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Carrying out a computer-aided thematic  
content analysis with ATLAS.ti



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## Abstract

There are many different methods in qualitative research and also many ways to approach the analysis of qualitative data. Even though nowadays, the use of Computer-Aided Qualitative Data Analysis Software (CAQDAS) is widespread, usually in the books and papers that describe an approach, it is not explained how to implement the analysis using software; it is assumed that this is self-explanatory. This often leads to frustration when using an analysis package ((Weber 2014), up to the point where the analysis is given up and researchers return to paper and pencil. To work with CAQDAS, one must first know which requirements the chosen analysis approach has. Then one needs to be familiar with the features that the software offers. And thirdly, one needs to know how the individual methodological steps can be implemented. This paper shows how the phases of a selected Thematic Content Analysis (TCA) can be realized in a software-aided analysis. The sample project that is used here for illustration purposes was provided by Jacks Soratto and Denise Pires. It is about job satisfaction and the dissatisfaction of professionals working in the Family Health System in Brazil. The implementation is described by the CAQDAS expert Susanne Friese. Before presenting the implementation, the different approaches of TCA are presented, and the individual analysis phases are explained. This paper is the second in a series that describes how a qualitative data analysis approach can be implemented using computerized qualitative data analysis software. The first one was on how to conduct a Grounded Theory analysis with ATLAS.ti (Friese, 2016).

**Keywords:** thematic analysis, computer-aided qualitative data analysis, ATLAS.ti, case study

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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.

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## Introduction

Currently, technological innovation affects all economic sectors, multiple areas of knowledge, including the research process itself. Beginning in the 1980s, computational resources have been increasingly used in research, and today many software programs are available for use in qualitative and quantitative research (Flick 2009). The acronym, CAQDAS (Computer Assisted Qualitative Data Analysis), refers to software created to aid qualitative data analysis. The use of this type of technology in research is not without fault. Some authors (Flick 2009; Lage 2010; Polit and Beck 2011) warn about the possibility of the researcher becoming too concerned with procedure, clipping specific words and phrases, which eventually results in data interpretation weaknesses that distance the findings from the context of the relationships and scenarios in which they occurred. Another criticism concerns the use of CAQDAS resources to imbue the research with scientific authenticity. However, the statements of qualitative theorists and researchers concerning the usefulness and risks of the software used in data analysis processes have diminished over the years with the evidence of its usefulness for analysis.

The software ATLAS.ti is an example of CAQDAS, which has been used by professionals and many researchers from different fields of knowledge, such as education, engineering, criminology, management, anthropology, as well as healthcare professionals such as nurses, physicians, and psychologists (Flick 2009; Friese 2014). ATLAS.ti can be used with different theoretical approaches and multiple data analysis processes. The use of Thematic Content Analysis (TCA) as for instance described by Bardin (2011), Braun and Clarke (2006), Boyatzis (1998), or Yardley (2004), is one of these possible approaches, and it is a useful resource for data analysis in qualitative research (Vaismoradi, Turunen, Bondas, 2013). When searching *Publisher Medline* (PubMed) a health database using multiple variations of the terms: *ATLAS.ti*, *Thematic Analysis* and *Content Analysis Method*; a considerable number of studies were found using Thematic Content Analysis (TCA). In some studies, the use of ATLAS.ti was also mentioned, but only few studies applied TCA and used ATLAS.ti (Ferreira et al., 2012; Okello et al., 2014; Silva et al., 2014; Mahmud, et al., 2015). None of these describe in detail how the software was applied in the process. The aim of this work is to close this gap and show how methodical descriptions can be implemented with the help of software tools (see also Woolf and Silver 2017).

## Thematic Content Analysis – an Overview

Thematic analysis, similar to content analysis, is an umbrella term for analyzing qualitative data. Braun and Clarke (2006: 79) describe thematic content analysis as a method for “identifying, analyzing, and reporting patterns (themes) within data. It minimally organizes and describes your data set in (rich) detail. However, frequently it goes further than this, and interprets various aspects of the research topic.” Brown and Clarke suggest that thematic analysis should be a foundational method for qualitative analysis as “thematizing meanings” is one of a few shared generic skills across qualitative analysis and it can be applied across a range of theoretical and epistemological approaches.

Looking for patterns in the data is also common in other methodological approaches, but often these methods are theoretically bounded like interpretive phenomenological analysis to phenomenology (Smith and Osborn 2003) or the various forms of grounded theory to theoretical positions like objectivism, constructivism, symbolic interactionism, feminism, or Foucault’s discursive approach (Glaser 1998; Corbin and Strauss 2015; Charmaz 2014; Clarke 2015).

Thematic analysis can be used within different theoretical frameworks in a deductive “top down” way (e.g., Boyatzis 1998; Hayes 1997), or in an inductive “bottom up” way (e.g., Frith and Gleeson 2004). As Priya and Dalal (2015: 212) put it: “a method which works both to reflect reality, and to unpick or unravel the surface of ‘reality’.” As any theoretical framework implies several assumptions about the nature of reality and the data that stand for this reality, a good thematic analysis, according to Brown and Clarke (2006) will always make this transparent.

### *What is a Theme?*

According to Braun and Clarke (2006: 82), “a theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set.” It is an outcome of coding, but is not represented by a single code directly. Codes help in organizing, structuring, and retrieving data and they support the identification of themes, but rarely is a code also a theme. Prevalence in the data, i.e. frequency of occurrence within or across document is not necessarily a criterion for developing a theme. Essential is the researcher’s assessment of whether or not the theme captures something important in relation to the overall research question. This is guided by the overall aim of the

analysis, which in turn influences the level at which themes are identified. Should the analysis result in a rich thematic description of the data set, or should it give a detailed account of one aspect? In the first case, themes are extracted at the semantic or explicit level, in the latter case, at a latent or interpretative level (Boyatzis 1998).

#### *Semantic or latent level of analysis*

A thematic analysis can be conducted at the semantic or at the latent level. Semantic analysis means that data is coded at face value, i.e. at the explicit or surface meaning. The analyst is not looking for anything beyond what has been said or written. This applies to the identified themes as well. According to Brown and Clarke (2006: 13),

ideally, the analytic process involves a progression from description, where the data have simply been organized to show patterns in semantic content, and summarized, to interpretation, where there is an attempt to theorize the significance of the patterns and their broader meanings and implications (Patton 1990), often in relation to previous literature (see Frith and Gleeson 2004, for an excellent example of this).

