would assist researchers in the retrieval of text from data, allow users to code that data, and to develop a system of relating codes to each other using a tree structure.

Software, in one form or another, has been viable since the advent of the Microsoft Windows platform in the early 1990's which provided the power and flexibility these programs needed. However, the uptake of these products has not been without controversy. The research community is sharply divided as to the benefits and effects of digital intervention in what is fundamentally a human enterprise (Basit, 2003, p.143; Crowley, Harré, & Tagg, 2002, p.193). Opponents cite the methodological impurities that may result as data are transferred into a digital environment and the resulting abstraction as a result of software manipulation. This can certainly be the case with plain text programs, where expression and emphasis can be lost, but rich text programs tend to mitigate this deficiency (Bourdon, 2002, 1; Crowley et al., 2002, 193). Computers are excellent tools for counting and producing numbers and users can fall into the trap of turning qualitative accounts into semi-quantitative arrays of analysis by enumerating the facts rather than interpreting them. While qualitative analysis software will often provide these facilities, it is not their strength and it detracts from their purpose (Crowley et al., 2002, 193; Welsh, 2002, 1). Software can also work to distance the researcher from their research by providing a buffer between the person and their data (Bourdon, 2002, 1; Welsh, 2002, 1).

Proponents see qualitative analysis software as the genesis of the new age in qualitative research. The software assists these researchers by providing better management of their data, saving time and offering greater flexibility. They see this electronic data analysis as providing greater accuracy and greater transparency (Welsh, 2002, 3). The software can provide faster and more comprehensive methods of inquiring into the data, and much more versatile and efficient systems of collecting, storing and reporting (Basit, 2003, 145; DeNardo & Levers, 2002, 5). As is often misconstrued by the opponents of computer analysis, the programs do not do the analysis for the researcher. The researcher must still collect the data, decide what

to code and how to name the categories. The software does, however, render more easy the repetitive and mechanical tasks of data analysis; those traditional tasks of making concept cards, creating categories, segmenting, coding and duplicating (Bourdon, 2002, 3). Where 'paper and pen' activities once thwarted the qualitative researcher's work, software removes many of these less pleasant areas of research. Computer assistance is merely a tool which facilitates more effective and efficient analysis (Coffey & Atkinson, 1996). "Researchers who use the packages are often amazed that this kind of work, with its thousands of pages of data, could ever have been conducted by hand" (Basit, 2003, 145). Welsh provides a good analogy of how computer software can enhance the task of qualitative analysis:

It is useful to think of the qualitative research project as a rich tapestry. The software is the loom that facilitates the knitting together of the tapestry, but the loom cannot determine the final picture on the tapestry. It can though, through its advanced technology, speed up the process of producing the tapestry and it may also limit the weaver's errors, but for the weaver to succeed in making the tapestry she or he needs to have an overview of what she or he is trying to produce. It is very possible, and quite legitimate, that different researchers would weave different tapestries from the same available material depending on the questions asked of the data. However, they would have to agree on the material they have to begin with. Software programs can be used to explore systematically this basic material creating broad agreement amongst researchers about what is being dealt with. Hence, the quality, rigour and trustworthiness of the research is enhanced. ( 2002, p. 5).

Despite these debates, computers are being increasingly employed in the use of qualitative data analysis (Basit, 2003, 145; DeNardo & Levers, 2002, 5). A number of notable qualitative theorists have encouraged the use qualitative data analysis software within their research: (Berg, 2001; Denzin & Lincoln, 1998; Krueger, 1998; Merriam, 2001; Miles & Huberman, 1994; Morse & Richards, 2002; Patton, 2002; Silverman, 2000, 2001; Taylor & Bodgan, 1998; Tesch, 1990). Tom Richards, the

Designer of one very popular analysis program – Nvivo™, illustrates one of the most basic advantages of software with a very simple example. (NVivo uses the term *node* instead of code):

Suppose for example you had coded all text from interviews by women at a node (call it Women), and all text by divorcees at another node, Divorcees, and all discussion on bringing up children under Parenting. Then of course, using retrieval you can look at everything a divorcee has said, and everything that is said about parenting. But you should also be able to look at everything women divorcees have said about parenting, to compare it with what everyone else, or male divorcees, or other groups, have said on the subject. And how does what women divorcees say about parenting relate to their views on nuclear families? This is the sort of comparative questioning that is typical of much probing and analysis of qualitative data. It implies the need for two processes, 'node search' and 'system closure'. (Richards, 2002, p.201)

Richard's terms this function as 'relating' where locations of data within nodes are virtual, but access to the original coded data is provided through many nodes. Being able to have this facility within a 'paper and pen' system is very difficult, it requires the duplication of each applicable node or code several times, and it does not allow the addition of information, for instance an observation, reflection or annotation, nor does it allow for easy editing.

