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Note that some editorial changes will be made from this submitted version.

## Using NVivo for Mixed Methods Research

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### What is NVivo

NVivo is software designed to support analysis of qualitative and mixed methods data. It belongs to the “theory-building” class of qualitative data analysis programs (Tesch, 1990) as it goes beyond providing basic tools for data management, word searching, coding and retrieval: NVivo allows researchers to interrogate their data and associated coding systems through the application of logic-based queries that identify connections in their data and thus to develop (and test) higher-order concepts and theoretical propositions.

NVivo was originally developed by Lyn and Tom Richards, the founders of QSR International ([www.qsrinternational.com](http://www.qsrinternational.com)), with the initial intention of meeting the needs of researchers working with non-numeric data in the social and behavioral sciences. Despite its primary focus on tools for analysis of qualitative data, since its very early days NVivo (or NUD\*IST, as it was previously known) has also supported the work of mixed methods researchers looking for ways to combine demographic and numeric variables with their text data, or to convert qualitative coding to quantitative variables (Bazeley, 2002).

### Mixed Methods Research (MMR) and use of analysis software

Developments in technology over the past decade have combined with growth in the mixed methods movement to ensure that NVivo, like several other qualitative analysis programs, has continued to develop enhanced and new tools to meet the strategic analysis goals of a mixed methods researcher. These allow for inclusion of a greatly increased range of data types within a project, new ways of visualizing data and the relationships within data, versatile coding, searching, and query tools to support complementary and comparative analyses that combine text and numeric data, and improved methods for exporting qualitative coding information as variable data for further, statistical analysis. In this chapter I will introduce NVivo's tools within the context of the specific mixed methods analysis and integrative functions they serve.

Because the boundaries between major methodological approaches are unclear (Bazeley, 2018b), my definition of mixed methods research does not necessarily demand the combination of a quantitative with a qualitative method, although it typically happens that way. Rather it emphasises the role of integration of the approaches used: “In *mixed methods* research, varied approaches, sources of data, methods of data collection, and/or strategies for analysis are integrated during the

process of achieving the purpose of the research” (Bazeley, 2018a, p. 10). More specifically, I see *integration* in mixed methods research as *purposeful interdependence* between data sources and/or the different methods used for analysis of those data (Bazeley, 2018a). The first of two primary ways in which integration occurs is through the iterative exchange between different elements in a project that takes place more or less incidentally during the design and development of the project, during data collection, and during the analysis process (e.g., Burch & Heinrich, 2016). In this process, ideas and understanding developed through one kind of data stimulate ideas, revised processes, and fresh perspectives in another, leading to deeper insights overall. The second primary way in which integration occurs is through a planned “point of interface” where different methods are deliberately brought together for a significant developmental or analytic purpose (Morse & Niehaus, 2009). This more deliberate approach to integration can be seen when the analytic gains from one method are used to inform the development or analysis of another, when data from different sources are brought together for complementary and/or comparative analyses, or when data are transformed to allow a second, different type of analysis that will complement or extend the initial analyses.

Mixed methods research might include any or all of the following tasks:

- Determining a purpose for a project;
- Design of a project, including
  - deciding whether one or more sources of data are needed to answer the research questions;
  - ensuring that data to be generated can be analyzed in a way that will benefit the purpose of the research;
- Data gathering and management of those data;
- Preliminary preparation and analyses of data from different sources and of different types;
- Analysis of the combined data sets, including one or more of the following activities:
  - Combination of multiple and varied sources of data in a complementary analysis;
  - Comparison of data from different sources or types;
  - Comparative analyses based on the intersection of linked quantitative and qualitative sources;
  - Transformative analyses in which qualitative coding is converted to variable data and analyzed statistically
- Reporting from a project.

Capacities and tools provided within NVivo to support tasks involved in mixed methods analysis include:

- Mapping and visualization tools to assist with planning, exploring, thinking through, and communicating analyses
- Capacity to import and manage data of multiple types (text, image, audiovisual, social media, survey) in a variety of formats.
- Data management tools that allow you to concurrently sort, cut, and recombine data in multiple ways, whilst also keeping track of source information for any segment of data.
- (Interactive) coding tools to bring together all that is known from across the full range of sources on any and all topics of interest for complementary analyses or as data for further comparative or transformative analyses

- Auto coding tools to assist in theme identification (with potential for transformation) in large corpuses of text-based data
- Linking and memoing tools to record reflections and connect these with evidence, and to connect items across the database
- Searching tools to assist in exploring data and in locating specific items or combinations of items
- Query tools that combine quantitative and qualitative data for complementary and comparative analyses
- Query tools that identify patterns of association between data items
- Capacity for transforming coded data to variable data for statistical analysis.

Effective use of software tools involves working out how best to apply them to the tasks that need to be undertaken. What follows is an outline of some strategies to achieve this, learned through long experience. For more detail, see also Bazeley (2018a), Jackson and Bazeley (2019), and Woolf and Silver (2018).

## **Strategies for using NVivo: the *Wellbeing* Project**

Tools available in NVivo to assist with the various stages of a mixed methods project will be illustrated with reference to an evolving mixed methods project. The *Wellbeing* project is designed to assess the health benefits to older women of participation in exercise and other community-based classes organized through the Older Women's Network of New South Wales. It began as, and primarily remains, an ongoing evaluation exercise to meet annual reporting requirements. At the same time, the data available are allowing for conceptual development in relation to what wellbeing means for older women, and for an exploration of the interrelationship between health and wellbeing for older women.

### **Determining project purpose and design – project planning**

Project planning typically involves reviewing relevant literature, and planning for obtaining the information needed to gain necessary understanding to meet the purposes of the research.

Literature providing a foundation for a mixed methods project is imported directly into NVivo from selected bibliographic databases (EndNote, RefWorks, Zotero, Mendeley). PDF articles are coded, and notes recorded in memos. 'See also links' directly link literature, data, and emerging ideas in a web of data to support theory development and reporting.

The complexity of mixed methods projects demands that planning be as thorough as possible, although flexibility is also necessary. Visual tools assist in the planning process, in mapping either a conceptual framework for a study or a theory of change model for an evaluative or explanatory (causal analysis) project. A (simplified) theory of change model for the *Wellbeing* project, developed from a focus group discussion using an NVivo concept map, is shown in Figure 1. This points to the varied kinds of information that will be required in order to determine the potential value of the activity programs for the wellbeing and health of older women. Concepts and categories identified in this process can, additionally, be explored and expanded using a mind map. A mind map translates to a starter coding system for data that will be gathered during the project.