In comparison, a latent level analysis goes beyond the semantic content of the data. It starts with examining the underlying meanings, assumptions, and conceptualizations that inform the semantic content of the data. In addition to applying codes to the data, the researcher is writing detailed analytic memos. Thus, the development of the themes involves interpretative work and the results are not mere description but are already theorized. Analysis within this latter tradition tends to come from a constructionist paradigm (e.g., Burr 1995), fits well with some discourse analytic approaches like Taylor and Ussher (2001), and is overall more suitable when you are theoretically rooted within the interpretive paradigm (Denzin and Lincoln 1994; Keller 2012).

#### *Inductive or Deductive Analysis*

Depending on which type of thematic content analysis you use, data can be analyzed inductively or theory-based in a top-down deductive fashion. Inductive analysis is data driven, and the analyst is not trying to fit the data into a pre-existing coding frame. The codes do not map the questions asked to the participants, they reflect the responses given by the research participants; the identified themes are derived from the data. This, however, does not mean that data are coded in an epistemological vacuum. As discussed earlier, the researchers need to clarify their underlying theoretical and epistemological point of view. Brown and Clarke's thematic content analysis approach fit this type of TCA.

In comparison, a theoretical thematic analysis is driven by the researcher's theoretical or analytic interest in the area. Coding will be based on the specific research interest and the researcher may not code the content of the entire data set. The resulting analysis will therefore cover the areas of special interest in detail but will be less rich regarding the data set overall. A coding frame is developed at the beginning of the analysis process and applied to the data. If the coding frame does not cover all aspects related to the topic of analytic interest, it may be adapted and filled with codes that are developed inductively to complement the original coding frame. Bardin's thematic content analysis, for example, falls under this type of TCA. It is much more restrictive than the approach described by Brown and Clarke. According to Bardin, there are three phases: pre-analysis, material exploration, and interpretation. In the first phase of pre-analysis, the researcher selects documents to be analyzed to formulate hypotheses, objectives, and indicators to substantiate the final interpretation (Bardin 2011). In the second phase of material exploration, the goal is to understand the text; it is a "long and tedious phase consisting of coding operations, decomposition or numbering" (Bardin, 2011: 131). In the third phase of interpretation, the analyst queries the coded data according to the research goals and the theoretical framework.

Semantic analysis can be both inductive or deductive, while a latent analysis will always be inductive. With inductive research, the specific research question can evolve through the coding process and codes are derived from the data. Researchers do not formulate hypotheses up front. Combined with latent level analysis, coding is a necessary process to manage data; writing interpretive memos is equally, if not more important.

## The Case Study

The study used here for illustration purposes is based on the PhD dissertation of one of the authors (Soratto 2015). The study was conducted in Brazil and the research question was: What is the influence of the Brazilian Family Health Strategy (FHS) on the satisfaction and dissatisfaction of health professionals? The aim of research was to find and analyze aspects of processes generating satisfaction and dissatisfaction in professionals working in the FHS. The data for this study was collected between November 2010 and April 2014, and included data from 27 family health teams, working in 11 Basic Health Unities (BHU) of six municipalities, distributed in

five geographical Brazilian regions. The final data corpus consisted of 76 semi-structured interviews, and notes on 130 hours of field observation. The interviews were transcribed and the observational notes were also available as Word documents, each corresponding to one summary file for each geographic region. All files received an alphanumeric code, to ensure anonymity. For data analysis, an inductive approach was chosen following the thematic content analysis as described by Braun and Clarke (2006). Epistemologically, the research is rooted within a constructivist approach.

Braun and Clarke describe six phases of conducting thematic analysis.

1. Becoming familiar with the data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report

If CAQDAS is used for data analysis, it is necessary to add an extra phase. After the initial coding phase, a structured code system needs to be developed so that the data can be queried using the software.

Even though the phases are listed in sequential order, as Ely et al. (1997) pointed out: analysis is not a linear process, where one simply moves from one phase to the next. Instead, it is a recursive process, where the researcher moves back and forth as needed.

## Implementation of an Inductive TCA with *ATLAS.ti*

*ATLAS.ti* was developed as part of the *ATLAS* project (1989-1992) at the Technical University of Berlin, Germany. The acronym *ATLAS.ti* stands for “Archiv für Technik, Lebenswelt und Alltagssprache” (Archive for Technology, the Life World and Everyday Language). The extension “ti” stands for “text interpretation.”. In addition to the more academic minded project name, it was also the Greek God *Atlas* that inspired the software name. According to Greek mythology, Atlas tried to conduct a raid to destroy Zeus. As he was unsuccessful, he received a punishment from Zeus for having confronted him, which was to carry the world on his shoulders. This myth stands for the weight of daily difficulties and is related to excessive duties, obligations, and accepted tasks (Rand 2010). This myth typifies very well the role of the

software in qualitative data analysis, to store and manage all information collected for a research project at one place. This means that the researcher will no longer have difficulties with manual duties of cutting out pieces of narrative, forming a collage of papers and posters, or developing spreadsheets and schemas to systematize qualitative data. ATLAS.ti offers features to centralize all the necessary information for organizing one's research and has mechanisms to enable data analysis to be performed in the software itself, mediated by the researcher, who continues to play the leading role in the analysis process being the critical thinker (Flick 2009; Frieze 2014).

Even if hermeneutic, phenomenology and grounded theory have inspired the development of ATLAS.ti, the use of the software is not limited to these approaches. Since 1992, when the research project ended, the software was developed further and today it is a commercial product used by many analysts around the world in academic and non-academic settings. Traces of its origin can at times be found in the names of some entities or menu options, like for instance open coding. Open coding in ATLAS.ti, however, means to apply a new code to a selected data segment and it is unrelated to the open coding process in Grounded Theory as described by Strauss and Corbin (see Frieze 2016). When using CAQDAS, what is important to consider is how a given methodological task can be carried out in the software. The researcher needs to translate each step in the analysis process to the corresponding feature in the software (Woolf and Silver, 2017). Below it is shown how the phases of thematic content analysis as described by Braun and Clarke can be translated for use with ATLAS.ti. Similarly, this can be done for other CAQDAS.

