

## Three Methods Of Qualitative Data Analysis Using ATLAS.ti: 'A Posse Ad Esse'

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### **Abstract**

This article appraises the possibilities, limitations and challenges in undertaking three different methods of qualitative data analysis using ATLAS.ti. The discussion is based on three different research projects carried out from 2004 to 2012. In the first project, a grounded theory analysis of data collected in 2004 was carried out using an inductive approach to make a theoretical proposition on Mauritian early adolescents' internet-mediated dating pattern. In the second project, an abductive thematic network analysis was carried out using qualitative data collected in 2006 from Kenya and Zambia on adolescent sexual and reproductive health. In the third project, a deductive critical discourse analysis was carried out using an eco-social work research from Mauritius, undertaken in 2012. This article concludes that ATLAS.ti presents numerous possibilities for researchers to carry out different methods of qualitative data analysis. However, there are certain limitations and challenges that need to be considered by the researchers when undertaking computer assisted qualitative data analysis.

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### **Keywords**

*ATLAS.ti, qualitative analysis method, grounded theory, abductive, thematic network analysis, inductive, deductive, critical discourse analysis, computer-assisted analysis, challenges, limitations, possibilities*

### **Introduction**

ATLAS.ti has been rightly acknowledged as an essential tool that facilitates researchers' ability to undertake well-organized, systematic, effective and efficient data analysis in many studies (Lewis, 2004; Lu & Shulman, 2008; Konopásek, 2008; Friese, 2012; Rambaree & Faxelid, 2013; Rambaree, Forthcoming, to name a few). The software renders qualitative data more visual, portable, and it also eases the process of analytical discussion in between two or more researchers. For some researchers, ATLAS.ti is not only a tool for supporting qualitative data analysis; it is also a companion that accompanies them from the conception to the end of a project. When researchers begin to think about a project, they can start using ATLAS.ti to make preliminary reflections on ideas and the knowledge construction from the very beginning of the research process. For instance, they can create free memos, which focus on reflexivity related to the setting up of the research process. Reflexivity basically means making reflections on and accounting for how decisions are made and influenced within the research process. For instance, researchers can reflect and note in memos, why theory X is preferred rather than theory Y for framing the research. Reflexivity is carried out through procedural memos, where researchers start describing the phenomena to be studied, the background of the issues/problems to be studied and so on. Reflexivity is not to be restricted only to the data analysis, but rather it needs to be carried out throughout the whole research process (Mauthner and Doucet, 2003). Friese (2012) reminds us that reflexivity is essential throughout the entire research project and it helps researchers to be aware of biases. In particular, researchers can use ATLAS.ti

to undertake literature reviews, explore data, and use a variety of available functions to code, sort data, study quotations, and create links that greatly facilitate the process of understanding the underlying meanings behind the gathered evidence (Rambaree, Forthcoming).

However, some researchers have also voiced concerns regarding data analysis with the help of CAQDAS - such as ATLAS.ti (St John & Johnson, 2000; Blismas & Dainty, 2003; Bryman, 2008; Harding, 2013). For instance, St John and Johnson (2000: 393) name the following concerns: "...increasingly deterministic and rigid processes, privileging of coding, and retrieval methods...and distraction from the real work of analysis". Moreover, it is argued that software like ATLAS.ti has limited capabilities that hinder researchers from undertaking diverse types of qualitative analysis using different analytical methods and approaches (Blismas & Dainty, 2003). On the contrary, as it can be found from the below given three cases, ATLAS.ti allows certain flexibilities, where researchers were able to choose different ways of looking at the data using different approaches as well as making different types of rigorous analysis.

Friese (2012: 92) proposes a method for computer-assisted qualitative data analysis based on the three principles Noticing, Collecting and Thinking (NCT). According to Seidel, the three aspects represent a simple and most logical way of proceeding with any type of qualitative data analysis (Seidel, 1998). Given that there are different methodologies of qualitative data analysis - such as thematic analysis, narrative analysis, and discourse analysis - it therefore becomes important to discuss how ATLAS.ti can be utilized in each of these. In particular, information is still lacking on how to apply NCT when using ATLAS.ti in the context of different qualitative analysis methodologies. Specifically, novice researchers using ATLAS.ti could benefit from more specific step-by-step guidance in undertaking qualitative data analysis that is framed within different approaches and theory of method (Rambaree, Forthcoming). Friese (2012) calls upon researchers to use the NCT approach to work with ATLAS.ti for reporting what else may be discovered; and she provides an interesting analogy by stating

The data material is the terrain that you want to study; the chosen analytic approach is your pathway through it. The tools and functions provided by ATLAS.ti... are your equipment to examine what there is to discover (p.4).

In this article, three different methodological approaches of qualitative data analysis using ATLAS.ti are described as examples, and the discoveries are reported. The aim of the article is to appraise the possibilities, limitations, and challenges in undertaking these three different methods of qualitative data analysis using ATLAS.ti. Following this introduction the three different projects and their respective analytical approaches are briefly described. Before the conclusion, an appraisal of the possibilities, limitations and challenges in using ATLAS.ti in undertaking the three methods of qualitative data analysis is carried out.

