

**QUALITATIVE METHODS OF ANALYSIS: AN EXAMPLE OF ATLAS.TI™
SOFTWARE USAGE**

ANÁLISE QUALITATIVA: UM EXEMPLO DO USO DO SOFTWARE ATLAS.TI™

ANÁLISIS CUALITATIVO: UN EJEMPLO DE USO DEL SOFTWARE ATLAS.TI™

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Abstract

Purpose: Atlas.ti™ provides useful analytical resources in academic research, particularly for social science disciplines. This technical report presents a case study utilizing a CAQDAS package, as example of research, to show how to utilize Atlas.ti™ version 7. This will serve as a practical guide for qualitative researchers who are beginning to use CAQDAS Atlas.ti™.

Design/methodology/approach: Atlas.ti™ software is required to disclose an academic study data introduction, analysis and retrieval outcomes about how commitment, development and innovation contribute to resources mobilization and stimulate capacity of research, development and innovation (R&D&I) team in a traditional business.

Findings: Better outcomes have demonstrated Atlas.ti™ usage as a software that organize, retrieve, analyze data in a continuous and cyclical ways in procedures that require constantly comparison.

Practical implications: Atlas.ti™ components, such as co-occurrence code, query tool and network view are applied to support data analysis and make easier code validation and emerged categories to understand how to handle qualitative data to organize scientific qualitative approach.

Originality/value: Practical presentation of Atlas.ti™ and discussion about benefits of such technology adoption.

Keywords: Atlas.ti™, Qualitative methods, Qualitative analysis, software.

Resumo

Objetivo: Atlas.ti™ fornece recursos analíticos úteis na pesquisa acadêmica, particularmente para disciplinas de ciências sociais. Este relato técnico apresenta um estudo de caso utilizando um pacote de software CAQDAS, como exemplo de pesquisa, para mostrar como utilizar o Atlas.ti™ versão 7. Isso servirá como um guia prático para pesquisadores qualitativos que estão começando a usar o software CAQDAS Atlas.ti™.

Projeto / metodologia / abordagem: O software Atlas.ti™ é necessário para divulgar uma introdução, análise e resultados de recuperação dos dados de um estudo acadêmico sobre como o comprometimento, o desenvolvimento e a inovação contribuem para a mobilização de recursos e estimulam a capacidade da equipe de pesquisa, desenvolvimento e inovação (P&D&I) em um negócio tradicional.

Resultados: Os melhores resultados demonstraram o uso do Atlas.ti™ como um software que organiza, recupera e analisa dados de maneira contínua e cíclica em procedimentos que exigem comparações constantes.

Implicações práticas: os componentes do Atlas.ti™, como código de coocorrência, ferramenta de consulta e exibição de rede, foram aplicados para apoiar a análise de dados e facilitar a validação de código e categorias e entender como manusear dados qualitativos para organizar abordagens científicas qualitativas.

Originalidade / valor: Apresentação prática do Software Atlas.ti™ e discussão sobre os benefícios da adoção dessa tecnologia.

Palavras-chave: Atlas.ti™, Métofo qualitativo, Análise qualitativa, software.

Resumen

Propósito: Atlas.ti™ proporciona recursos analíticos útiles en la investigación académica, particularmente para las disciplinas de las ciencias sociales. Este informe técnico presenta un estudio de caso usando un paquete CAQDAS, como ejemplo de investigación, para mostrar cómo usar Atlas.ti™ versión 7. Esto servirá como una guía práctica para investigadores cualitativos que están comenzando a usar CAQDAS Atlas.ti™.

Diseño / metodología / enfoque: El software Atlas.ti™ es necesario para divulgar los resultados de la introducción, el análisis y la recuperación de datos de un estudio académico sobre cómo el compromiso, el desarrollo y la innovación contribuyen a la movilización de recursos y estimulan la capacidad del equipo de investigación, desarrollo e innovación (I + D + i) en un negocio tradicional.

Hallazgos: Mejores resultados han demostrado el uso de Atlas.ti™ como software que organiza, recupera y analiza datos de manera continua y cíclica en procedimientos que requieren una comparación constante.

Implicaciones prácticas: los componentes Atlas.ti™, como el código de co-ocurrencia, la herramienta de consulta y la vista de red, se aplican para respaldar el análisis de datos y facilitar la validación del código y las categorías emergentes para comprender cómo manejar datos cualitativos para organizar el enfoque científico cualitativo.

Originalidad / valor: Presentación práctica de Atlas.ti™ y discusión sobre los beneficios de la adopción de dicha tecnología.

Palabras clave: Atlas.ti™, métodos cualitativos, análisis cualitativo, software.

1. INTRODUCTION

A researcher, in a qualitative research, aims to understand phenomena studied (Minayo, 2011), following an interpretative and/or constructivist perspective where procedures are used to allow deep dive in researched social reality (Silva;Godoi;Bbandeira-de-Melo, 2010). Qualitative approach to study social sciences allows deeper understanding of phenomena (Azungah, 2018). Regardless a wide discussion about researching practices and rigor, the Computer-Assisted Qualitative Data Analysis Software (CAQDAS) still needs attention about its usage.

Qualitative data analysis software (CAQDAS) has been part of the research landscape for over 30 years. The current iterations of CAQDAS include features that can be used not only for data analysis, but also for conducting literature reviews (Lubke et al, 2017),

managing projects, collecting data, and visualizing and writing up findings (Bourque;bourdon, 2016). Scholars across disciplines, including sociology (Niedbalski; Slezak, 2016) and family therapy (Humble, 2012), have explored the use of CAQDAS for a variety of tasks, such as faculty evaluations, group work and to enact critical and deconstructive approaches to analysis (Bhattacharya, 2015).

Dealing with research opportunity requires relevant technological approach. Therefore, we highlight Atlas.ti™ as a methodological awareness and analytic adeptness crucial to successful independent use of CAQDAS, in general. If researchers come to software learning without any skills, they will not be able to identify the analytic strategies or tasks that they wish to translate into the tactics of the software.

Notwithstanding, when it comes to research that takes a qualitative approach, some researchers, editors, journals still have restrictions on software applications for data collection and analysis. Therefore, the question remains about software usage into qualitative data analysis which provides an opportunity to discuss the advantages and contributions of Atlas.ti™.

Despite of researchers' resistance, much progress has been made in qualitative analysis with technology usage (Azungah, 2018). Woods et al (2015a), describe how 763 empirical studies, between 1994 and 2013, in Scopus platform, using CAQDAS for data analysis (Woods et al., 2018) There are studies of teaching CAQDAS in a systematic way, some studies have investigated the teaching and learning of CAQDAS in terms of course design, curricular content, and learning activities and have identified several points of best practice as well as areas for further research. Here we intend only to present a technical report about how to use Atlas.ti™ software and support those are in process of learning.

An overview of computer-assisted qualitative data analysis (CAQDAS) literature

CAQDAS-based qualitative research has been used widely across different fields, from arts and humanities, business, to nursing and medicine, and has been highly popular in the health sciences (Woods et al., 2015A, 2015B). Scholars have published numerous articles that discuss the advantages and disadvantages of various CAQDAS software that supports qualitative research such as NVivo, Atlas.ti™ and MaxQDA (Woods et al., 2015A, 2015B), as well as the methodological foundations behind CAQDAS-based qualitative research (Leech; Onwuegbuzie, 2011; Sinkovics; Alfoldi, 2012).

A review of the CAQDAS literature (Chandra; Shang, 2017) reveals a consensus among researchers who view CAQDAS positively as a resource to enhance: the transparency, validity, rigor and trustworthiness of qualitative research projects (Sinkovics; Alfoldi, 2012; Woods et al, 2015a); the efficiency in coding and in code comparisons; the efficient handling and management of relatively large data sets; the management of the “messiness” of data collection during fieldwork (Sinkovics; Alfoldi, 2012, p. 817).

Qualitative scholars are also becoming aware of the pitfalls (potential and actual) of CAQDAS including “reflexive blindness” (i.e. lack of awareness of the software’s influence on how researchers conduct research (Woods et al., 2015b), rigid and inflexible analysis, using a technique/tool simply because the software allows it, incorrect code label naming, contextually distancing the researcher from his/her the data (Sotiriadou; Brouwers; Le, 2014) and “coding trap” among others (Chandra; Shang, 2017).

These pitfalls provide opportunities to improve the use of CAQDAS in qualitative research. Chandra and Shang (2017) argue that CAQDAS is like a sword (Woods et al., 2015b): its usefulness depends on the user’s goals, how it is used and, like in the quantitative fields, what its community of users believe about what it stands for and how it should be used (or not) (It is also subject to the legitimization process as qualitative scholars writing in leading scholarly journals have legitimized CAQDAS as a preferred research tool. (Chandra; Shang, 2017).