### *Phase 1: Becoming familiar with the data*

Phase 1 already starts during data collection and continues when the researcher transcribes the data. A repeated reading is recommended to fully immerse oneself in the data, especially if the researcher does not transcribe the data him- or herself. It is through this process of in-depth reading that ideas for patterns and meanings progressively emerge. Accordingly, the primary investigator will read all transcripts and observational notes carefully to familiarize him- or herself with the data.

### *Phases 2 and 3: Generating initial codes and building a coding frame*

After obtaining an overall understanding of the data, the researcher created an ATLAS.ti project and added all documents. ATLAS.ti automatically assigns a number to each document, based on the order in which they are added to the project. To

facilitate the organization and later analysis of the documents, document groups were created based on the five geographic regions and the characteristics of the participants: gender, age, type of profession, education level, professional experience, experience in the FHS, working hours, and type of contract. Each group held the corresponding interview files and the observational notes. Figure 1 shows the documents with their alphanumeric code and some of the document groups.

Document Groups	Id	Name	Groups
*age 30 to 39 (31)	D 70	PSDE1.doc	[age 30 to 34] [education: master's degree] [gender: female] [loc: Sudeste] [prof
*age 40 to 49 (12)	D 71	TeSDE1.doc	[age 45-49] [age 50-54] [education: high school technical training] [gender: fem
*age 50 - 59 (12)	D 72	TeSDE2.doc	[age 20 to 29] [education: high school technical training] [gender: female] [loc: !
*age 50 and older (17)	D 73	TeSDE3.doc	[age 35 to 39] [education: high school technical training] [gender: female] [loc: !
age 20 to 29 (11)	D 74	TeSDE4.doc	[age 55 to 59] [education: high school technical training] [gender: female] [loc: !
age 30 to 34 (16)	D 75	TsbSDE1.doc	[age 30 to 34] [education: high school technical training] [gender: female] [loc: !
age 35 to 39 (15)	D 76	OBS Centro-oeste...	[loc: Centro-oeste] [observational notes]
age 40 to 44 (5)	D 77	OBS Norte.doc	[loc: Norte] [observational notes]
age 45-49 (7)	D 78	OBS Sul	[Loc: Sul] [observational notes]
age 50-54 (7)	D 79	OBS Nordeste.doc	[loc: Nordeste] [observational notes]
age 55 to 59 (5)	D 80	OBS Sudeste.doc	[loc: Sudeste] [observational notes]
age 60 and higher (5)	D 81	DSDE1_62	[age 35 to 39] [education: specialization / residency] [gender: female] [loc: Nort
education: graduate (11)			
education: high school technical training (25)			
education: master's degree (4)			
education: specialization / residency (36)			
gender: female (64)			
gender: male (12)			
loc: Centro-oeste (20)			
loc: Nordeste (21)			
loc: Norte (12)			
loc: Sudeste (16)			

Preview:	Comment:
<p>OBSERVAÇÃO REGIÃO NORTE</p> <p>Data: entre os dias 13, 15, 21 de novembro, 12, 21, 28 de dezembro de 2012, 09, 16, 23 e 30 de janeiro de 2013.                      Horário: cada dia foi realizado 3,5 horas de observação no período matutino ou vespertino e tem um tempo total de 35 horas.                      Locais: ESF Parque Amazônia I e ESF Canal do Galo I.</p>	

Figure 1: List of documents with meta information

The aim of the initial coding process was to label the topics mentioned by the respondents, or those written down in the observational notes to describe what is in the data. Figure 2 shows how a coded document looks in ATLAS.ti.

The screenshot shows the ATLAS.ti interface. On the left, the 'Search Codes' navigator displays a list of initial codes with their respective counts and densities. A red box highlights the list, with the text 'list of initial codes' written inside. The main window shows a document titled 'D4: ECE1.rtf' with text in Portuguese. A red callout bubble labeled 'Coded data' points to a section of the document. On the right side, there are several search filters and a 'Coded data' section with a list of codes applied to the text.

Figure 2: : A code document with the list of initial codes in the navigator

The process of initial coding resulted in a list of 140 codes as shown in Figure 3. The number in the column “Grounded” shows how frequently a code was applied. There are no linkages yet between codes, as it would have been too early to establish relationships between codes at this stage. This is indicated by the zeros in the density column in Figure 3.

	Name	▲	Grounded	Density
<input type="radio"/>	◇ acidente de percurso		2	0
<input type="radio"/>	◇ acidente material biológico		5	0
<input type="radio"/>	◇ acolhimento		9	0
<input type="radio"/>	◇ afinidade com trabalho		46	0
<input type="radio"/>	◇ alcance de metas		3	0
<input type="radio"/>	◇ alergia		2	0
<input type="radio"/>	◇ arquivista		1	0
<input type="radio"/>	◇ assistência ao usuário~		18	0
<input type="radio"/>	◇ assistência médica curativista~		16	0
<input type="radio"/>	◇ assistencialismo na ESF		1	0
<input type="radio"/>	◇ atendimento as populações vulneráveis		7	0
<input type="radio"/>	◇ atendimento especializado		21	0
<input type="radio"/>	◇ atendimento especializado -		3	0
<input type="radio"/>	◇ atendimento especializado +		4	0
<input type="radio"/>	◇ autonomia profissional		11	0
<input type="radio"/>	◇ baixa qualidade da assistência		3	0
<input type="radio"/>	◇ burnout		1	0
<input type="radio"/>	◇ burocracia~		37	0
<input type="radio"/>	◇ carência de exames		3	0
<input type="radio"/>	◇ carga psíquica		18	0
<input type="radio"/>	◇ comprometimento da gestão		8	0
<input type="radio"/>	◇ comprometimento do usuário		7	0
<input type="radio"/>	◇ comprometimento profissional		11	0
<input type="radio"/>	◇ condições de vida da população~		8	0
<input type="radio"/>	◇ convívio/relação com os profissionais		34	0
<input type="radio"/>	◇ cumprimento de horário		7	0
<input type="radio"/>	◇ déficit salarial		15	0

Figure 3: Partial list of initial codes in ATLAS.ti Code Manager

The next step was to validate coded segments, to find meaningful headers to sort and organize the codes with the aim of building the final code structure. Helpful at this stage was the visibility of code frequency in the Code Manager (see Figure 3), the ease of data retrieval to check coded data segments, the ability to rename, merge, split and group codes. Candidates for splitting are those codes with high frequency like *afinidade com trabalho* (46), *burocracia* (37), or *convívio* (34).