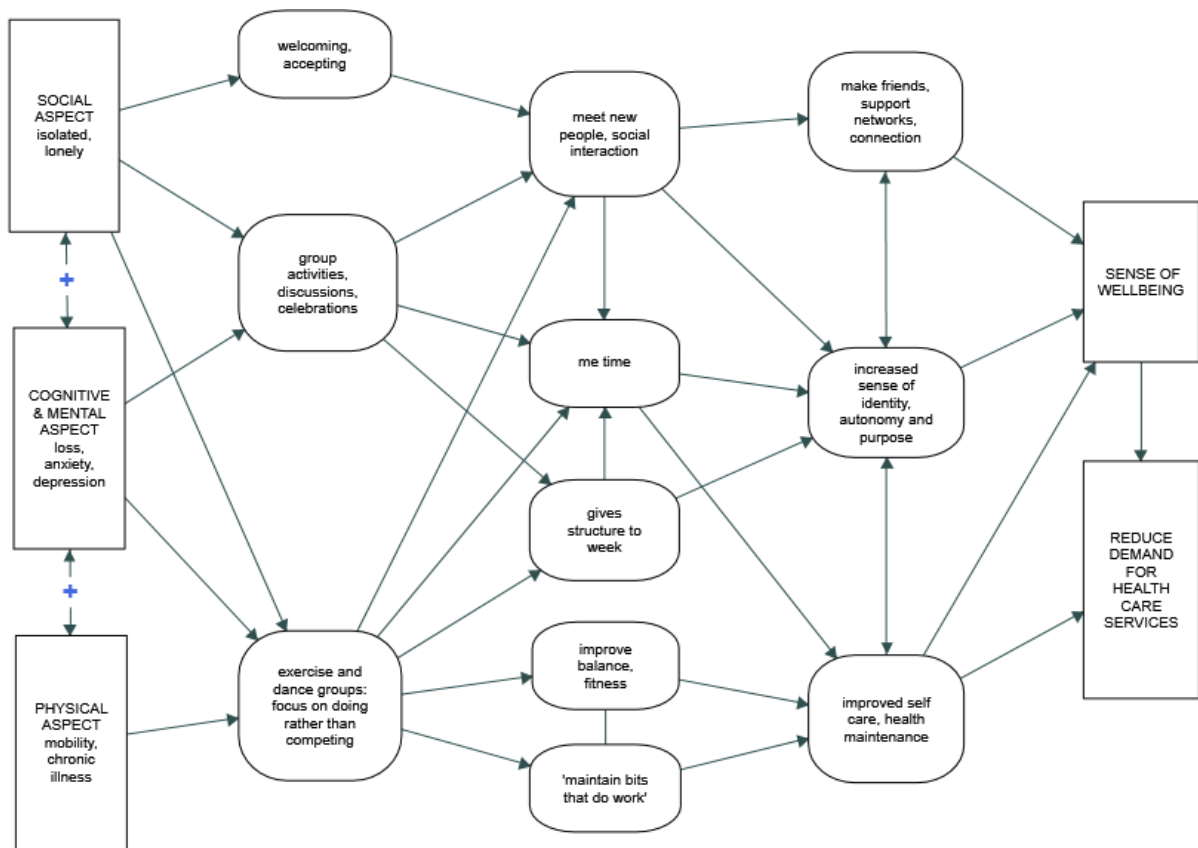


Figure 1: Concept map to show theory of change

A concept map can be used also to create a design diagram illustrating the type and sequencing of methods to be used in a project. This has dual benefits: it assists the researcher in planning the project by clarifying the steps needed to complete the project, and it assists in communicating the intent of the project to funding agencies or, eventually, to readers of reports from the project. As plans are likely to be modified during the course of the project, so visual diagrams can be duplicated and then modified, allowing for adaptation while the history of their development is preserved.

### Data management, involving multiple data types

Mixed data types and/or sources are an inherent component of a mixed methods project. As well as literature, the Wellbeing project makes use of annual questionnaires, interviews, cultural domain data (e.g., free listing), video, and observation. Records from these various data sources were imported as files into a single NVivo project, for both separate and joint analyses (Figure 2 shows the range of data types that can be imported). Audio and video files can be transcribed within the software. Survey data that contains open-ended response fields is imported directly from an online source, or via MS Excel. Reports from statistical analyses are imported as text documents.