With rapid advancement in computing technologies, there are new rivers to further advance in qualitative research methodology by marrying it with CAQDAS-based tool that increases the rigor, transparency, validity, and replicability of qualitative research. In the past decade, we see the rapid growth of the open source (i.e. “free”) computing tools (e.g. from R, Perl to Python) in the industry and academia as highly promising resources that will support the growth of qualitative research in the future (Chandra; Shang, 2017).

Researchers experiences demonstrate that some scholars prefer yet to use “manual approach” (not using any technology or software to facilitate data storage, analysis, retrieval and visualization, but rather using colored pens, highlighters, stickers, different folders and containers to classify the data; (Coviello, 2014) in doing qualitative research. This practice has its own value and works well when the research data are small and research team members work in adjacent locations.

However, problems arise when the research data are large (e.g. involving hundreds of interviews or more, thousands of news articles as data) and researchers work collaboratively

across the regions and countries. In other situations, researchers may like to openly share the qualitative data and the processes of transforming them into the final product (i.e. a process model or theory) to better persuade journal editors and reviewers to demonstrate the rigor and comprehensiveness of how they carry out research – which can be done using online platforms. These are reasonable arguments for why CAQDAS is beneficial for qualitative research.

Atlas.ti™ functionalities and resources

A prototype of Atlas.ti™ was developed by Thomas Muhr at Technical University in Berlin in the context of project ATLAS (1989–1992). A first commercial version of Atlas.ti™ was released in 1993 to the market by company "Scientific Software Development," later Atlas.ti™ Scientific Software Development GmbH. The methodological roots of Atlas.ti™ lie in - but are not restricted to grounded theory, content analysis and knowledge elicitation. Atlas.ti™ is currently available for the Windows desktop version, Mac desktop version, Android mobile, iPad version, as well as the Cloud version (Muhr, 1991).

As shown in Table 1, Atlas.ti™ can be contrasted along their technical specifications, computing capabilities and methodological orientation. We highlight several key attributes (Chandra; Shang, 2017).

Atlas.ti™ capabilities, It is a software program via “point and click” in a graphical user interface and similar methodological abilities including the treatment of all loaded textual data (e.g. interview transcripts, news articles, company prospectuses) as a single entity for analysis or “one hermeneutic unit”, ability to record, store, index, sort and retrieve large data sets; flexible coding; audit trails so that other researchers or journal reviewers can check how data were analyzed; data attributes (e.g. source of data, year of data, demographic variables of interviewees) and visible codes.

The comprehension about Atlas.ti™ capabilities and resources becomes our analyze more valuable considering to main approach provided by authors and researchers in terms of lacking official teaching and learning environments (Paulus et al, 2018), resistances from researches in using software (Chandra; Shang, 2017), numbers of new researchers to drift available waves from tutorials or support from developers etc.

Notwithstanding, researchers and authors take time from technologies to pursue a detailing aspect about how to use their capabilities and resources.

Other aspects about Atlas.ti™ usage is related to charged fees. A knowledge dissemination should be something available for all researchers and authors without charges. Atlas.ti™ is charged by developers, however, it would be worth for researchers have free access without charging fees. It would be helpful for those learners interested and have conveyer of didactic skills in spread out this kind of knowledge among academia.

It also contributes to the value co-creation literature by concentrating analysis, in general, on CAQDAS integration as a methodological discipline for scholars; while research has already classified resource and capabilities types of CAQDAS , much of this takes a goal-orientated approach that support qualitative research analysis, however knowledge construction from experiences with CAQDAS could provide is not under analysis, yet.

Aspects of analysis	Atlas.ti™
<i>Technical Specifications</i>	
Year of first release	1993 (prototype in 1989)
License	Proprietary
Technical support	Paid version and technical support are available
OS supported	Win, OSX, iPad, Android
File compatibility	Audio, graphic, text, video
Languages	Allow import data in several foreign languages
<i>Capabilities</i>	
Programming language skills	No programming language skills needed, it is a point and click program
Statistical functions	Enable data attributes to be transform into tabulations or crosstabulations (matrix) for further statistical analysis in SPSS
Mode of use	Lack of simultaneous use of software by multiple users
Main CAQDAS functions	Coding, Aggregation, Query, Memo, Visualization
Code aggregation	Limited to no function for hierarchical structure of coding
Output sharing	Export to SPSS and XML
Boolean search	Allow for complex Boolean search
Methodological	
Treatment of all materials as one hermeneutic unit	Yes, all types of files
Large data set recording, storage, indexing, sorting	Yes
Cross-border collaboration	Yes, real-time team collaboration
Coding flexibility	Yes
Codes comparison	Yes
Exhaustive coding schemes	Yes
Researcher reflexivity needed	Yes
Closeness to data	Yes
Data attributes addition	Yes
Transparency, credibility of data analysis	Yes
Efficient, accurate retrieval	Yes
Visualization of codes	Yes

Table 1. Atlas.ti™ program technical description

Source: made by authors based on Chandra and Shang (2017)

After knowing a little about literature approach, we assume as a possibility to discuss in depth about Atlas.ti™ (version 7) which is a software that promote for researches to organize data collection (Sinkovics; Alfoldi, 2012, p. 817), to follow methodological foundation approach (Leech; Onwuegbuzie, 2011; Sinkovics; Alfoldi, 2012) and corpus analysis (FRIESE, 2012). Consequently, it increases researcher's capacity to show higher rigor to build arguments of analysis (Sinkovics; Alfoldi, W012; woods et al., 2015a)

Even some researchers (Silver; Woolf, 2015; Leitch et al, 2016) have been teaching Atlas.ti™ in courses and workshops for approximately 20 years mainly in the U.S. and UK, respectively, we believe that this article will contribute for an additional knowledge. As mentioned by Paulus et al (2018) a teaching method is founded on several key principles, including: (a) there is no correct way to use a software; (b) analytic strategies and software tactics must be understood as separate, though they are often confounded in the literature; (c) and these strategies and tactics are used to accomplish harnessing the software most effectively (Paulus et al, 2018).

Paulus et al (2018) also recognize that nearly three-quarters of the learners take the introductory qualitative methods course recommended as a pre-requisite before performing any CAQDAS, yet when asked which methodology would be guiding their analysis, responses varied from naming theories (cultural historic activity theory) to types of data (semi-structured interviews and participant observation) to analytic tasks (writing memos, coding) to 'basic qualitative methodology' and thematic analysis. Only half of learners can name their specific methodologies using software (e.g. constant comparative method, narrative analysis, case study, phenomenology) (Paulus et al, 2018).

Although, some advances are evident about using technological tools and we should stimulate more discussion in CAQDAS, for instance. We pursue to assist in rigor research proof as needed (Woods et al., 2015a; Olson et al., 2016), however for the sake of lacking access or experience, many mistakes are still made when CAQDAS is under usage.

Researchers should be aware about opportunities to employ data collection and analysis with technological techniques and methods. A research may aim to construct new assumptions to understand an observed reality, which justifies theory-building perspective adoption. (Kiernan; Hill, 2018). Therefore, under qualitative analysis approach a software can be used to capture data from several evidences' sources, as well as their management analysis that allows cyclically verify findings from data collected. One can use a theoretic perspective

search to understand a certain phenomenon, and in turn follows a theory-testing perspective (Eisenhardt; Graebner, 2007).

Software support to test hypotheses and assumptions raised into contemporary social complexity environment that show challenges for their phenomena. So, we aim to clarify Atlas.ti™ functionalities during a qualitative data analysis. Ang, Embi and Yunus (2016) deal with improvements in qualitative research presentations based on software like Atlas.ti™. It should be noted authors perform Atlas.ti™ as an example and no one distinction done (Ang; Embi and Yunus, 2016).

therefore, we illustrate a case study registration as didactic example, coding, analyzing, and retrieving the outcomes came from a research on how R&D team's commitment contributes to resources mobilization to foster innovation capacity in traditional businesses.

Atlas.ti™ inputs and outputs, as well as steps guided to organization, recovery, and data cross-referencing are shown. This paper measures Atlas.ti™ contribution not as a simple presentation and pursue discussions about how CAQDAS - Atlas.ti™ functionalities are executed to more researcher's usage opportunities. Thus, it is separated in (a) research example and its development and (b) how to use a CAQDAS - Atlas.ti™ in qualitative data analysis.

We believe that without this support, some researchers can lose enthusiasm, experience frustration, settle for a mechanistic or surface use of the program, or abandon software completely (Gilbert, Jackson, Di Gregorio, 2014; Silver; Rivers, 2016). Unfortunately, it is common for CAQDAS users to receive truly little support from their home institutions. Even when support is readily available, Leitch et al. (2016) report that learners can struggle to explain the problems they encounter and are unsure whether they are due to the software or their own actions (Leitch et al., 2016).