With codes having low frequencies of 1, 2 or 3, like *arquivista*, *acidente de percurso*, or *alergia*, it should be considered whether or not they can be merged with other codes. Often the code label is too close to the data and only describes one instance. If this instance is like other statements, these should be merged into a code with a more abstract label. Figure 4 illustrates how data segments can be reviewed by code and it shows the merging and splitting options.

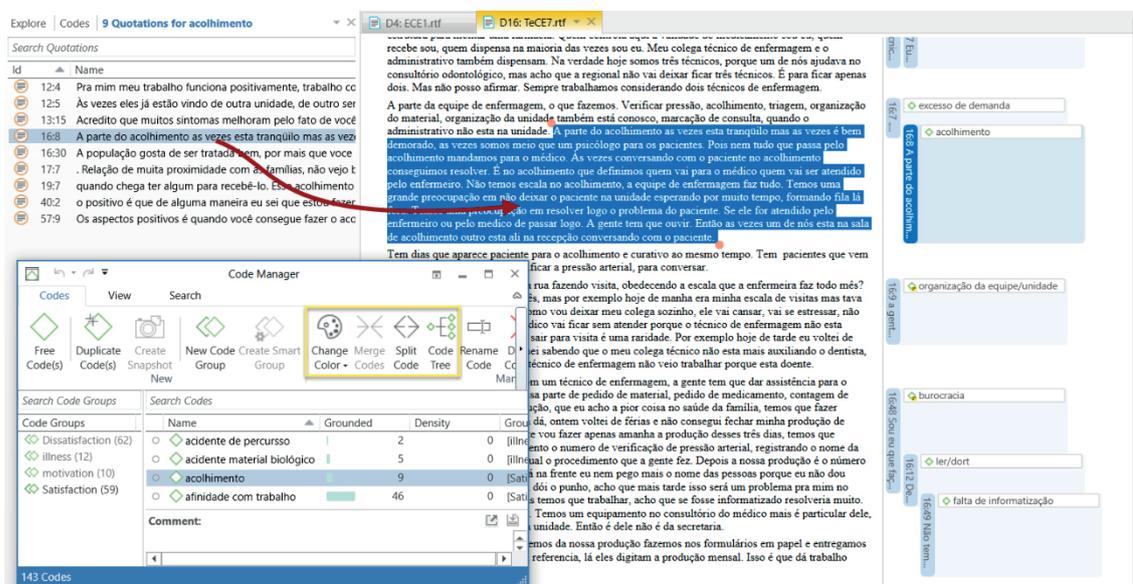


Figure 4: Data retrieval in context, merging and splitting tools

A code list consisting of a couple hundred codes with very low frequencies is neither going to be helpful in finding patterns in the data, nor will it allow to query the data in a meaningful way using software tools. This does not mean that all low frequency codes need to be merged. At times, something important is only mentioned one or two times and the researcher does not want to lose this. On the opposite end of the scale, if the analyst is lumping too many data segments into one code and only ends up with 10 codes for the entire data set, the detail is missing and nothing much is gained if there are 200 or so data segments in only one high-level code. This code will

then need to be split so that the various aspects and nuances of an issue are reflected. Most likely, such a code will not only hold sub codes, but also a number of higher order subjects that each can be split into further subcodes (Guest et al. 2012; Frieze 2014).

Figure 5 shows a part of the structured code system of the case study. The capital letter codes like APPROACH, COMMITMENT or ECONOMICS, present category labels that mostly no longer hold coding. The idea is that the category label serves as title, and all data segments are distributed into the subcodes of a category. There is also a code group for each category. The purpose of code groups is to help in the process of sorting and ordering, and to serve as filters throughout the continuing data analysis.

Code Groups	Name	Grounded
◇ +illness (6)	● ◇ APPROACH	0
◇ approach (6)	● ◇ approach: care network	5
◇ Commitment (4)	● ◇ approach: emphasis on patient quality of life~	12
◇ economics (7)	● ◇ approach: ESF better than ABT	7
◇ health work management (5)	● ◇ approach: home visits	4
◇ Identification (9)	● ◇ approach: prevention	18
◇ Lack of resources (5)	● ◇ approach: specialized care	4
◇ Organization (14)	● ◇ approach: the nurses who work in the ESF	4
◇ overwork (4)	● ◇ approach: to involve family / community	20
◇ Rel patient family health system (5)	● ◇ COMMITMENT	0
◇ related to patients (12)	● ◇ commitment: government incentives in the ESF	4
◇ relation staff & patient (8)	● ◇ commitment: management	8
◇ resources (3)	● ◇ commitment: professional~	14
◇ work related (18)	● ◇ ECONOMICS~	0
	● ◇ economics (ds): salary	66
	● ◇ economics (ds): wage differential~	57
	● ◇ economics: availability of jobs	7
	<b>Comment:</b> Edited 11.08.2017 21:27 by Susanne	
	<b>Labor and financial aspects</b>	

Figure 5: Structured code system with code groups

The underlying research questions – looking for processes generating satisfaction and dissatisfaction in the life of professionals working in the Brazilian Family Health Strategy (FHS) – offered a general direction. Codes holding data segments, were respondents expressed dissatisfaction were labeled with (ds). In addition, red, orange, and pink code colors were used for dissatisfactory aspects; blue, green and purple colors for satisfactory aspects.

*Pitfalls in Building a Structured Coding system*

A common way to build a code structure is to sort and order codes into a hierarchical structure, i.e. into higher- and lower order codes. This should not be mistaken with the process of finding themes. It also serves the purpose of organizing and managing data, and enabling the retrieval of data segments according to specific queries. A higher order category may reflect a theme, but this is not necessarily the case. A theme may also consist of multiple categories or of sub codes from multiple categories.

Another issue researchers need to be aware of, is that the categories are not yet at the right level and the codes need to be grouped differently. Below, an example from the case study is shown. In the first framework, *capacity development* was sorted under six distinct categories as subcodes. Later, it was decided that *capacity development* was an important topic in its own right and it became a category with several sub codes:

**Table 1: Category development in building a coding frame**

First framework	Later development
<b>assess (-):</b> capacity development	<b>Capacity development:</b> HR
<b>assess (+):</b> capacity development	<b>Capacity development:</b> institutional level
<b>enabling aid:</b> capacity development	<b>Capacity development:</b> individual level
<b>recommendation:</b> improve capacity development	<b>Capacity development:</b> enabling environment
<b>reasons:</b> resource and capacity constraints	<b>Capacity development:</b> room for improvement
<b>strategy:</b> priority capacity building	<b>Capacity development:</b> training

While developing a code system and eventually themes, the researcher will constantly move back and forth between reading the data, re-reading coded segments, arranging codes, renaming, and re-ordering codes and recoding data segments. The more data is coded, the more stable the code system will become. After having developed a first code structure, the researcher can continue to code more data. It will be necessary to stop coding and review the code list a few more times until the coding frame is stable. For instance, when realizing that a code gets “too big”, meaning the code has been applied to too many instances, the codes will need to be reviewed and, in most cases, can be split into subcodes.