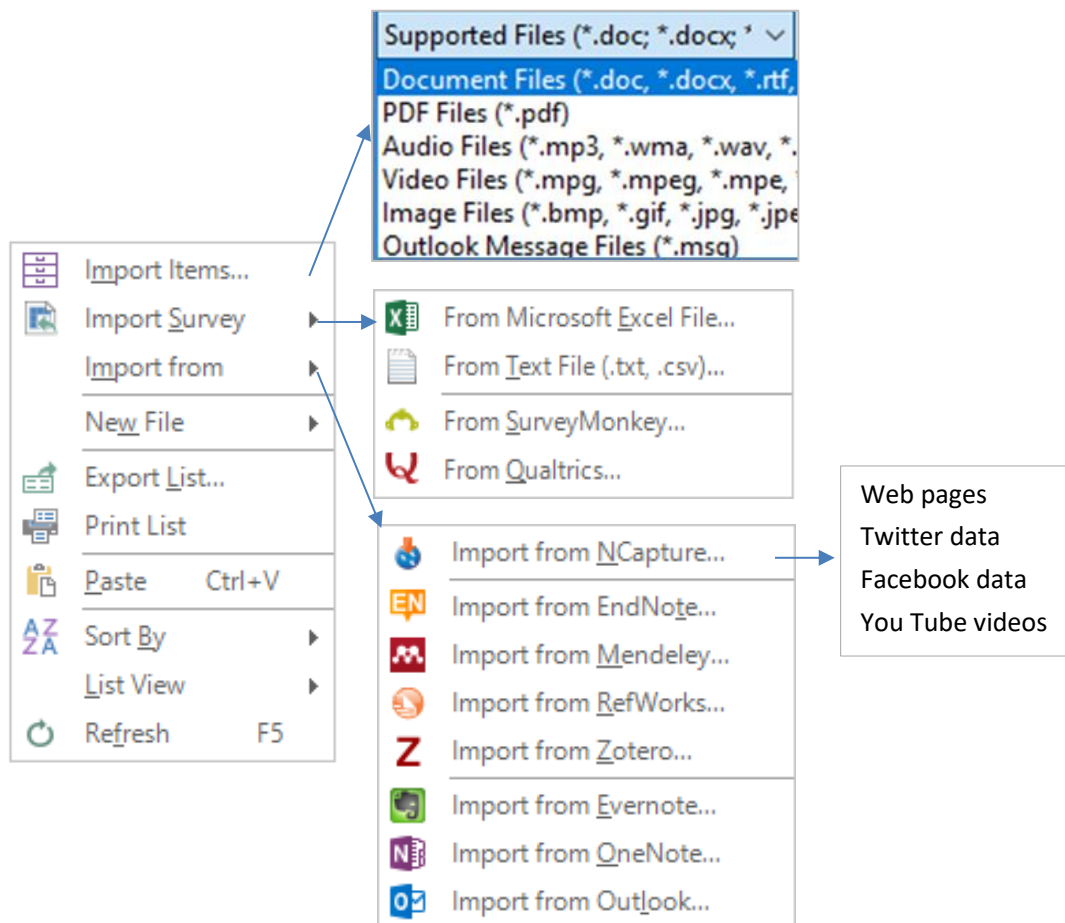


Figure 2: Import options, allowing mixed data types

Management of these different files is facilitated by the use of folders, sets, and cases, to allow for retrieving, cutting, and splicing data in multiple ways, while never losing track of the source of any data segment. Imported files of different types are placed into different *folders* (those for the Wellbeing project are shown in Figure 3), serving both visual clarity and searching within or interrogation of particular types of data. *Sets* comprise shortcuts to particular imported files; these might be collections of files from different phases of a project (e.g., Time 1 and Time 2 in the Wellbeing project), or perhaps a set of all files relating to older women with a low score for wellbeing. Files are placed in one folder only, but shortcuts to them can be placed in more than one set. These are used for comparative analyses or to restrict (“scope”) other analyses to a particular set of the data. *Cases* are essentially a type of coding category used as an administrative tool to gather together everything that is known about a particular case – a unit of analysis – in a project, regardless of whether that information is found in multiple files, a single file, and/or just part of a file. Often cases represent people, but they might also represent sites, families, organizations, items in a collection, and so on. Importantly, for mixed methods work, demographic and variable data can be attached to cases as *attributes* of those cases, so that any qualitative data can be viewed in relation to associated quantitative data. These various management tools mean that selected folders or sets of qualitative data can be sorted, explored, and interrogated in relation to demographic or other variables. For example, interview or pictorial data about wellbeing gathered at different phases of a project can be compared for individuals or for women who have different scores on a wellbeing scale.

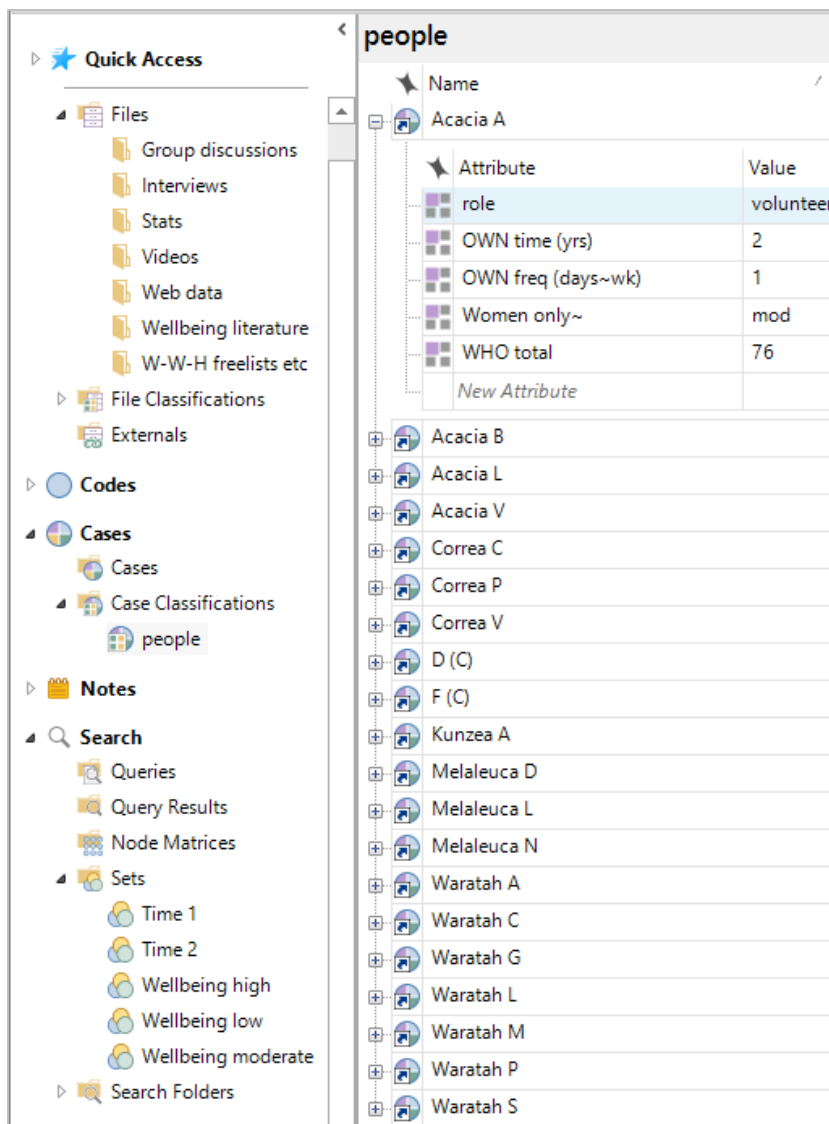


Figure 3: Navigation pane, showing data management tools

## Preliminary analyses

Although some integrative strategies can be employed using 'raw' data, in most projects preliminary (initial) analyses of data of different kinds from the separate sources will be necessary.