At this stage, it would be worth acknowledging that perhaps there are other ways (possibly more efficient, effective and rapid) to undertake the below described analysis; nevertheless, in an area of limited guidance this article is presented as a material for initiating further discussion for the advancement of qualitative data analysis with ATLAS.ti.

## Project 1: Grounded Theory As An Inductive Approach

In this project, grounded theory analysis was carried out using an inductive approach to make a theoretical proposition on Mauritian early adolescents' internet-mediated dating pattern. Data for this project were gathered in 2004 through the use of tools such as digital voice recorders for Focus Group Discussions (FGDs) and floppy-disks for collecting individuals' written narratives from 136 adolescents from Mauritius. Glaser's (1978) non-linear method of theory generation through data analysis was used as guidance for the data analysis (see Figure 1). An article related to this particular project is published in the International Journal of Emerging Technologies and Society (Rambaree 2008).

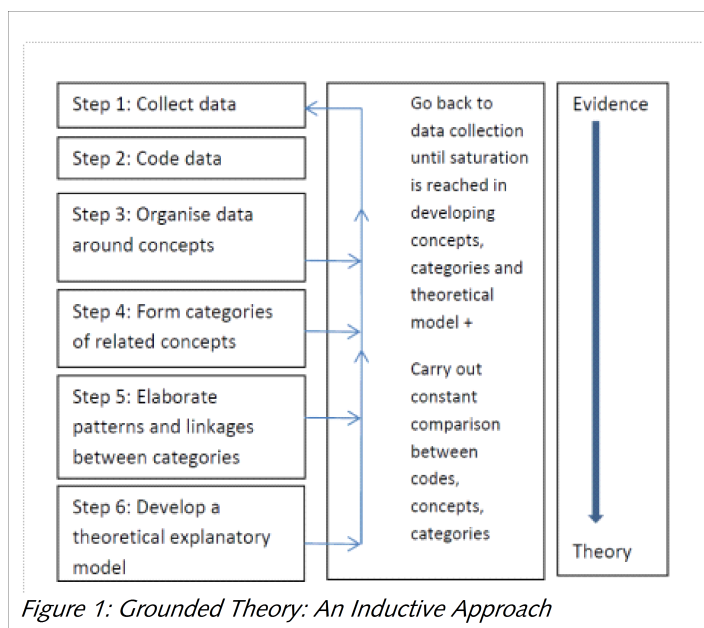
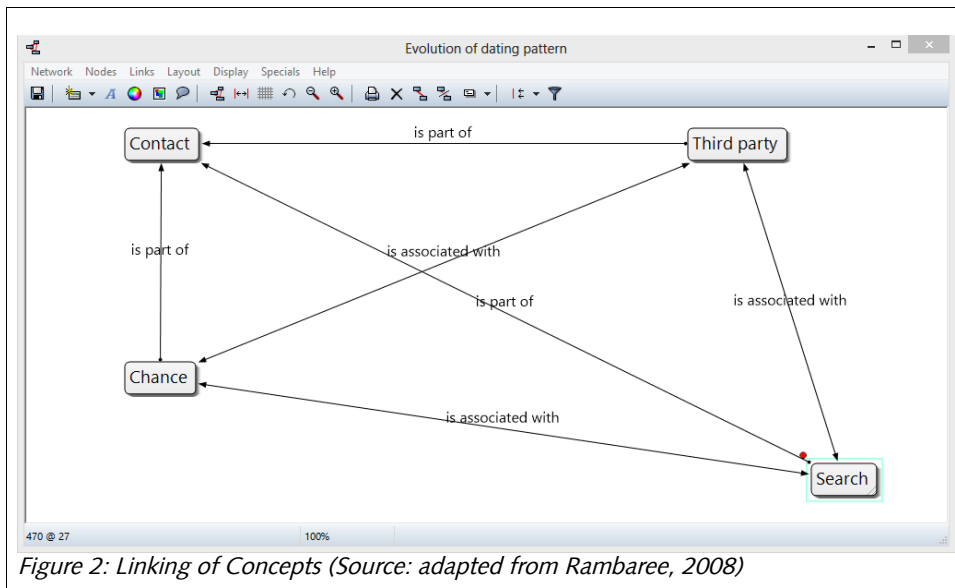


Figure 1: Grounded Theory: An Inductive Approach

Immediately after collecting a layer of data, ATLAS.ti 5 (the version available at the time) was used for facilitating the grounded theory analysis. Using the panoply of coding functions - such as open coding, code by list and code in vivo - available in ATLAS.ti, the first layer of data was coded. For open coding, say for example in a NI, the following quotation was gathered from a research participant: "Alan first chatted with Nella on Servihood. Days went by and both chatted more and more. They learned more about each other. They

decided to meet after a month of chatting with each other". Then, based on this particular quotation, several open codes such as 'Building Relationship', 'Knowledge', 'Face-to-Face Meeting' were created (Rambaree, 2008). For in vivo coding, the exact word/s appearing in a quotation is selected as a code. For example, from the sentence: "We were sharing happiness", the two words 'sharing happiness' were used as in vivo code.