Qualitative data analysis software can be divided into three basic categories (DeNardo & Levers, 2002, 4). Some will only retrieve text, others will enable users to both retrieve and code the text, while a final group will assist users in retrieval, coding and theory building. The first group – retrieval only – provides functions that are more akin to a search engine. They will locate keywords usually using a Boolean interface, they can then extract these extended pieces of data as well as doing other functions like counting retrieved phrases. The second group add to the functionality of the first by being able to tag retrieved information with identifiers or codes. These codes can then be accumulated into categories. The categories can then be compared and manipulated. These retrieve and code programs operate in a manner similar to, although much more efficient, those systems developed by 'paper and pen' researchers. The third type of software – theory building software – usually provides the

features of the first two, but adds to the inventory of features by being able to establish relationships between categories and codes, assemble higher order categories with developed abstraction, and develop and test hypotheses (DeNardo & Levers, 2002, 4).

In the experience of this researcher with qualitative data analysis software – predominantly NVivo™ 2.0 (QSR International Pty Ltd, 2002) – the software approach has been an invaluable tool. Large amounts of data, in excess of 20 hours of transcripts, were managed relatively easily. Data were coded more generously than would be achieved with ‘paper and pen’ methods, and while this most probably led to over-coding (this is a problem reported by Blismas and Dainty (2003, 460), it allowed ideas and issues to emerge more freely without the compulsion to force data into already established categories. When it came to reporting the findings, the natural emergent system of logical categories and nodes, and the reflection that is part of the process assisted greatly with the structure and content. Another great feature of the software approach is that categories and nodes can be changed or re-shuffled at will, therefore as new data re-focussed the study the old data could be easily reshaped to fit into the emerging framework. A final observation on the value of software is the ability to duplicate and distribute the findings; it is important to keep all stakeholders up-to-date with all developments. Software allows easy copying and distribution by either compact disk or through email. This facility would be extremely difficult to achieve with a traditional ‘paper and pen’ system.

Blismas and Dainty (2003, p.457) describe similar sentiments towards the use NVivo™. They selected this package because they were after a tool which would enable them to manipulate large amounts of data. They wanted to have visual coding, in text editing, contextual annotating, and hyper-linking for other document or multimedia support:

The ability to hyperlink any file from NVivo™ allowed the researcher to access and link instantly any piece of data. Documents in the system remain unaffected by the coding and manipulation of the user, allowing limitless manipulations on the data without altering the original data set. This provides a great advantage over more traditional manual methods. The data-handling capabilities of the software proved a great benefit to the research by

significantly increasing the rate at which data could be accessed, retrieved and viewed. Whereas without computer assistance a trade-off is required between the number of cases that the researcher investigates and the number of attributes studied within those cases (assuming that the research is time limited), NVivo™ provides the potential for a virtually unlimited sample size and unlimited searches of the data. Additional features such as colour coding of documents were useful in managing the coding and analysis status of documents. It is difficult to foresee an occasion where analysis of textual data or interview transcripts would not benefit from such data-handling capabilities.

These views are also supported by Bourdon (2002, 8), where he found that qualitative analysis software made a collaborative enterprise possible, which may not have been as easily coordinated and executed without the software. A final testament to the advantages of qualitative analysis software comes from Basit (2003, p.152), finding that the use of software makes the life of the researcher relatively less difficult. In this research Basit compared the two types of analysis. In the first project he completed his analysis using the 'paper and pen' method and in the second project he used the software method:

Data analyses were tedious and frustrating in the first project. In the second, electronic coding made the process relatively smooth, though considerable time had to be spent initially to get acquainted with the package. The computer also facilitated the analyses to be carried out in more depth and the reports generated were invaluable. Nevertheless, coding was an intellectual exercise in both the cases. The package did not eliminate the need to think and deliberate, generate codes, and reject and replace them with others that were more illuminating and which seemed to explain each phenomenon better.

## What Does NVivo™ Offer

NVivo™ is a retrieve, code and theory building tool. It allows users to replicate all of the abilities of the 'paper and pen' system into the software, and much more. The software utilises rich text which allows integrated emphasis through colour, font and character style (DeNardo and Levers 2002, 8). Once imported, text can continue to be emphasised through the internal rich text editor for the manipulation of colour, font and character style (Blismas and Dainty 2003, 460). Selected data can be coded both *in vivo* and through an accumulated tree structure. Editing is dynamic, in that text can be edited while it is coded, and memos and comments can be added throughout. This allows for easy and progressive reflection and conceptualisation (Richards 2002, 211). In addition, documents and nodes can have attributes attached. The use of attributes allows the integration of quantitative and demographic data which can augment the results of analysis. As Tom Richards States: "A project need no longer be separated into the bits you do on the computer (e.g. coding the interviews) and the rest (your notes, results, reports, and conclusions). A qualitative project becomes seamless again" (2002, p. 211).

