

Qualitative Analysis Software (ATLAS.ti/Ethnograph/MAXQDA/NVivo)

TABITHA HART

San Jose State University, USA

PEG ACHTERMAN

Seattle Pacific University, USA

The functions of qualitative data analysis programs

Qualitative data analysis is the process of closely scrutinizing and interpreting qualitative data with the aim of transforming it into findings and conclusions, generally presented as thick descriptions, overarching themes, and detailed investigations of varying sociocultural realities. To engage in this process, a researcher must have a dataset that is amenable to qualitative analysis. Such a dataset is typically comprised of non-numeric data like audio- and video-recordings of interactions; interviews; transcriptions (written representations of people's speech and activities); field notes from observations and/or participant observations; images (photos, screenshots); and other textual data from the field (letters, emails, reports, signage, and other types of messaging, etc.). This is in direct contrast with *quantitative data analysis*, for which researchers use data that is amenable to statistical analysis and other types of numerical and predictive measurements.

Qualitative data analysis is a rigorous, complex, iterative, nonlinear, and intellectually demanding method of discerning and describing emergent patterns in rich and nonuniform qualitative datasets (Lindlof & Taylor, 2011; Lofland & Lofland, 1995; Tracy, 2013). Of course, some analytical work is always done prior to the concerted data analysis phase. Consider, for example, the informal analysis that happens when researchers choose a study site, design their interview questions, select interviewees, determine what to observe, and navigate their comportment with participants. However, in the focused data analysis phase of a project, the qualitative researcher is charged with reflecting deeply and systematically on the relationships between topic, research participants, and the information that their data collection yielded.

Up until the advent of *qualitative data analysis software* programs, researchers relied upon tools like pen and paper, scissors, notecards, highlighters, and sticky notes to work through and make sense of their data. Nowadays qualitative researchers have the option of using the powerful functionalities of qualitative data analysis (QDA) software to assist in their data analysis. While QDA software neither analyzes the data

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on its own nor fully automates the data analysis process, it does give users effective and highly efficient tools with which to systematize and categorize electronic datasets, thereby making analysis less burdensome and potentially more thorough. At the macro level, QDA software supports researchers as they progress through the necessary steps of noticing, collecting, and thinking through the data and the patterns that arise from them (Seidel, 1998). Effective use of QDA software can help qualitative researchers engage in thoughtful analysis from the moment that they begin to import and sort through their data. At the micro level, QDA software can be used to better organize data files, search through the data, produce reports, and—most importantly—engage in qualitative coding. The most important tasks enabled by QDA programs are described below.

Attach codes to data

As qualitative researchers pore over their data, they label it with tags or codes. These codes are a kind of shorthand that researchers create to categorize the data and to tell themselves and others something about its significance. Researchers apply codes to excerpts or even to entire texts, images, or recordings.

Create codes on the fly

As qualitative researchers pore over their data, they typically develop codes on the fly. Most QDA programs are designed to help researchers generate whatever new codes they wish, whenever they need them.

Import a priori codes

Some qualitative researchers make use of a priori codes; that is, codes that they conceptualize and refine before the data analysis phase begins. Most QDA programs allow users to either import or input a priori codes, which researchers then utilize as they codes their data.

Create, maintain, and use a codebook

Most qualitative researchers make use of some or many codes as they analyze their data. As noted above, these codes may be created on the fly, determined beforehand, or some combination of these. In any case, the research project ultimately involves a set of codes, represented as the codebook. QDA programs allow researchers to create and store entire codebooks, and to generate information on them, such as comprehensive lists. QDA programs also allow researchers to enter descriptive information about each code, such as what it means and why, similar to a dictionary entry. Ideally, the QDA program will let researchers sort the codes in a number of ways, whether alphabetically or by other criteria.

Change codes names throughout the dataset

Sometimes researchers may wish to amend or change the name of a particular code. Rather than manually going through all the coded instances and changing them one by one, QDA programs can be used to automate this type of revision. That is, the researcher would change the desired code name in the master codebook, and this would then trigger that code name change throughout the data.

Create memos and attach them to codes and excerpts

Most QDA programs permit researchers to attach notes to codes as well as data excerpts. Such notes might be brief explanations, thoughts, ideas, questions, reminders, or tentative conclusions.

Link files

Researchers may wish to link data files, excerpts, or passages with other such information. Many QDA programs support this, and may even allow links to external files, bibliographic information, or even websites.