Further, the Network View Manager (NVM) was of paramount importance. Using the linking and related functions under NVM, nodes were imported to create categories of concepts for eventually looking at a logical pattern that could explain how internet-mediated dating starts and evolves. For examples, the following initial codes 'Access by Mistake', 'E-mail from a Stranger'; 'Contact by Accident' were grouped under one concept labelled as 'Chance'. See Figure 2. Then after such concepts were linked to categories, say for instance 'Contact' and linkages between the categories were establish in order to provide theoretical explanatory patterns. For instance, the categories of concepts such as 'Contact', 'Attraction', 'Friendship' and so on were linked and organised in a logical manner, in order to provide theoretical explanation on the evolution of the dating pattern (Refer to Figure 3).



The same process was carried out with several other layers of data. Several layers of data were therefore assigned and analysed as part of the same Hermeneutic Unit until saturation was felt in the concepts, cat-

egories, and the theoretical patterns being developed. Saturation is achieved when the codes fully fit the emerging concepts, categories, and theory from the data. Objectively, saturation was confirmed when each of the concepts and categories had no new data that was any different from what was already found in the analysis (Rambaree, 2008). Say for instance, a concept like 'Attraction' was confirmed as being saturated when new data from the field were found to be similar, in their explanatory terms, to the ones already existing in the analysis. Theoretical saturation was determined when findings for providing theoretical explanation on certain causes/occurrences/observations from the data were somewhat a repetition to the already existing ones.

In this study, ATLAS.ti 5 supported the researcher in exploring patterns of behaviour by creating a 'visual playground' with the codes, categories, concepts and networks to draw a logico-empirical pattern that emerged from the data in studying the Mauritian early adolescents' Internet-mediated dating. Moreover, ATLAS.ti 5 facilitated the study by allowing the researcher to present the findings in a vivid, visual and transparent manner (as shown in Figure 1, Figure 2, and Figure 3).

## Project 2: Abductive Thematic Network Analysis

The second project was a mixed-method (qualitative and quantitative) study that was carried out in 2006 by a group of researchers from the Department of public health sciences, at the Karolinska Institute, Sweden. The research participants were students aged 11-22 years, from secondary schools in two urban settings in Kenya and Zambia. Within the qualitative part, a total of 1875 students completed a questionnaire where they were asked to write pertinent (in some cases more than one) questions (most of them were open-ended) that were related to adolescent sexual and reproductive health. This particular item generated more than 2000 open-ended questions, representing a rich qualitative data set. In this project, two researchers (Faxelid and myself) used Abductive Thematic Network Analysis (ATNA) using

ATLAS.ti 6 for developing a model that provides a typology of sexual and reproductive health questions asked by the research participants in the context of Kenya and Zambia (Rambaree & Faxelid, 2013).

Abduction is the pragmatic way to construct descriptions and explanations that are grounded in the gathered data from the activities, discourses, concerns, motivations and meanings used by research participants in a study (Lewis-Beck, Bryman, & Liao, 2004). It is a way of 'guessing right' in making inferences and providing interpretations on 'new discoveries' by using intuitive reasoning (Swedberg, 2012). The use of intuitive reasoning in abductive research, which relates to the process of providing hypothetical explanations based on the newly found facts was introduced and advocated by Charles Sanders Peirce in the 1950s (Levin-Rozalis, 2004). Expanding on ideas borrowed from Pierce, Haig (2008) posits that abduction adds to knowledge construction by reasoning from factual premises to explanatory inferences. In its simplest form, abduction is therefore the process of associating data with ideas that could be checked through further research (Richardson & Kramer, 2006). Haig (2005) states that, the important feature of abductive method is its ability to serve as a framework for framing more specific research. For several researchers, abductive reasoning is based on a pragmatic approach that allows reasoning to move back and forth between theories and empirical evidence (Dubois & Gadde, 2002; Morgan, 2007; Feilzer, 2010). ATNA can be considered as a pragmatic methodological approach with an abductive way of reasoning in studying and explaining linkages between emerging themes from the gathered qualitative data (Rambaree & Faxelid, 2013). It is a combination of ideas borrowed from Haig's (2005) Abductive Theory of Method (ATOM) and Attride-Stirling's (2001) Thematic Network Analysis (TNA).

TNA is a technique for examining linkages between themes emerging from gathered data (Attride-Stirling, 2001). Within TNA, researchers study the data to identify themes and then develop graphical representation/s of the linkages between the themes. According to Attride-Stirling (2001), the networks between the themes are merely a graphical tool to organize themes and show the interconnectivity between them in order to facilitate the subsequent analysis. The central part of TNA is where researchers relate the principal themes and patterns that emerge in the analysis to the original research questions; and then propose explanations from empirical data to such questions (Attride-Stirling, 2001).

