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Mind mapping in qualitative data analysis: Managing interview data in interdisciplinary and multi-sited research projects

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Abstract
Typically, interviews are transcribed to enable coding and analysis of the data to establish the research findings. However, where discourse is not central, this article argues that mind mapping is a valuable tool to identify relationships and differences across large datasets. This is particularly useful for large-scale research projects that may also be interdisciplinary and/or multi-sited where the ability to transcribe and analyse audio-recordings is often a time-intensive process for the researcher and costly if outsourced. Additionally, there are challenges to analysing vast amounts of text into something meaningful. This article first reviews what mind maps are, and how they work. Second it explores the value of mind maps in qualitative data collection and analysis, particularly in the role of transcription. Third, using research conducted on volcano alert level systems, a methodology using mind maps to analyse interview recording is established. Fourth, the pros and cons of mind maps and potential application in other qualitative research methods and in different academic fields is discussed. Findings demonstrate that mind maps can be highly time beneficial providing a close and intimate reading of the data and enabling the researcher to make sense of the emerging themes, particularly for large data sets typically collected through multi-sited research, or smaller research projects with limited resources.

KEYWORDS
mind-mapping, multi-sited research, qualitative data analysis, interviews, transcription

1 | INTRODUCTION

As I child I remember my mother bringing home a video tape titled *Get Ahead*: *Ace your Exams* (1992)[1] by Lana Israel. The video documented how the method of mind mapping devised by Tony Buzan helped Lana "ace" her school exams. I watched it and marvelled at the wonder of what the mind map could achieve; I watched the video several times and started applying this abstract tree-branch-like method to my schoolwork to act as an aid memoir in my note-*taking* to

help revise and make the vital connections needed in my various disciplines at school (Buzan & Buzan, 2006). Little did I know that 20 years later I would be using the same technique as a note-*making* one to order and organise a growing mass of original research data. Nearly 35 years later I marvel at how little there is published about the use of mind maps as a tool to help researchers organise large quantities of rich empirical data to clarify their thoughts on a particular research project.

This paper aims to outline what mind maps are, how they work and have been applied in key research literature, and by using my PhD research as a case study I demonstrate how mind maps can be used to analyse large data sets to help provide a succinct analysis ready to start writing up from. This is particularly useful for interdisciplinary and multi-sited research that typically engages with a wide range of stakeholders over a range of locations (or sites) so to address the complexities involved. My PhD titled "Standardising warning systems" (2011) involved 93 recorded interviews to analyse, and with tight PhD budgets and deadlines, the 300 hours of transcription was not a feasible option. This raised practical questions about how to analyse vast amounts of text, and how to make sense of the data once transcribed without being overwhelmed. To resolve this conundrum I drew a mind map to represent each interview identifying key quotes, made notes on my thoughts in relation to the interview, and analysed the data to define my key arguments and points for the thesis. Whilst technology is seen to make interpretation and analysis ever easier by using software for qualitative data analysis such as Atlas-Ti and NVivo (Faste & Lin, 2012), where coding can be used on transcribed interviews, there is value in the researcher themselves engaging in the data and processing it to help map out what the research key ideas or findings are, and how they relate to one another, rather than outsourcing transcription (Kitchin & Tate, 1999). All mind maps were drawn by hand as studies demonstrate the value of writing and sorting data through writing increases memory and understanding whilst enforcing connections far more than typing, or using computer software (Mueller & Oppenheimer, 2014; Wiley & Rapp, 2021). In addition, there are audio nuances that cannot be captured in transcription that help the comprehension and analysis of the data (Thomas Markle et al., 2011).

Whilst this paper focuses on a case study of using mind maps to analyse interview data as a method of replacing transcription, there are broader applications of using the mind mapping technique that could benefit by the methodology devised, for example in analysing focus groups, mapping oral histories and communications, and more traditional ethnographies. Additionally, mind mapping can be used with already transcribed materials, or to make sense of large data sets for example from videos or other media. This paper demonstrates how these to use mind mapping techniques using hand drawn mind maps, which may be ideal for those less technologically literate, with less time or will power to learn new software, limited access to computers or relevant software, or those looking to be more creative with the ways they engage with data.

