

# Computer Assisted Qualitative Data Analysis Method for Management Research using NVivo

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**Abstract** — The qualitative data analysis (QDA) without using any software tool is very challenging and time consuming process for qualitative research in management studies. There are various Computer Assisted Qualitative Data Analysis Software (CAQDAS) tools for QDA. Among these tools, NVivo is used as at the most to store, categorize and analyse the qualitative data from the literature as well as the field study in various types of research. NVivo also seems to be appropriate for many of the problem facing in management researches, but its uses are limited in these researches. This article explained the systematic method for QDA using the CAQDAS tool NVivo. The method includes the five steps procedure for QDA using NVivo as computer assisted software package. The five steps of QDA include the importing and classification of the documents, data condensation or coding, displaying the data, drawing and verifying conclusions, and developing a theory. This method has also suggested various tools and techniques for effective and efficient analysis of qualitative data. The method suggested from this article could be used as a computer assisted guide for QDA using NVivo as CAQDAS tool for various management research studies.

**Keywords** — NVivo, Qualitative Data Analysis, Management Research, Computer Assisted Qualitative Data Analysis Software.

## I. INTRODUCTION

A grounded theory is normally developed through the qualitative data analysis (QDA). But it is very difficult to analyse the qualitative data without using computerised tools and techniques. Hutchison, et al. [1] mentioned that many grounded theory studies failed to carry out qualitative data analysis efficiently. Charmaz [2] argued that the tendency is to construct conceptual analysis instead of building substantive theories and this results in the creation of a descriptive account that fails to demonstrate interrelations between concepts and create a theory from which hypotheses can be generated. Many researchers, though, adopt techniques commonly associated with grounded theory (i.e. coding and memo-making), but they fail to engage in processes such as in-depth analysis of categories [2], and/or the iterative process of concurrent data collection and analysis [1]. The researchers [1, 3-5] have suggested a Computer Assisted Qualitative Data Analysis Software (CAQDAS) tools for efficient QDA for the development of grounded theory. Hutchison, et al. [1] suggested that CAQDAS has the potential to turn qualitative research into a rigid automated process that neglects the role of human interpretation and reflection. Similarly, Leech and

Onwuegbuzie [3] mentioned that the CAQDAS programs provide an excellent tool for recording, storing, indexing, and sorting the voluminous data that are the hallmark of many qualitative research studies.

There are various CAQDAS programs, like NU\*DIST, ATLAS, XSIGHT, Web QDA, Ethnograph, and NVivo that could be used for qualitative data analysis [6]. Amongst these CAQDAS programs, the NVivo have been used at the most and helped the analysis move beyond thick description of the studied phenomena to an explanatory model grounded in the data. Bringer, et al. [4] have mentioned that CAQDAS programs can be used successfully to facilitate a grounded theory investigation and further explained that the software package NVivo helped the analysis move beyond thick description of the studied phenomena to an explanatory model grounded in the data. Specifically, it was demonstrated that NVivo can facilitate many aspects of the iterative process associated with grounded theory and can help provide a transparent account of this, which should ultimately enhance the study validity [1]. CAQDAS program, NVivo, can find individual words and search patterns of words, coding, or attributes and these search results then can be saved, allowing the researcher to undertaken in-domain analysis, taxonomic analysis, and componential analysis [3]. Also, NVivo software package has been used for qualitative data analysis in various types of research's in social sciences like 'higher education research' for examining the patterns of leadership among young student leaders in local universities [6]; 'sport research' for swimming coaches' perceptions of sexual relationships in sport [4]; 'physical health research' for successfully maintaining of long-term physical activity' [7], and 'school education research' on performance of school-aged athletes at Australian Schools [8].

NVivo also seems to be appropriate for many of the problem facing in management researches, but its uses are limited in these researches. This article explained the systematic method for QDA using the CAQDAS tool NVivo10. The method includes the five steps procedure for QDA using NVivo as computer assisted software package. The five steps of QDA include the importing and classification of the documents, data condensation or coding, displaying the data, drawing and verifying conclusions, and developing a theory. This method has also suggested various tools and techniques for effective and efficient analysis of qualitative data. The method suggested from this article could

be used as a computer assisted guide for QDA using NVivo as CAQDAS tool for various management research studies.

## II. DEVELOPMENT OF NVIVO

Computer Assisted Qualitative Data Analysis Software (CAQDAS) program, NVivo, has used to manage and analyze qualitative data [6, 9]. QSR International [10] mentioned that NVivo is a software that supports qualitative and mixed research methods. It is designed to help a researcher to organize, analyze and find insights in unstructured or qualitative data like interviews, open-ended survey responses, articles, social media and web content. NVivo helps people to manage, shape and make sense of unstructured information [7]. By using NVivo for qualitative data analysis, researchers can work more efficiently, save time, quickly organize, store and retrieve data, uncover connections in ways that are not possible manually, and rigorously back-up findings with evidence [10]