View coded passages within the context of the original files

When viewing coded excerpts, researchers may want to see them within the context of their original file, whether an interview, a set of field notes, an article, and so on. Ideally the QDA program will provide a quick and easy way to pull up the passage or content surrounding the coded excerpt when desired.

Run searches, both general and specific

Any QDA software worth its salt will offer the ability to run various types of searches on the dataset, whether the researcher is looking for all instances of a particular code or set of codes, particular words or phrases, particular types of data (interviews, field notes, images), or something else.

Generate reports

Some QDA programs may offer the ability to generate reports, which is a useful feature, especially when comparative reports are possible. For example, if all interviewees are asked the same set of questions, the researcher may wish to generate a report on a particular answer, or set of answers. Perhaps the researcher wants a report on all instances of a particular code that occur within a type of file (interview, field notes, image) or among a participant group. Perhaps the researcher needs to examine co-occurrence of

codes, count extant codes (generate a list of extant codes along with the number of coded instances for each one), or generate a code count by file. QDA programs make it possible to generate these types of reports quickly and easily.

Transcription

While most QDA programs allow the researcher to import and analyze transcriptions, only some programs support the actual transcription process—that is, the act of listening to and/or viewing a recording and writing down the words and activities that it contains. Being able to transcribe within a QDA program can be useful, as it may allow for immediate coding and analysis.

As indicated above, the power of QDA programs lies in their usefulness for categorizing and tagging data, sorting through coded excerpts, identifying and making explicit note of the connections between code categories, and articulating the patterns and themes that emerge. Again, it is not the software that is *doing* this analytic work; rather it is the researcher who is doing the tagging, categorizing, sorting, identifying, and analyzing. The QDA software supports researchers as they finely navigate their datasets, examining, retrieving, and making sense of their material. The larger and more complex the dataset, the more useful QDA software becomes.

Considerations for selecting a QDA software program

There are many QDA programs currently on the market, and more continue to be developed. Choosing which QDA program to use for a research project is an important decision, bearing consequences not only for the act of analyzing data but also for collecting it, storing it, sharing it, and reporting on it (Hart, 2015). Deciding upon and committing to one particular QDA program generally hinges upon an array of factors, the most essential of which are summarized below.

Project arrangements

Is the project being run by a solo researcher or a team of researchers? If it is a team project, how will all members access the data as well as the QDA software? Whenever the project involves more than one researcher, the question of how to collaboratively share tools and access to those tools must be considered. With some QDA programs, a creative workaround must be implemented for team access, such as housing the software on a shared server. Other QDA programs are built specifically with team access in mind. Dedoose, for example, is a web-based program that team members can log into simultaneously, anytime and anywhere, provided they have an Internet connection. Before selecting any tool or platform for data collection or analysis, make sure that it will adequately support the project arrangements.

Data type

What type of data (video, audio, text, still images, maps, etc.) will be collected for the research project? It is imperative to ensure that these data types will be compatible with the QDA program. QDA software packages usually accommodate only certain types of data files. While some may support a broad range of file types, others will be much more limited in what they can accommodate. What's more, some QDA programs are designed with very particular file types in mind. Transana, for example, was built expressly for audio and video files and is perhaps the most sophisticated QDA program for transcription. While TAMS Analyzer can import audio and video files, its forte is textual analysis. The Ethnograph cannot use audio or video files, only text. Waiting until after data collection has concluded to choose a QDA program means that the dataset will necessarily dictate the choice of software.

Compatibility

Before choosing any type of hardware or software, make sure that it is compatible with the machines and operating systems that the researchers will be using. While some QDA programs have cross-platform compatibility, others will work only on Windows, or only on Mac OS X. Web-based QDA programs like Dedoose will require particular browsers and extensions.

Cost

QDA programs nearly always have some cost associated with them. While a few are open source and free to all users, most must be purchased. Some QDA programs involve a one-time only payment for a license. Others require a monthly or yearly subscription. In some cases, trial versions and/or reduced-cost student versions may be available, though these can require validation of the purchaser's status. While the cost of paid-for QDA programs can be an obstacle, these often come with more extensive user support and tutorials. Researchers working within organizations may find that they already have paid-for access to certain programs. For example, a university may have blanket coverage for its students and faculty to use a particular QDA program.