It is important to note that like any methodological tool, mind maps generate questions about how the world is being interpreted, engaging with the time old discussion of ontology versus epistemology (Mauthner & Doucet, 2003). In addition, they raise questions about how we make sense of an increasingly complex and connected world, and the growing interest in multi-sited research approaches to understand these connections. How can we standardise these interpretations to make sense of them? How can we find and define key connections and silence the background noise from these? These aspects are explored further in this paper in the hope to guide others who wish to try this method. First, the paper explores what mind maps are, how they work, and what they bring as a methodological tool in data sorting and analysis. Second, the roles of qualitative data analysis and transcription are reviewed to explore what mind maps have to offer as an alternative tool to traditional ones. Third, using my PhD research, a methodology is outlined to use mind maps to analyse recordings of interviews and demonstrate how these mind maps were used to generate the thesis. Fourth, the pros and cons of using mind maps, what they contribute to our understanding of the world, and the role of tacit knowledge and biases are examined. Of particular interest is the use of these tools for large data sets typically collected through multi-sited research. Finally, the potential application of the method outlined in the paper to different data sources such as focus groups, and different disciplines such as computer sciences is discussed.

2 | WHAT ARE MIND MAPS, AND HOW DO THEY WORK?

Following a personal quest on how to learn, think, memorise, be creative and read efficiently, Tony Buzan studied "psychology, neuro-physiology, semantics, neuro-linguistics, information theory, memory and mnemonic techniques, perception, creative thinking and the general sciences" (Buzan & Buzan, 2006, p. 11) to find the best solution. In short, his findings indicated that bringing together the physical and intellectual skills of the brain to work harmoniously with each other, rather than being divided, yielded extraordinary results. Simply building on both sides of the two hemispheres of

the brain enables a significant increase in memory retention and productivity. Even the simple use of colour in making notes made significant improvements. In 1971 Buzan published a series of books based on his research *An Encyclopaedia of the Brain and Its Use* which led to the concept of radiant thinking and mind mapping. Radiant thinking is a term coined to reflect the associative processes that proceed from or connect to a central point (Buzan & Buzan, 2006, p. 57). Radiant thinking in the human brain has five major functions: receiving, holding, analysing, outputting and controlling, that reinforce each other to promote all aspects of the brain working in synergy, with thoughts beginning from a central point. A mind map is the external expression of "radiant thinking", always radiating from a central image and reflecting the natural function of the human brain and following four key characteristics (p. 59):

1. The subject of attention is crystallised in a central image.
2. The main themes of the subject radiate from the central image as branches.
3. Branches comprise a key image or word printed on an associate line. Topics of lesser importance are also represented as branches attached to higher level branches.
4. The branches form a connected nodal structure.

As Frederick R. Barnard reportedly stated in *Printer's Ink* (December, 1921), "a picture paints a thousand words" as exemplified by Figure 1, which provides an excellent visual representation of the power of mind mapping.

Initially thought of as a tool for memory, it was Tony's brother Barry that highlighted the importance of this technique for creative thinking, for note-*making*, not just note-*taking*. In Barry Buzan's words:

> Mind maps were a more powerful tool for thinking because they enabled me to sketch out the main ideas and to see quickly and clearly how they related to each other. They provided me with an exceptionally useful intermediate stage between the thinking process and actually committing words to paper (Buzan & Buzan, 2006, p. 13).

Separating thinking and writing enabled Barry to think more clearly. *The Mind Map Book* (2006) provides a robust theoretical, practical, and graphic guide to the origins, use, and application of mind maps.