In this study, Stein (1989) theorisation of sexuality was used for abductive reasoning in carrying out TNA of gathered data from the field. In particular, Stein (1989) highlighted a theoretical explanation on sexuality with three specific central themes: Drives - view of sexuality as an overpowering natural and instinctual drive, which is represented in both the medical and psychological disciplines; Identity- self-identification, preference and orientation as well as socially constructed image based on interactions and cultural influences; and Practices- behaviours and activities controlled mainly through power agents, such as religion, school, family etc.

TNA can be both theory and data driven. In a theory driven approach, researchers can use a theory to design a conceptual framework; and, the themes observed from the gathered data can be linked deductively to the already established theoretical concepts to form a network of linkages between the theoretic-

al driven themes. For instance, in studying adolescent sexuality researchers can look at how gathered data fit the themes - such Drives, Identity and Practices - as explained within the Stein's (1989) theorisation of sexuality. In a data driven approach, researchers can look for emerging themes and create a network of linkages to provide theoretical explanation in an inductive manner. For instance, in researching sexuality a researcher can observe, for instance, 'morality' as a central concept that is linked to a variety of themes that emerge from the data; and therefore provide theoretical explanation on sexuality through the patterns within the linkages between the emerging themes from the data. For Braun and Clarke (2006, 2013) themes within gathered qualitative data can be identified either in an inductive manner from the data towards the theory--'bottom up'--or in a reverse manner through a theoretical deductive way--'top down.' In other words, researchers can adopt either inductive or deductive or even a hybrid inductive-deductive approach in the data analysis process (Fereday & Muir-Cochrane, 2006). Braun and Clarke (2006) mention that thematic analysis is a non-linear process that requires researchers to move back and forth between the different stages of data analysis. The combination of the technique of TNA with the abductive reasoning, which can be labelled as ATNA, can be outlined as in Figure 3. Here is a summary of the steps through which ATNA was carried using ATLAS.ti 6.2.

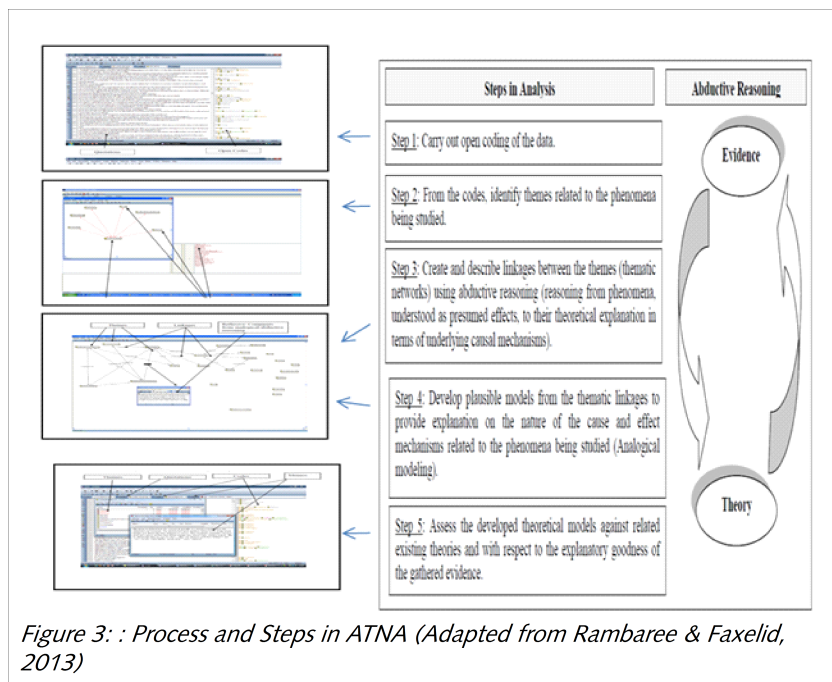


Figure 3: : Process and Steps in ATNA (Adapted from Rambaree & Faxelid, 2013)

For Step 1, several coding functions (open, by list, in vivo) as explained above were used.

Moving to Step 2, the 'Family Manager' function was used to group the codes under themes. For instance, codes like 'Rape', 'Masturbation' and 'Abortion' were grouped under the theme 'Sexual Practices'. In Step 3, the network building function was mainly used.

For instance, links were created

in between codes and themes, such as in between 'Contraception', 'Family Planning', 'Pregnancy' and 'Sexual Practices'. The 'Network View' function helped the researchers to explore the complex phenomena, inherent in the gathered data, through creating the linkages and assigning relationships between the identified themes/codes/quotations (Rambaree & Faxelid, 2013).