The first NVivo software product was developed in 1999 by QSR International, which was formed in 1995 by Tom and Lyn Richards. In 2008, QSR International developed NVivo in other languages such as Chinese, Spanish, and Japanese beside English with the launch of NVivo8. By 2009, with the launch of NVivo9, more than 400,000 researchers in nearly 150 countries have taken license to use NVivo software for qualitative data analysis [11]. Researchers have opted to work with NVivo because of many features that could help them in the analysis. Ishak and Bakar [6] have indicated the key features to include:

- Ability to organize and arrange all information in the folder, including all literature read before, and during the study, and integrate the literature with the data for better discussion;
- Ability to directly use video or audio data as data source;
- Ability to make many modes of queries that will satisfy qualitative researchers thirst for new information regarding the phenomenon they are studying; and
- Comparison with Kappa calculation that will enable researchers to determine reliability (and therefore, the stability) of the coding process

Recently, QSR International launched NVivo10 in 2013, which has additional features to import images and videos, and gives user new ability to capture and analyze the web and social media data [12]. NVivo10 program imparts rigor to the analysis and enables to store the 'primary textual data and to assist in coding, sorting and organizing the text'[7]. The software also offers a more natural way of working and facilitating the search for particular features within the data [13].

## III. STEPS OF QDA USING NVIVO

The QDA for the development of grounded theory has been conducted by varieties of chronological steps by numerous researchers. For instance, Hutchison, et al. [1] described the methodology of QDA though NVivo, includes the steps are creating the memo, incorporating the literature, managing data documents, early concept identification, and conceptual and theoretical development. Bringer, et al. [4] conducted the grounded theory techniques through open coding, writing memos, axial coding, and creating models in NVivo. Ishak and Bakar [6] have elaborated the QDA using NVivo in five

essential steps: developing a document for in-depth and focus group interviews, managing documents using folders, mapping of variables through nodes, data queries using matrix coding, and developing coding reliability using coder comparison and Kappa value. Recently, O'Neill [7] established the four steps of QDA in NVivo, which includes Descriptive: entering data sources into NVivo; Topic: organizing and coding your data; Analytic: analyzing and querying your data; and Conclusion: drawing answers from your data. Out of these four methods explained by various researchers, the method established by O'Neill [7] have been well organized and expressive for QDA in NVivo. In addition to this, Miles, et al. [14] have developed the three standard steps of qualitative data analysis are data condensation, displaying the data and drawing and verifying conclusion. Table 1 shows the similarity between the concepts used in standard QDA (Miles et al. 2013) and other two qualitative data analysis methods for developing grounded theory in NVivo [6, 7].

TABLE I  
STEPS OF QDA IN NVIVO BY VARIOUS RESEARCHERS

Miles, et al. [14]	O'Neill [7]	Ishak and Bakar [6]
	(1) Descriptive: Entering data sources into NVivo	(1) Developing document for in-depth and focus interviews (2) Managing documents using folders
(1) Data condensation: Coding	(2) Topic: Organizing & coding the data	(3) Mapping of variables through nodes
(2) Displaying the data: Matrix display	----	----
(3) Drawing and verifying conclusion	(3) Analytic: Analyzing & querying the data	(4) Data queries using matrix coding
	(4) Conclusion: Drawing answers from the data.	(5) Developing coding reliability using coder comparison & Kappa value

It has been observed from above review that the various researchers have developed their own methods of QDA in NVivo for various research applications, but they haven't followed the standard method of QDA developed by Miles et al. (2003). In the present study, the researcher has established the new approach of QDA with five stages using the combination of standard three stages developed by Miles, et al. [14] and four stages established by O'Neill [7]. The new method for QDA established in this study is explained in detail in the next section and summarized in Table 2.

## IV. METHOD OF QDA USING NVIVO

The restructured method for QDA has included two steps as 'displaying the data' from Miles, et al. [14] and 'descriptive: entering data sources into NVivo' from O'Neill [7] rest of three stages are same as used by Miles, et al. [14] and O'Neill [7]. Also, the first and fourth steps of a new approach for QDA have divided into two sub-steps are summarized in

Table 2. In addition to this, the researcher has identified through the literature review a qualitative tool and techniques for smoothly conducting of each stage of QDA in NVivo; and summarized through literature review in Table 2. A detail discussion on the current steps of QDA has adopted for this study using NVivo is as below:

TABLE III  
METHOD OF QDA IN NVIVO WITH TOOLS & TECHNIQUES

Sl.	Steps of analysis	Tool and Techniques	References
1.	Importing and classification of the documents		
a.	Uploading of documents / transcripts	Source folder: Internal sub-folder, External sub-folder	O'Neill [7] and QSR International [15]
b.	Classification of the documents	Attributes, values, and classifications	O'Neill [7] and QSR International [15]
2.	Data condensation: Coding	Open coding: Free node, Axial coding: Tree node, Selective coding: Tree node	Strauss and Corbin [16]; Leech and Onwuegbuzie [17]
3.	Displaying of the data	Framework matrices or Associated view of node	QSR International [15]; Bazeley [18]; O'Neill [7]
4.	Drawing and verifying of conclusions		
a.	Drawing of conclusions	Constant comparison, Classical content, Domain, Taxonomic, Componential, Keywords-in- context, and Word count analysis	Leech and Onwuegbuzie [3]; Leech and Onwuegbuzie [19]; Leech and Onwuegbuzie [17]
b.	Confirming / Testing of finding	Micro-interlocutor analysis (for interview data only)	Onwuegbuzie, et al. [20]
5.	Developing a theory	Memos: Memo witting	Hutchison, et al. [1]; O'Neill [7]