Following the adoption of mind maps, mind mapping software has developed that enables both the options for enormous mind maps made up of large data sets, but also the ability to integrate these tools with project management programmes, alongside its role as a visual aid. This has resulted in an increase in the use of mind maps, particularly in the context of business brainstorming and project management, which in stark contrast to Figure 1 tend to contain larger
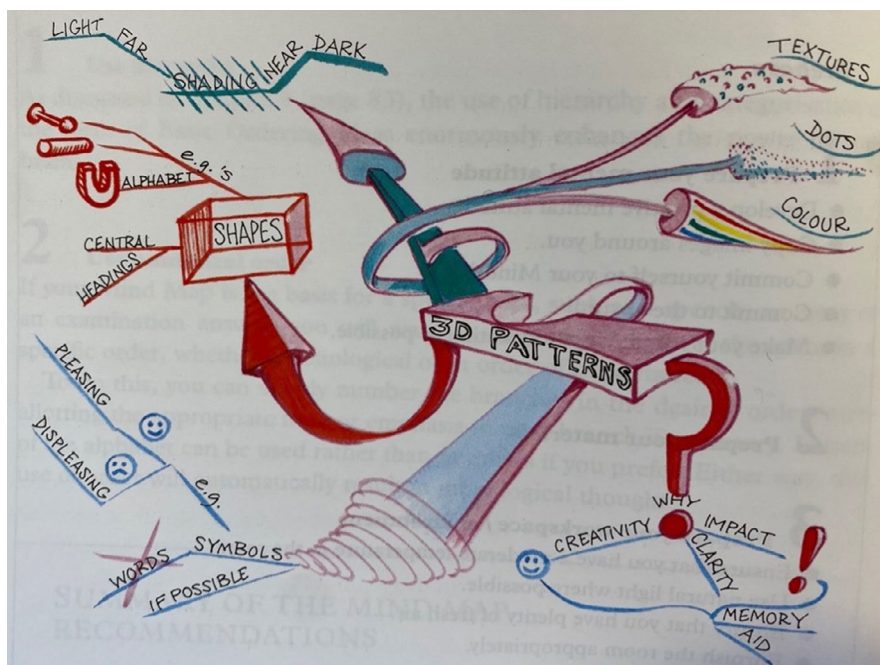

FIGURE 1 Mind map by Mark Brown demonstrating spectacularly the use of images, shape and dimension (Buzan & Buzan, 2006, p. 106)
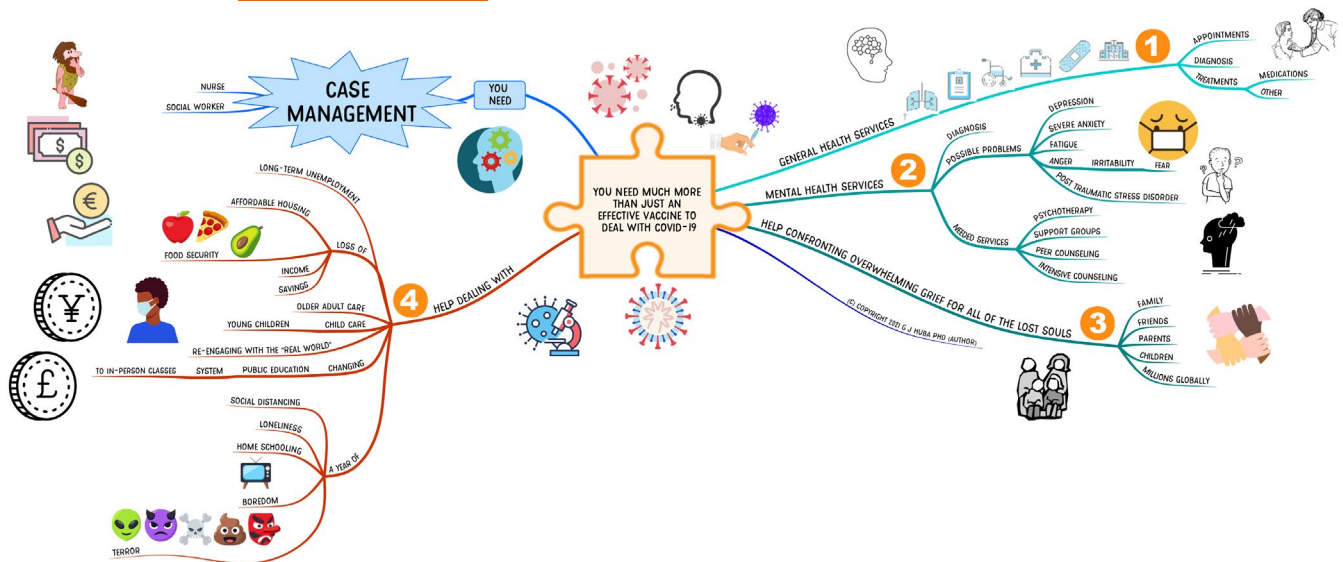
FIGURE 2 Example of mind mapping software to create the mind map 'You need much more than just an effective vaccine to deal with COVID-19' (Huba, 2021)