Many learners are reluctant to ask for help, feeling guilty for asking a trainer to repeat what had just been taught (Leitch et al., 2016). Thus, it is not uncommon for learners to resort to self-teaching after a training. Most CAQDAS companies have made 'self-teaching' easier – through online video tutorials, blog posts, and other instructional materials freely available online as already mentioned. However, self-teaching is likely not the most successful or efficient method of learning (Leitch et al., 2016), potentially resulting in incomplete or even incorrect understandings of how the software functions and could therefore jeopardize the integrity of the research work.

Learning to use CAQDAS effectively, as Atlas.ti™, requires a deep understanding of research design and methodology (Silver; Rivers, 2016). Without this, self-teaching is futile. For example, it is not difficult for novices to watch a video tutorial or read the software manual to learn how to create, modify or delete codes, memos, or networks. But without a clear understanding of what the codes mean, how memos are supporting a analysis any software will be useless (Silver; Rivers, 2016).

Our understanding of these struggles that CAQDAS learners face, combined with our recognition of the growing reliance on self-teaching, motivated us to conduct this article about Atlas.ti™ version 7, described next.

2 METHODOLOGICAL DESIGN

We describe in a methodological matrix (Table 2) our qualitative methods approach followed (Minayo, 2011), in a descriptive type (Martins; Theóphilo, 2009). Multiple case study method is used (YIN, 2011), being units analysis: (a) TB (Traditional Business), (b) BRAILE (“Innovation FINEP” winner); and (c) SIB (Social Innovation Business), a Nutrition Education and Recovery Center - CREN (“Social Entrepreneur” award from the Folha de S. Paulo Newspaper). These awards selection is done due to their newness generated in health with merit distinction (including technological and social innovations), business size (medium-sized organizations) and its purpose (technological and social business innovation).

Primary data is collected from 14 semi-structured interviews (Martins; Theóphilo, 2009), carry out with directors, human resources managers, R&D&I managers and BRAILE R&D&I staff. Furthermore, as data collection procedures a secondary data provide from human resources documents, namely: timekeeping report (hours frequency), promotions, turnover data and the last three R&D&I staff performance appraisals. It is worth summarizing that field research resulted in 10 hours and 30 minutes of recording and 114 transcript pages in addition to documents collection which resulted in two compiled pages of collected evidence (table 2).

We work collaboratively to identify recurring patterns and themes in the data (Braun; Clarke, 2006) as they related to the phenomenon. This involved first reading through all the data, making notes using the comments and memos features and planning an initial coding scheme as it related to our goals

METHODOLOGICAL MATRIX		Authors
Research nature	Qualitative	(Minayo, 2011)
Methodological Approach	Descriptive	(Martins; Theóphilo, 2009)
Paradigm	Constructivist	(Paulus et al., 2018)
Method	Multiple case study	(Yin, 2011)
Analysis Unit	Tradicional Business (TD)	Braile <i>biomedica</i> , “finep (funding of studies and projects) innovation award winner”.
	Social Impact Business (SIB)	nutrition education and recovery center (cren), “social entrepreneur” winner award from folha de s. paulo newspaper.
Data collection procedures	Semi-structured interviews and documentary research	(Martins; Theóphilo, 2009)
Data collection tools	Interview scripts and documentary research	
Data analysis	Interviews and documents analysis using Atlas.ti™ to organize and codification raw data documents collected	(Trejos-Castilho; Noriega, 2020)
Questions for Directors, HR Managers, and R&D&I Managers	Is there a formal structure for R&D&I activities? What is the most important innovation (technological or social) projects? How were they developed? What does commitment mean to you? What commitment characteristics do you identify in managers and employees involved in R&D&I activities? What practices are used to make employees feel their work as something important to the business? What about performance recognition, how R&D&I activities are rewarded? How does business culture (traditional or social impact) stimulate R&D&I team performance?	
Questions for R&D&I Staff	What actions are done by leadership in favor of R&D&I performance? How do you feel about your R&D&I performance feedback? How would you talk about your business to someone who not know you? How do you evaluate your current salary (or non-monetary rewards) comparing to the same position in other similar sized and businesses? How do you visualize your professional career in business? What does commitment mean to you? Do you evaluate yourself as an employee committed to the business? For what reasons? What current actions in the business do help you to be more committed? What situations are present in the business today that make you happy to work on it? What situations do makes you unhappy? If you have received a job proposal, what would be decisive to not leaving the business? If you left the business today, how would you feel?	

Table 2. Methodological Matrix

Source: Made by authors, 2019.

We define first codes using comments, created quotations for relevant parts of the data, and attached codes to the quotations. We retrieved all quotations for each code and compared

them with their definitions to ensure applicability, refining the coding scheme and adjusting the coded quotations accordingly. Finally, we combined these codes into descriptive themes and retrieved quotes for each theme, creating report outputs for review. We read through the quotations for each theme to ensure congruence, writing memos that captured our interpretations and using the memos and reports to guide us as we wrote up the findings. We then organized the themes in a temporal manner, according to where they occurred (Silver; Rivers, 2016) to maximize their utility for others engaged in designing Atlas.ti™ instructional events.

In a sequence, interviews and documents collected are interpreted (research corpus) and a second coding process is followed where incidents (data) are categorized according to codes meaning which represents an explanation of researching phenomenon (Saldaña, 2015; Probst; Pucholtz, 2015). codes assign to each incident can be described as words, experiences (Linneberg; Korsgaard, 2019), examples etc. Found into research corpus, they are created from data-driven or codes selected from systematic literature review (theory-driven).

Content analysis of the transcripts are done using a constant comparative content approach with a computer-assisted qualitative data analysis system (CAQDAS) Atlas.ti™ (Babbie, 2013). The researchers created codes, wrote memos, and mapped relevant concepts in the process of identifying relevant themes and subthemes for the study. Table 9 provides a summary of the themes, codes, and constructs of the qualitative analysis in Atlas.ti™.

Reliable assumptions from researched corpus are pursued by researchers from actors or authors speeches and writing. Text essence, information detailed, and all data and evidences are valuable in this process. It is emphasized not only writings but also detailed environment context which can be utilized for exploratory (discovery) and checking (assumptions and evidences confirmation) (Martins; Theóphilo, 2009).

3 HERMENEUTICAL UNIT

Atlas.ti™ support in outcomes data analysis begins from Hermeneutical unit creation (coding), entitled as "R&D&I team commitment and Innovation capacity into traditional business and social impact" (Figure 3). Each file assigned into hermeneutic unit is called "primary document", that are raw data because interview documents collected are linked to a project. Figures are print screens and represent Atlas.ti™ performing data inputs and outputs.

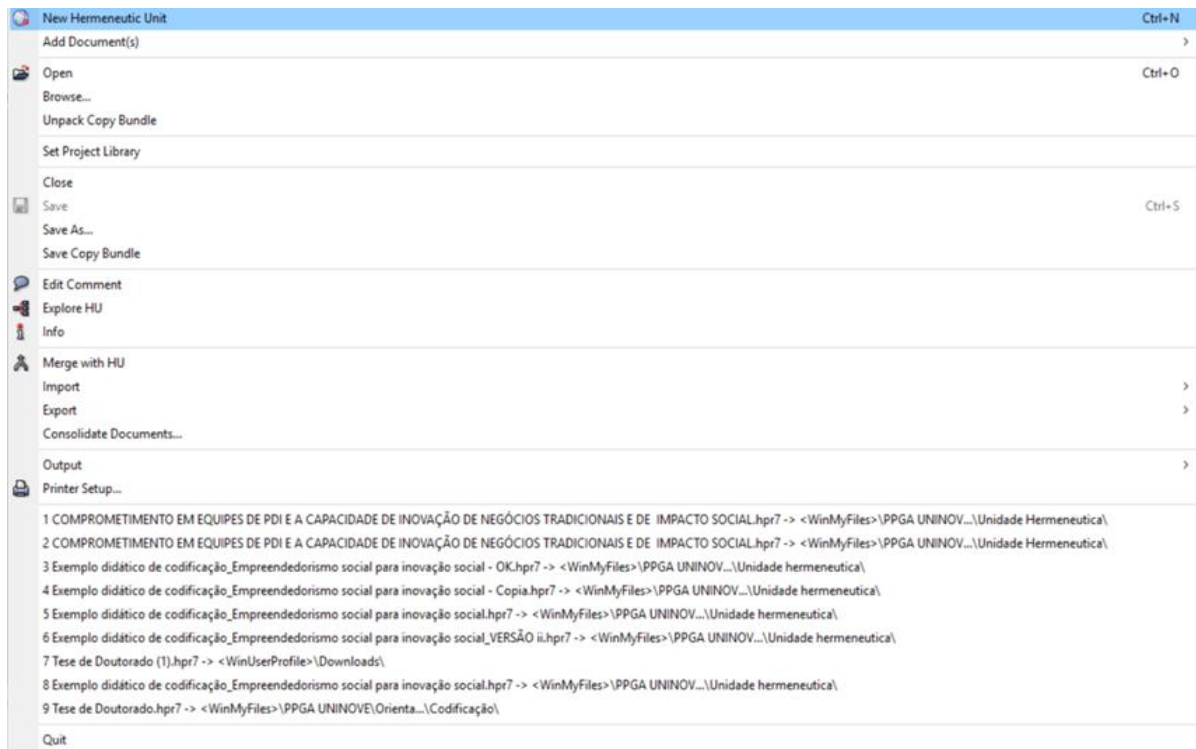


Figure 3. Hermeneutic unit creation.