Other, more advanced functions allow the hyper-linking of external documents and other data, the construction of conceptual models, and the testing of hypotheses through advanced search facilities which not only offer standard Boolean operators but also offer more sophisticated options like scoping, attributions, and proximity, as well as matrix searching (Richards 2002, 214). Figure 1 provides a breakdown of NVivo's functional elements.

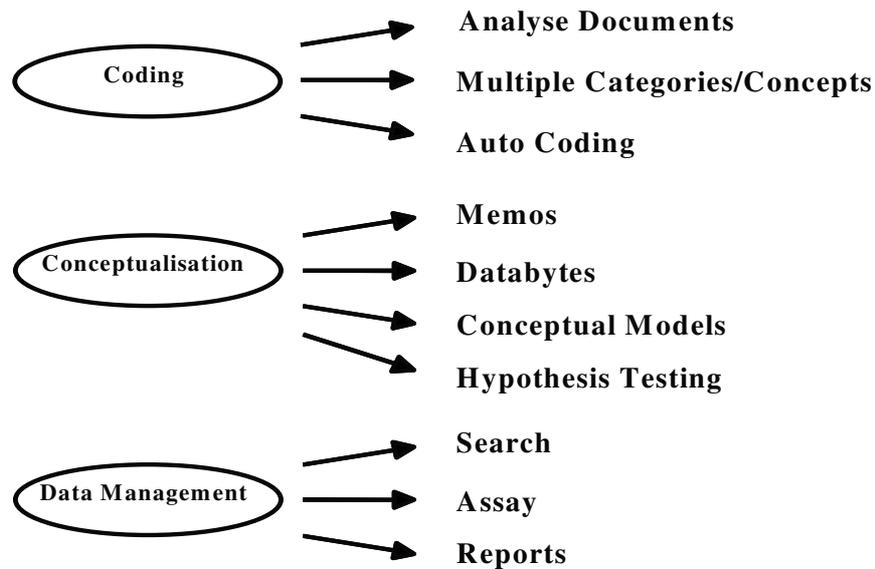


Figure 1. The functionality of NVivo

### Using NVivo™ to Analyse Qualitative Data

NVivo is relatively easy to learn, and can also be learned on the fly - while you are engaged in the process of research. NVivo also comes with a tutorial/demo program and very good help facilities. The following will enter into a brief discussion of the software; the intention of this discussion is not to provide comprehensive instructional advice, but to provide an overview which highlights the more important functions of the package along with a few helpful hints.

When opening NVivo, the first screen encountered is the launch pad – see Figure 2. From here the user can create a new project, open an existing project or run a tutorial. On creating a new project the user is prompted to select either a ‘typical’ or a ‘custom’ project. New users should select – typical.



Figure 2. The launch pad

Once a project is commenced the user is presented with the project pad – see Figure 3. The project pad is divided into two symmetrical functionality screens. One deals with the documents and the other the nodes. With each the user is able to create, explore and read, as well as dealing with attributes and other advanced functions.