### Text and audio-visual data

Once text, PDF sources, image and other multimedia sources are imported, reflective reviewing provides an initial overview of their content, giving context to later coding and providing seeds for questions and ideas that might become important as analysis proceeds. Reflections are recorded in linked memos or in a general research journal (within the software), potentially using see also links to connect thoughts with the source material that prompted them (Figure 4). These reflective journals will be extended throughout the project and become a vital resource during later analyses and when writing up; coding their content as you work helps with later retrieval of ideas, with the links pointing to supporting evidence.

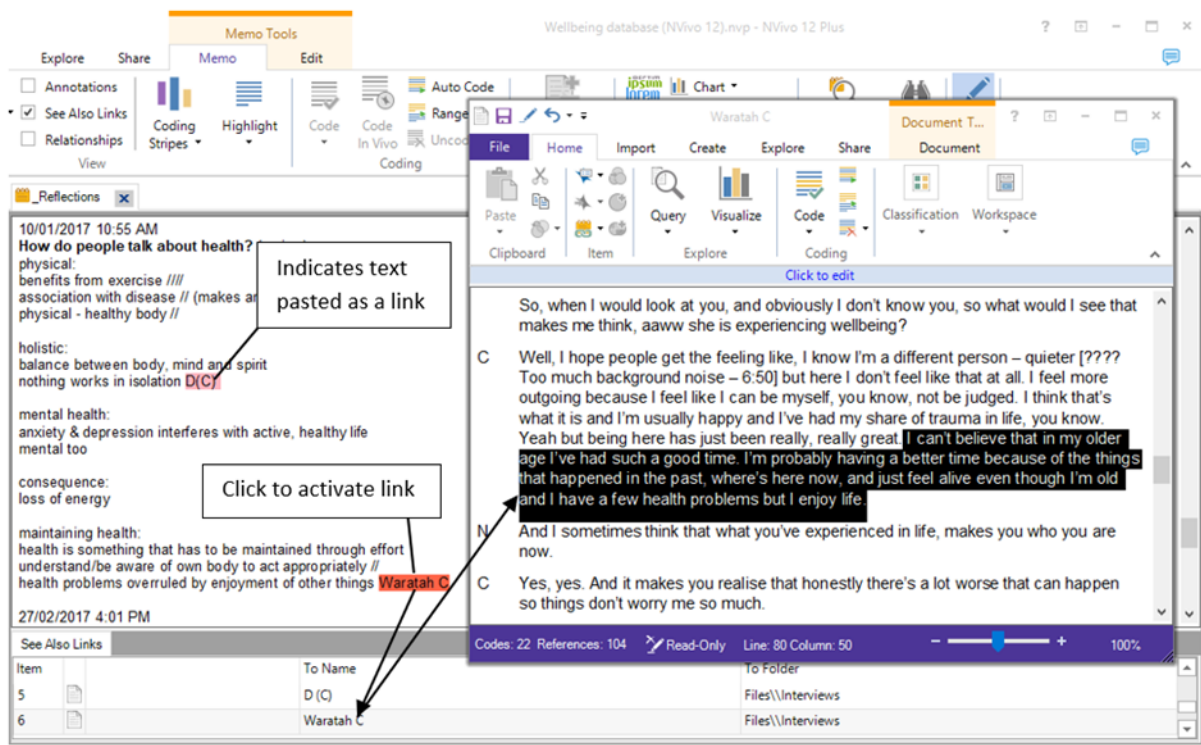


Figure 4: Using see also links to connect reflections with source material

Segments within imported sources are then coded to user-defined categories in one or more of several ways, with the first being most common:

- interactive coding in which the user selects a passage of text, a region of a picture, or a selection from an audio/video waveform, and uses drag-and-drop or context menus to apply one or more codes to represent the content and any other relevant aspects of that segment;
- auto coding based on the structure of the file (e.g., where there are different speakers) in order to identify and code sections (i.e., what those speakers said) to case codes that capture just what was contributed by each speaker;
- auto coding to 'themes', based on word/phrase analysis of the text; or
- predictive coding of uncoded text, based on existing patterns of coding;
- sentiment analysis, identifying positive or negative statements based on words used.

These last three should be used with great caution! NVivo provides results from these in codes, so that the content can be checked, merged and modified by the user.

Coding is designed to tag or index the content of the various sources for further interrogation, but the development and application of codes are, in themselves, an interpretive (i.e., analytic) activity as decisions are made about what has been said or written or otherwise shown in the files. Codes are initially created from a priori theorizing or freely as text is read, but then are progressively arranged in a hierarchical taxonomy of project concepts. This helps the user see "what have we got here" as well as with querying the data at later stages of the analysis. The coding system In the Wellbeing project went through several iterations as the project (and my thinking about it) developed. Currently it has code groups covering dimensions of wellbeing and health (e.g., physical, affect, relationships, personal resources), the focus of the conversation (ageing, challenges, wellbeing, health), and aspects of the social context (e.g., being female, widowhood); also groups of

codes covering the more administrative aspects of running the Wellness Centers (system inputs, coordination, group activities).

### **Survey and social media data**

When a survey dataset is imported into NVivo it retains its tabular format. A 'wizard' is used to automate the process of creating a case for each participant (i.e., one per row of data), with relevant open-ended responses coded to the case, and demographic, categorical and scaled responses recorded as attribute data for the case (similar to that shown in Figure 3). Open-ended responses are also auto coded to codes to indicate the question being answered, and their content can be auto coded for themes and sentiment. Further searching or interactive coding of case data or responses to particular questions is, of course, also possible (and encouraged). Statistical analyses of closed-response data are conducted separately.

Social media datasets containing text and associated metadata (e.g., location, status of message, demographics of the sender) imported through NCapture are also imported in tabular format. Coding is less automated but data are quickly sorted, for example, by hashtags and usernames, with comments gathered into codes for further interactive coding.

### **Statistical data**

Preliminary coding and analysis of any statistical data such as from surveys or other databases that are part of a mixed methods project will normally be carried out using statistical software. This kind of information is then imported into a mixed methods NVivo project in one or both of two forms: (1) a report from the statistical data might be imported as a file, where it will be coded to capture relevant aspects of the content (including statistical results and tables) using the same coding system as was used for the qualitative data; (2) selected variables, for those cases where qualitative data is also available (e.g. from interviews), will be imported and recorded as attribute data for those cases, in MS Excel or IBM-SPSS format.