#### A. Importing and classification of the documents

In this preliminary step, all the documents from the literature or interview sources are used to upload into the source folder of NVivo for the analysis. The source folder is divided into the three sub-sections/sub-folders of internals, memos, and externals for classification of the documents [7]. Internal sub-folder includes any combination of documents, PDFs, audio, video, pictures or data sets. The research materials like books or manuscripts that can not possible to import into NVivo, which can create an external source and summarize the content of the item. Further, it is possible to create various additional folders in internal sub-folder to classify the each document in various categories. Also, the demographic study of respondents for an interview has been conducted to validate the criteria of used for respondent's selection such as age, gender, experience, and education. These criteria would then be classified through attributes value in NVivo [15]. Above mentioned tools and techniques in NVivo are used in this study for the uploading and classification of documents from literature and interviews.

#### B. Data condensation: Coding

This refers to the process whereby the mass of qualitative data obtained from any source is reduced and organized through coding, writing summaries, and discarding irrelevant data. The best way to condense the data is using the coding procedure. The open, axial, and selective coding are the three types of coding established by Strauss and Corbin [16] for coding of the first, second, and third cycles for condensation of the data respectively. The open and axial coding are normally conducted at free and tree node respectively in NVivo [17]. Further, selective coding with axial coding conducted at second tree node in NVivo. Open coding is the part of the analysis dealing with identifying, naming, categorizing and describing phenomena found in the text. Axial coding is the process of relating codes (categories and properties) to each other, via a combination of inductive and deductive thinking. Selective coding is the process of choosing one category to be the core category, and relating all other categories to that category (Strauss and Corbin 1998).

#### C. Displaying the data

Data display goes a step beyond data condensation to provide an organized, compressed assembly of information that permits the drawing of conclusions from the data. A display can be an extended piece of text or a diagram, chart, or matrix that provides a new way of arranging and thinking about the more textually embedded data. Data displays, whether in word or diagrammatic form, allow the analyst to extrapolate from the data and start to discern systematic patterns and interrelationships. At the display stage, additional, higher order categories or themes may emerge from the data that go beyond those first discovered during the initial process of data condensation [14].

To draw conclusions from the mass of data, Miles and Huberman (1994) suggested that a good display of data in the form of tables, charts, networks and other graphical formats is essential to analysis the data systematically for drawing conclusions from the mass of data. The 'framework matrix' and 'associated view of node' is the best tool to display the qualitative data in NVivo [7, 15]. The framework matrix displays the data in the matrix with authors of article or interview respondents in a row and free or tree node/issues in the column. While in associated view of node displays the data directly, which shows the view of data coded in respective free/tree node with the name of author/respondent.

#### D. Drawing and verifying of conclusions

This stage allows beginning and developing conclusions regarding the qualitative study. There are various tools and techniques in NVivo for drawing and verifying conclusions from any source of qualitative data. The qualitative data analysis tools like a constant comparison, classical content, domain, taxonomic, componential, keywords-in-context, and word count analysis are the better option to generate meaning and drawing conclusions from any type of the data [19]. In management research study, the constant comparison, classical content, taxonomic, componential analyses are used for the analysis of coded data from both the sources. The constant comparison analysis is used as to classify the coded data in free node with the tree node in NVivo; while and classical content analysis is used to count the number of sources (articles or respondents) coded the data in each free

node. The taxonomic is used to define the relationships between the variable through developing of models in NVivo; while componential analysis is used to test/check the coding similarity amongst the various groups of experts through matrix query in NVivo. The taxonomic and componential analyses are used for drawing conclusions from only interview data. In addition to these analyses, the micro-interlocutor analysis technique introduced by Onwuegbuzie, et al. [20] is used in this study for testing / confirming of findings from the interview data. Micro-interlocutor analysis is used to confirm the findings through displaying of respondents consensus in the form of a matrix using a rating scale for each variable.

#### E. Developing a theory

After the coding and analysis of the qualitative data, there is need to interpret data for development of the grounded theory. The qualitative technique using memo writing in NVivo is the best option to interpret the coded and classified data to generate the meaningful new theory [1]. The same concept of memo writing is used to develop the deductive theory from literature review data through developing conceptual memos in NVivo. Further, the inductive grounded theory has been developed from interview data and corroboration of literature data through writing of final memos in NVivo.

#### V. CONCLUSIONS

This article has explained the systematic method for QDA using the CAQDAS tool NVivo10. The method includes the five steps procedure for QDA using NVivo10 as computer assisted software package. The five steps of QDA include the importing and classification of the documents, data condensation or coding, displaying the data, drawing and verifying conclusions, and developing a theory. This method has also suggested various tools and techniques for effective and efficient analysis of qualitative data. The method suggested from this article could be used as a computer assisted guide for QDA using NVivo as CAQDAS tool for various management research studies.

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