## Symmetrical Systems

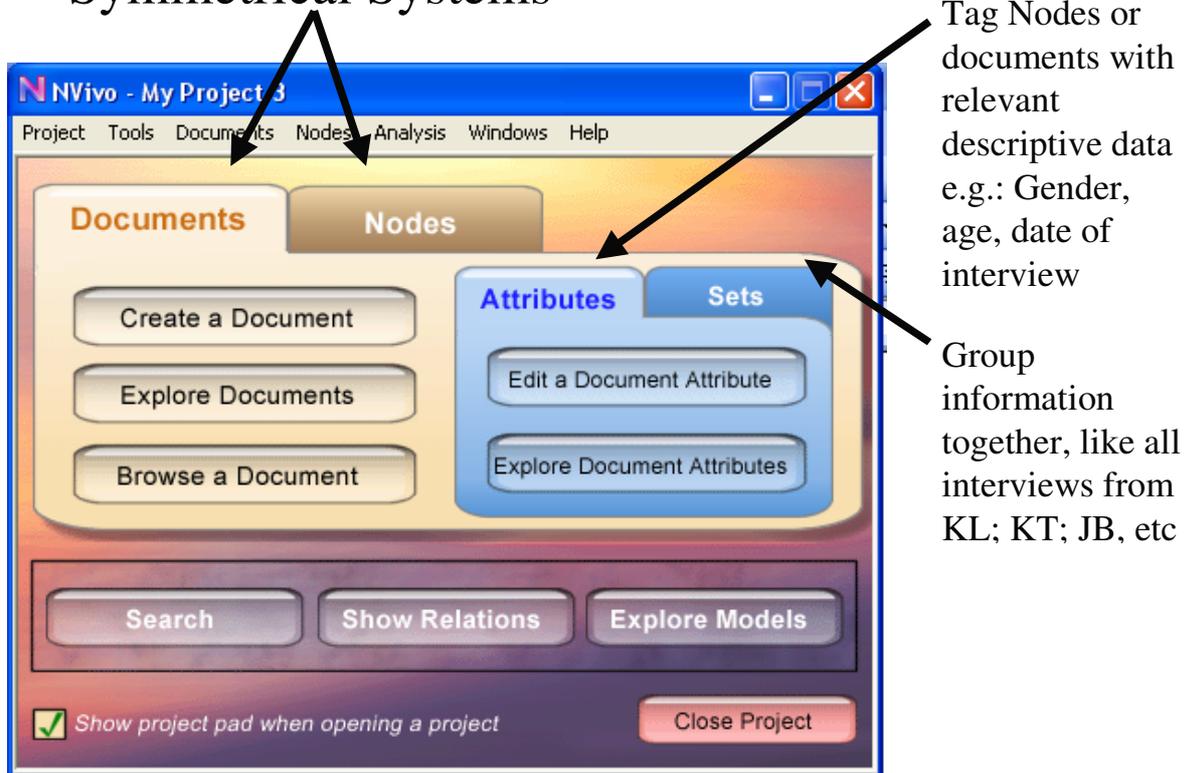


Figure 3. The project pad

The next step after creating the project is to import some data – see Figure 4. NVivo deals with text (.txt) and rich text (.rtf) documents; therefore, the user should ensure that the document is in one of these formats. Rtf is usually better because it will bring along with it any variances in formatting (eg. italics, bold, colour, etc). However, importing rtf can sometimes be problematic, especially if the source document is from the internet or is html. This is because the document may have embedded objects which are not visible and will cause NVivo to reject the import. If this problem occurs, either find the contentious object or save the document as txt.

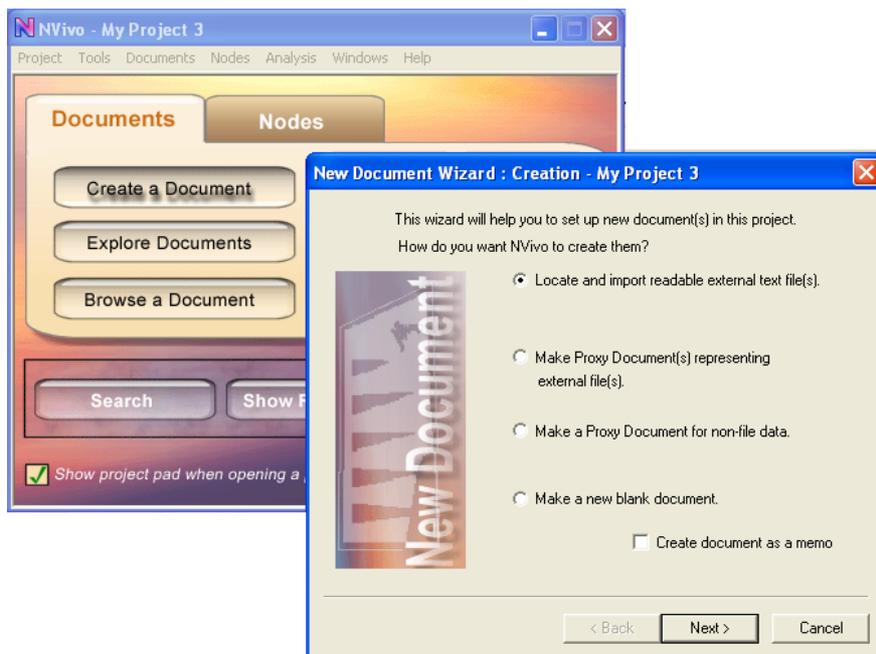
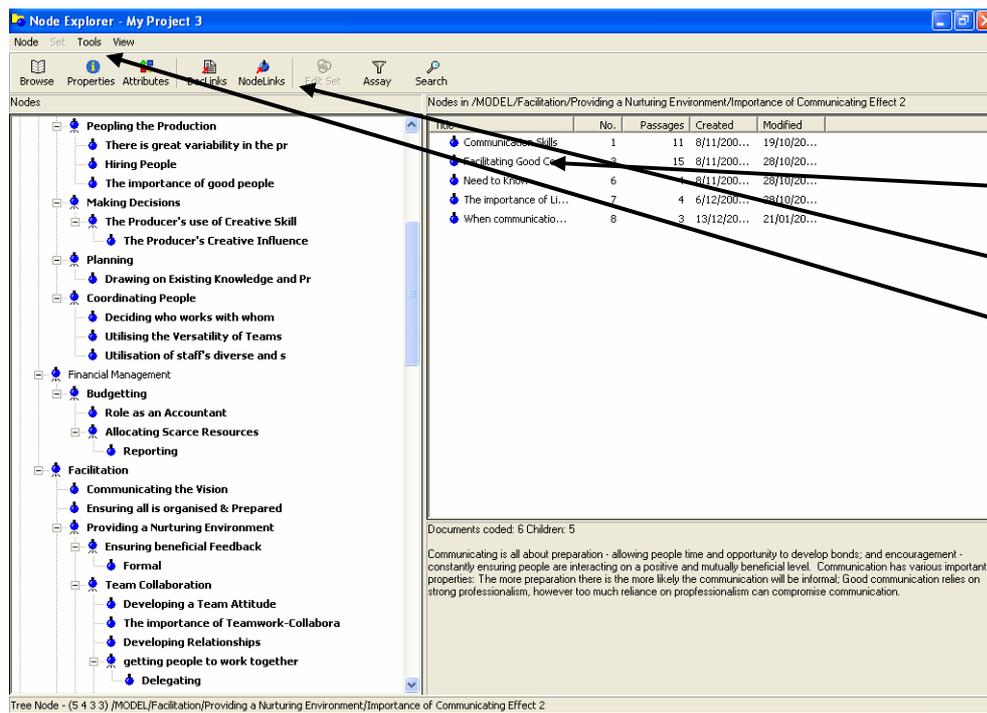