## **Integrative analyses**

Integrative analyses take many forms and shapes, as researchers construct methods for bringing together diverse forms of data, and for exploring and analyzing data in a variety of ways. Essentially, however, there are three core processes underpinning these different strategies for which the computer provides specific assistance. The '3 Cs' are to combine, to compare, and to convert.

### **Combining data and analyses in a complementary process**

Data retrieved from different sources are integrated in a complementary way through using one source to supplement a finding from another by illustrating or expanding on it; through weaving the information from different sources together into a narrative, description, or explanation; or through merging the information into a composite understanding of the topic.

In many mixed methods projects, a great deal of complementary analysis occurs outside the computer environment as data and preliminary results from different sources are brought together by the researcher during an analytical writing process. There are, however, specific ways in which NVivo can facilitate this process, from early stages of a complementary analysis. (1) A simple process of retrieving coded segments for a particular code will bring together the data from all sources,

regardless of type, on that topic or issue for complementary review and combination (Figure 5). Retrieved segments are ordered by folder, so that what is known about the topic can be reviewed as a whole, or for each type of source in sequence. (2) If there is a larger amount of data, a matrix coding query will separate the material relating to selected codes (in rows) as contributed by different source types (in columns). This will reveal what has been contributed by each type of data for each of the target codes, providing a range of counts and, critically, also access to the source content within each cell (Figure 6).

changed self-perception

<Files\Group discussions\Wellness Centre volunteers 25 Feb 2016> - 5 1 reference coded [1.38% Coverage]

Reference 1 - 1.38% Coverage

No one is judgmental is part of the process that gets you to the end point [yeah] which is feeling good about yourself and being ..

And the increase of self-esteem.

Yes, when you go there you're just yourself and you are welcomed for who you are.

<Files\Interviews\Acacia B> - 5 2 references coded [3.88% Coverage]

References 1-2 - 3.88% Coverage

B: I tell the story of one of the women that came. When she came, the first day she came she struggled to get up the stairs, and when she got up there she had to sit down for a while. She was puffing so much. Anyway, she wanted to do some exercises you know and that. Anyway, when she first came she was very overweight and not very mobile at all, and first of all, I encouraged her to, things that she'd say, oh I can't do that, I'd say, yes you can and you know I'd do it next to her and encouraged her to try and then she found out that she could do it, which surprised her. Anyway, after she'd been coming for about a year and a half you wouldn't know it was the same person. She dyed her hair, she used to wear make-up, she dressed really nicely.

Sources of retrievals always identified and accessible by clicking

Retrieve data from a variety of source types about any topic or issue

Access additional context for retrievals as needed

Figure 5: Code retrieval for complementary analysis

	A : Literature	B : Participant data	C : Stats results
1 : being active	5	11	1

Frequent trips outside home are related to better physical function and physical independence [49]. These findings led to the inclusion of the "be active daily" recommendation in the UK physical activity guidelines targeting older people. During trips outside home, people accumulate most of their total daily activity and more specifically most of their moderate intensity activity,

<Files\Wellbeing literature\The solid facts WHO 2e 2003> - 5 1 reference coded [0.55% Coverage]

Reference You know, Once you can't get around, this has happened to my sister, now she's slowing up and not able to walk. That makes, the minute you can't, you lose your mobility, it takes a lot of mental power to keep positive. So that's why keeping yourself physically fit is so important.

<Files\Interviews\Acacia A> - 5 3 references coded [12.89% Coverage]

Referen Most (32; 76%) exercise for 20 minutes or more several times each week with 9 of those doing so daily. More than half (28; 64%) did so 'yesterday'. Neither was associated with age or length of attendance at OWN. Those who exercised yesterday had significantly better general wellbeing than those who did not (WHO 71:51;  $p=.001$ ) and tended to experience better general mood (MGMQ).

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid daily	9	20.5	21.4	21.4
several time/week	23	52.3	54.8	76.2
weekly	3	6.8	7.1	83.3
less than weekly	7	15.9	16.7	100.0

Figure 6: Matrix showing contribution of different sources on topic of physical activity

In the Wellbeing project, the process of sorting and refining codes, and of reviewing data from multiple sources together, in combination with mapping ideas, has contributed to developing a preliminary conceptual model of wellbeing for older women (Figure 7) that will be subject to refinement as the project progresses.

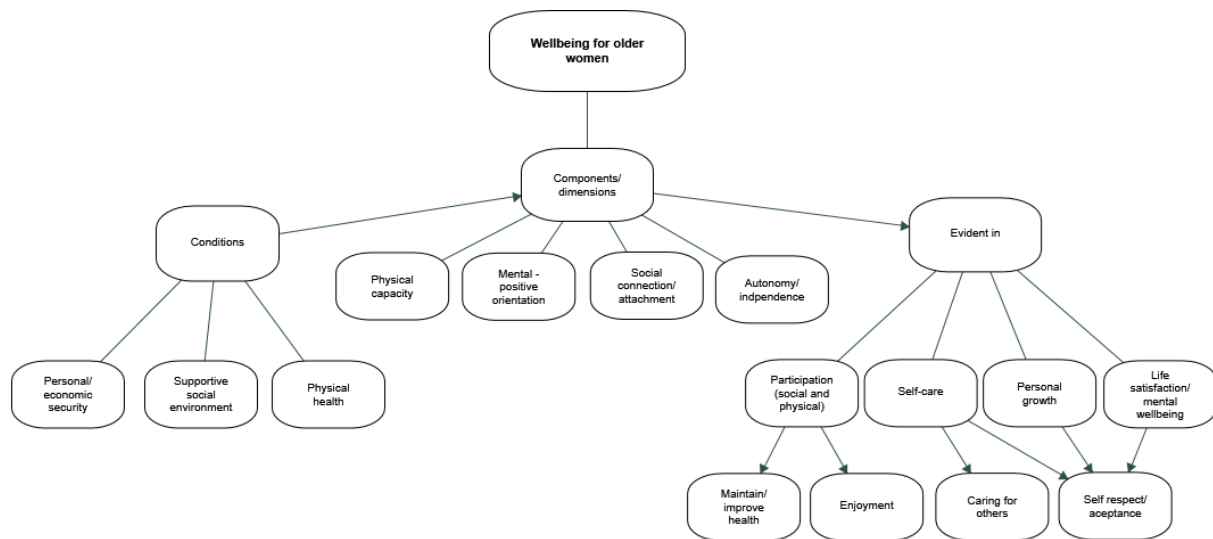


Figure 7: Wellbeing for older women – preliminary concept map

### Comparative processes

Comparative processes are an essential component for any kind of data analysis, and mixed methods is no exception. Constant comparison during coding to enrich category development is a well-known tool of theory development (Glaser & Strauss, 1967). Within-case and cross-case comparisons are a staple of both qualitative and mixed methods analysis (Bazeley, 2013, 2018; Miles, Huberman, & Saldaña, 2014). Such comparisons might be undertaken, for example, to compare responses given in different settings, in relation to different events, from different participant groups, or at different times. In NVivo, three tools are used for these types of analyses – framework analysis, the crosstab, and the matrix query.