Usability

QDA programs vary in their complexity. Before committing to one, it is advisable to assess the learning curve associated with it. What technical knowledge must the researcher have to use the QDA program? Can the researcher realistically learn how to use it within the time constraints of the project? What user support (customer service center, online forums, manuals, videos) exists for that program? Are there institutional or disciplinary personnel who can assist the researcher as they learn that

particular QDA program? In some cases, the researcher's affiliated organization may offer free workshops and/or technical support for particular software, and this is a major plus-point when deciding which QDA program to select.

Security

Protecting data is almost always a requirement for human subjects approval, which in turn is required for most research projects, certainly those conducted under the auspices of a university. It is therefore critical to have strategies in place for keeping digital files and data secure. The responsible researcher should investigate what data protection measures are built into the QDA programs being used.

Fit with fieldsite

In some cases, the researcher may need a QDA program that fits with their fieldsite and their chosen data collection processes. For example, some QDA programs now offer tablet- and phone-based applications, thus enabling more flexible, even spontaneous, data collection and analysis.

Other knowledge and resource requirements

What special technical knowledge and/or resources will be required of the researchers to use the array of tools and technologies selected for the project? Teams using web-based applications will need adequately fast Internet access. Transcription may require headsets and/or foot pedals.

Reporting

What sorts of reports (textual, visual, etc.) will be needed, and does the QDA program have the capacity to produce them? This is worth thinking about early on in a project, even before the researcher begins the data collection phase.

Durability

Can the QDA program save the data in a format that will be viewable and usable without the original software? Can it export it? Present it? With many QDA programs, the files imported into and analyzed within the program are permanently earmarked only for that program's use. That is, the files that are saved and imported into the program can never be opened or used again except from within that program. It is therefore critical to consider what will happen with the coded data down the line if and when the researcher's license or subscription to the QDA program expires.

Overview of popular QDA programs

Bearing the above criteria in mind, a researcher can begin to review and assess the many options for QDA programs. Seven of the most popular are ATLAS.ti, Dedoose, The Ethnograph, MAXQDA, NVivo (formerly NUD*IST), TAMS Analyzer, and Transana. A brief overview of each of these programs, including their unique features, is provided below.

ATLAS.ti

ATLAS.ti was developed by a German researcher in the early 1990s, and was originally designed for social scientific researchers using grounded theory. This software works with a range of file types, including text, images, audio, video, and locative data such as material from Google Earth.

To use ATLAS.ti one must purchase the software, download it, and then run it on a local machine. Though originally created for use on Windows, ATLAS.ti now runs on Mac OS X, too. The developers have also recently added versions for iPad and Android, making this program potentially useful for recording data in the field and then immediately coding it. The cost of acquiring ATLAS.ti licenses is tiered; less expensive student versions are available.

ATLAS.ti has many highly developed features for coding data, with codes attached directly to the files. (In some programs with some file types, codes are attached to wrappers overlaid on the file. TAMS Analyzer, for example, uses this approach with image files.) ATLAS.ti easily links audio and video files with transcript and text files. What's more, audio and video files can be played back in ATLAS.ti, and the researcher can even use the program to transcribe data. Another useful feature in ATLAS.ti is its built-in mapping tool for creating visual representations of the relationships between codes and coded excerpts.

Many types of sophisticated searches (queries) can be run in ATLAS.ti. Data can be exported as pdf, jpg or other graphic files, or Excel spreadsheets.

Dedoose

Dedoose was developed in the late 1990s by an interdisciplinary team based at the University of California, Los Angeles, whose members had expertise in mixed-method social scientific research (psychology, anthropology) as well as computer science. Unlike most other QDA programs, Dedoose is web-based and therefore accessible from any Internet-enabled device with a web browser. This is its most unique feature, making it ideal for team-based research projects, particularly those in which the researchers are geographically dispersed. On the flip side, users must be connected to the Internet and have Adobe Flash Player loaded on their device in order for this

program to work. While Dedoose does offer a desktop application, which permits users to work outside of the browser, it is not intended to replace the web-based version of the program. Dedoose is built to handle a variety of survey-type data, and can import spreadsheet and related types of files, as well as text, audio, and video files.

Dedoose is accessible via subscription only, with rates decreasing as the number of subscriptions increases. In this way the larger the project team is, the more cost-effective using Dedoose becomes.

