



Max Planck Institute for the Study of
Religious and Ethnic Diversity

Max-Planck-Institut zur Erforschung multireligiöser
und multiethnischer Gesellschaften

MMG Working Paper 16-07 • ISSN 2192-2357

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CAQDAS and Grounded Theory Analysis



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Max-Planck-Institut zur Erforschung multireligiöser und multiethnischer Gesellschaften,
Max Planck Institute for the Study of Religious and Ethnic Diversity
Göttingen

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ISSN 2192-2357 (MMG Working Papers Print)

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Abstract

In this paper, I show how the various steps of a Grounded Theory analysis can be conducted in a computer-assisted environment. As the Grounded Theory approach was developed before the event of CAQDAS (Computer-Aided Qualitative Data Analysis Software), the various steps and procedures have been described for manual ways of analysis. In newer books one finds references to the effect that this can, of course, also be carried out in CAQDAS, but little detail is provided about how this can be done, as if it were self-explanatory. Based on my experience, this is not the case. Learning the various tools and features of a piece of software does not automatically teach the user which tool is the best fit for a certain process given a specific methodological framework. In writing this paper, I wanted to show how the various steps and procedures of the Strauss and Corbin approach to Grounded Theory can be translated for use in ATLAS.ti.

The paper is organized into three parts. In the first part of this paper I discuss the sometimes difficult relationship between qualitative researchers and software applications for data analysis and the use of various terminologies that might be causing common misunderstandings. The second part is rather brief, being simply a pointer to the NCT method of computer-assisted analysis. A full description and explanation of the method as a core process of computer-assisted analysis would go beyond the framework for this essay. Part three offers a practical application of the NCT method in combination with Grounded Theory methodology. I assume that the reader will be familiar with the basics of the grounded theory methodology as described by Strauss and Corbin and with ATLAS.ti or other CAQDAS and wishes to know how the methodological approach can be translated into software tools.

Keywords: Grounded Theory, Corbin & Strauss, computer-assisted, ATLAS.ti, NCT method, open coding, axial coding, theoretical sampling, core category.

Author

Dr. SUSANNE FRIESE started working with computer software for qualitative data analysis in 1992. Her initial contact with CAQDAS tools was from 1992 to 1994, as she was employed at **Qualis Research** in the USA. In following years, she worked

with the **CAQDAS** Project in England (1994 – 1996), where she taught classes on The Ethnograph and Nud*ist (today NVivo). Two additional software programs, MAXQDA and ATLAS.ti, followed shortly.

During her dissertation in consumer economics and in her subsequent position as an assistant professor at the institute of marketing at the Copenhagen Business School in Denmark, she carried out a variety of research projects using both qualitative and quantitative methods. From 2004 to 2011, she taught qualitative and quantitative research methods in the Sociology Department at Leibniz University of Hannover. In addition, she has accompanied numerous projects around the world in a consulting capacity, authored didactic materials and is one of the principal contributors to the ATLAS.ti User's Manual, sample projects and other documentations. Her book "Qualitative Data Analysis with ATLAS.ti" published with SAGE publications.

Susanne's academic home is the Max Planck Institute for the Study of Religious and Ethnic Diversity in Göttingen (Germany), where she pursues her methodological interest, especially with regard to computer-assisted qualitative data analysis.

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Background

In contemporary books on qualitative methods, one finds pointers and references to computer-assisted analysis, but little about how to translate manual ways of going about analysis to computer-assisted operations, as if it is self-explanatory. For example, Remenyi (2014) dedicates half a page to the topic, Breuer (2009) two pages, Bryant and Charmaz (2007) four pages spread across three chapters written by three different authors, Goulding (2002) three and a half pages, Charmaz (2014) zero pages, and in Seale et al. (2004) a chapter written by Udo Kelle on the historical development, application and limitations of software. Again, nothing about implementation. The fact that software is mentioned does not necessarily mean that it has been embraced. On the contrary, often the few sentences that have been added express a dislike and rejection of it. Some authors even pride themselves on not using software:

As a risk taker and a thrill seeker, I find hand coding and hand sorting exciting, and maybe a little dangerous; every time you present your research you risk your reputation, since someone in the audience may think you're a fool, and may say so. You have no statistics, no proofs; no software evidence that your take on a scene is meaningful. Fear of public shame may be the best impetus for making sense. (Stern 2007, S. 120)

Holton (2007) refers to Glaser (2003) to support her argument against the use of software. Glaser even dedicated two chapters to express his disapproval of software. One of the arguments that both he and Holton make is the inability of computers to replace human thinking. “Experienced classic grounded theorists continue to await a ‘package’ that can replicate the complex capabilities of the human brain for conceptualization of latent patterns of social behavior” (Holton 2007, 287). This statement is based on expectations about the potentials of computers expressed in the 1960s, which have long been overcome. Even in the era of ‘smart’ phones, no one would expect computer software to perform such wonders. This has already been expressed by Strauss when, in 1996, he wrote that the developer of ATLAS.ti, Thomas Muhr, made no claim to have produced a program that performs miracles. Rather, he stated that it is still the researcher who must “have the ideas and the gifts to do exceptional research” (Muhr 1997, 4).

As for Glaser, another reason he uses against the use of software is a quote from a Ph.D. student, who wrote: “I wrote day and sometimes night. I got into the ‘drugless trip’ and eventually the core variable of balancing came to me almost as a revelation.

‘Joy to the world the core has come’” (2003, 36). Glaser appears to overlook the fact that software provides many places for writing. The added advantage of software is that, if you wish, you can attach your writing directly to the data segments you write about. And even if you decided not to use the editors provided by the software for writing, that is, prefer to write in a text processor or on paper, software does not prevent the researcher from doing so.

To believe that analysis is done simply by coding the data, independent of computer software, reflects a general lack of skills and knowledge about CAQDAS. Good teachers will always tell their students that analysis is more than coding, and that writing, reflecting, rewriting, rereading the data, re-reflecting, re-rewriting and so on are essential activities in the process of analysis. From the point of view of an experienced CAQDAS user, it goes without saying that software will *not* present the core category to the researcher.

Glaser, however, still has one more argument against using software. The final blow to the use of computer software, he states, is the process of sorting memos: “SO WHY ON EARTH WOULD THE GT RESEARCHER WANT TO BLOCK THIS STAGE OF THE GT PACKAGE WITH A COMPUTERIZATION? The answer is there is no reason to. Computers would erode, block and remodel GT at the sorting stage” (upper case as in the original, Glaser 2003, 37).

An immediate response to this could be that every CAQDAS package has a button or a menu option that allows the user to print out memos. After printing, one could proceed to sort, rearrange and reorder the paper versions of the memos as usual (in the old days). However, knowing how a computer-assisted analysis works, even this is no longer necessary. All of this can be done within the digital environment. By attaching comments and memos to data segments that at some point are also coded, and by sorting and re-arranging the codes, one sorts memos all the time throughout the process of analysis. This will be shown below in the sample study. It is also no longer necessary to copy parts of the data on to the memos (cards), as is done with manual analysis. Since the memos are digitally linked to the data, the data can always be accessed and do not have to be part of the memo content. Linked data segments can be exported (if desired) together with their memos.

Implications of Terminology

QDA or CAQDAS?