If the list of subcodes within a category gets too long, this is another indicator that something is wrong. Often, this means that the category is too broad and covers

several different topics. The researcher may have developed a category called **EMOTIONS** and gathered thirty subcodes within this category. When reviewing this category, it becomes clear that a number of codes define certain emotional states, others are consequences of emotional states, and others are about contexts leading to the expression of different emotional states. Thus, this category can be split into four categories with their respective subcodes. For further information on how to build a coding frame see for example Frieze (2019, 2014), Guest et al. (2012), or Richards and Richards (1995).

After the researcher develops a first code structure, it is important that all codes are defined. When using a CAQDAS, researchers often neglect this step as it is so easy to just apply existing code labels. Writing a code definition will clarify what exactly is meant by a given code and how to apply it. It will also help to applying the codes consistently over time.

#### *Phase 4: Searching for themes*

After having developed the coding frame, the principal investigator had a good overview of the data as refining the codes required to read and re-read the data many times. The next step was to group codes in a meaningful pattern in relation to the research question. It is like developing a story line, where each theme makes up a part of the story.

In analyzing the data of the case study, 14 code groups were created and further summarized into five topic areas serving as first ideas for themes (see 2). As part of the process, the codes were translated into English to allow data exchange with international project partners.

Figure 6 shows how the codes around work related issues were explored further in the process of theme development. For this, the *ATLAS.ti* network function was used. Codes that either led to work dissatisfaction or satisfaction were pulled into a network and related to each other. This is not an automated process. The software does not create links, nor does it name the links. The software only gives a space for the researcher to think conceptually. This happens in arranging the nodes in the networks, thinking about meaningful links and naming those links. The network below, for instance, shows that the factors leading to satisfaction / dissatisfaction were either extrinsic to the person like demand, staff, job security, or health hazards; or intrinsic like identification with the profession, recognition, or relationship with colleagues. For most factors, positive and negative examples were mentioned by the respondents.

**Table 2: : List of code groups and first ideas for themes**

Code group	Ideas for themes
<ul style="list-style-type: none"> <li>• Illness</li> </ul>	illness
<ul style="list-style-type: none"> <li>• Approach (of the FHS)</li> <li>• Commitment (to the FHS)</li> <li>• Health work management</li> <li>• Organization</li> </ul>	organizational issues
<ul style="list-style-type: none"> <li>• Identification with work</li> <li>• Economics</li> <li>• Overwork</li> <li>• Other work-related issues</li> </ul>	work related
<ul style="list-style-type: none"> <li>• Related to patients</li> <li>• Relation staff &amp; patient</li> <li>• Relation patient &amp; family health system</li> </ul>	patient related
<ul style="list-style-type: none"> <li>• Availability of resources</li> <li>• Lack of resources</li> </ul>	resources

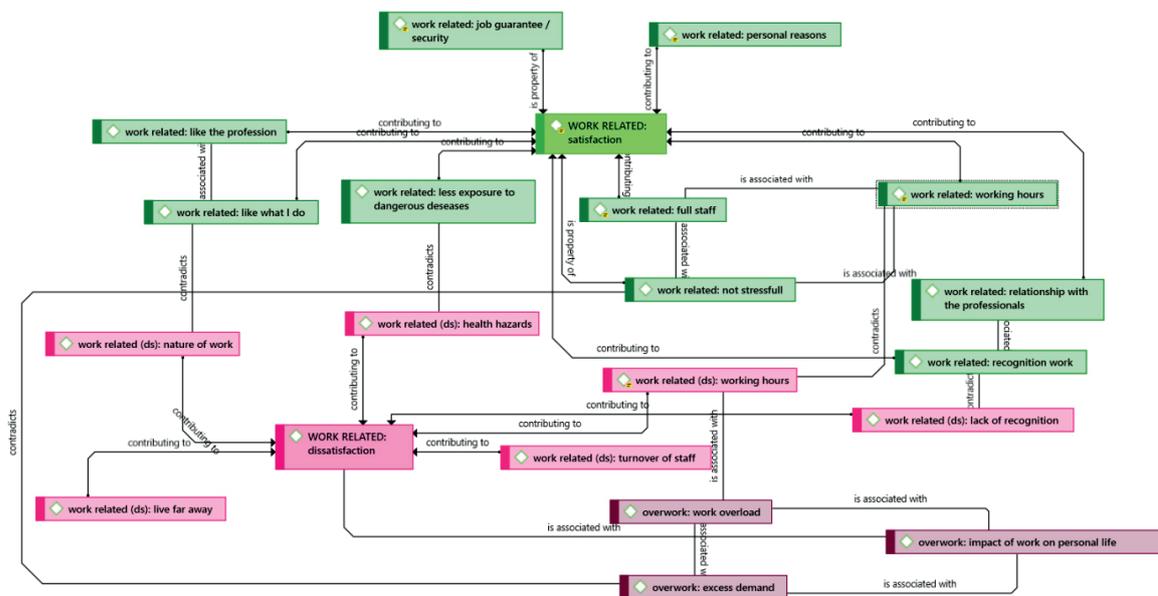


Figure 6: Developing a theme through visualizing

### *Phase 5: Reviewing themes*

In phase 5, the fit of each theme with individual data segments, and the data set as a whole needs to be checked. The researcher begins to describe each individual theme and relate themes to each other. While doing so, a constant question needs to be whether the themes and the codes related to it tell a compelling story, or whether codes need to be moved between themes, whether themes need to be collapsed, or expanded upon. Below this process is demonstrated by exploring the work-related theme further in comparing the data within each code by region and profession. This was done by generating tables in a first step to look at the quantitative distribution as show in Table 3. In a second step, the data behind the numbers was reviewed. This allowed the researchers to see that in the South, health professionals complained about excessive demands and long working hours more than others. Some felt recognized at work, others did not. Querying the data by profession, this applied about