Source: Made by authors, 2019.

Introducing main documents into Atlas.ti™, "P-Docs" access is required to add them as show figure 4. Users common error to add documents is selection omission "all files" in header. This mistake limits files access and potentially files exist into folder might not appear during this process. Researchers can codify directly from audios, videos, and pictures with Atlas.ti™ usage. It allows to build up a robustness research corpus and cross over evidences considering to voices intonations or people photo as relevant sources to promote inferences to researchers (Pobst; Bucholtz, 2015).

It is useful to categorize texts and documents in families to support analysis. Each document family can represent a case, period and some aspect that might different and provide evidence source. Thus, when Atlas.ti™ filters data by family, during data analysis, a behavior comparison in each data family can be done. It helps to triangulate intra-cases and inter-cases analysis.

Triangulation methods is applied to increase the trustworthiness of the qualitative data (Zaboli et al, 2018). To ensure data's accuracy, the researchers applied data triangulation such as semi-structured interview and document analysis. The peer debriefing technique and member check are used to increase the credibility of qualitative findings. The researchers read manuscripts to confirm the encoding and categories. The primary codes and sub-categories

are derived from the pilot interview. Subsequently, the data reduction in all unit's analysis (codes) is continued until the themes emerged.

Note no files are add into Atlas.ti™, only shortcuts are created in various documents types, such as, figures, videos, slides, audios etc. It recommends all files and hermeneutic unit make available in a single folder. It reduces files path failures and content access errors. We emphasize coding job or analysis is realized based on path registration into text parts, figures and/or evidences sources. (Linneberg; Korsgaard, 2019). It is executed as a mirror where we can see a content however it is only its reflection. Therefore, if only one letter in file name or documents records is introduced incorrectly, no results will be visualized. Consequently, files recovery procedures take times and are not simple or fast.

Data unit analysis are composed by two main businesses in health market: one traditional (BRAILE) and winner 2014 FINEP Innovation Award; another one social impact (CREN) according to SEBRAE classification and winner 2011 Social Entrepreneur Award organized by Folha de São Paulo newspaper.

Atlas.ti™ coding data include 16 primary documents spread out as follow: (a) two general managers interviews (one BRAILE and one CREN); (b) two R&D&I managers interviews (one BRAILE and one CREN); (c) two HR managers interviews (one BRAILE and one CREN); (d) eight R&D&I collaborators interviews (four BRAILE and four CREN); and (f) Employees performance documents and R&D&I team performance appraisals (one BRAILE and one CREN).

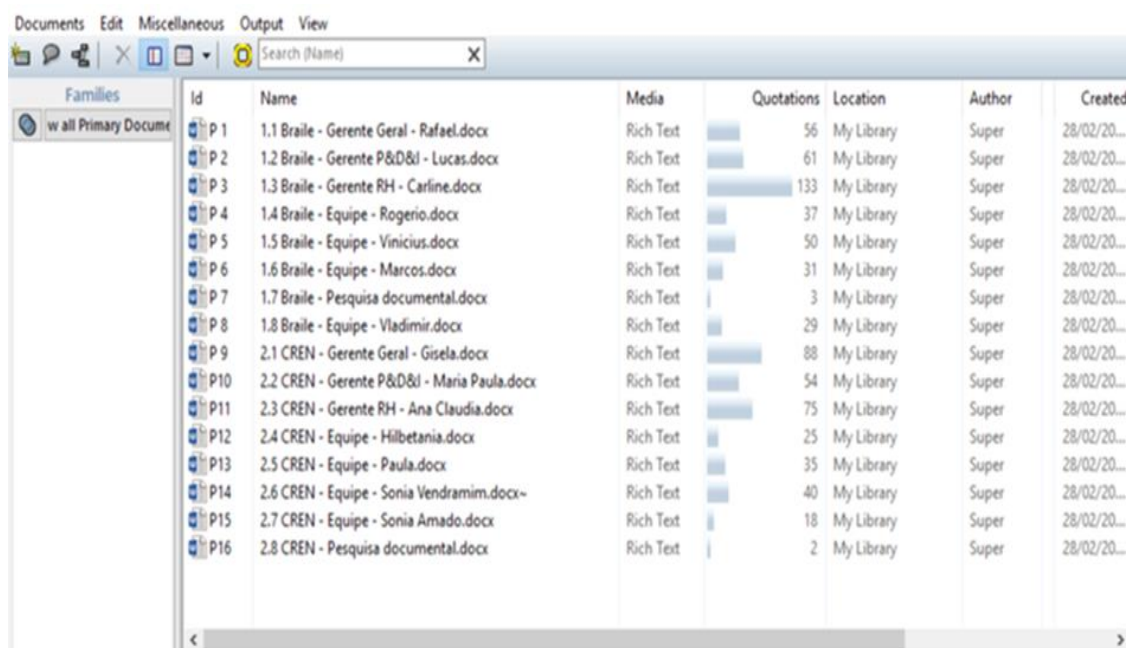
Scholars advocate enhancing reliability and research validation (Silva; Godoi; Bandeira-de-Melo, 2010) through audios, videos, reports, docs, pdf and photos to permit triangulate data and atlas.ti™ is able to assist on many types of evidences sources like these. another relevant aspect is theoretical saturation check (Saunders et al., 2018) since evidences source analysis can generate to research evaluators and readers how saturation type is reached from research source.

4 PRIMARY DOCUMENTS ENCODING

Atlas.ti™ encoding (Figure 5) embrace classification and reduction data, categories preparing and its features interchanging them with the phenomenon. To do so, researchers use coding process at all levels (Straus; Corbin, 2008). Atlas.ti™ usage facilitates coding,

searching, and retrieving segmented data to make easier a stare observation data into category created (Friese, 2012; Saldaña, 2015).

Codes are created in coding header localized on right button. After selection Atlas.ti™ shows an option to assign code which represents the incident. Users also can choose new code (Enter Code Name(s)) or a Code already created (Select Code(s) from List) if necessary. One other way to assign existent codes is click on code chosen on lower left side and drag to selected field. If this field is not visible, click on arrows on left side.



Id	Name	Media	Quotations	Location	Author	Created
P 1	1.1 Braille - Gerente Geral - Rafael.docx	Rich Text	56	My Library	Super	28/02/20...
P 2	1.2 Braille - Gerente P&D&I - Lucas.docx	Rich Text	61	My Library	Super	28/02/20...
P 3	1.3 Braille - Gerente RH - Carline.docx	Rich Text	133	My Library	Super	28/02/20...
P 4	1.4 Braille - Equipe - Rogerio.docx	Rich Text	37	My Library	Super	28/02/20...
P 5	1.5 Braille - Equipe - Vinicius.docx	Rich Text	50	My Library	Super	28/02/20...
P 6	1.6 Braille - Equipe - Marcos.docx	Rich Text	31	My Library	Super	28/02/20...
P 7	1.7 Braille - Pesquisa documental.docx	Rich Text	3	My Library	Super	28/02/20...
P 8	1.8 Braille - Equipe - Vladimir.docx	Rich Text	29	My Library	Super	28/02/20...
P 9	2.1 CREN - Gerente Geral - Gisela.docx	Rich Text	88	My Library	Super	28/02/20...
P10	2.2 CREN - Gerente P&D&I - Maria Paula.docx	Rich Text	54	My Library	Super	28/02/20...
P11	2.3 CREN - Gerente RH - Ana Claudia.docx	Rich Text	75	My Library	Super	28/02/20...
P12	2.4 CREN - Equipe - Hilbetania.docx	Rich Text	25	My Library	Super	28/02/20...
P13	2.5 CREN - Equipe - Paula.docx	Rich Text	35	My Library	Super	28/02/20...
P14	2.6 CREN - Equipe - Sonia Vendramim.docx-	Rich Text	40	My Library	Super	28/02/20...
P15	2.7 CREN - Equipe - Sonia Amado.docx	Rich Text	18	My Library	Super	28/02/20...
P16	2.8 CREN - Pesquisa documental.docx	Rich Text	2	My Library	Super	28/02/20...