Glaser (2003) strongly emphasizes the difference between classic GT and “QDA” (Qualitative Data Analysis). Similarly, I have always placed value on using the term CAQDAS—Computer Aided Qualitative Data Analysis Software—as compared to QDA software (cf. Frieze 2011). The term QDA software is easier on the lips, but it has caused many misunderstandings. QDA software implies that the software is doing the analysis instead of being a tool assisting the researcher (who still must do the thinking). Automation is certainly an issue these days, given the massive amounts of data available. But big data analysis is not the same as qualitative data analysis, even though big data may consist of qualitative, i.e. non-numeric data (Frieze 2016). Thus, we need to distinguish between the **analysis of qualitative data** and **qualitative data analysis**, whereby GT is a form of the latter. In moderation, CAQDAS packages also support the former. To tackle larger amounts of data, CAQDAS, for instance, provides text-searching tools and automatic coding functions, whereby the type of text search offered may be as simple as looking for string of characters up to generating built-in algorithms that can be trained by a human being and thus deliver quite reasonable automatically coded segments. The other features supporting the analysis of qualitative data are all tools that provide numbers like cross-tabulations or frequency distributions of codes that can also be related to variables. These tools might also come in handy at later stages of a qualitative data analysis, but to begin with one needs other tools that support an inductive way of working, interpretive writing and thinking. Knowing about these tools and how best to work with them requires more than simply citing secondary sources that describe computer-assisted analysis as Glaser (1998) did – it requires active work with one or more software packages and gaining first-hand experience, at least before taking a critical stance. Knowing only one package may also lead to false conclusions through generalizations such that, for instance, this package does not support me in doing x and y, and therefore all available CAQDAS packages are not useful (Weber, 2014). If, for instance, one was to attempt a GT analysis with QDAMiner, which is better able to support deductive approaches, one can easily become frustrated and might reject CAQDAS as unsuitable for GT. Another common pitfall is the translation of methodological steps to software functionality. As will be shown later in this paper, equating the GT coding process with the function to apply codes in a software package can already be troublesome.

Thus, we have two problematic issues here: the use of terminology, one implying that the software will do the analysis for you, at least for the uninitiated user; and ignorance or too little knowledge. As there are many studies that claim to be GT-based, irrespective of whether they have been conducted manually or are computer-assisted (Morse et al. 2009), but are not in fact genuine GT studies, they are also many computer-assisted studies that are “quick and dirty” rather than presenting excellent pieces of qualitative analysis. This, however, is no reason for rejecting either GT as methodological approach nor the use of software in conducting a qualitative data analysis. As Strauss said, long ago, research is hard work, and without working hard, neither a manual nor a computer-assisted analysis will result in a good piece of academic writing.

Not all GT researchers of the first and second generation, however, condemn the use of software. Corbin, although herself preferring to analyze data manually, writes in the current issue of *Basics of Qualitative Data Analysis*: The computer has the ability “to augment the human mind by doing a lot of the detailed and tedious work involved in many endeavors, thus freeing up the user to be creative and thoughtful. And this is what computer programs do for qualitative analysis” (Corbin and Strauss 2015, Chapter 11, item 5207).

Coding or tagging?

Reflecting on the arguments put forward for not using software, it occurred to me that one reason for it could simply be a misunderstanding in respect of another commonly used term and its application. The use of the words “code” and “coding” in the context of qualitative data analyses is probably a result of the widespread adoption of the Grounded Theory approach, and it has also been embraced by almost all CAQDAS developers. But what does “coding” mean in a computer environment? It simply refers to the process of attaching a label to a data segment. Computer scientists call this “tagging”, which might be a much better term to use to avoid confusion with the much more complex process of Grounded Theory coding.

Both Strauss (1998) and Corbin and Strauss (2015) mention that some researchers write the concepts they usually develop in memos (i.e. writing index cards) as labels in the margin of a document. Strauss assumed that this was probably common practice, but he pointed out that these “codes” would then be less detailed and more difficult to sort (Strauss 1998, 114). Looking at the examples Strauss provides, the notes on the index cards contain quotes from the data, references to other related data seg-

ments, analytic reflections, pointers for theoretical sampling, and references to the coding paradigm – like whether the coded segment represents or contains references to a condition, an interaction, a consequence, etc. This also applies to the examples provided by Corbin and Strauss (2015). Thus, what is commonly referred to as *coding* with CAQDAS is not what Glaser, Strauss, Corbin and other GT authors mean when they talk about coding in the Grounded Theory sense. GT coding is much more than just attaching a label to a data segment.

In the German edition of 1996, Strauss and Corbin define coding as “the process of data analysis” (p. 43). In the 2015 edition, it is defined as delineating concepts to stand for interpreted meaning (Chapter 12). Applying this process to a computerized analysis, this means tagging *and* writing. Depending on the computer program you are using, the process of writing is implemented in different ways. All programs offer a memo function, but this is not necessarily the best software feature to use when applying the GT way of coding in a computer environment. Using comments and annotations is often more appropriate, especially at the stage of open coding.

The first step is to understand the meaning and purpose of a specific analytical task in a methodological sense. Next you need to be familiar with the various functions your preferred software package provides to find and use the appropriate tool(s) for the task at hand. If viewed in this way, it becomes comprehensible why some researchers reject the application of software when using Grounded Theory methodology. To bridge the gap, a translation of the various methodological steps to computer mouse clicks is needed. This is what I would like to offer in the remainder of this paper.

The NCT method as a core process of computer-assisted data analysis

The acronym NCT stands for Noticing, Collecting and Thinking about things. I have been developing this method throughout the many years I have been working with and teaching CAQDAS (see Frieze 2014). I regard it as central to any computer-assisted analysis, no matter which brand of software you are using. The three main components are project management, building a coding system, and further analysis after coding. The NCT method provides guidance on how to set up a research project in a computer-assisted environment. Already at this stage lots of mistakes are made that hinder further analysis at later stages. The method explains how to build an efficient coding system and how to use the various software tools for additional analysis

after coding. By “efficient”, I mean using the available software tools to their fullest potential. Over time, certain procedures have proved to be advantageous to fully utilize software functionality. Based on this, I have derived a few rules and describe indicators that help users to identify potential problematic issues when using software.

The following post from Research Gate shows one typical problem that often arises when software is used, namely having created too many codes. What it also shows is that students often do not receive the guidance they are looking for due to a lack of translation skills:

I'll give the example of a student who had Grounded Theory in mind (“open coding”) who came to me after his round of using CAQDAS. Without a trace of irony, he told me had over 200 codes and asked, “What do I do next?” I have to admit that I didn't have (an) idea what to say!

https://www.researchgate.net/post/What_is_your_experience_with_or_attitude_towards_using_software_tools_CAQDAS_in_hermeneutic_phenomenological_and_exploratory_analysis/2 (last accessed November 7th, 2016).

The NCT method provides guidance for those types of situations. Two hundred codes are indeed not very much; I have seen projects using a thousand and more codes. Software does not tell you when the item that is called “code” or “node” is good and appropriate or not. There are no red lights to flash at you when you develop too many codes, that is, when you walk straight into what I call the code swamp. Software does not tell you when the proper level of abstraction is reached, how long a coded segment should be or how to best label a code. You can either learn it over time by gaining your own experience, or you need someone who can provide feedback and guide you through the process.

For the methodologically uninitiated, the NCT method can be used by itself for a content analysis of qualitative data. For those with more methodological background knowledge, it can be embedded in a larger methodological framework like Grounded Theory, phenomenology, discourse analysis, ethno- methodology, mixed methods, and the like. Depending on the chosen approach, some software functions will be more prominent than others. What always remains the same, though, is the way the coding system is built up; how you get there is a question of your methodological approach. This paper provides more detailed instructions on how to apply the NCT method in the context of Grounded Theory methodology. In a recent publication, Wright (2016) explained how he used it in the context of actor-network theory.

The sample study

The data of the sample project used here are the same that Juliet Corbin uses in the 2012 and 2015 editions of her book *Basics of Qualitative Data Analysis*. The data consist of an open interview carried out by Anselm Strauss in 1987 with a Vietnam veteran who worked in the medical corps; two others, one semi-structured with a US Marine who had served in the Vietnam War, and an email conversation with a Panama, Saudi and Bosnia veteran, also US Marine, were conducted by Juliet Corbin in 2006. Initially, there are no detailed or fixed research questions, merely a general broad interest in the soldier's experience of war. The selected data material is used for demonstration purposes only and is not sufficient to derive a full theory anchored in the data. At the end of the paper, however, some ideas for further theoretical sampling are provided highlighting how one could extend this study to achieve saturation to build theory.