data sets with more text displayed. MindGenius is commonly available to use via university licenses and there are numerous open sources packages such as Miro Mind Maps and MindMaster. Many of these provide a sketch-like quality to the mind map, enabling colour, images and icons to reinforce the ideas of Buzan and Buzan (see Figure 2).

In essence, mind maps are diagrammatic representations of words, ideas or tasks, arranged around a central theme (Buzan & Buzan, 2006). This is unlike mental maps that are used to refer to a person's individual perception of their world or environment (Gould & White, 2012), or concept maps that focus on the relations and connections between ideas and concepts, often organising them into a hierarchical structure, as opposed to a thematic structure as seen in mind maps (Maxwell, 2012; Novak, 2010; Novak & Cañas, 2008). Mind maps have becoming increasingly popular tools to demonstrate how people visualise relationships between various concepts (Wheeldon, 2011). They are used to generate structure and classify ideas as an aid in study, organisation, problem-solving, decision-making and many other purposes, and have been used from everything from educational purposes, family storytelling, to personal reflection, to even the development of a Boeing Aircraft. Kotob et al. (2016) provide a detailed literature review on mind mapping and its use, incorporating key studies over the past 30 years. Mind maps are a useful guide to the intuitive arrangement of concepts into branches, using key words to make connections between portions of information and are often hierarchical. In this respect they bear many similarities to the use of nested hierarchies of codes used in qualitative data analysis. However, literature on the use of mind maps as a tool in qualitative research, particularly qualitative data analysis, is surprisingly scant given an increasing tendency to visualise and represent data in more digestible formats (e.g., infographics) that are prime to share on social media. The use of mind maps in qualitative data analysis is further discussed below, and whilst it is perhaps not uncommon to apply mind maps in such analysis, it is seldom reported.

3 | THE VALUE OF MIND MAPS IN QUALITATIVE DATA COLLECTION AND ANALYSIS

Qualitative data are the backbone of multiple disciplines' research processes, often resulting in a more nuanced, context-rich and representative data than those used in quantitative research. Interviews are a common means of data collection as they facilitate interactive dialogues between the researchers and the participants. Semi-structured interviews in particular enable flexibility and adaptability for the researcher to get to the heart of their research questions and explore varying understandings and perspectives (McCracken, 1988). Given the richness and quantity of data generated in an interview, it is common practice that these interviews are recorded for subsequent analysis, with ethical consent by the interviewee. Analysing vast amounts of data in a single interview can be a daunting process, not least because the researcher may frequently adopt grounded theory or engaged theory approach to devising common themes, issues, values, questions or findings to present in empirical chapters or papers that ideally need to be rich with quotations from the interview as

supporting data, giving a voice to those who contributed. Major qualitative data textbooks outline the method of using transcription as the key tool adopted to help capture the information in an interview (Denzin & Lincoln, 2017; Saldaña, 2015), and the role of coding (manually or with the use of software such as NVivo) to code the data and help the researcher analyse the data to generate themes and catalogue perspectives on a particular issue or topic (Kitchin & Tate, 1999).

3.1 | The value of transcription

Shelton and Flint provide an up-to-date literature review on the dichotomies of transcription methods and practice that is informative, but also flags that:

> Transcription is a complex undertaking, often rife with ethical, theoretical and political implications. That transcription is such a pervasive component of qualitative research alone argues for thoughtful consider-ations of how the practice and product get discussed, applied, analyzed and taught (2020, p. 9).