Figure 4. Primary documents adding / Primary documents distribution
 Source: Made by authors, 2019

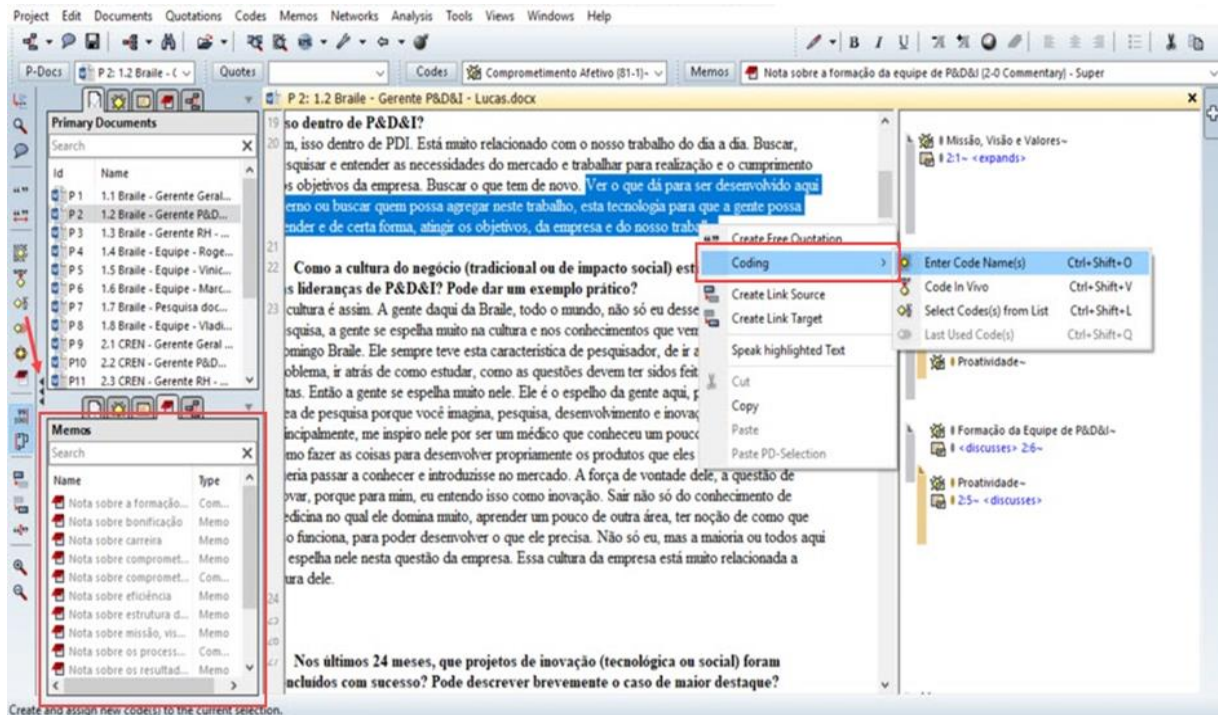


Figure 5. Primary documents encoding

Source: Made by authors, 2019

It is worth highlighting code creation "In Vivo" (Figure 6). This code type receives label from incident itself which is the best translation of incident observed into interviewees' speeches.

Once codification concluded, 819 evidences correlated to study components (citations) are linked to 27 evidenced codes (categories components). From 27 evidenced codes, 15 codes emerge from field (asterisk mark) and 12 codes had already added during research protocol creation (Graph 7).

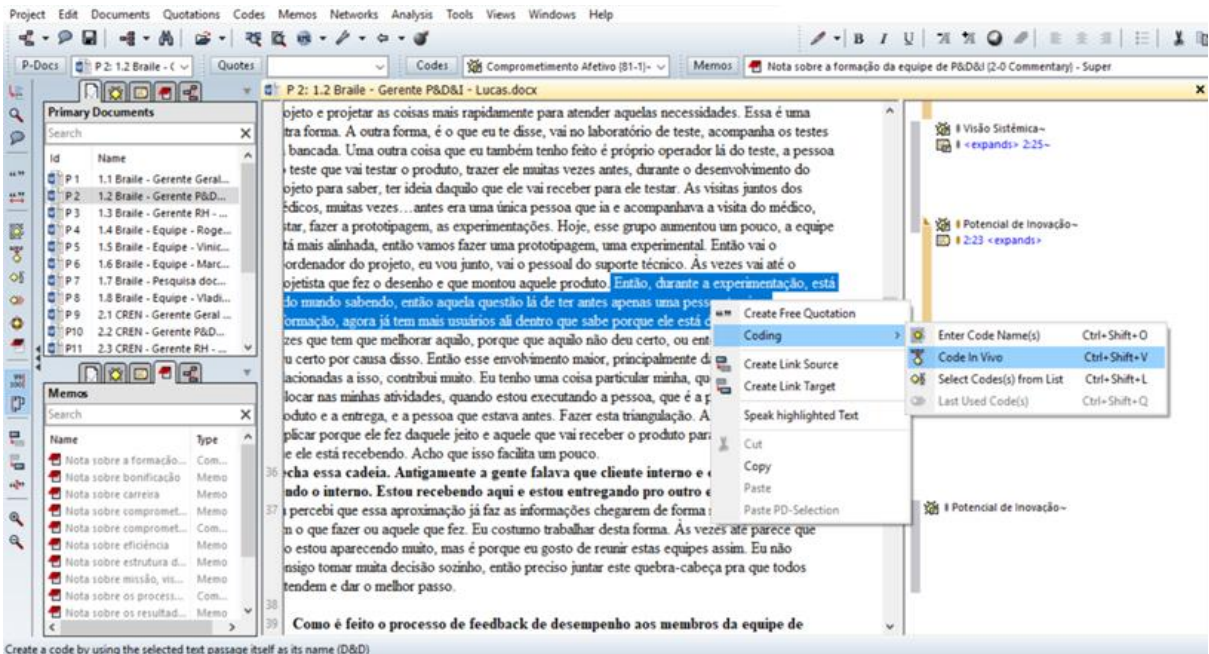


Figure 6. "IN VIVO" code creation

Source: Made by authors, 2019.

Graphs and reports preparation from Atlas.ti™, demand select "output" option. Several sections from Atlas.ti™ offer this option; however, researchers should verify among reports options what would be the best one.

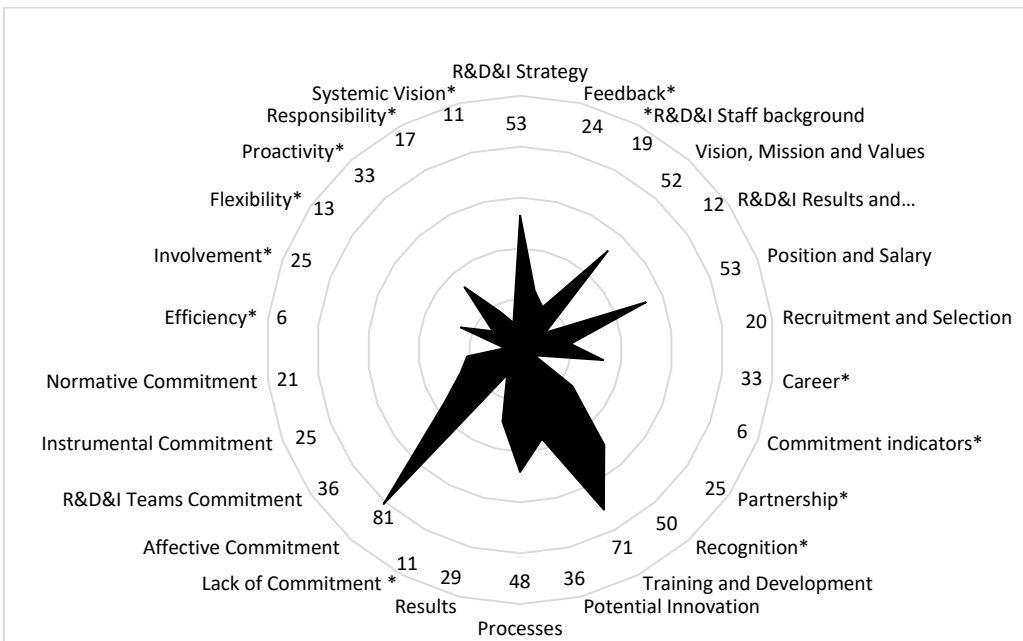


Figure 7. Components evidences analysis.