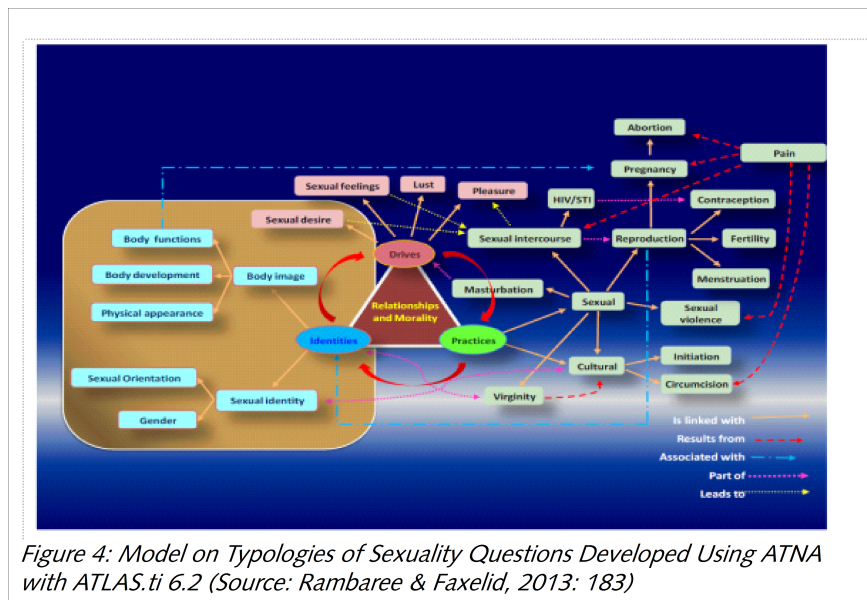
For carrying out Step 4, different types of cause and effect relationships between the themes were explored, explained and saved using the 'Edit Comment' function of ATLAS.ti 6.2. For instance, when es-

establishing the link between 'Sexual Identity' and 'Growth & Development, notes related to the link, such as on how sexual growth and development is important for sexual identity were written and saved using the 'Edit Comment' function

For the final part, Step 5, ATLAS.ti 6.2 capabilities of assigning PDF documents under the same Hermeneutic unit was utilized. Stein's (1989) theoretical model (literature in PDF format) was assigned to the same Hermeneutic unit to compare and contrast the codes, themes and linkages with the theoretical framework in the literature. For instance when data segments that supports or contradicts with ideas and arguments referred in selected literatures were identified, memos were created to capture the observations.

In particular, a theoretical framework outlined by Stein (1989) was found to be relevant for comparing with the one that was being developed from the gathered data. Stein's theoretical explanations were therefore used as rivals for Inference to the Best Explanation (IBE) and Theory Explanation Coherence (TEC) in the process of assessing the developed model from the gathered data. The 'Memo' function in ATLAS.ti 6.2 was used for writing, editing and saving the 'IBE' and developing 'TEC.' Haig (2005) states:

"...inference to the best explanation is founded on the belief that much of what we know about the world is based on considerations of explanatory worth ... to infer that a theory is the best explanation is to judge it as more explanatorily coherent than its rivals." (p. 381).



Furthermore, according to Haig (2009: 948), three important criteria are used to judge coherence of a newly constructed model: (a) Explanatory breadth—it explains a greater range of facts; (b) simplicity—it makes fewer ad hoc assumptions; and (c) analogy—it supports itself by

analogy to other theories and improved explanation for better knowledge on the subject matter.

Using ATLAS.ti 6.2, it was therefore possible to carry out ATNA and depict a model as shown in Figure 3. Thus, starting with Stein's (1989) three models of sexuality, the researchers were able to further develop the theoretical explanation through an expanded model on typologies of sexuality questions asked by young people, with reference to a greater range of facts, with fewer ad hoc assumptions and provided

better knowledge on the subject of adolescent sexuality. The new model, emerging from ATNA with ATLAS.ti 6.2, also made it possible for the researchers to frame further studies on similar subject matter in other African countries. Conducting a follow-up quantitative study, one could for instance test the hypothesis: 'Lust is part of sexual drives which is conditioned through relationships and morality'.

### **Project 3: Deductive Critical Discourse Analysis**

Discourse, which is socially constitutive as well as socially conditioned, is not only ideas or patterned ways of thinking, reasoning and communicating (Lupton, 1992); but also a system of possibilities for the construction of knowledge based on interpretations and understandings (Flax, 1992). Critical Discourse Analysis (CDA) is an analytical approach used by researchers to describe and undertake critical reflection on the social processes and structures that give rise to certain discourses, which in turn provide the basis for understanding of and explanation on social issues, concerns and problems (Wodak, 2001). In CDA, researchers deconstruct text and talk to analyse underlying meanings, motivations, ideologies and power. For instance, text and talk, in a particular social and political context, contains discourses related to power, abuse, dominance, and also meanings/motivations regarding inequality that are enacted, reproduced, and resisted (van Dijk, 2008). In critical discourse analysis, researchers therefore provide interpretations of the text and talk through quotations that support such claims.