They further highlight that researchers tend to consider transcriptions as "straightforward and matter of fact, ignoring interpretations and choices necessarily involved" or at the extreme other discuss "transcribing as theoretically laden without fully examining the more practical elements of transcription" (p. 9). Their study highlights that transcription itself, whilst extensively used and adopted as a qualitative data analysis tool, has a number of limitations that affects its value. However, Halcomb and Davidson (2006) ask whether verbatim transcription of interview data is always necessary. Verbatim transcrip-tion refers to the "word-for word reproduction of verbal data, where the written words are an exact replication of the audio recorded words" (p. 38). The way that interview content is both heard and perceived by a transcriber is key to the accuracy of the transcription. Halcomb and Davidson argue that "the use of analysis techniques such as thematic or content analysis seeks to identify common ideas from the data, and therefore does not necessarily require verbatim transcripts" (p. 40), as opposed to conversation, discourse and narrative analysis. There is a need to recognise the researchers' notion of participants' non-verbal behaviours as central to the reliability, validity and veracity of qualitative data collection (MacLean et al., 2004). To date, however, there has been limited discussion on the use of selective transcription and how it can be achieved (Gilbert & Stoneman, 2015). To go further, Britten (1995) also questions the authority of transcription to other methods of managing interview data. There are many cons to verbatim transcription, the cost in terms of time, physical and human resources, the scope for human errors including misinterpretation of content, class, cultural differences and language errors. Memoing and field note writing are said to be more beneficial than just using an audio recording that is then transcribed (Fasick, 1977; Wengraf, 2001). These notes help capture researchers' thoughts and interpretations during the process of listening to the audio recordings that go beyond the potentially simple clerical task of transcribing verbatim. Indeed recording interviews also provides a wealth of advantages in itself, for example it is possible to review the content, and for others to listen such as supervisors (Halcomb & Davidson, 2006).

It is challenging to generate a verbatim transcription of interviews when there are many of them. With an increase of inter-disciplinary and multi-disciplinary research projects that cut across numerous disciplines, frequently addressing com-plex problems, researchers are expanding the scope of their research to engage with a wide range of actors or stakeholders on a topic, and also may need to engage with those in a wide range of geographically different regions or institutions. The concept of multi-sited ethnography devised by George Marcus (1995) encompasses this widening scope and is described as:

> A name for modes of research which collapse the distinction between the local site and the global system, thereby challenging the division of labour separating the "fieldsite" as province of the ethnographer from the more abstract "context" requiring the different tools of the economist or the political scientist. The multi-sited ethnographer should identify "systemic" realities in "local" places, studying the world system directly on the ground; this requires a willingness to leave behind the bounded field- site and follow people, stories, metaphors, or objects, as they themselves travel from place to place, and move between different media (Candea, 2011, p. 485).

Ultimately, as Marcus believes, adopting multi-sited approaches makes it possible to "map a terrain, which may not be a holistic representation, but one that cannot be understood by analyzing just one site" (1995, p. 112). Whilst the idea of multi-sited research has gained significant momentum, it has not been without criticism or debate on "refunctioning ethnography" (Holmes & Marcus, 2005), that robs ethnography of its central tenant. Hage (2005)

argued that the concept of a single geographically discontinuous site is more useful than that of multi-sites, and that the method can imply tacit holism. Candea (2007) argued that ethnography is about setting up "arbitrary locations" and challenges to a methodology that has limitless narrative possibilities (p. 168). Despite the criticisms, the debate around multi-sited research has shown differing values in multi-sited versus single-sited approaches, where the former is about extending rather than containing research, raising questions around "Depth", responsibility and holism (Falzon, 2009). The 2009 collection *Multi-sited ethnography*: *Theory*, *praxis and locality in contemporary research*, edited by Mark-Anthony Falzon, provides a rich set of critical reflections and practical examples for researching social formations spanning numerous localities, including a chapter focused on "Localizing climate change: a multi-sited approach" (Krauss, 2009), a topic core to Geography and the concept of multi-sited ethnography. In addition, Jokela-Pansini (2019) highlights the value of multi-sited research in improving understanding of transnational concepts, in this case "women human rights defenders" by arguing that:

> Conducting collaborative and participatory research at multiple sites helped to break hierarchies and to include multiple perspectives in the research process. It made us –the participants, research collaborators and me– together critically view the concept and think about other ways to frame the same issues. Therefore, multi-sited research goes beyond mere self-reflection on positionality because it encourages us to include participants' and researchers' gaze beyond a single case study (p. 521).