Open coding: identifying concepts

In this section I describe how I translated the process of “open coding” in ATLAS.ti: During the first phase, I read through the data and recorded the ideas and thoughts that occurred to me. I tagged the data accordingly. This translate to the Notice & Collect process of the NCT method. Deviating from J.C., I only wrote few memos at this stage. Rather, my intention was to pre-structure the material to take advantage of the computer early, in that it allowed me quick access to the material for further analysis via tags (called codes or nodes in most CAQDAS). Table 1 compares the concepts developed by Corbin and myself, from which it should be clear that many of my tags tackle the same issues. In some instances, Corbin or I chose a more abstract term, sometimes naming a possible property or a sub-code.

Table 1. Results of open coding of interview 1.

Concepts J.C.	Concepts S.F.
Locating the self: at time of entry	*family background professional background reasons to go into war attitude: patriotism attitude: war *war: preparation
Volunteering versus being drafted versus draft dodging	*about being drafted

Being a noncombatant versus being a combatant	
The enemy	*about the enemy
Zones of safety and zones of conflict or killing zones	
Military systems	military way
The war experience and strategies for blocking out minimizing inconsistencies	self-consistency bias
The war experience	war experience war experience: dealing with death death and war
The culture of war and its inconsistencies	inconsistencies self-aware conscience
Psychological survival strategies	denial? dealing with: changing opinion to match facts dealing with: cleansing experience
The enemy and psychological survival strategies	depersonalizing consequences of depersonalizing in-group / outgroup conditions: language issues
Letting down one's emotional guard	war experience: dealing with death
Moral contradictions of war and psychological survival strategies	war experience: fade out / cut off war effect on attitude
Inconsistencies within the military system	military way
Normalizing the situation: another survival strategy	war experience: normalization
Moral contradictions	nurse codex in action simple human feelings
Coming home and getting on with life	Dealing with war: effect on life war experience: fade out / cut off deal- ing with: dealing with: cleansing experience *feelings about Vietnam today
The American disillusionment: a new meaning of war	peace movement: explaining rejection peace movement: first reaction peace movement: retrospect dealing with: changing opinion to match facts attitude: government
War as maturational stepping-stone: the changing self	war effect: maturation
The wall of silence	no exchange with others about experi- ence
Breaking through the wall of silence	
Survival	
	*important incidences
	justifications

In ATLAS.ti, this initial tagging looks as shown below. Tags are not yet sorted or colored; at this stage of analysis, there is only a simple list of terms. If you work with other programs, my recommendation is to use a flat code list at this stage, even if, for example, NVivo and MAXQDA permit a tree structure.

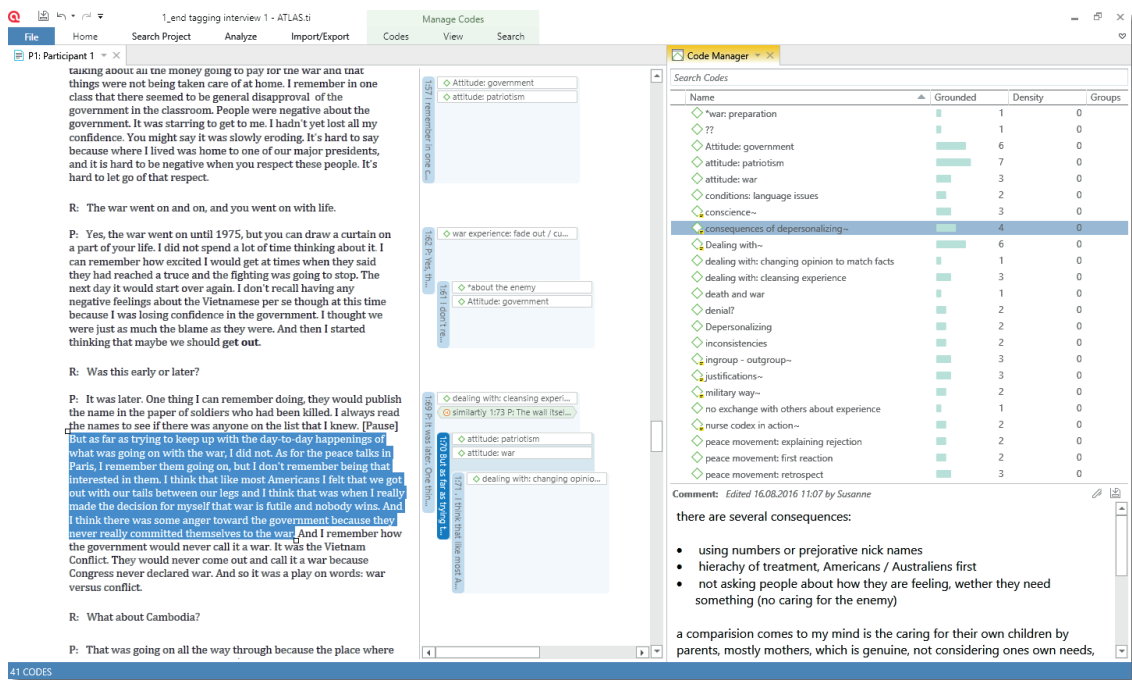


Figure 1. Initial phase of open coding in ATLAS.ti 8.

In Figure 1 the Code Manager is opened on the right-hand side of the screen. One quotation is highlighted. Quotations in ATLAS.ti are marked data segments, which may be tagged, but do not have to be. A small post-it note designates an annotated quotation. This also applies to other entities. If you link quotations to each other, this is called a hyperlink in ATLAS.ti. A hyperlink can be named and commented on.

Figure 2 below shows the Hyperlink Manager and the five links that were created in this first phase. In the document, you can jump back and forth between hyperlinked quotations via double-click on a hyperlink, just like clicking a link on the Web. This means it is not necessary to copy or write down references (on index cards as is customary in manual analysis) —they are available instantaneously.

Before I proceeded with analyzing the data in detail through axial coding, I tagged interviews two and three. The changes to the tag list that resulted from this are shown in Figure 3, exemplifying the emerging category of “DEALING WITH.” The first two lists expand and clarify the open coding process as defined by Corbin and Strauss: open coding is the process of “breaking apart data and delineating concepts to stand

Search Links

Source	Relation	Target	Owner	Author	Created	Modified
[1:41] P: I think it was a stepping-s	● continued...	[1:42] P: I think that they gave over	Susan...	Susan...	29.03.2015 11:40:...	29.03.2015 11:40:...
[1:13] A lot of things that I hold sa	● dealing with	[1:31] I was very busy. I worked part	Susan...	Susan...	29.03.2015 11:09:...	29.03.2015 11:09:...
[1:31] I was very busy. I worked p...	● expands	[1:89] As for books, I've read a coup	Susan...	Susan...	29.03.2015 16:14:...	29.03.2015 16:14:...
[1:14] For a while then, I worked in	● discusses	[1:18] Then again, this would be ab...	Susan...	Susan...	29.03.2015 10:05:...	29.03.2015 10:05:...
[1:69] P: It was later. One thing I c	● similartiy	[1:73] P: The wall itself did. I went	Susan...	Susan...	29.03.2015 15:46:...	29.03.2015 15:46:...

Quotation [Show in document](#)

[1:69] P: It was later. One thing I c

P: It was later. One thing I can remember doing, they would publish the name in the paper of soldiers who had been killed. I always read the names to see if there was anyone on the list that I knew. [Pause] But as far as trying to keep up with the day-to-day happenings of what was going on with the war, I did not. As for the peace talks in Paris, I remember them going on, but I don't remember being that interested in them. I think that like most Americans I felt that we got out with our tails between our legs and I think that was when I really made the decision for myself that war is futile and nobody wins

Comment:

Figure 2. Hyperlink Manager in ATLAS.ti 8 with activated quotation content.

for blocks of raw data. At the same time, one is qualifying those concepts in terms of their properties and dimensions” (Corbin and Strauss 2008, 195).