For smaller projects, *framework analysis* is valuable for within-case and cross-case analyses. One or more cases define rows in the framework tool (these can be sorted by case attributes so that, for example, all females are listed before males), and codes reflecting topics discussed or categories identified in the data define columns. Coded data segments matching row and column specifications for a particular cell are displayed in a panel to the right of the matrix, allowing the user to review these and enter a summary in the relevant cell (Figure 8). Alternatively, cells can be auto-filled with all relevant coded data for each. The tabular layout helps the analyst to compare or perhaps see connections between responses coded at different codes for selected participants (working across a row). Reviewing summaries for different cases for the same code (reading down the columns) draws attention to key features and common patterns across the various cases. The resulting matrix (summaries or coded data) can be exported for printing and further review.

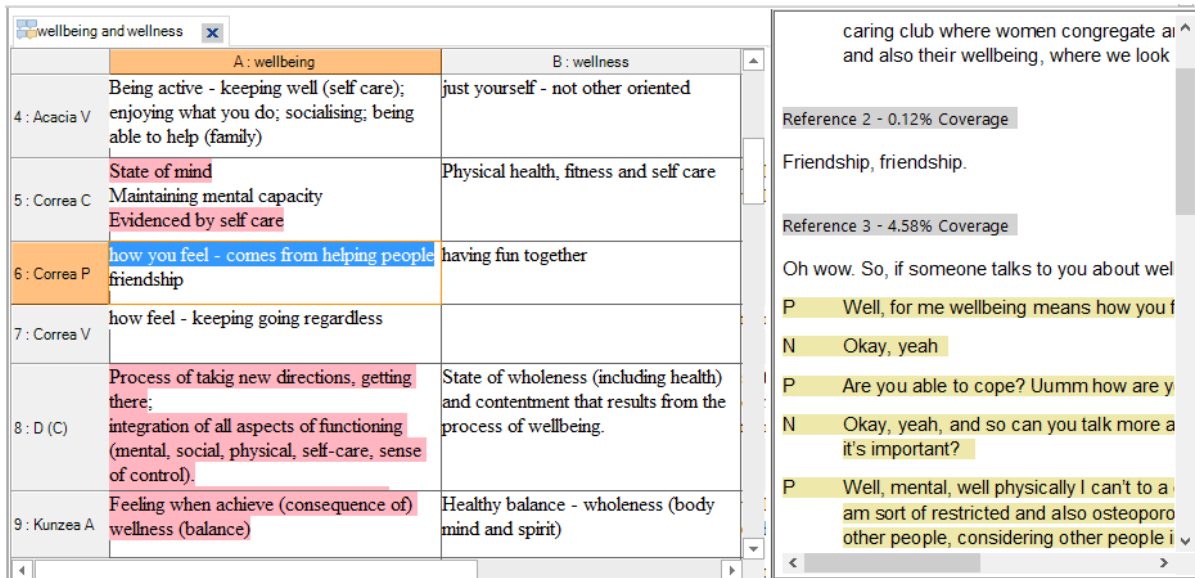


Figure 8: Cross-case analysis using a framework matrix

These kinds of comparisons will occur in a mixed methods project also (where coded content in any cell potentially includes mixed data), but the particular contribution of software such as NVivo in a mixed methods context is to facilitate comparisons that combine quantitative and qualitative data. Thus, when projects involve more cases or a faster analytic process is desirable (e.g., viewing responses for all members of a numerically-defined group of cases together), or more freedom about what is used to define rows or columns in the analysis is needed, either a *crosstab* or a *matrix coding query* is used.

Cells in a crosstab or matrix will report on content found by intersecting items used to identify the rows and columns, providing both counts and qualitative content for each resulting cell. Content counted and shown can be limited (scoped) to that located in particular folders or items (e.g., codes or sets). These tools can serve a range of analytic purposes, answering questions such as:

- Do different (types of) sources agree?
- Is the way in which participants talk about the future differentially associated with their age (or other demographics), which classes they attend, for how long they have attended, whether they meet with other members at other times, or their score on the WHO wellbeing scale?
- If a score on a scale to assess depression is associated with a difference in verbal responses, do these differences validate the scaled measure?
- What does it mean experientially to be at a certain point as measured by, say, a visual analogue scale for pain?
- Do responses rating satisfaction with a service correspond with concurrently gathered verbal responses about the same service?
- Does examining differences across subgroups of a sample reveal variations in (or sub-dimensions of) a concept?

A *crosstab* is ideal for sorting qualitative data coded at one or more codes by values of demographic variables, categorical responses to survey questions, or scaled values – each of these having been stored as attribute data. The crosstab tool, used for this purpose, is illustrated in Figure 8, to show

how a scaled score is reflected within the qualitative data – in this case, the ways in which (a small sample of) older women talk about some aspects of wellbeing sorted by their (grouped) scores on the WHO wellbeing scale. Numbers can be shown to represent cases, number of passages coded, or percentages (based on the available number of cases in the sample for either columns or rows). Double-clicking on any cell opens up original (text) data for that cell.