Source: Made by authors based on the research data.

Note: * Codes emerge from field.

Researchers who adopt reports with codes frequencies, citations (incidents) and their relations should be aware of absence or lack of this relation between some codes. Attention should be applied in qualitative research where researchers are main data analysis instrument. Software or additional technical instruments are accessories. Therefore, inferences are outputs from researcher's observation throughout research because software's role is to support findings materialization.

5 CODES RETRIEVE AND ANALYSE

Initially codes cooccurrence table is generated from Atlas.ti™ totalizing 27 raw codes, its analysis serves as a base grouping made from the highest cooccurrence level (highlighted blue cells, Figure 8) and indicate as simultaneous linguistic units exist into context analysis (citations and / or text fragments which giving meaning to phenomenon).

Cooccurrence degree consists by relation between codes analyzed which represents linguistic units' correlation (Friese, 2012). Linguistic units' correlation is based on proximity level between codes in the same context. It means correlation by proximity or overlapping. An indicator applies between 0 and 1 for each base analyzes and researchers should interpret the values.

"Self-assessment and Feedback" (0.10) highlight in yellow color as an example (Figure 8) of cooccurrence level study retrieved from raw data. They come from both codes' citations, subsequently clustered according to simultaneous language unit's occurrence. In other columns, same grouping criteria subsidize an aggregate analysis to descriptive categories about R&D&I team commitment (Table 9).

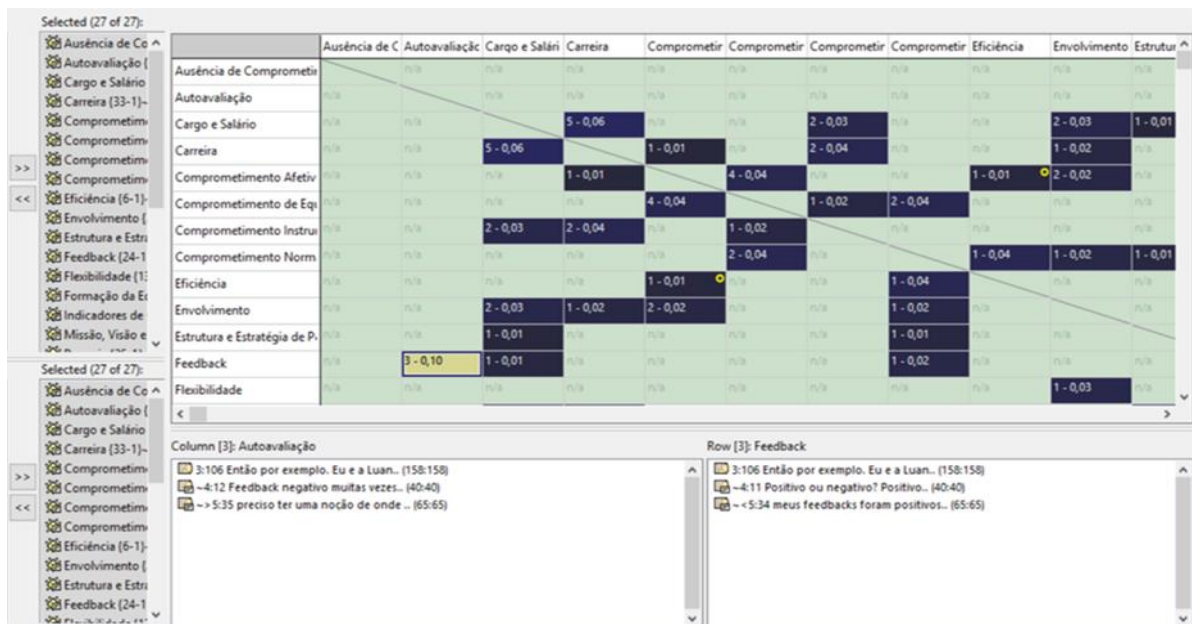


Figure 8. Cooccurrence table
Source: Made by the authors, 2019.

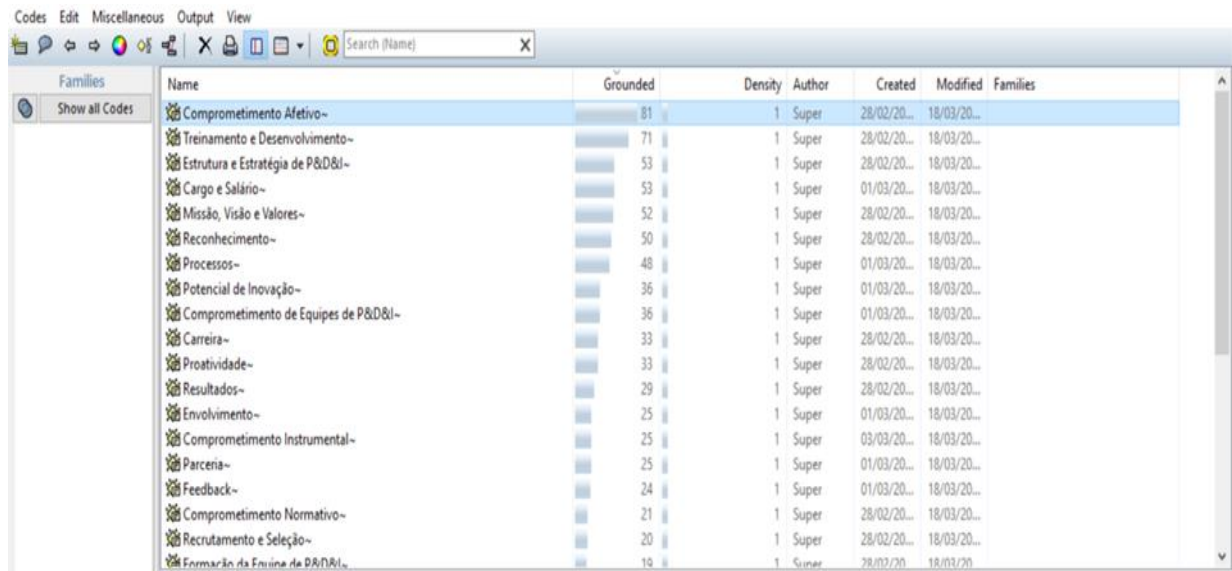
Categories	Components (codes)	Degree (citations)
Estrategic fundamentals	Self-evaluation*	9
	R&D&I Strategy	53
	Feedback*	24
	*R&D&I Staff background	19
	Vision, Mission and Values	52
	R&D&I Results and Performance	12
People management	Position and Salary	53
	Recruitment and Selection	20
	Career*	33
	Commitment indicators*	6
	Partnership*	25
	Recognition*	50
Inovation capacity	Training and Development	71
	Potential Innovation	36
	Processes	48
Commitment	Results	29
	Lack of Commitment *	11
	Affective Commitment	81
	R&D&I Teams Commitment	36
	Instrumental Commitment	25
	Normative Commitment	21
	Efficiency*	6
	Involvement*	25
	Flexibility*	13
	Proactivity*	33
Responsibility*	17	
Systemic Vision*	11	

Table 9. Codes groups (Cooccurrence highest levels and research categories analysis)

Note: *Codes emerge from field

Source: made by authors based on 2019 data research

Atlas.ti™ preview is simple and allows a perfect and rapid comprehension between category of analysis. Furthermore, as already pointed out, a simply report request by output command is enough and below it show how information in table 9 is gotten (Figure 10).



Name	Grounded	Density	Author	Created	Modified	Families
Comprometimento Afetivo-	81	1	Super	28/02/20...	18/03/20...	
Treinamento e Desenvolvimento-	71	1	Super	28/02/20...	18/03/20...	
Estrutura e Estratégia de P&D&I-	53	1	Super	28/02/20...	18/03/20...	
Cargo e Salário-	53	1	Super	01/03/20...	18/03/20...	
Missão, Visão e Valores-	52	1	Super	28/02/20...	18/03/20...	
Reconhecimento-	50	1	Super	28/02/20...	18/03/20...	
Processos-	48	1	Super	01/03/20...	18/03/20...	
Potencial de Inovação-	36	1	Super	01/03/20...	18/03/20...	
Comprometimento de Equipes de P&D&I-	36	1	Super	01/03/20...	18/03/20...	
Carreira-	33	1	Super	28/02/20...	18/03/20...	
Proatividade-	33	1	Super	28/02/20...	18/03/20...	
Resultados-	29	1	Super	28/02/20...	18/03/20...	
Envolvimento-	25	1	Super	01/03/20...	18/03/20...	
Comprometimento Instrumental-	25	1	Super	03/03/20...	18/03/20...	
Parceria-	25	1	Super	01/03/20...	18/03/20...	
Feedback-	24	1	Super	01/03/20...	18/03/20...	
Comprometimento Normativo-	21	1	Super	28/02/20...	18/03/20...	
Recrutamento e Seleção-	20	1	Super	28/02/20...	18/03/20...	
Formação da Equipe de P&D&I-	19	1	Super	28/02/20...	18/03/20...	