If the list of sub-codes grows very long as was the case after having tagged the second and third interview (Figure 3), this is an indicator to take a closer look and to check whether some tags can be aggregated, or whether they belong somewhere else. Before I could aggregate the codes, meaning that I gained a better understanding of what was going on in the data, I differentiated the sub-codes further by introducing a temporal dimension: after and during/after when tagging interview three. Also, the tag “dealing with: fade out / cut off” was getting quite large (see groundedness count (15) = code frequency) as I was indeed tagging two different things. It was split into the two sub does “closed out” and “fade out”.

At a later stage in the analysis when integrating categories and focusing the analysis around a core category, it became much clearer what some of the ‘dealing with’ strategies were all about. I developed two new categories called “BARRIERS (to home coming)” and “AIDING (home coming)”. The sub-code “dealing with: active” became part of the category AIDING and the sub-code “dealing with: alcohol” became part of the category BARRIERS (see Figure 8). This is an example that the individual steps of coding are not necessarily consecutive but blend into one another (see Strauss 1998, Corbin and Strauss 2008).

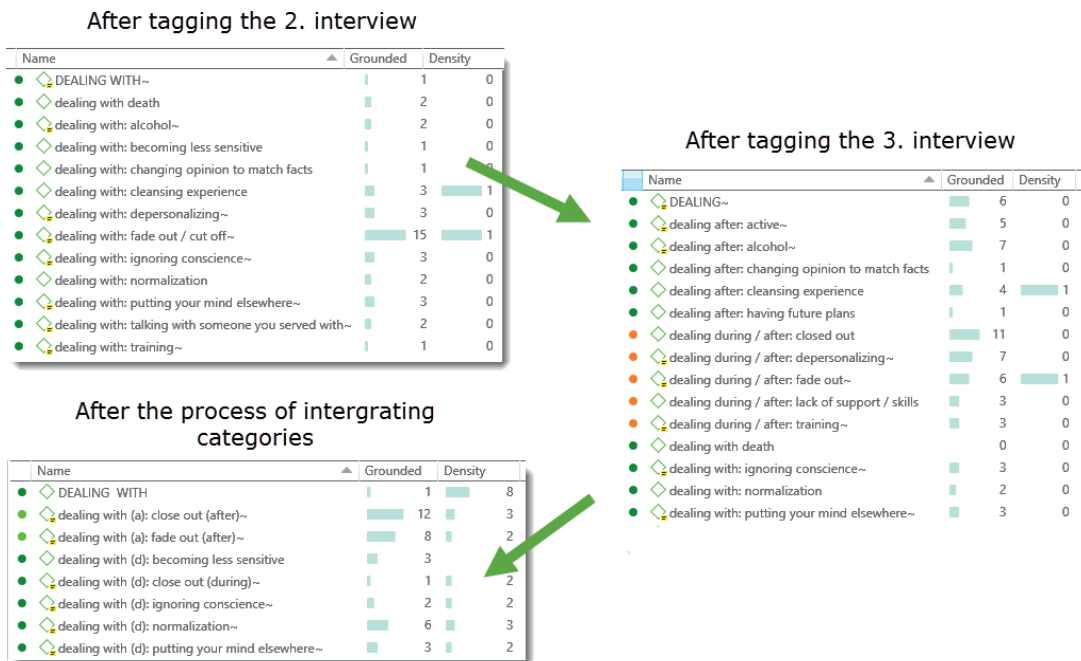


Figure 3. Ongoing changes in building the category DEALING WITH.

If your preferred software offers a hierarchical code structure, you may want to organize all “dealing with” tags as sub-codes underneath “DEALING WITH”. However, be aware that arranging tags in a tree structure is not synonymous with analytical in-depth differentiation of different concept levels. Novice researchers often find this hard initially (cf. Corbin and Strauss 2014, Strauss 1998). The technical facility of simply shifting to different levels in a tree structure can create a false sense of security that you have indeed created a proper higher order category or lower order sub-code. No software will point out inconsistencies in parent and child codes. If you create “Horse” as parent code and assign “dog,” “animal,” and “corn-flower” as sub-codes, the software will be indifferent about it. This may sound trivial, but unfortunately I have seen too many coding schemes which were set up incorrectly or inefficiently. There are certain rules to observe, already described by Richards and Richards (1995), and if those are not followed, you quickly end up in the “back to Excel” game or back to paper and pencil. Errors of this kind in the development of tag lists can, of course, also occur when using prefixes, as is common in ATLAS.ti. This is but one example of the importance of learning both the analytical principals of qualitative methodology and the appropriate mouse clicks in CAQDAS.

Naming conventions for tag lists

The attentive reader may already have noticed that in Figure 3 I use uppercase for category names. Since there is no tree structure in ATLAS.ti, one uses prefixes for sub-code, for example, for the properties of a class. Dimensions can be part of code names (as is the case in Figure 3), or else dimensions are separated out as their own code group and coded twice, i.e., once with the sub-code and once with the dimension. This can be advantageous for further analysis if you want to relate dimensions to properties in the form of a table. This rule is not ATLAS.ti-specific and should be also considered when using other programs.

For all the tags that have not yet become a category or do not belong to one, I use an *asterisk* as a prefix. All attribute tags, such as family background, professional biography etc., I prefix with a *hashtag* (#). As ATLAS.ti sorts the tag list in the following order: special characters, numbers, letters, those types of codes are listed first. Table 2 summarizes the naming conventions I use to turn a list of tags into a code system that differentiates between different levels and types of codes.

Table 2. Syntax for the meanings of tags on the various levels.

Meaning	in ATLAS.ti	Examples
concept	Small letters, black	Depersonalizing Conscience In group - outgroup
category	Capital letters, colored	WAR EXPERIENCE
sub-code	Small letters, colored like all other codes in the category	War experience: inconsistencies War experience: killing War experience: survival
concepts in developing a code schema	Small letters, prefixed by special character (*), black	*about the enemy *about being drafted
dimension	Small letters, prefixed by special character, colored	/TIME /time: during /time: after
Socio-demographics, i.e. if you code attribute of actors, group interviews / focus group data / comments of different people on a blog, comments on YouTube videos	Small letters, prefixed by # or any other special character, grey	#background: personal #background: professional #gender: male #gender: female

The code system for this sample study is shown in Figures 4 and 5. I would not call it a “final” code system, as it would certainly change if further data material were added to the study. There are seven codes that do not yet belong to any category (those beginning with an *). When more data have been coded, these might become a property of a category that does not yet exist, or they might be a part of a new category. Depending on how much needs to be changed with more data coming in, this is an indicator how stable a code system already is, given an open mind. If only a few changes and adjustments need to be made – that is, you mostly apply already existing tags, no new properties are emerging and the existing ones are filling with content – you approach theoretical saturation.

In the process of developing categories, all tags belonging to a category were colored and added to a code group. Code groups in ATLAS.ti are useful for filtering, sorting and organizing tags and for use in advanced analysis tools. Code groups were created for categories and for the different aspects of the coding paradigm.