Figure 4. Importing screen

Once imported, the new document will be visible in the Document Explorer – see Figure 5. At this point it is useful to point out that there are generally three ways to access NVivo functions. Usually an item can be right-clicked to gain access to the functions, or a button can be pressed with the mouse, or the menu can be operated.



Three Methods for accessing Nvivo functions:

1. Right-click the item
2. Press the button
3. Operate the menu

Figure 5. Document explorer

The document that has been imported can now be browsed, edited or coded. Coding is the most important function of qualitative data analysis and it is a particular strength of NVivo. Documents can be coded in two fundamental ways; coding can be done automatically using NVivo's search features – which are both powerful and comprehensive – or codes can be applied manually. For a first time user it is recommended documents are coded manually.

Within the manual coding environment there are two ways of coding – codes can be applied *in vivo* – where the selected text becomes the title of the node – or they can be coded according to the structure or tree. Initially, unless the researcher knows what they are looking for, the *in vivo* method is best. Here tags, which are optimally descriptive, are collected in the 'free nodes' area, where they can be later analysed, abstracted, and organised. After coding a number of free nodes, the researcher will then move to a stage of organising these collected free nodes. To facilitate this the researcher should return to the project pad and click on the Nodes tab then the 'Explorer Nodes' button. Here the node explorer will show all of the collected free nodes. These nodes can now be browsed and organised. By dragging them into the

'trees' section, an embryonic structure can be crafted. This is the first stage of analysis.

The next step is to begin coding other documents with the structure that is beginning to be developed. To do this the user would first import another new document and then browse that document. In this window 'Coder' should be selected. Here the tree is brought up and new coded sections of text can be placed directly in the nodes that have already been established, or new nodes can be created and structured into the existing hierarchy – see Figure 6. Coding Stripes can also be selected to enhance the coding process by illuminating the codes that already exist, helping the researcher develop consistency – see Figure 7.