Figure 10. Code Management

Source: Made by authors.

Thematic Network view is an additional resource provided by Atlas.ti™ (Figure 11). It means, module set (codes) and their relations (arrows). Each module can be entailed by an arbitrary other modules numbers and depend on relations identified into continuous comparisons flow executed by encoding.

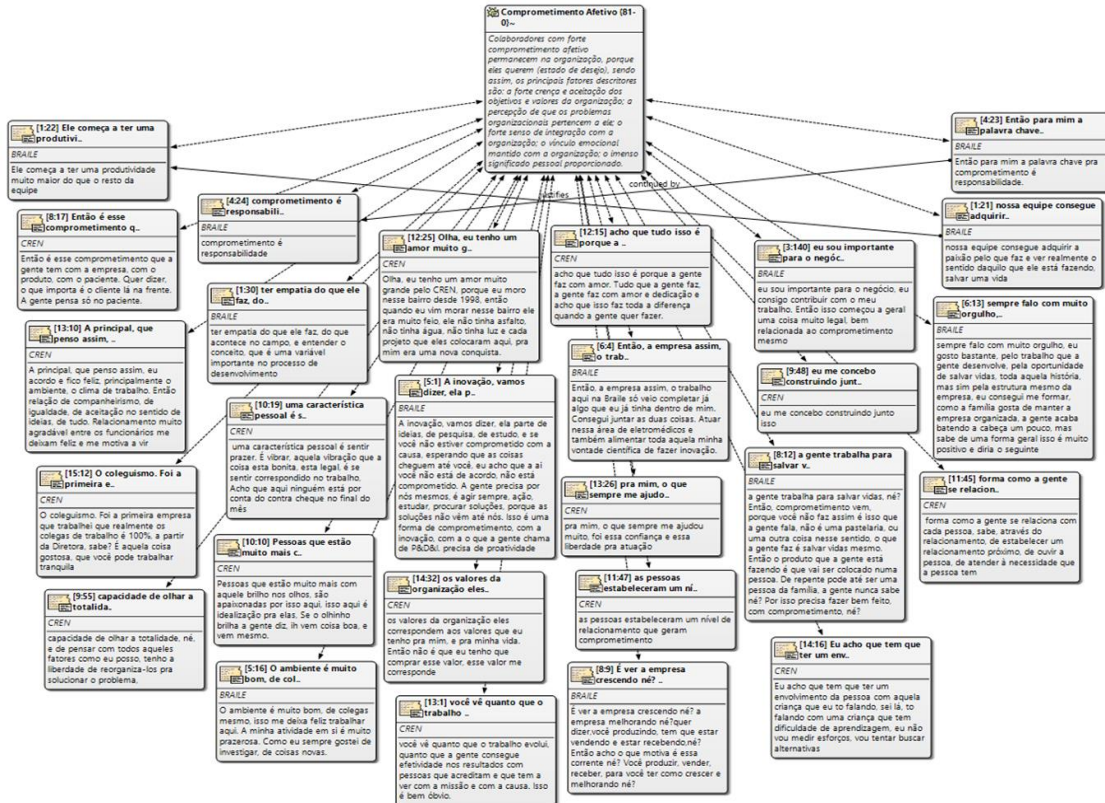


Figure 11. Thematic Network view associated with “Affective Commitment”

Source: Made by authors.

Thematic Network view demonstrated are relevant citations (interviewees' statements) associate to components (codes) in high reasoning degree supporting inter-case analysis and syntheses, such as affective commitment (81 citations) and processes (48 citations) as mentioned in Table 9.

Thematic Network Analysis (Trejos-Castilho; Noriega, 2020) is used to extract and examine associations across themes and sub-themes; More specifically, in a first step, transcribed data is checked for accuracy and finalized transcriptions were uploaded to Atlas.ti™ .7 in preparation for analysis. In a second step, basic themes should be extracted by identifying statements and key words related to general topics (e.g., behaviors, commitment, performance, relationships) that were later grouped into organizing themes that were clearly related to a similar issue. The organizing themes are then clustered into broader overarching global themes or thematic networks in a final step. During the coding and analytical phases, graphical representations of the associations among basic, organizing, and global themes are

developed using Atlas.ti™. Researcher checking is completed to ensure trustworthiness and validity of the coding process.

It is important to note that all Hermeneutics Unit elements are interconnected, therefore, any change or linkage between codes and incidents carry out in one stage or activity interferes in others. It means in whole project. Codes relation when established in network or even if it is undone, they will affect and apply to each Hermeneutical Unit. It is not advisable to delete or undo analyzes at any time, completely or partially without being sure what will be reflected in final qualitative outcomes.

Encoding process ready and relations between codes established, as well as reports survey to understand dataset, insights and assumptions can be developed. At this research stage, it is possible to raise questions to data using Atlas.ti™ query tool (figure 12). There is a demonstration about how to access such tools and its options, below.

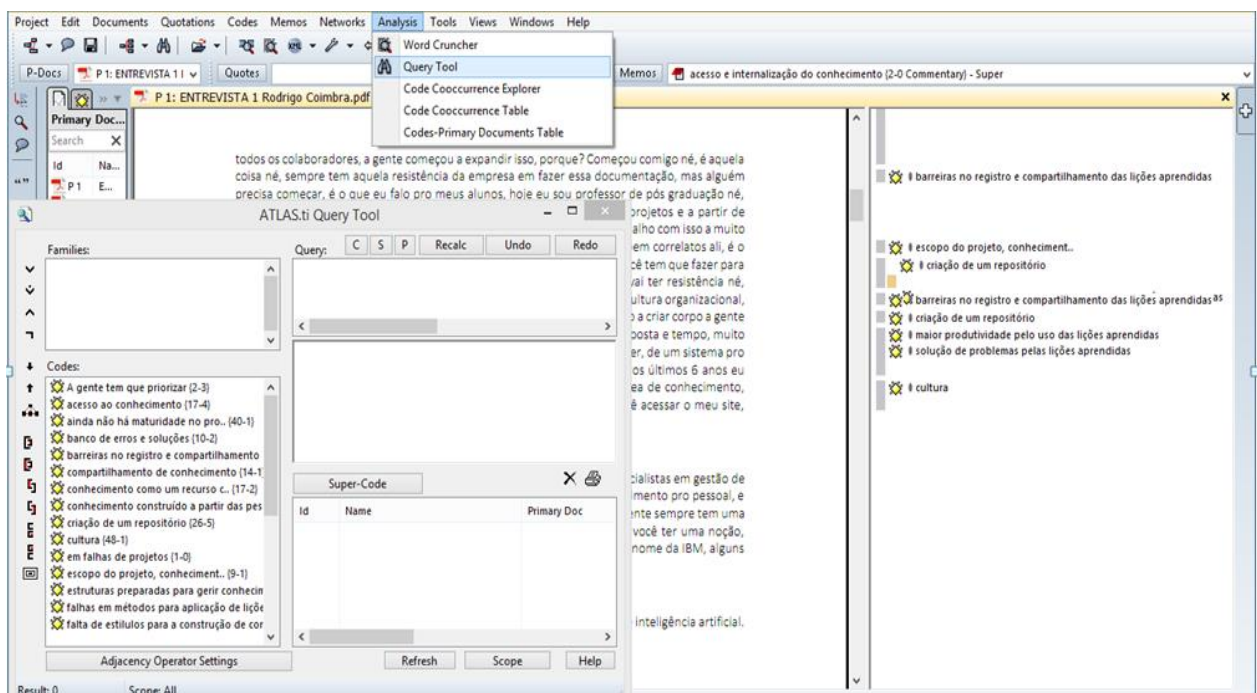


Figure 12. Searching Operation (Query tool)

Source: Made by authors.

Query Tool process is performed by selecting analyzed codes firstly and an operator later. Each operator is available as an icon on the left side in “Query Tool” section. Operation logic is equation addition under elements to be analyzed (codes or code families) and then operator performs the analysis. Each option allows validating an insight or proposition by proximity degree between citations and among others overlapping. Operators are described

(Figure 13) and questions raised from them allow to understand if a certain speech has a code (category of analysis).