Code Groups	Name	Grounded	Density
◇◇*conditions (14)	● ◇ #background: personal	7	2
◇◇*consequences (15)	● ◇ #background: professional	5	0
◇◇*emotional responses (4)	● ◇ #combatans	0	19
◇◇*phenomena (2)	● ◇ #non-combatans	0	18
◇◇*strategies (13)	● ◇ #path to war~	5	0
◇◇action / interaction (5)	◇◇*consternation~	6	2
◇◇adding theory (2)	◇◇*disillusion	4	1
◇◇aiding to (5)	◇◇*important life events	3	0
◇◇attitudes (3)	◇◇*military training	2	1
◇◇Barriers (5)	◇◇*military way~	5	0
◇◇dealing with (8)	◇◇*traumatic experience	0	7
◇◇effects neg (5)	◇◇*war: activities~	4	0
◇◇effects pos (3)	● ◇ AIDING	0	7
◇◇justification (3)	● ◇ aiding: active handling~	11	4
◇◇the enemy (4)	● ◇ aiding: counseling / medical support~	2	1
◇◇war experience (3)	● ◇ aiding: family support	2	2
	● ◇ aiding: having future plans	2	2
	● ◇ aiding: recognition~	4	2
	● ◇ ATTITUDE	0	0
	● ◇ attitude: changing	15	4
	● ◇ attitude: patriotism	7	2
	● ◇ BARRIERS	0	6
	● ◇ barriers: drinking alcohol~	7	3
	● ◇ barriers: lack of coping skills	4	4
	● ◇ barriers: lack of meaning~	4	5
	● ◇ barriers: no recognition~	8	5
	● ◇ CH_ coming home as a process / Journey	3	7
	● ◇ CH_COMING HOME	0	1

Figure 4. Sample study code system.

Code Groups	Name	Grounded	Density
◇*conditions (14)	● ◇ DEALING WITH	1	8
◇*consequences (15)	● ◇ dealing with (a): close out (after)~	12	3
◇*emotional responses (4)	● ◇ dealing with (a): fade out (after)~	8	2
◇*phenomena (2)	● ◇ dealing with (d): becoming less sensitive	3	0
◇*strategies (13)	● ◇ dealing with (d): close out (during)~	1	2
◇action / interaction (5)	● ◇ dealing with (d): ignoring conscience~	2	2
◇adding theory (2)	● ◇ dealing with (d): normalization~	6	3
◇aiding to (5)	● ◇ dealing with (d): putting your mind elsewhere~	3	2
◇attitudes (3)	● ◇ EFFECTS NEG	1	0
◇Barriers (5)	● ◇ effects neg: aggression~	2	3
◇dealing with (8)	● ◇ effects neg: anger / stress~	6	7
◇effects neg (5)	● ◇ effects neg: nightmares~	2	3
◇effects pos (3)	● ◇ effects neg: physiological~	1	2
◇justification (3)	● ◇ EFFECTS POS~	2	0
◇the enemy (4)	● ◇ effects pos: maturation~	6	3
◇war experience (3)	● ◇ effects pos: motivator~	4	3
	● ◇ ENEMY	0	0
	● ◇ enemy: depersonalising~	6	4
	● ◇ enemy: described with respect / distance~	3	3
	● ◇ enemy: human being~	2	3
	● ◇ JUSTIFICATION~	0	3
	● ◇ justification: defend our way of life~	5	4
	● ◇ justification: patriotism~	1	3
	● ◇ WAR EXPERIENCE~	4	13
	● ◇ war experience: inconsistencies~	7	5
	● ◇ war experience: killing~	5	2
	● ◇ war experience: survival	3	2
	● ◇ XX TH: THEORIES	0	0
	● ◇ xx th: ingroup - outgroup~	6	0
	● ◇ xx th: self-consistency bias	1	0
	● ◇ xx th: trauma denial?~	2	0

Figure 5. Sample study code system continued.

As an ATLAS.ti code can be sorted into multiple code groups, the codes were added to a category group plus the fitting coding paradigm group, as appropriate.

Axial coding

Axial coding, which is coding along the axis of a category, is not immediately visible in the tag list. In the third edition, Corbin defined axial coding as “crosscutting or relating concepts to each other” (p. 195). And in more detail in the fourth edition (Corbin and Strauss 2015), we read:

When researchers are coding for context, they are doing what Strauss (1987) called ‘axial coding’. They are locating and linking action-interaction within the framework of sub

concepts that give it meaning and enable it to explain what interactions are occurring, and why and what consequences real or anticipated are happening because of action-interaction. (Chapter 8, position 4126)

While tagging is no solution here, creating linkages is. Yet, easy though it is to create links in the software, you first must work out exactly where and how to link something meaningfully. This is best possible if you start to think about your data during the process of writing. Axial coding therefore takes place primarily in memos, not when “tagging” raw data. Figure 4 shows an example of the axial coding process. I started with the personal biographies of the veterans (tags: *#background: personal* and *#background: professional*), their motivations for going to war, their war experiences, and how these were perceived, described and processed (tags: *#war experience*, with sub-codes *effects* and *dealing with*). The main purpose of using tags is to provide quick and reliable access to data and to be able to move smoothly within the data. Each interview document also has a number that is given in each quote; this makes it easy to identify a person/case/document. For example, D3 is the Panama, Saudi and Bosnia veteran, D1 is the medical corpsman.

So far, the “memo” feature of the software has not yet been used. All analytical notes up to this point have been written in the comment field for each quote. Figure 6 shows the Quotation Manager. Quotation 3:14 is selected, and the detailed analysis of this quote appears in the lower right-hand part of the window as a comment.

The screenshot shows the Quotation Manager interface. The left sidebar lists search codes such as CH_BARRIERS (0-0), CH_SUPPORT (0-0), and DEALING (3-0). The main window displays a table of search results with columns: Id, Name, Document, Density, Owner, Author, Created, and Modified. Quotation 3:14 is selected, showing the text: "I wasn't really shot; rather, I was hit with a hand grenade...". Below the table, there is a 'Preview' section showing the selected text and a 'Comment' field containing detailed axial coding analysis. The comment discusses the quote's meaning, the 'ingroup and output' perspective, and the concept of 'being scared' as a 'fight or flight' response.

Figure 6. Using the comment field in the Quotation Manager for axial coding.

The quotation itself is shown in the Preview field. In this quotation, it was possible to identify various strategies used by the respondent, interactions and a consequence. Other quotations may also contain information about the various types of conditions or other combinations of the paradigmatic elements suggested by Strauss and Corbin (2008).

The commentary also contains references to other tags in the form of (---> code name) as a note for a possible connection. Cross-connection to other quotations that come to mind while reflecting on and writing about the axis of a category are immediately implemented by creating a hyperlink. Hyperlinks can be accessed and visualized using the network function (see Figure 7). It shows three quotes with their codes and document source, and one commented link.

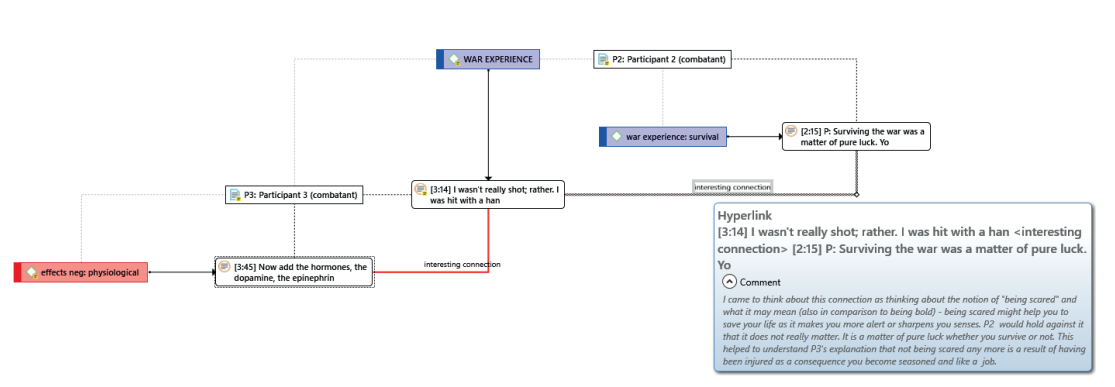


Figure 7. Visualization of first connections.