Like most QDA programs, Dedoose supports users in reviewing data, excerpting it, and creating and attaching codes to it. Users can also note interesting excerpts while reading, viewing, or listening to their material. Going along with its unique focus on team-based projects, Dedoose permits research project leaders to set permissions and roles for each individual member of the team. Dedoose also has built-in features for testing inter-rater reliability and code rating.

Dedoose can generate various reports, many of them highly visual. Files can be exported to spreadsheets or word processors, though not directly to SPSS.

The Ethnograph

The Ethnograph (Seidel, 1998) was developed in the mid-1980s by a U.S. sociologist and is built to analyze text files only. It runs on the Windows operating systems but not on Mac OS X.

To use The Ethnograph one must purchase a license, download the software, and then run it on one's local machine. The more licenses purchased, the cheaper the per-license cost. Discounted single licenses for students are available.

After importing the data into The Ethnograph, researchers can engage in all of the standard coding activities supported by QDA programs: coding and creating codes on the fly, maintaining and modifying a codebook, creating and adding memos, and searching for coded segments. The Ethnograph can export data as pdf, rtf, or as Excel spreadsheets.

MAXQDA

Like ATLAS.ti, MAXQDA was developed in Germany in the early 1990s and has been continually updated and improved since its initial release. It can handle text, audio, video, and image files as well as bibliographic and survey data. MAXQDA is a cross-platform program and works on both Windows and Mac OS X. It can interface with other programs, such as EndNote and SPSS.

To use MAXQDA one must purchase the software, download it, and then run it on one's local machine. Different options for purchasing it are available, from single-user licenses to network licenses (for simultaneous use) and lab licenses for up to 30 computers in one network.

MAXQDA has many powerful features for coding, creating and managing codes, creating and managing notations, running queries, and more. It supports data transcription with a foot pedal, and lets the researcher link transcripts and recordings. Many

types of searches can be run with MAXQDA, and the results can be portrayed as a range of visualizations. Data can be exported as text, tables, images, html, or xml.

MAXQDA offers some support for team-based projects. Specifically, researchers can merge projects, assign different roles for the individuals on a research team, and calculate intercoder agreement.

*NVivo (formerly NUD*IST)*

NUD*IST, which later became NVivo, was developed in the early 1980s by two social scientific researchers at La Trobe University in Melbourne, Australia. While originally written for Windows only, NVivo now offers a version for Mac OS X as well. It is designed to support a wide variety of mixed-method research approaches and is compatible with text, audio, video, image, pdf, and spreadsheet files. NVivo can interface with other programs such as SPSS, EndNote, OneNote, SurveyMonkey, and Evernote. NVivo also contains a plugin for Internet Explorer that allows the capture of web pages for import into a project.

Like most of the other QDA programs described in this entry, NVivo operates under a licensing model, with users purchasing licenses and then installing the software directly onto their machines. Discounted student licenses are available.

NVivo offers all the standard functionalities pertaining to coding and annotating data, running queries, and generating reports and other visualizations. It also supports languages other than English, such as French, German, Japanese, Portuguese, and Spanish. For an additional fee NVivo offers transcription services. Transcripts can be ordered from and delivered directly to the user's electronic NVivo project. The NVivo team will organize transcription of audio or video data in any of the languages noted above.

TAMS Analyzer

TAMS Analyzer (Weinstein, 2008) was developed in the early 2000s by an American professor in the field of education. Unlike most QDA programs, TAMS Analyzer is free and was developed expressly for use with Mac OS X. Compared to other big-name QDA programs, it supports a more limited number of file types, relying primarily on rtf, pdf, and jpg files.

While TAMS Analyzer's look and feel is more low-frills compared to the most popular programs described here, it is equally effective. Using TAMS, a researcher can create, maintain, and utilize codebooks of an unlimited size. New codes or families of codes can be created and paired with descriptive information and annotations. Like other QDA programs, TAMS supports overlapping and nested codes, so any given passage can have multiple codes attached to it as needed. TAMS also offers *context codes*, which are higher-level codes that can be applied to excerpts or to entire files, thereby allowing the user to tag data with contextual information.

Audio and video files can be imported into TAMS and played back as well as transcribed. Codes cannot be laid onto the actual audio or video files, however. Rather, they are attached to the rtf file containing the transcription.

TAMS can export material as tables for use in a Word document or an Excel spreadsheet.