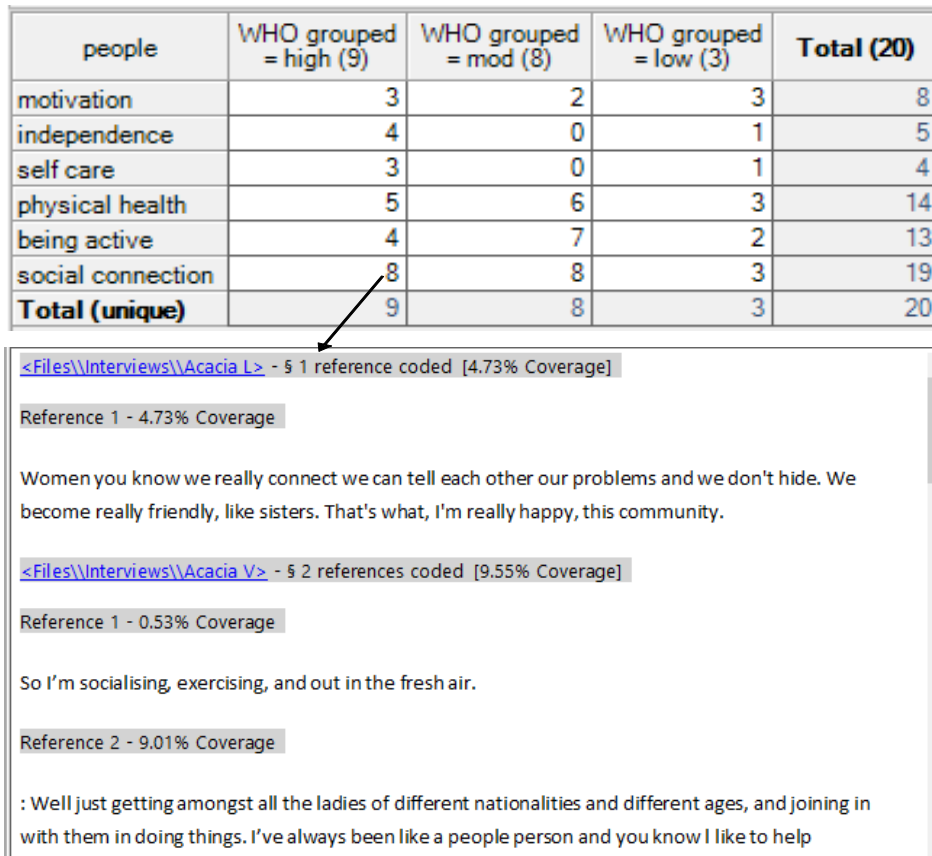


Figure 9: Using the Crosstab tool to compare comments contributed by women experiencing different levels of wellbeing

A *matrix coding query* works in a similar way, but is more versatile than the crosstab in the kinds of project items that can be used to define both the rows and the columns, and in the way in which these can be combined. As well as codes and attribute values, items entered might additionally include files or sets of files (as shown earlier in Figure 6), metaconcepts represented by sets of codes (entered as separate items or as a group), and results from previous queries. A greater range of counts are provided in the resulting matrix (including number of words, or files), although percentages, less usefully, are based on proportion of row or column content coded in a cell. Again, the qualitative content for each cell is available. Of interest in the Wellbeing project, for example, will be changes in understanding of health and wellbeing (codes) and in measures of wellbeing (attribute values), over time (sets, as more data are added), for women of different age groups (attribute values).

### Transformative processes, directly converting data from one form to another

This third broad area of integration assisted by NVivo occurs during the analysis stage of a project, most often as codes used for qualitative data are counted or converted to variable data. This form of conversion is undertaken so that qualitatively derived variables can be used in a statistical analysis, so that data from different sources can be entered into a single database to aid complementary analysis, or in order to create a blended variable (a composite variable derived from both quantitative and qualitative sources) for use in further analyses. Alternatively, as demonstrated in the Wellbeing project, interpreted statistical data is included and coded with qualitative sources or perhaps is combined with qualitative data as summarized (qualitized) entries in a meta-analytic database.

Producing qualitatively derived variable data is aided, once more, by NVivo’s crosstab or matrix coding query, either of which can be used to create and export a case by variable table in either .xlsx, .sav, or .txt format, suitable for importing directly into a statistical program, or for adding to an existing statistical data set. Figure 10 shows coding counts (number of passages) for some cases for selected wellbeing dimensions; data can alternatively be exported as dichotomous (0/1) values to indicate coding presence. Careful thought (and justification) needs to be given by the user regarding which form most appropriately reflects the underlying qualitative data. These data are not appropriate for describing population parameters because of inherent sampling and response rate issues, but where sufficient cases exist in exported data, associations between code-derived variables can be assessed. If there is a dependent (outcome) variable, transformed data can be incorporated into predictive (regression-based) analyses; or latent class or cluster analysis can be applied to identify groups of either cases or variables based on the similarity of their patterns of distribution across variables or cases, respectively (Bazeley, 2018). Any conclusions drawn from these analyses should be interpreted cautiously, as being indicative more than conclusive, and always in association with analyses of the qualitative data on which they are based.

	forward orientation	at peace, relaxed	personal resources, self	being active	achievement, satisfaction, purpose	social connection
Acacia A	1	2	1	3	0	3
Acacia V	3	0	7	6	1	2
Correa C	4	0	7	0	0	5
Correa P	0	0	1	0	0	6
Correa V	2	1	3	0	1	5
Melaleuca D	2	2	3	4	1	5
Melaleuca L	8	5	0	1	0	5
Melaleuca N	2	4	3	2	0	5
Waratah A	3	0	0	3	0	4
Waratah C	0	0	0	2	1	3
Waratah G	0	1	0	2	1	4

Figure 10 A case by variable table derived from transformed qualitative coding

### Exploratory visualizations using transformed data

Exploratory multivariate statistical strategies – primarily cluster analysis, multidimensional scaling (MDS) and correspondence analysis – are often used with transformed qualitative data as they recognize the nominal nature of the variables and so do not have the same demands as regular inferential statistics with regard to sampling and normality of distribution for the variables used.

These procedures result in graphic displays, supported by statistical output, that point to possible relationships between codes or other items. Cluster analysis (referred to earlier in connection with case by variable data) and multidimensional scaling can be applied to a similarity matrix of codes created in NVivo, and correspondence analysis to a matrix of codes by codes or codes by attribute values.