Operators	Description	Query
	Citations Code A or B. Citations have at least one code.	OR (“Code A”, “Code B”)
	Exclusive citations code A or B. Operator excludes incidents with both terms	XOR (“Code A”, “Code B”)
	Citations contain both selected codes.	AND (“Code A”, “Code B”)
	Citations do not contain selected code.	NOT (“Code A”)
	Selected code citations and all sub-terms.	SUB (“Code A”)
	Citations code A and its ascendant term.	UP (“Code A”)
	Submissions citations selected code and “relatives”.	SIB (“Code A”)
	Overlapping citations code, A include in B.	WITHIN (“Code A”, “Code B”)
	Citations code A which contains no B.	ENCLOSES (“Code A”, “Code B”)
	Citations code A in which overlaps citations B.	OVERLAPPED_BY (“Code A”, “Code B”)
	Citations code A in which they appear overlapping citations B.	OVERLAPS (“Code A”, “Code B”)
	Citations subsequent code B to Citations A on a specified number of lines. When this option is selected, a checkbox will appear to place numbers of rows.	FOLLOWS (“Code A”, “Code B)
	Citations code A precedent to Citations B on a specified number of lines. When this option is selected, a checkbox will appear to place number of rows.	PRECEDES (“Code A”, “Code B)
	Competing Citations for Selecting Codes.	COOCCUR (“Code A”, “Code B”)

Table 13. Search operator’s description (Query tool)

Source: Made by authors based on Silva, Godoi and Bandeira-de-Melo (2010) in Atlas.ti™ version 7.

Each operator (symbol) its description an equation has been shown above (Figure 13). Relevant aspect is after elaborating reasoning which allows validate a certain assumption, it is possible to record this reasoning as “Super Code” (Figure 14). This new code may be part of network, that means, a map that represents your search findings.

Atlas.ti™ report generated in the menu “Project <Output> <All Objects>” provide whole route of analysis and interpretation followed by researchers which makes simpler audit and validate outcomes by readers and interested parties (Figure 3).

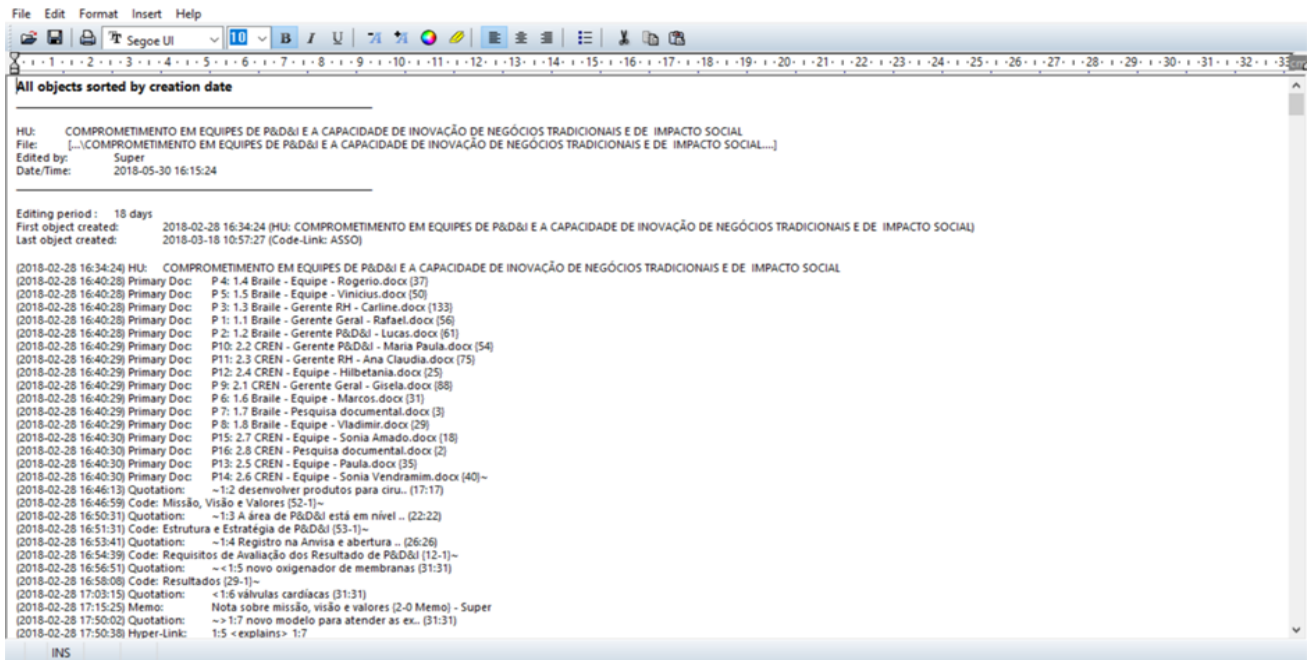


Figure 14. Analysis and interpretation report

Source: Made by authors, 2019.

Atlas.ti™ reports sustain research outcomes and validity and reliability criteria. It is making easier to prove which statements contribute to build certain categories and verify relations between valid codes or not done by cooccurrence table. Initial assumptions tests can be supported by reports using query tools.

Although qualitative research presents certain subjectivity in its analysis, is mandatory to materialize arguments and findings to guarantee consistency throughout researching. Transparency is established by presenting how each evidence source contribute to reach findings, in addition to build each analyzed category, as well as allow study replication.

6 CONCLUSION AND CONTRIBUTIONS

This exercise of Atlas.ti™ usage highlights the importance of keeping learning principles (Silver; Rivers, 2016) in mind when teaching CAQDAS. The hands-on portion of our pedagogical approach offer learning experiences where and how we work during the research, providing depth by offering opportunities to work out the software. Even the fact that there is no one right way to use CAQDAS - Atlas.ti™ (Leitch et al., 2016), it represents challenges to novice researchers in their process of learning.

An effective CAQDAS Atlas.ti™ usage involves translating the needs of a given study (informed by methodology and the analytic techniques of conceptualization) into practices of using software tools to achieve research aims (Paulus et al, 2018). Without ongoing methodological support, we have observed how things can go wrong during the software independent usage; e.g. coding without a clear purpose (Chandra; Shang, 2017) or analytic plan, not knowing what to do after coding, or searching for ways to use particular features (Sotiriadou; Brouwers; le, 2014), rather than identifying how features can support the analytic plan and this might generate a lack of rigor to prepare arguments do support theories, propositions or hypotheses. (Sinkovics; Alfoldi, 2012; Woods et al., 2015a).

Thus, by demonstrating active and completed Atlas.ti™ steps, we expect to allow readers to redirect their own learning and avoid any refuse about Atlas.ti™ usage. Combining experiential and self-directed learning offer a way of succed learning process that might be used in future research scenarios (Gilbert; Jackson; Di Gregorio, 2014; Silver; Rivers, 2016).

Atlas.ti™ usage is demonstrated becoming likelihood organizing, retrieving, and analyzing data in continuous and cyclical way during a qualitative approach. a process that demands back and forth of data comparison constantly. qualitative analysis in a circular way allows deeper understanding from a given phenomenon since explanation search comes from real interaction cycles (Eisenhardt; Graebner, 2007).

Embracing data qualitative analysis, some Atlas.ti™ resources are performed, such as cooccurrence code table which helps code validation and respective categories emerged from data. it also allows ideas mature and assumptions taking a certainty, effectivity, agility path and support to follow a methodological foundation (Leech; Onwuegbuzie, 2011; Sinkovics; Alfoldi, 2012). Atlas.ti™ does not replace researchers' skills in qualitative research, it is a bridge forward to right mental model employed by researchers and allied for qualitative researches.

Additionally, Atlas.ti™ demonstrates its high capacity in visualization and interpretation among codes relations (Rosenfeld; Gatten; Scales, 2013), categories and subcategories which clarify and support in our case study the phenomenon of R&D&I team commitment into traditional business that make us confident to infer some propositions, at that time.

This exercise with Atlas.Ti™ usage allows us to demonstrate researchers flexibility to add documents, as well as different data sources providing clarity and transparency from each evidence source and their respective parts (Sinkovics; Alfoldi, 2012; Woods et al., 2015a).

more functionalities are still available, and the software may embrace any researchers' skills levels. we also emphasize that Atlas.ti™ usage ought to reduce resistance in software usage which can increase the ability of observing broadly and quickly evidences from given phenomenon researched (azungah, 2018).

Atlas.ti™ software can be used at any point along qualitative research spectrum, whether it is close to the theory-building or grounded-theory end or close to theory testing or hypothesis-testing end. For practical benefit, using Atlas.ti™ software will save time and make your work easier to manage, especially for large sets of data and teamwork settings. For empirical benefit, we believe it will enhance credibility building by making the research processes more transparent and replicable (Zaboli et al, 2018).

We propose further studies about CAQDAS usage to overcome any barrier among researchers during qualitative approach and more exploration into the relationship between analytic strategies, software tactics, and how are impacts of learning and teaching software.

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