Transana

Like TAMS Analyzer, Transana (Woods & Fassnacht, 2012) was developed by American researchers in the discipline of education. It is compatible with Windows (Windows 10, Windows 8, Windows 7, and Vista) as well as Mac OS X (10.7+ recommended). Transana supports most standard audio and video file types (mpeg, mov, mp4, m4v, wav, aac, etc.), though file types specific to a particular operating system (wmv, wma) can only be used when that operating system is running. Transana also contains a media conversion tool, which can be helpful in dealing with resolution and bitrate, potentially saving processing power.

The cost of acquiring a Transana license depends on the type (Standard, Professional, Multi-User, Computer Lab); the more expensive the license, the more features offered. The most expensive license is for multiple users; it offers teams the ability to maintain cloud-based projects accessible via as many client computers as needed.

What sets Transana apart from other QDA programs is that it is designed expressly for the analysis of audio, video, and image files. Transana also offers a highly accommodative platform for transcription, supporting basic verbatim transcription, descriptive transcription, and even Jeffersonian notations. While it does not offer voice recognition, Transana does offer side-by-side views to aid in the transcription process with a variety of keyboard shortcuts for playing, clipping, and typing concurrently. It can also be used with some foot pedal controllers.

Transana allows users to insert time codes for particular segments of video or audio data. Clips can be transcribed and then time-coded, or time-coding can be done as the clip plays. Using Transana, researchers can also format transcripts and create new transcript templates for use in future projects. Clips can be added to collections of similar material, and still images can be added to transcripts. Users can also create stills from video data.

Transana supports a variety of note-taking, annotation, memoing, coding, and search-related activities. It can also create reports and some detailed visualizations, such as maps of keywords and their sequencing. It has a built-in presentation mode that lets researchers show data excerpts to an audience. It also has a multi-user version that helps researchers collaborate simultaneously on a common project, sharing media files as well as data analytic tasks.

Free QDA programs

Note that with the exception of TAMS Analyzer, all of the most well-known and popular QDA programs described above cost money to acquire and use. For researchers operating on a tight budget, it might be worthwhile to investigate free QDA software programs, a few of which are listed below.

- *AQUAD*: An open-source program that can interface with R (statistical software). AQUAD handles text, audio, video, and image files.
- *ELAN*: Runs on Windows, Mac OS X, and Linux. Designed for analyzing and annotating audio and video files.
- *Coding Analysis Toolkit (CAT)*: Can import data from ATLAS.ti. Geared towards keyboard rather than mouse-clicks to speed tasks.
- *Computer Aided Textual Markup and Analysis (CATMA)*: For text-analysis only, so a good choice for analyzing ready-made transcriptions, but not ideal for datasets containing multimedia. CATMA has an intuitive graphical user interface with many options for tagging. Like other QDA programs, CATMA can be used to generate charts and graphs of the findings.
- *QDAMiner Lite*: This free version of QDAMiner runs on Windows and can handle many types of text files.

Conclusion

The decision to use QDA software is an important one, impacting a researcher's entire project from data collection, through data analysis, all the way to reporting. Good QDA programs do offer invaluable support to qualitative researchers, but they should not be mistaken for all-powerful tools that do the actual analytical work. It is always the human researcher who does the intellectual heavy lifting in qualitative data analysis, not the machine. As QDA programs continue to be developed and refined, their sophistication deepens and their fit with different types of project configurations and qualitative datasets improves. At the time of this writing, there are QDA programs to fit nearly every need, even more so when cost and time are not major obstacles to selection.

SEE ALSO: Data Transcription; Data, Types of; Online Research Methods, Qualitative; Qualitative Methodology; Research Method Selection; Rigor in Qualitative Research

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Peg Achterman (BA, University of Washington, history & communications; MS, Syracuse University, broadcast journalism; PhD, University of Washington, communication) is an assistant professor of communication and journalism at Seattle Pacific University. She returned for her PhD at the University of Washington following a 20+ year career in broadcasting. Her research examines changes within print and broadcast newsrooms as they incorporate web and multimedia into daily news work.

Tabitha Hart (BA, University of California, San Diego, communication; MA, California State University, Sacramento, communication studies; PhD, University of Washington, communication) is an assistant professor of communication studies at San Jose State University. Her research areas include the ethnography of communication, intercultural and organizational communication, and applied communication. As a teacher/practitioner she is interested in hybrid coursework and high-impact practices such as project-based learning, study abroad, and internships.