Along with writing during the axial coding phase, the list of tags continuously changed. I proceeded topic by topic: war experience, strategies for coping with experiences during and after the war, explanations or justifications for the war, public response to the Vietnam War from the perspective of veterans, etc. This makes it possible to see connections within and across categories. The tags make it very simple to locate specific segments: the descriptions become more focused, the connections obvious. A mere reordering of tags, without dealing more closely with the data behind it, would not have this effect. While doing this, the tags are sorted and renamed, thus forming new categories. With the reordering of tags, everything I had written about the data was also reordered. The need to sort memos, as highlighted by Glaser (2003), is thus eliminated. This is not a separate step but happens organically. If desired, one can output any written texts (i.e., comments or memos), with or without the raw data. If your computer screen is big enough, or if you work with multiple monitors, actual printing may be unnecessary.

Note that not a single ATLAS.ti “Memo” proper has been written thus far; up to now I have been using comments to write what GT calls “memos”, and these are linked to quotations or codes, and are automatically reordered with them. See Table 3 for an overview of how ATLAS.ti functions can be applied in a GT analysis.

Table 3. Software functions and their application in GT.

Software functions (ATLAS.ti)	Application
code (tag)	<ul style="list-style-type: none"> – initial structuring of the data – concepts – categories – sub codes – dimensions
Quotation comment	<ul style="list-style-type: none"> – open and axial coding – code notes – notes on theoretical sampling
Code Comments	<ul style="list-style-type: none"> – first thoughts that serve concept building – description of properties – summaries and interpretation of data segments tagged with the code
Hyperlinks	<ul style="list-style-type: none"> – References to other data segments, which would be noted on a record card when analyzing data manually – The type of link can be named like: confirms / explains / is consequence of / is strategy for / contradicts, etc. – The linked data segment can be retrieved in context, one can directly jump to it via a mouse click – Hyperlinks can also be created and displayed in network views
Networks	<ul style="list-style-type: none"> – Recommended when working on the conceptual level – Supports the process of integration – Presentation of core category and its connections
Memo	<ul style="list-style-type: none"> – Research diary – Writing down ideas on theoretical concepts that might be helpful in interpreting the data – Writing up answers to research questions based on queries – Writing up the various parts that will later form the theory – Description of theory – On the technical side: creating code lists for import
Code Groups Smart Groups	Technical: <ul style="list-style-type: none"> – Filter for easy access and retrieval – Filter for queries (not demonstrated in this paper)
Smart Codes	Technical <ul style="list-style-type: none"> – Saved queries (not demonstrated in this paper)

Integration and Visualization

For Corbin, the concept of “survival” gained importance in the process of analysis, and she developed it later into a core category. As I was only working with the three sample files, for me it was the concept of “coming home” that caught my attention. However, it would be too soon to call it a core category based on the small data set, and with more data at hand and further immersion into the topic, this might have been different. At the time, I had a few ideas on how “coming home” could be connected to the developed concepts and categories in the data. I therefore called up a network and dragged my “coming home” tag into the center. To build the connection, I approached the data with several questions in mind. For a soldier who had been in the war, what makes him feel that he has fully arrived back home? What inhibits a successful homecoming? What strategies counteract the impact of war? Are there differences between those who fought on the front lines and those who served behind the lines like the paramedics? What types of experience did the respondents report, and what effects did they have? What coping strategies were employed during the war? What was the impact of the original attitude toward the war; was the experience altered by it? In other words, I worked backwards in time from the present to the past, looked for evidence in the data, and dragged all applicable tags into the network.

In Figure 8 we see that “coming home” has not been used for tagging data and that it is only linked to one other tag: “coming home as process/journey” {0 - 1}. This tag, in turn, is connected to seven tags, and these in turn to other tags. There is a dense network of linkages, although not all of them are directly linked to “coming home.” Since a representation of the entire network would require a larger format, I present only two partial aspects that, step by step, interrelate all the aspects that lead to “coming home” with one another. In other programs, the mapping function (MAXQDA) or the modeler in NVivo could be used.

Figure 10 shows the relational context of the category “war experience” in an ATLAS.ti network. This includes aspects of the war experience, the consequences of these experiences, and coping strategies with these experiences, as well as the perception of the enemy, broken down by group of persons (combatants / non-combatants). In writing the summary analysis, an ATLAS.ti memo was used (see Figure 10).

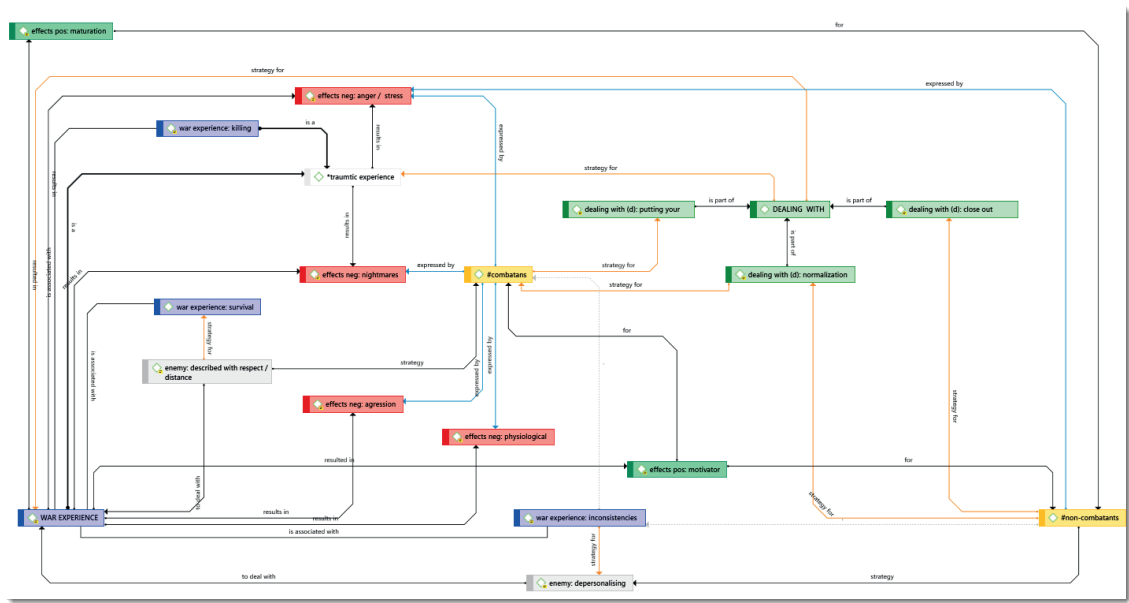


Figure 8. Network “War Experience”.

Figure 9 illustrates another partial aspect; it examines the question of whether the attitude towards war changed over time based on what was experienced throughout life.

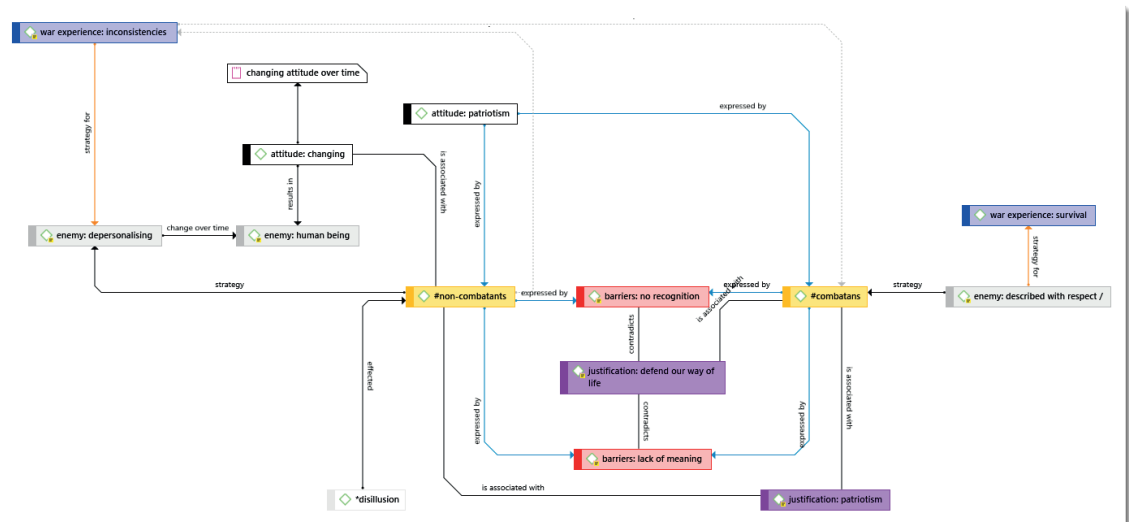


Figure 9. Network on changing attitude towards the military and war over time.