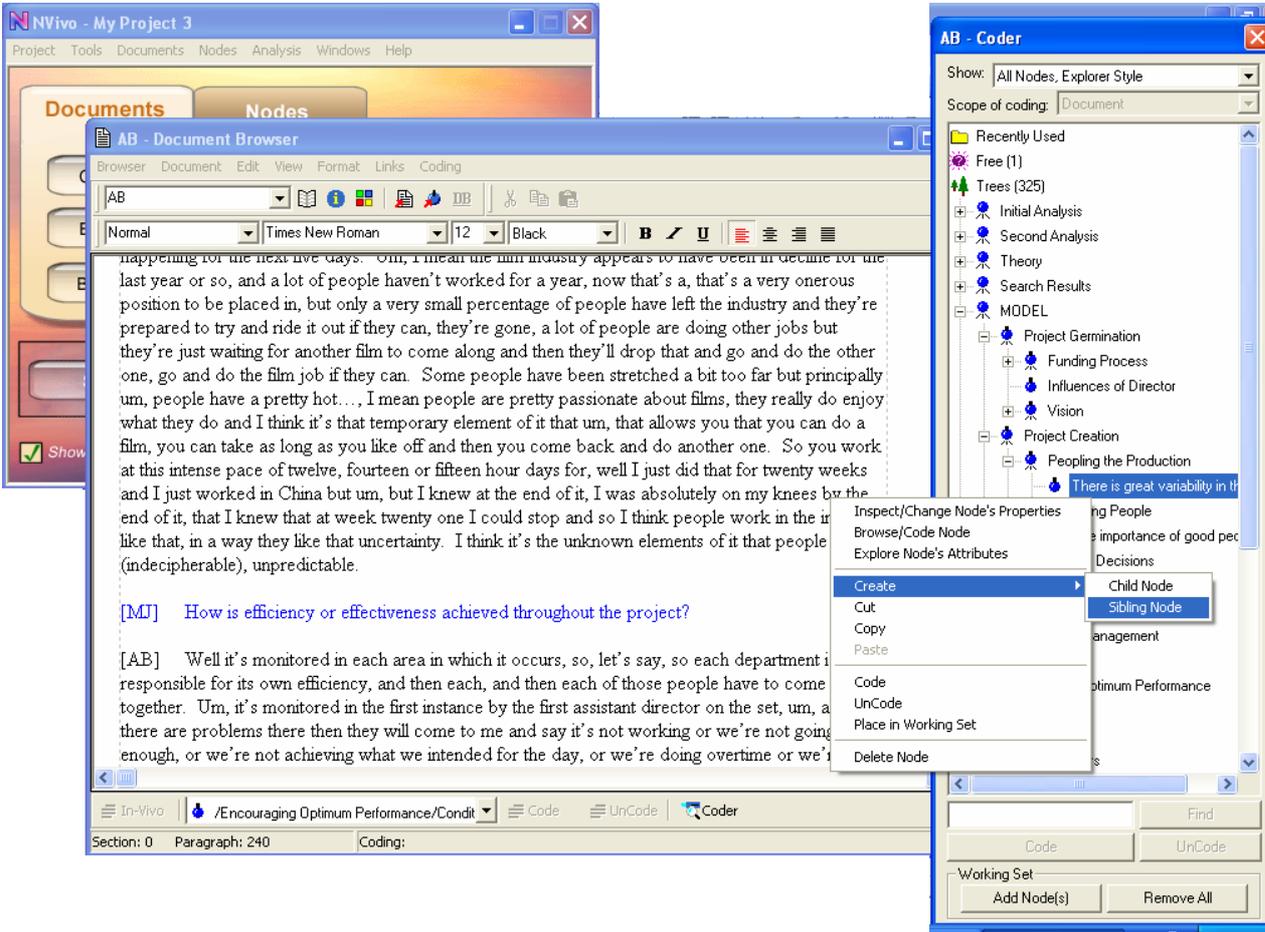


Figure 6. Coding using the Node Tree

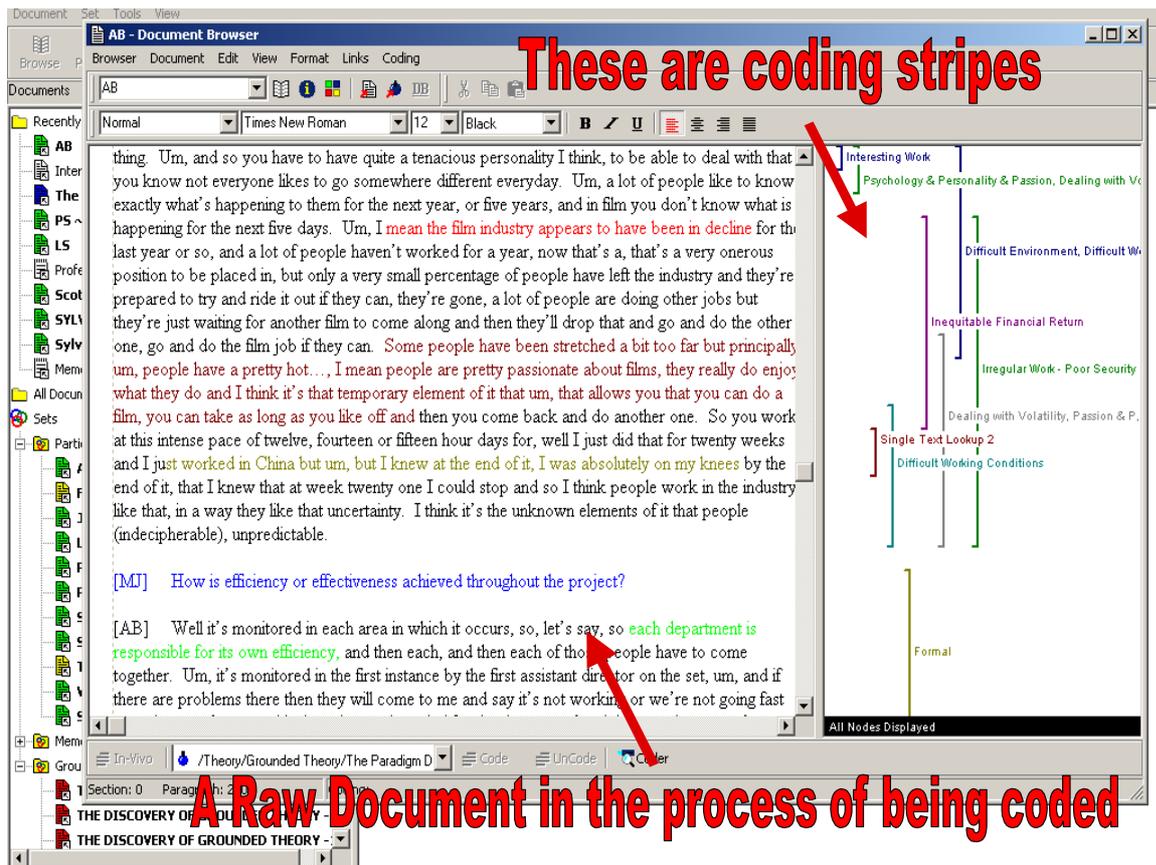


Figure 7. Coding showing the Coding Stripes

When reading the raw data, and during coding, it is important to continually reflect upon the data and the emerging trends. NVivo has two useful features that assist the researcher in this process of reflection. The first is 'Databites' – see Figure 8 – which are a system of hypertexts where internal or external data can be attached to a discrete passage of text. In the case of an internal Databite the annotation which is attached to a document is transferred to all nodes associated with that section of text – this is a very powerful feature. Databites can also be used (like hypertext) to link to external files like tables, photos and graphs. The other tool for reflection is memos – see Figure 9. Memos can be accessed through the node explorer by clicking on DocLinks. Using this feature the researcher can reflect on the data accumulating in each node. In addition, the researcher can cut and paste quotes directly into the memo. This is very useful when it comes to writing up. Through the memos the researcher can explicate the outcomes of analysis and enrich the reflection with anecdotal evidence providing thick description. This step – along with the collection,

comparison and refinement of nodes and concepts – is an important step in the development of theory.