With the advent of new technological tools such as new social media (Facebook, Twitter, Skype, YouTube and so on) and digital recorders (graphics, audio, video), the analysis of large volumes of data as discourses becomes challenging even for experienced researchers (Rambaree, Forthcoming). Fortunately, software such as ATLAS.ti makes it possible for researchers to manage and organize larger quantities of qualitative data, albeit it is not a data mining software. Large quantity of data in different format (text, graphics, audio, video) can all be add to the same project and codes, memos, comments can all be arranged in an orderly manner that can be easily retrieved using functions such as the 'Code Manager' (Refer to Woolf, 2012; for details on putting order to data in ATLAS.ti).

In this third project a deductive critical discourse analysis was carried out in 2012 using an eco-social work theoretical framework to analyse data from Mauritius. A methodological article related to this project is being published as a book chapter (Rambaree, forthcoming). As a deductive approach, the research started with a literature review in ATLAS.ti 6.2. In deductive CDA, researchers study quotations from the gathered data using a theoretical framework as a guide for analysis (Rambaree, forthcoming). Theoretical statements in some selected publications related to theoretical discussions on eco-social work were assigned in the software; and relevant quotations were identified, selected and saved. Using ATLAS.ti's coding features and techniques, all gathered publications were reviewed and a repertoire of gathered theoretical and conceptual codes were used as a base for developing a structured framework that guided the intended CDA of the gathered data (Rambaree, forthcoming). Reflexivity with regard to the literature review for developing the conceptual/theoretical framework was carried out using the AT-



LASti Memo feature. 'Edit Comment' was used for minor comments as reference for the codes and networks, and Memos were used for making some general reflexive notes in relation to the conceptual/theoretical framework (Rambaree, forthcoming).

ATLAS.ti 6.2 made it possible to undertake a rigorous CDA by allowing the combination of literature review with primary and secondary data in the various formats (text, photo, audio, and video) under the same hermeneutic unit. ATLAS.ti 6.2 therefore enabled the researcher to explore the gathered data

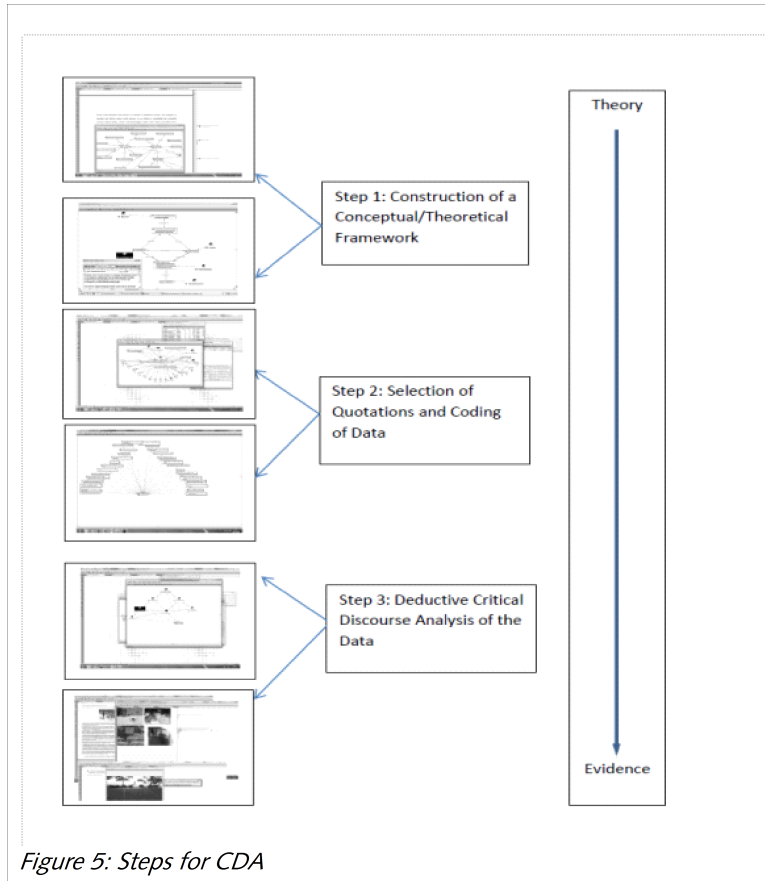


Figure 5: Steps for CDA

more in depth and breadth in looking for the meanings, motivations, and ideologies with an integration of supportive evidence from secondary sources. For instance, when analysing a discourse on how certain people try to control access to public beaches using their political and financial power, the researcher was able to link quotations from the interviewees with secondary materials such as press reports, court decisions, relevant reports and theoretical literatures from various journal articles and books etc. In this manner, it was relatively easier for the researcher to create breadth, depth and support for reporting such dis-

courses with reference to the memos and linkages. The analysis, presentation, and explanation of the gathered discourses, were once again done in a systematic, rigorous and transparent manner using a range of techniques, tools and functions of ATLAS.ti 6.2. The steps followed for CDA with ATLAS.ti 6.2 are depicted in Figure 5.