In a reflected similarity matrix designed for cluster analysis or MDS, the same codes are entered in both rows and columns with cells indicating the frequency with which each pair of codes intersects (Figure 11). In using a matrix coding query to produce these matrices, NVivo offers a degree of precision not available in regular multivariate statistical analyses. Rather than simply identifying if pairs of codes are both present somewhere in the data for each case regardless of context, as usually occurs when analyzing variables from survey data in a statistical program, NVivo identifies and counts Intersections of codes that occur on exactly the same segment of data, thus providing a greater warrant for assuming a meaningful connection between them. The resulting matrix is then exported to a statistical program for further analyses, where results are displayed graphically, with associated statistical data. Cluster analysis, as before, identifies coherent groups of codes (although the clusters will vary from those identified from a case by variable table); multidimensional scaling assists the researcher in identifying dimensions within the data from the way in which codes (variables) are positioned in two- or three-dimensional space.

	relationships ▼	forward orientati... ▼	giving and recei... ▼	personal resour... ▼	mental wellbeing ▼
relationships ▼	174	11	11	10	7
forward orientation ▼	11	61	0	5	3
giving and receiving care ▼	11	0	45	10	4
personal resources, self ▼	10	5	10	61	3
mental wellbeing ▼	7	3	4	3	51
physical health ▼	14	11	2	5	13
positive affect ▼	15	5	2	4	0
at peace, relaxed ▼	15	2	0	0	4

Figure 11 Part of a similarity matrix showing frequency with which pairs of codes intersect

In matrices used for correspondence analysis, codes are intersected with other codes or attribute values. Again the resulting matrix is exported, although its format needs to be changed to allow for analysis in software such as IBM-SPSS (Bazeley, 2018; see *My Easy Statistics* at [www.youtube.com/watch?v=42Ts6JoG12A](http://www.youtube.com/watch?v=42Ts6JoG12A)). The resulting biplot (e.g., Figure 12) suggests, for example, which inputs are most associated with each outcome variable, or which characteristics are associated with a particular attribute.

For those wishing to explore their qualitative data, NVivo will create multivariate displays (cluster, MDS) based on the similarity of either words or coding in selected files or selected codes, where similarity is statistically assessed based on the number of times the same (top 100) words appear in each item, or the same codes are used in coding each item. Figure 13 illustrates the output from a cluster analysis of the main wellbeing codes, based on word similarity – a cluster display of the sub-codes for these showed broad support for my interpretive grouping, although with some differences. MDS displays, in contrast to cluster, show each item as a point in three-dimensional space, with capacity to rotate the display in order to explore the different dimensional views. As for all transformative analyses, visual or statistical output should always be interpreted in the light of the qualitative content on which they are based.

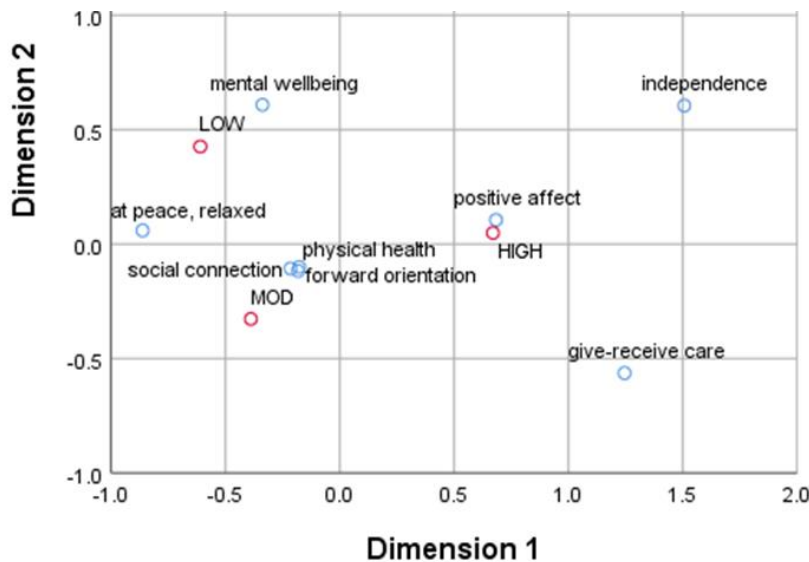


Figure 12: Correspondence analysis biplot\*

\* Analysis of vectors for different levels of wellbeing suggests a particular focus on positive affect (primarily, sense of achievement), independence, and giving and receiving care by those with higher levels of wellbeing, and a focus on mental wellbeing and relaxation by those with a lower experience of wellbeing.



Figure 13: Wellbeing codes clustered, based on the similarity of words coded into those codes

## Suggested Applications of NVivo in MMR

As shown for the Wellbeing project, NVivo is an appropriate tool to use for MMR in two critical respects:

- it is of assistance in the management and preliminary analysis of qualitative (e.g., text, image, multimedia, social media) data that will contribute to a mixed methods project;
- it provides tools that facilitate integrative analyses (combination, comparison, and conversion) of mixed methods data.

In so doing, NVivo supports mixed methods projects designed to satisfy a range of descriptive, conceptual, evaluative, and theory building purposes.

## Strengths and Limitations Using NVivo in MMR

Use of software greatly facilitates a range of analyses that combine text, numeric, and visual elements—as illustrated in this chapter—that would otherwise be difficult or impossible.

Integration, as a core element of mixed methods, is therefore greatly enhanced through the use of software such as NVivo. The particular strength offered to mixed methods researchers by NVivo is its capacity to flexibly manage very complex data sources and combinations through its use of cases, sets, and matrix coding queries.

As with any software, NVivo's usefulness will be determined to an extent by user skill in working with the software, but more particularly by the capacity of the user to focus on and jointly interpret all available data at all stages of the project, from initial reflections and coding through to interpreting combined numeric and text displays generated from the data.

### **Resources for Learning More About Mixed Analysis Using NVivo.**

A fully-functioning 14-day demonstration version of NVivo can be downloaded from [www.qsrinternational.com](http://www.qsrinternational.com), where extensive information about the program is also available. NVivo provides a "getting started" tutorial for new users of the program whenever a new project is created in the software. Other tutorials covering main features are available through accessing Help in NVivo, under the File menu. Comprehensive, web-based Help files provide detailed instructions for all functions available in the software.

Those who are looking for a general introduction to NVivo in the context of strategies for analysis of qualitative data should turn to Jackson and Bazeley (2019), or Woolf and Silver (2018). Both of these texts are accompanied by companion web sites with additional videos, resources, and examples. Understanding of integration in mixed methods analysis and strategies for achieving it (with and without computer software) are comprehensively covered in Bazeley 2018(a).

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