In Figure 10 you see the ATLAS.ti memos I have started to write in this process of integration. I created a memo for each partial aspect, which may ultimately be helpful when focusing the analysis with respect to the core category. While writing the

analysis, each memo was linked to quotations that I may want to cite in the final report (see column: Grounded). This makes them easily searchable and retrievable. The “density” column specifies how many tags and other memos the memo is linked to.

The screenshot displays the ATLAS.ti Memo Manager interface. At the top, there are two memo groups: 'analysis (6)' and 'theory / iterature (2)'. Below this is a table listing memos with columns for Name, Grounded (with a progress bar), Density (with a bar chart), and Groups. The selected memo is 'war experience combatant / non-combatant' with a density of 8 and is linked to the 'analysis' group.

Memo Groups	Name	Grounded	Density	Groups
[analysis (6)]	changing attitude over time	3	1	[analysis]
[theory / iterature (2)]	congruence (Roger)	0	0	[theory / iterature]
	Factors hindering and facilitating "coming home"	3	2	[analysis]
	role of family background	4	4	[analysis]
	Strategies to deal with the experience (during the war)	4	5	[analysis]
	Strategies to deal with the war experience after the w...	5	2	[analysis]
	Traumatic experience	3	0	[theory / iterature]
	war experience combatant / non-combatant	8	1	[analysis]

Memo: Edited 16.08.2016 22:36 by Susanne

Comment:

The war was for all, combatants and non-combatants a traumatic experience. P1, the non-combatant talked a lot about the inconsistencies he noticed. He was very conscious about that as compared to those directly involved in the fighting. The inconsistencies arose due to the different ways of acting and reacting as compared to "normal" civilian life.

the nurse experienced this different from the combatant as he had to deal with the enemy in a different way, he had to care for the enemy as compared to killing him or defending himself. In order to be able to do that the enemy was depersonalized, he became faceless, a number, so that one could justify to oneself to treat this "thing" differently, avoiding self-conflict.

the combatant expressed respect and mistrust towards the enemy. This can be regarded as a strategy for survival. Dealing with someone faceless or a thing would not raise the necessary attitude and awareness for combat. Being focussed very much on survival, the combat did not have much time to think about or to notice inconsistencies. He had to deal with them later on after he returned from war. Not being so much aware of what was going on (as compared to civilian life) appears to be related to military

8 MEMOS

Figure 10. ATLAS.ti Memo Manager.

The ‘T’ in the NCT method acronym stand for “thinking”. As has been shown, it can be accomplished extremely well in the writing steps, i.e., aided by the comment and memo functions in the software. The creation of network views further stimulates thinking in a creative way. It helps to recognize higher-order relationships, and to integrate the data with respect to the core category.

Continuing Analysis

The process described above can now be continued using additional material through theoretical sampling until saturation is reached. While working with the data through-

out the previous stages, you probably get some ideas of where to go for additional data. Software can help you avoid losing those ideas and finding them easily when needed. Technically this can be implemented via easily searchable and retrievable *abbreviations that you can note down in a comment or memo*. For example, I use the abbreviation *TS when writing a note regarding theoretical sampling (see Figure 11). This symbol can be used as search term in a project-wide text search to retrieve all the notes on further data collection.

The screenshot shows the CAQDAS interface. On the left, the 'Quotation Manager' window displays a list of quotations. The search term '*TS' is entered in the search bar. On the right, the 'Text Search Result' window shows the search results. A green arrow points from the search term '*TS' in the search bar to the search results window.

Id	Name	Document	Density	Owner	Author	Cre.
190	R: Did you even have a close friend that died in t	Participant 1 (nurs...	1	Susan...	Susan...	29/1
192	But we did give more attention to the South Vie...	Participant 1 (nurs...	1	Susan...	Susan...	29/1
193	When I was in Vietnam, I came to grips with the fa	Participant 1 (nurs...	4	Susan...	Susan...	29/1
194	P: No, I think ... I consider the fight against AI	Participant 1 (nurs...	1	Susan...	Susan...	29/1
195	I was pretty young-21 years old-and very patriotic	Participant 1 (nurs...	1	Susan...	Susan...	29/1

Comment: Edited 16.08.2016 12:57 by Susanne

family background as condition that he experienced war as a process of maturation

his family background (traditional, God fearing) can be regarded as a **condition** that he describes his war time as a process of maturation. It was liberating to **leave** being geographical far away, away from normal lives offered in a bizarre way a space for "freedom of development"

special place: extraordinary, no tomorrow, you have to live in the now

it was even an exciting time and this is remembered more than the bad experience
- the latter was faded out and "closed out" - see codes faded out & closed out (dealing with)

this was different for the other two respondents (combatants), who had a much harder time dealing with the war experience - the different paths to war may have to do with it and the family background, but being a combatant or non-combatant probably also makes a difference. *TS: There is too little data yet to draw any conclusions.

Figure 11. The Project Search function can be used to find notes on theoretical sampling.

The procedures for further analysis after adding more data remain the same: tag the data, develop categories, expand the axial coding process while writing quotation comments, take note of interesting connections through hyperlinks, and use the network diagrams to draw and visualize relationships. The nodes in a network are always directly linked to the actual data. This means you are not just juggling empty labels but can look at the underlying data at any time, re-reading and re-developing their comments, as well as your summary memos.

Based on Corbin's ideas (2015), Figure 12 shows which additional data could still be collected for the further development of a theory. The left-hand column shows the existing as well as desirable document groups. Highlighted (in boldface) are those groups for which data currently exist. A great deal is thus still missing for now.

Based on my personal history of having started to work with CAQDAS over twenty years ago, I can hardly imagine how one would handle the anticipated data material manually, and how to keep track of it. Using ATLAS.ti or a similar software, I can