### ATLAS.ti: An Appraisal

Before proceeding with the appraisal, there are two limitations in this article that need to be pointed out at this stage. Firstly, the appraisal of ATLAS.ti is not considered in relation to other similar software. Not only because the intention in this article is not to provide a comparison; but also because the author is not versed in other similar software. Secondly, the appraisal is limited to the knowledge and experience

of the author. Perhaps there have been new developments in the most recent versions of the software which the author is not aware of.

For a relevant appraisal of ATLAS.ti it is imperative to have a sound understanding of what qualitative data analysis is. In its broadest sense, qualitative data analysis is the organization and interpretation of gathered data, aimed at providing an in-depth understanding of meanings and interpretations regarding to the social phenomena that are being studied (Rambaree & Faxelid, 2013). In a similar manner, Boieje (as referred in Harding, 2013: 4) points out that, qualitative data analysis consists of interpretation of data in a manner that seems relevant and meaningful in providing explanation on the phenomena being studied. Through qualitative data analysis, researchers therefore try to gain deeper understanding by digging beneath the surface of the gathered data with an interpretative aim (Braun & Clarke, 2013). In this sense, the manipulation of gathered data for the sake of interpretation is central within the process of qualitative data analysis. According to Patton (2002):

“interpretation means attaching significance to what was found, making sense of the findings, offering explanations, drawing conclusions, extrapolating lessons, making inferences, considering meanings, and otherwise imposing order” (p. 480).

Thus, in any method of qualitative data analysis interpretation is central. With the aim of interpretation-making from gathered data, qualitative researchers start the process of analysis by bringing order and structure to a mass of collected data. ATLAS.ti is a perfect tool for this purpose. Indeed, the software has a wide range of tools and functions for manipulating the gathered data with the aim of interpretation-making. For instance ‘Merge Codes’ allows researchers to organize the gathered data for re-arranging them in a structured manner for making systematic and logical interpretations without getting messy in dealing with the mass of data. Say for instance, several codes such as ‘Coral Bleaching’, ‘Garbage Dumping’, and ‘Unplanned Industrial Waste Disposal’ were all merged with ‘Degradation of Eco-System’ as a central code. In this way, the researcher has to deal with only the central codes rather than having several codes capturing similar issue/meaning. Then, by linking central codes, researchers can make note on the establishment of relationship between them. ATLAS.ti has functions, such as ‘Edit Comment’, ‘Memo’, ‘Network View’, that not only help researchers to write, save, organize, and link the interpretations with different parts of the data; but also, facilitate the process of making conclusions, extrapolations and inferences. For instance, when reporting the findings on discourses on how power is used to control access to the beach, the research was able to look at the ‘Network View’, and study different links, memos (including those with theoretical reflections from literature review) and quotations that were assigned during the analysis process to write about such findings. In a similar vein, Friese (2012: 235) states: “Working with network views stimulates a different kind of thinking and allows further explorations in different ways. It can also be used as a means of talking with others about a particular finding or about an idea to be developed.”

In all the above-given three examples, ATLAS.ti has been very useful in facilitating the task of the researcher/s to interpret the gathered evidence using different methodological approaches. Whether it is grounded theory analysis, thematic network analysis, or discourse analysis, ATLAS.ti is fully equipped with the capabilities for facilitating different methodologies of qualitative data analysis. The central aspect of qualitative data analysis, which is interpretation of qualitative data, can be carried out with ATLAS.ti in an organized, structured, logical, and transparent manner with support for creating visual demonstration.

Over the last decade, ATLAS.ti has made enormous progress in facilitating the task of interpretation of data. In particular, ATLAS.ti has not only constantly improved its tools but also has turned itself into a robust, reliable, and dependable software for easing the process of interpretation-making. However when it comes to the real sense of interpretation, what ATLAS.ti (as all the computer data analysis software) still cannot do for you is thinking. As Konopásek (2008) puts it:

“Software packages such as ATLAS.ti simply cannot do mental work for you. It is always you, as the analyst, who has to do the real analysis. Because only human researchers can think.” (p.2)

Thus, in all the three above-given examples the researcher had to think about methodological approach before starting with the process of data analysis. In any rigorous study, the knowledge of researcher/s regarding methodological approach is vital. Thinking about methods when designing a research strategy sharpens and enriches the data analysis with ATLAS.ti; it also facilitates the understanding of external influences in assessing the trustworthiness of the research findings (Bazeley, 2013). Despite the importance of understanding methodological approaches, discussions on qualitative data analysis with ATLAS.ti often fail to present different choices for conducting such analysis (Bryman and Burgess, 1994). Before starting to use ATLAS.ti, the challenge for the researchers is to think about different possible methodological approaches for qualitative data analysis and then appropriately plan the utilization of the tools and functions of the software.