**Table 3: Quantiative exploration of the data**

	Central-East	North-East	North	South-East	South	total
overwork: work overload	22%	17%	14%	32%	15%	100%
overwork: excess demand	25%	17%	9%	16%	32%	100%
overwork: impact of work on personal life	12%	41%	8%	39%	0%	100%
work related (ds): working hours	4%	2%	24%	12%	58%	100%
work related (ds): lack of recognition	1%	27%	9%	20%	43%	100%
work related: relationship with the	40%	8%	28%	24%	0%	100%
work related: recognition work	3%	9%	8%	16%	64%	100%
work related: like the profession	4%	49%	14%	32%	0%	100%
work related: job guarantee / security	10%	0%	0%	11%	79%	100%

equally to doctors and nurses from the South. Despite the negative aspects, job security was mentioned proportionally much more in the South as compared to all other locations and may in part off-set the negative factors. Looking at the entire data set, long working hours was especially an issue for nursing technicians. Being recognized for their work was most important for nurses, followed by nursing technicians and then dentists and doctors. A lack of recognition on the other hand was an issue also for doctors, contributing to dissatisfaction.

In exploring recognition further and looking for code co-occurrences in the data, the following picture emerged: overwork, salary, bad management, lack of training, lack of resources and also the patients themselves contributed to feelings that one's work is not recognized. Comparing this with the factors contributing to recognition, it appeared that the patient played an important role, plus identification with the job and the team, professional autonomy, as well as commitment by management and the professionals themselves.

Code co-occurrences would be difficult to examine manually. The software offers three ways of doing it. Researchers can generate a table that shows the number of hits of selected co-occurring codes, read the data of all co-occurring segments, or visualize co-occurring codes as shown below.

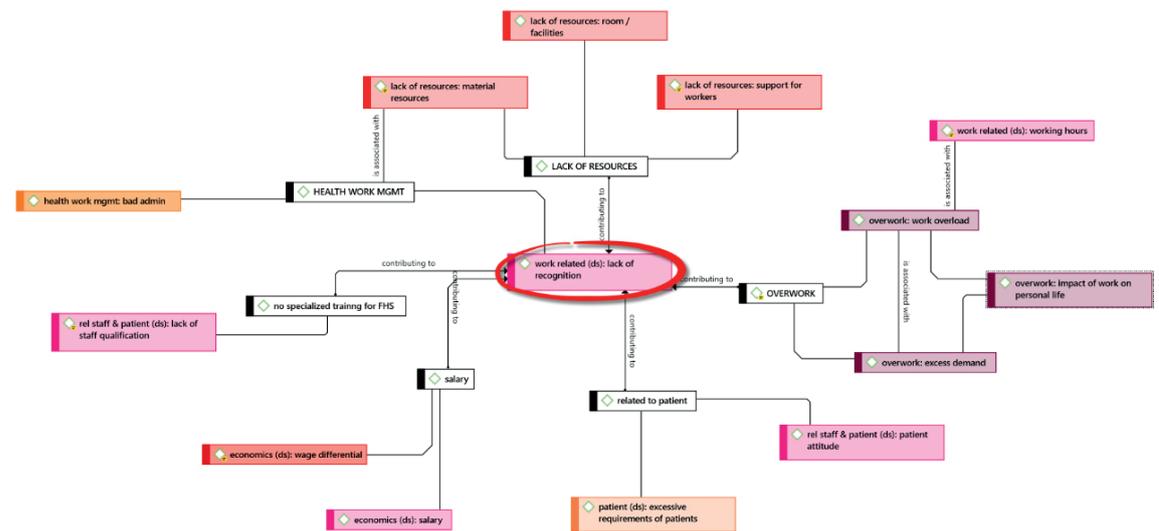


Figure 7: Exploring code cocurrence for lack of recognition

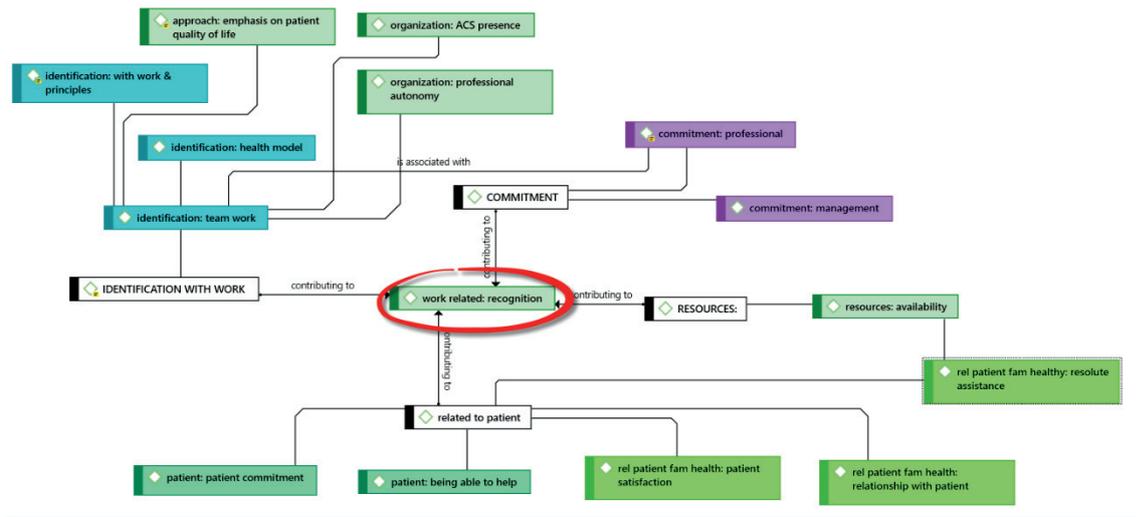


Figure 8: Exploring code co-occurrence for recognition

The data behind the nodes in a network can always be retrieved and reviewed (Figure 11) or exported as a report.