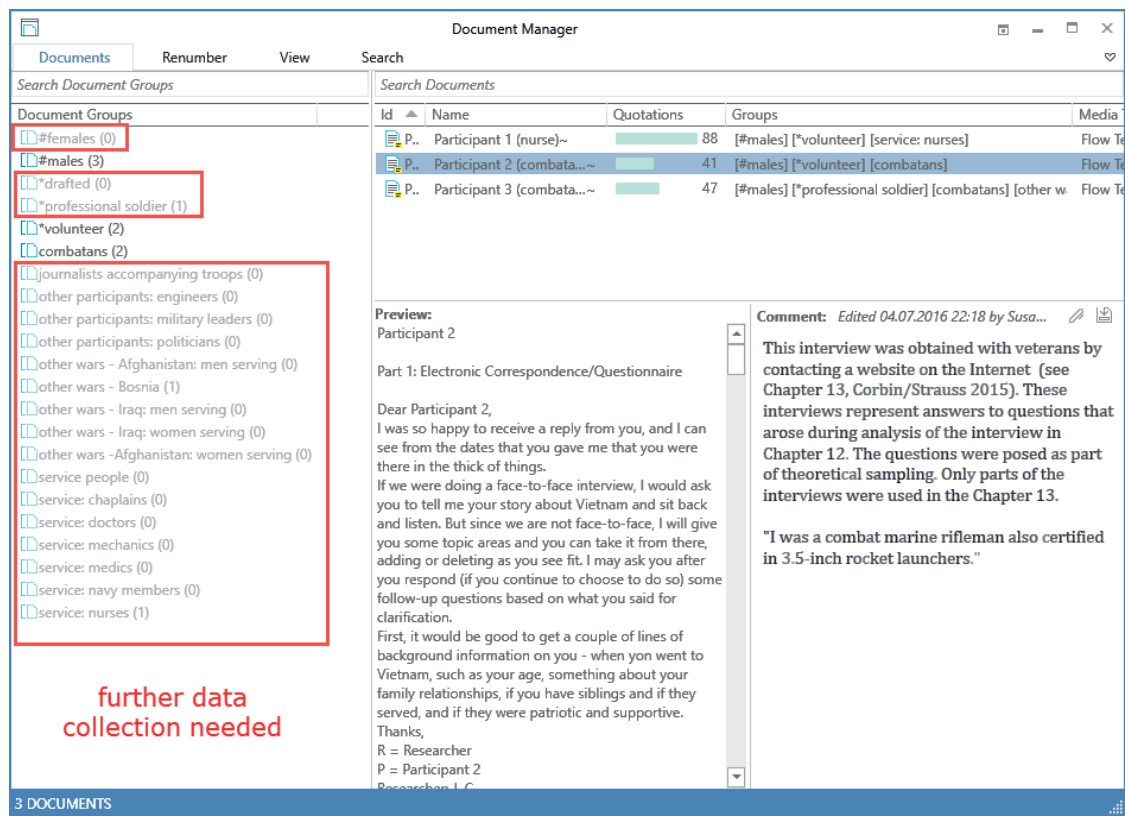


Figure 12. Ideas for further data collection (theoretical sampling).

not only manage the entire data material, but also ask important questions. Continuous comparison is a fundamental principle of Grounded Theory. CAQDAS enables me to compare statements on specific issues across different groups. For example, do the testimonies of soldiers who have served in Vietnam, Iraq or Afghanistan differ from one another? Do women report different things from men? Are there similarities? Are different or similar coping strategies employed? How is “homecoming” experienced depending on the context? These are all questions to which software can provide the data with a few clicks. The tools in ATLAS.ti that can be used for this type of analysis are the Query Tool, the Cooccurrence Tools and the Code-Document-Table.



Figure 13 Advanced analysis tools.

The Cooccurency Tools essentially perform a cross-tabulation of codes that have been applied to the same or overlapping data segments. Figure 14 shows the cross-tabulation of the barrier with the negative effects category. As the sample is very small, the frequency of occurrence is not yet very high. The purpose of showing the table is to demonstrate the potential of this type of analysis. The insights gained from such tables are not the numbers per se, but the data behind the numbers. At the bottom-right of the table, you see the list of quotations for the column and the row codes. Based on this, the researcher can access the data and continue to develop the analysis by paying attention to the possible relations between certain types of barriers resulting in certain types of consequences, and so on.

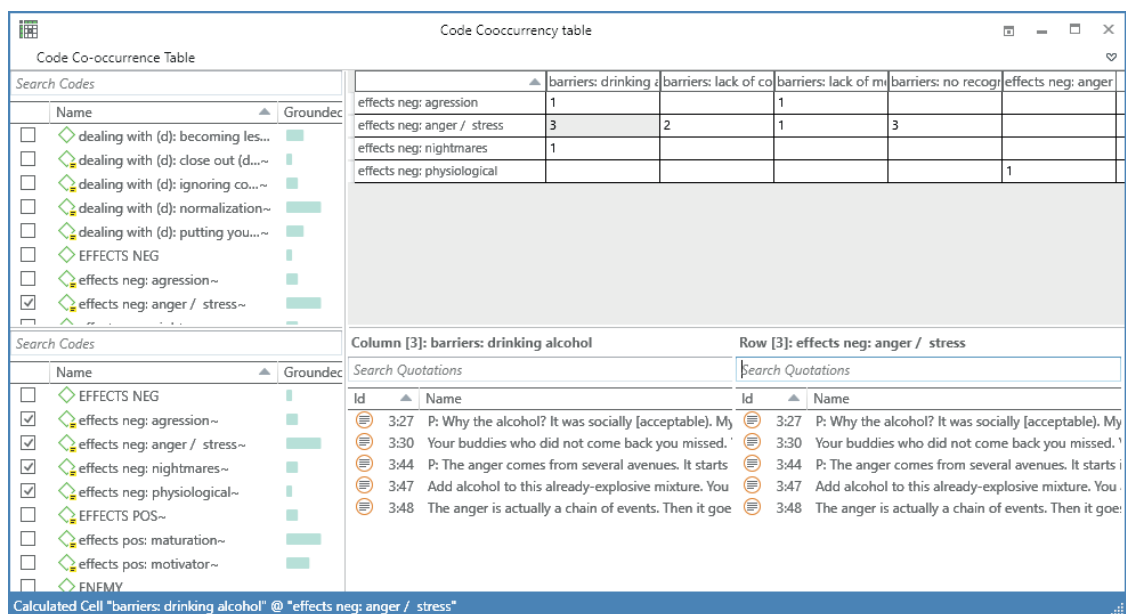


Figure 14. Code Cooccurency Table.

The Code-Document Table is a cross-tabulation of codes / code groups by documents / documents groups that can, for example, be used to compare combatants and non-combatants, respondents who have served in different wars, male and female respondents, or, as illustrated below, for a case by case comparison (Figure 15). This I already find interesting given the current data set. Based on looking at the code frequency distribution, ideas for further sampling might arise, and issues are pinpointed that are worth paying attention to. This type of analysis simply cannot be performed manually with growing amounts of data: it would be too time-consuming.

	Participant 1 (nurs)	Participant 2 (com)	Participant 3 (com)	Totals
dealing with (a): fade out (after)	8	0	0	8
dealing with (d): becoming less sensitive	2	0	1	3
dealing with (d): close out (during)	1	0	0	1
dealing with (d): ignoring conscience	2	0	0	2
dealing with (d): normalization	4	2	0	6
dealing with (d): putting your mind elsewhere	1	2	0	3
effects neg: aggression	0	1	1	2
effects neg: anger / stress	2	0	4	6
effects neg: nightmares	0	1	1	2
effects neg: physiological	0	0	1	1
effects pos: maturation	6	0	0	6
effects pos: motivator	3	0	1	4
aiding to	4	6	7	17
Barriers	5	5	13	23
dealing with	25	9	2	36
Totals	63	26	31	120

Figure 15. Code-Document Table.

Summary

Throughout this paper, it has probably become obvious that I am a convinced CAQDAS user. However, I do not propagate it for all types of qualitative data-analysis methodologies. There are, for instance, certain phenomenological approaches that do not lend themselves to software-supported analysis, as tagging, a main component of CAQDAS, has no part in it. Most GT approaches, however, can be supported well. For Clark's situational analysis, also an offspring of the original Grounded Theory approach, I would for example implement CAQDAS for data-management purposes and data-tagging, but not for the situational maps.

I would like to end this essay with a reference to a recent post (August 2, 2016) on the DTRG (Digital Tools for Qualitative Research) blog entitled: **Determinism vs. Constructivism: the polarizing discourse regarding digital tools for qualitative research and how it threatens our scholarship**. The argument put forward is that we mainly use deterministic language to criticize the "other" and constructivist language to defend our own position. Thus, the argument goes, we are building boundaries to protect our own points of view against the oppressive, homogenizing other. I must admit that I am myself guilty of a few charges put forward in the blog. My hope nonetheless is that, by illustrating the process of the Corbin and Strauss branch of Grounded Theory methodology in ATLAS.ti, I have started to build a bridge.

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Adapted and translated from the following book chapter:

Frieze, S. (2016). Grounded Theory computergestützt und umgesetzt mit ATLAS.ti. In C. Equit and C. Hohage, *Handbuch Grounded Theory: Von der Methodologie zur Forschungspraxis*, pp. 483-507. Weinheim: Beltz Juventa.