Moreover, qualitative data analysis is a complex process that can sometimes be confusing (Thorne, 2000; Harding, 2013). The confusions in qualitative data analysis can arise when different groups of people carry with them different rigid ideas (right or wrong and sometimes completely opposing) about how qualitative research should be (Bazeley, 2013). To minimize confusion, data analysis with ATLAS.ti needs to be clearly structured and explained. In this connection, step-by-step guidance on different functions of the software for undertaking within the frameworks of different methodological approaches is important. For example, researchers could explain how grounded theory, thematic network analysis, or critical discourse analysis were undertaken under the methodology section when reporting the findings, in a similar manner as shown in the above cases.

Furthermore, confusion usually results from the lack of explanation on how findings evolved out of data; as well as, when researchers use language that accentuates the sense of mystery and magic in getting results out of data (Thorne, 2000). For example, obvious confusion arises among readers of a qualitative

research article when it is reported that a 'theme emerged from the data' without explaining the process of the data analysis involving the interpretation of data as a theme (ibid.). ATLAS.ti is a perfect tool for dissipating such confusions. See Figure 4, Step 2, for an example on construction of themes from data. When readers can see visual illustration on how themes were constructed from the gathered codes and quotations, they might be less confused about how exactly themes emerge from data.

In all the above examples, utilizing various tools, techniques, and functions of ATLAS.ti, it was possible for the researchers to provide clear and systematically organized explanations on how codes/themes/concepts/categories were created from raw data. In particular, through its VISE philosophy, which stands for Visualization, Integration, Serendipity, and Exploration (Friese, 2013: 9-10), ATLAS.ti helps researchers to demonstrate in an apparent and transparent manner the way through which findings (in the form of themes, concepts or categories) emerged from raw data.

In the past qualitative research had suffered from the criticism of not making data analysis explicit and open for inspection (Neuman, 2006). Owing to software like ATLAS.ti, qualitative research methods no longer have to be questioned for transparency and relegated to the marginalia of exploratory stages (Rambaree & Faxelid, 2013; Rambaree, 2007; Attride-Stirling, 2001). Software like ATLAS.ti has also made it possible for researchers to move away from 'purist' methodological approaches—either as positivism or constructivism—and to more pragmatically adopt contextualism in social research. For instance, it is easier to combine and interchange qualitative and quantitative data with computer based software. Indeed, software like ATLAS.ti has revolutionized qualitative research by allowing researchers to venture towards more variety of research strategies, focusing on how to provide best possible empirical explanations to research issues, problems and questions; and adopt innovative approaches in exploring new avenues for scientific inquiries (Brewer & Hunter, 2006; Rambaree, 2013). For instance, ATNA is one example on how it is possible to bring innovation to qualitative data analysis with ATLAS.ti. Taylor and Coffey (2009) state:

“...innovation in qualitative research methods can arise from the creation of a new method or idea. But it can equally be found in the development and enhancement of existing methods. Innovation can come in the form of a new analytical tool, or it can come in the form of a new conceptual approach or perspective to qualitative research data” (p 524).

In addition, ATLAS.ti enhances rigor in qualitative research through a variety of ways: By facilitating; data triangulation (primary with secondary data), coding reliability, reflexivity process, and perhaps most importantly in improving credibility, conformability and dependability (Rambaree, 2007; Friese, 2011).

It may be worth noting that Lu & Shulman (2008: 109) argue that, “ATLAS.ti lacks an easy mechanism to measure and report inter-coder reliability and validity.” It is important to point out that the scientific procedures and requirements of quantitative research, with an emphasis on indicators and numbers, are not advisable to qualitative studies (Hamberg, Johansson, Lindgern & Westman, 1994). However, this does not mean that validity and reliability have no significance. Tobin and Begley (2004: 388) state: “it is

argued that the transference of terms across paradigms is inappropriate; however, if we reject the concepts of validity and reliability, we reject the concept of rigour". Perhaps, it is high time to reflect on mechanisms through which both inter/intracoder reliability and validity can be reported in a concise qualitative manner within ATLAS.ti.

## Conclusion

Qualitative data analysis software like ATLAS.ti has enhanced our ability to undertake data analysis by presenting a multitude of means and ways of retrieving, sorting, and interrogating raw data (Bazeley, 2013). Indeed, ATLAS.ti itself has made enormous progress in facilitating the process of qualitative data analysis by incorporating new technological capabilities, and enhancing the existing ones. In this article, the possibilities, limitations, and challenges of using ATLAS.ti for undertaking three different methods of qualitative data analysis have been considered. From this examination it can be concluded that although there are numerous possibilities for supporting the analysis of the gathered data, the challenge of thinking about which methodological approach to adopt and how to proceed creatively with data analysis still remains on researchers. As Braun and Clarke (2013: 220) put it: "...any use of CAQDAS does not replace knowledge of an analytical approach". Software like ATLAS.ti facilitates the application of a particular methodology and supports the analytic process through coding, memoing, linking, and the network view functions. Researchers have to have a prior sound understanding of qualitative data analysis and methodological approaches so as to explore and take advantages of the great many benefits offered by ATLAS.ti.

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