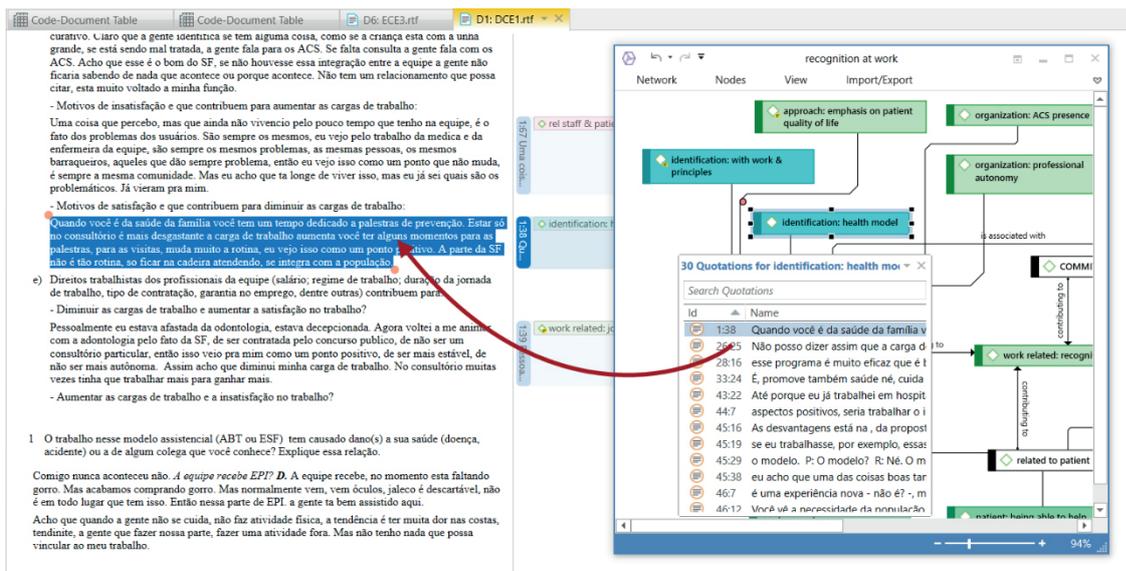


Figure 9: Reviewing data during theme exploration

For checking the data related to specific questions, the query tool can be used. The query shown in Figure 10 retrieves all quotations where both lack of resources and overwork were mentioned by respondents from the northeast. This allowed the researcher to check the fit of the theme within a subset of the data.

At this stage, more extensive memo writing began leading to phase 6, where the themes were named.

Search Document Groups

Document Groups

- education: high school techni
- education: master's degree
- education: specialization / re
- gender: female (64)
- gender: male (12)
- loc: Centro-oeste (20)
- loc: Nordeste (21)
- loc: Norte (12)
- loc: Sudeste (16)
- Loc: Sul (12)

Documents

Search Documents

Documents

- D1: DCE1.rtf (34)
- D2: DCE2.rtf (39)
- D3: DCE3.rtf (18)
- D4: ECE1.rtf (28)
- D5: ECE2.rtf (32)
- D6: ECE3.rtf (29)
- D7: MCE1.rtf (30)
- D8: MCE2.rtf (34)
- D9: MCE3.rtf (30)
- D10: TeCE1.rtf (17)

Term: DS: overwork COOC DS: Lack of resources

Scope

loc: Nordeste

Query

DS: overwork DS: Lack of resources

Search Quotations

Id	Name	Document
41:8	São 30 horas.	
41:10	Porque a... eu era da u	AeNDE1.do
41:11	ndo de colaborar, não	AeNDE2.do
41:12	O serviço em si que eu	DNDE1.doc
41:13	E se questiona muito...	ENDE1.doc
41:14	E só. E... pronto, tem a	ENDE1.doc
41:15	porque também eles c	ENDE1.doc
~ 41:...	O estresse aqui... (ach	ENDE4.doc
41:17	Eu procuro não levar p	TsbNDE2.doc
41:18	Aí agora está bom, toc	
41:19	Aí o pessoal, a popula	
41:20	Ficava pensando no q	
41:21	Eu vim trabalhar estim	

Search Quotations

Id	Name	Document
41:17	Eu procuro não levar para casa, mas acho que tem, né, porque os meus f	AeNDE1.do
42:10	Mas se tivesse esparadrapo, estava cheio. Porque estava em greve os ou	AeNDE2.do
44:25	esse somatório de coisas negativas estruturais e as demandas sempre au	DNDE1.doc
48:17	Por exemplo, há uma carga muito grande para (a gente) ter referência.	ENDE1.doc
48:22	. Eu trabalhei... quando fui entrar na Estratégia, eu entrei, eram quatr	ENDE1.doc
48:33	o pessoal que eu convivo eu tenho uma sobrecarga muito grande, porque	ENDE1.doc
51:18	Aí você fica muitas vezes fazendo as coisas em casa, você fica levando	ENDE4.doc
60:19	A equipe não está composta. No momento só tem duas técnicas, está falt	TsbNDE2.doc

Term Quotations 8 Scope Quotations 510

Scope Editing ..

Figure 10: Cooccurrence query in relation to one document group (location)

### Phase 6: Defining and naming themes

When naming themes, researchers need to ask themselves what each theme is about, what are the key elements and what is the core message. This allows the construction of “a concise, punchy, and informative name for each theme” (Brown and Clarke 2013: 125). In the case study, the following themes were named: Work / Patients / Resources / Management & Commitment / Organization.

The theme *Work* included economic aspects like salaries and wage differentials, identification with the job and principles, working hours from satisfactory to over-load, relationships to colleagues as well as receiving recognition for one’s work. In ATLAS.ti, five categories and a total of 38 codes present this theme.

The theme *Patients* holds issues that directly lead to satisfaction or dissatisfaction with the job, either directly linked to the patient – like lack of patient compliance or patients being committed to the treatment – or linked to the staff-patient relation, or the patient relationship to the family health system. In ATLAS.ti, this theme encompasses 4 categories and 25 codes.

The theme *Resources* has two aspects – availability of resources or a lack therefore (2 categories, 8 codes). The theme *Management & Commitment* is also a combination of a positive and a negative side: bad health work management on the one hand, and commitment to the FHS on the other (2 categories, 9 codes).

The theme *Organization*, like the Patients theme, holds organizational issues directly linked to satisfaction and dissatisfaction like bureaucracy, time management or well-organized team work, and all codes related to the FHS approach itself. In *ATLAS.ti*, this theme encompasses 3 categories and 23 codes (Figure 11).