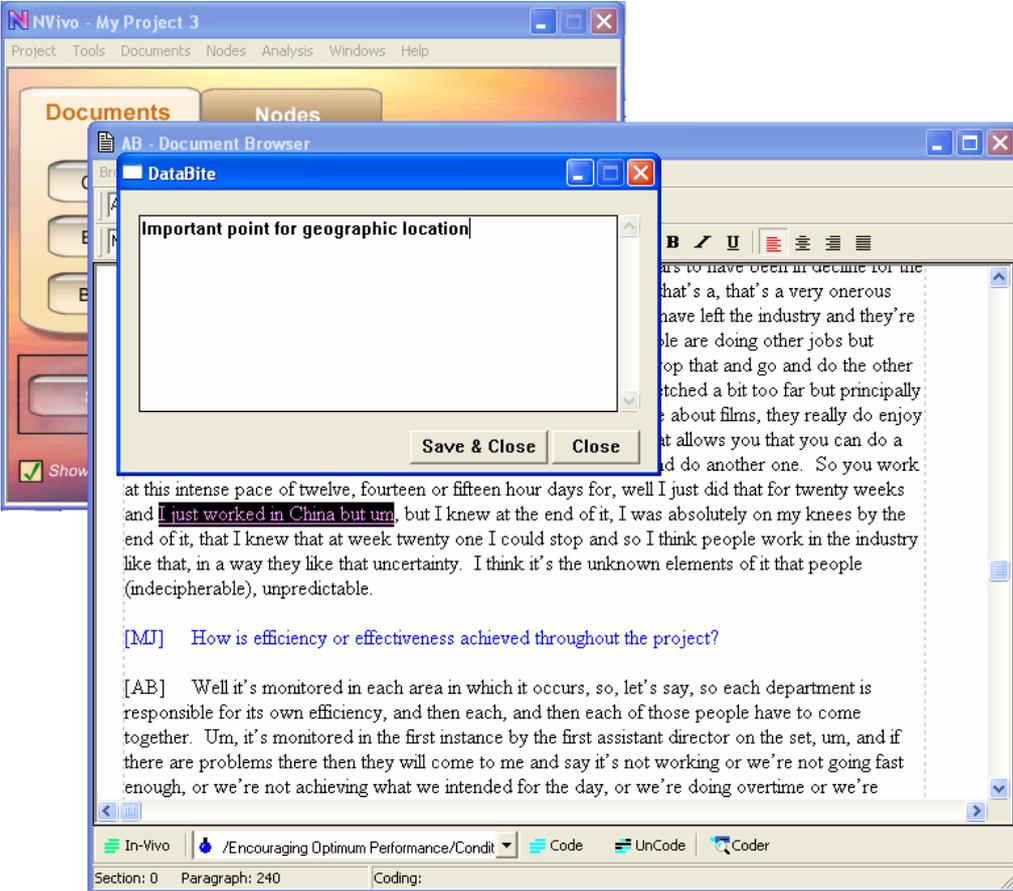


Figure 8. A Databite

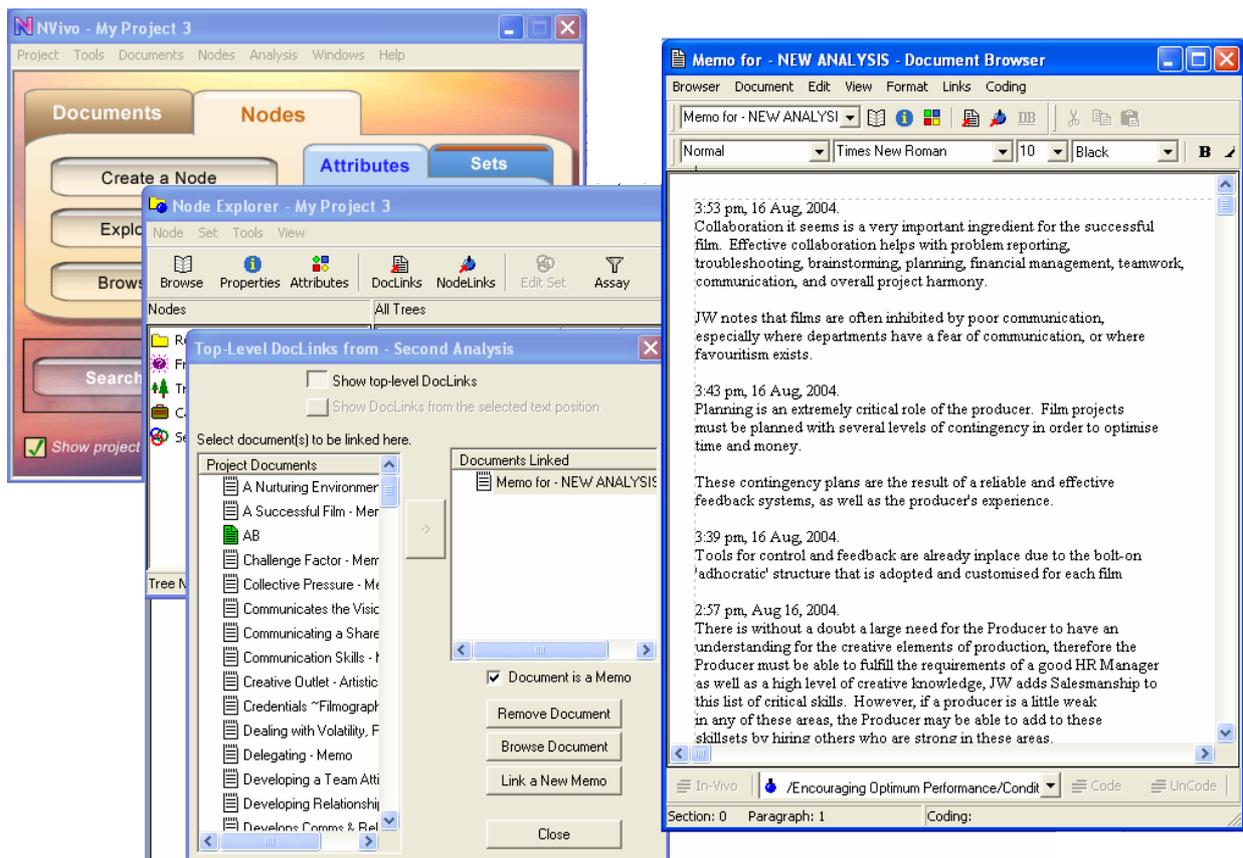


Figure 9. A Memo

This brief overview of NVivo has discussed how to get started in the program, how to code and analyse the data, how to conceive concepts, and through reflection, how to develop theory. While there are many more advanced functions of NVivo that have not been discussed here, this overview should be sufficient to enable most researchers to get up and running with the program.

### What's Next?

The latest product for qualitative data analysis will become available in 2006. This product NVivo 7 combines the power of NUD\*IST 6 with the flexibility and advanced features of NVivo 2 offering users more power and greater flexibility (QSR International Pty Ltd, 2005a). In addition, the new program allows analysis of data in languages other than English, including Chinese and Tamil. The import and data handling features have moved beyond rich text to be able to manage full MS Word™

documents including tables and graphics. The new search engine retains the advanced capabilities of the old search tools, but now has the power and speed of a google™ type engine, with a query based language, and the ability to rank findings in order of relevance. NVivo 7 will also provide undo facilities, the ability to experiment with the data and improved security and portability (QSR International Pty Ltd, 2005a, 2005b).

## **Conclusion**

Qualitative data analysis software is fighting for, and winning dominance in the world of qualitative researchers. More and more researchers are adopting electronic tools, even if they are not using them to their complete advantage. While there is definitely an argument for and against their use, there are tangible benefits for those who make the investment. Qualitative data analysis software makes many of the more repetitive and mechanical aspects of qualitative research easier and more efficient. In addition, the software offers researchers an abundance of tools and accessories which, when used appropriately, will enhance the research project and remove much of the stress and tedium.

NVivo™ is one such analysis product that is quite widely used in the qualitative research community. It is a type three product that allows researchers to retrieve and code data, and develop theory building and modelling. This product is well regarded by researchers and has been used to great success by this author.

The future for qualitative researchers is set to improve with even more powerful and flexible data analysis tools such as NVivo 7, which offers features that will make analysis faster and collaboration easier.

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