Show codes in group *T5: organization		
Search Codes		
Name	▲	Grounded
●  APPROACH~		0
●  approach: care network~		5
●  approach: emphasis on patient quality of life~	■	12
●  approach: ESF better than ABT~		7
●  approach: home visits~		4
●  approach: prevention~	■	18
●  approach: specialized care~		4
●  approach: the nurses who work in the FHS~		4
●  approach: to involve family / community~	■	20
●  ORGANIZATION (DS)~		0
●  organization (ds): bureaucracy~	■	37
●  organization (ds): deviation of actual prof. function~		4
●  organization (ds): difficulties in the team~	■	17
●  organization (ds): failures in care network~	■	51
●  organization (ds): flaws in patient reception~	■	11
●  organization (ds): time management~		7
●  ORGANIZATION:~		0
●  organization: ACS presence~	■	19
●  organization: organisation of demand~		4
●  organization: patient reception~		8
●  organization: professional autonomy~	■	11
●  organization: scheduled demand~		9
●  organization: team work~	■	39

Figure 11: List of codes for theme 5: Organization

In the case study, memos were written for each theme and linked to data segments that illustrate the main aspects of the theme. When it comes to report writing, these memos can be exported including the linked data segments and references.

### *Phase 7: Producing the report*

If the above described process is followed, and the researchers do not limit the analysis to coding and extracting themes based on code labels, most of the writing for the report has already been done at this stage. The last step is to weave the analytic narrative together, adding extracts from the data in order to be able to tell the reader a coherent and persuasive story.

In writing the report all ATLAS.ti memos can be exported and inserted into a Word document. If memos have been linked to quotations, these can be included as well and used as excerpts in the final report. Further, networks like those included above can also be exported as graphic files and inserted into the report. All tables can be exported to Excel. If you want to report relative frequencies, e.g. because of unequal group size, you need to calculate those in Excel (see Table 2). If you want to insert charts, you also prepare those in Excel based on the data exported by ATLAS.ti.

As this paper is about the process of analysis and not the content of the analysis per se, the interested reader is referred to the thesis by Soratto (2015), to read up on the explication of each theme in relation to the main research question on the processes of generating satisfaction and dissatisfaction in professionals working in the Brazilian Family Health Strategy (FHS).

## Summary

In Table 4, the application of the various TCA phases within ATLAS.ti are synthesized.

**Table 4: Applying the various stages of TCA in ATLAS.ti 8**

Phases of thematic content analysis	Steps in ATLAS.ti
Phase 1: Pre-analysis, becoming familiar with the data	<ul style="list-style-type: none"> <li>• Create a project</li> <li>• Add documents.</li> <li>• Group documents.</li> <li>• Write first memos on the overall project aim including research questions</li> <li>• Explore the data using word clouds and word lists</li> <li>• Read the documents</li> </ul>

Phase 2: Material exploration, generating initial codes	<ul style="list-style-type: none"> <li>• Generate or import a list of codes</li> <li>• Read the data, select data segments and code them – either applying existing codes or creating new codes</li> <li>• Write code comments to explain what the intention is, how to use the code and what it means</li> </ul> <p>Additional features for latent level analysis:</p> <ul style="list-style-type: none"> <li>• Write quotation comments</li> <li>• Name quotations</li> <li>• Link quotations to each other</li> </ul>
Phase 3: Building a structured code system	<ul style="list-style-type: none"> <li>• Work with the list of codes in the Code Manager</li> <li>• Group codes / use them as filters</li> <li>• Split codes</li> <li>• Retrieve data segments by code, read them</li> <li>• Rename codes</li> <li>• Replace codes</li> <li>• Build categories and sub codes</li> <li>• Write code definitions</li> </ul>
Phase 4: Searching for themes	<ul style="list-style-type: none"> <li>• Explore categories and their potential fit with a theme</li> <li>• Begin to write a memo for each theme</li> <li>• Generate networks to explore how the various codes that make up a theme relate to each other</li> <li>• Review the coded data</li> </ul>
Phase 5: Reviewing themes	<ul style="list-style-type: none"> <li>• Explore the themes further to see whether relations hold across the entire data set or only apply within certain groups. The tools in <i>ATLAS.ti</i> are: Code-Document table, Code Cooccurrence Table / Explorer / operator, Query Tool for queries based on Boolean and proximity operators.</li> <li>• Refine themes accordingly.</li> <li>• Write memos</li> <li>• Relate themes to each other in networks</li> </ul>
Phase 6: Defining and naming themes	<ul style="list-style-type: none"> <li>• Write memos</li> <li>• Link quotations to memos</li> <li>• As needed, use any of the above listed query options</li> <li>• Review networks</li> </ul>

Phase 7: Producing the report	<ul style="list-style-type: none"> <li>• Export memos with quotations and construct your result section in Word around those memos</li> <li>• Export networks and insert into the report where suitable</li> <li>• Export tables and insert into the report where suitable</li> <li>• Prepare a few screen shoots, e.g. for the method section to show how a coded document looks like in <i>ATLAS.ti</i></li> <li>• Export a code book (code list + comments) to insert into the appendix</li> </ul>
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## Reflections

The procedure on how to conduct a thematic content analysis using *ATLAS.ti* as presented in this paper, is based on the experience of one of the authors, with more than twenty years of working experience with *CAQDAS*. This is explained at greater length in Friese (2014, 2019) and is echoed by other authors like Richards and Morse (2013), Guest et al. (2012), Bazeley (2013), or Woolf and Silver (2017). The guidelines on software procedures are based on practical considerations rather than on epistemological bias through quantification of qualitative data. Advising researchers to look at high and low frequency codes are used as heuristic devices to alert the researcher to the types of data segments that need to be revisited and reviewed. If done correctly in the methodological sense, tasks like splitting a code or merging will not be done blindly. Researchers have to read the data to make an informed decision. Rather than questioning the use of *CAQDAS* in terms of restrictions, as some people still do, looking for possible hidden theoretical assumptions, I would rather ask what the analysis of the 72 interviews and field notes would look like if done manually? Would the researcher be able to retrieve all data segments relevant for a topic, review them, develop ideas further up to the point where themes can be recognized? Would the researcher be able to check the fit of each theme by querying the data manually by going through stacks of paper looking for data segments highlighted in red, green or blue? How much detail could be coded? It is nearly impossible to handle 140 codes manually, and this is not an uncommon number of codes when using *CAQDAS*. What matters is to look at the software as a tool and to apply its functions in such a way that they serve the chosen methodological approach. This is what this paper is all about – to give researchers an example of how to translate the phases of an inductive thematic content analysis into a software-based analysis, in this case using *ATLAS.ti*.

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