With multi-sited research projects being a fundamental component of many areas of geographical inquisition, there are key questions around how is it possible to cut across large data sets to establish findings to address the research questions? Whatever the method, there is a need to standardise the approach to data analysis so it is fair, thorough and consistent to enable the researcher to reduce their bias and the impact of human judgement. Also, there may be limitations on resources to collect and analyse the research. Therefore, there is a wealth of reasons why a verbatim transcription may not be feasible or optimal, particularly in post-structuralist, complex research. On top of this, transcription itself is open to biases (as discussed above), and does not capture all the data an interview provides. Conversations are so rich: the tone of the voice, the specific language used, sarcasm or humour, are vital to assist in the complex analysis of data that do not transcribe readily into text (Greenwood et al., 2017; Thomas Markle et al., 2011).

3.2 | Replacing transcription

Is it possible to use different tools to replace transcription as a main form of qualitative data analysis (QDA)? There have been three key approaches commonly adopted to date:

1. **Scribing:** "The documenting of comprehensive notes, including verbatim quotes by an independent observer during an interview" (Eaton et al., 2019, p. 586). It was found by Eaton and colleagues that there is a high consistency in the number and content of themes from scribed versus transcribed data, yet scribing produced less data and was economically superior.
2. **Notes/field guides:** Halcomb and Davidson (2006) outline six key steps to data management, of which three outline the notetaking process:
   a. *Step 1*: *audio taping of interview and concurrent note taking*. Quite often this will take place as note taking concurrent to the interview taking place. There is always a danger that note taking in an interview will disrupt the flow, so the focus is to provide notes on the interaction or thoughts rather than the verbatim responses by the interviewees.
   b. *Step 2*: *reflexive journaling immediately post-interview*. Immediately after an interview the researcher will often provide some reflexive journalising to provide analysis and key reflections on concepts and ideas and issues.
   c. *Step 3*: *listening to the audiotape and amending/revision of field notes and observations*. When listening back to the audio recording the notes will be reviewed to check their accuracy and also give the option of providing additional notes.
3. **Mapping the interviews:** there are a number of different mapping tools adopted to represent audio data. This includes concept maps, mind maps and mental maps. Mind maps, as outlined in Section 2, involve focusing on one main topic that branches out into nodes in a centre-out hierarchical structure. Each node represents a specific subtopic described with symbols and images, which can be further elaborated and branched. Mind maps are more personal than concept maps. Concept maps, however, are diagrams that depict suggested relationships between concepts and typically represent ideas and information as boxes or circles, which they connect with labelled arrows, often in a

downward-branching hierarchical structure. Concept maps are more factual as they identify more main concepts and the systematic and complex relationships between them. The technique for visualising these relationships among different concepts is called concept mapping (Maxwell, 2012). Mental maps are a way of combining our objective knowledge of places in addition to our subjective perceptions, or opinions, of locations around the world, and are commonly used by geographers and psychologists to provide a first-person perspective. They are commonly used to collect data, but can be used by the researcher too as a tool to visualise and represent data (Gould & White, 2012).

4. **Visualising data:** a wide range of visual methods used to gather and analyse data such as those used within GIS (Cheshire et al., 2012), and more broadly in sketch maps and quantitative GIS (Boschmann & Cubbon, 2014). Specifically other visual methods have been applied within interview data collection and analysis, including grounded visualising to analyse interview data (Jones & Evans, 2012), and sketch maps on spatial experiences and knowledges of participants (Brennan-Horley & Gibson, 2009), although in many cases visual tools were used to collect additional data during an interview or potentially used in place of an interview, rather than to map the interview content. Consequently, the use of mind mapping of interview content may be useful for other methods of visual representation in terms of providing further visual ways of representing the data, themes and issues emerging from the research.

3.3 | Using mind maps in qualitative data analysis

Mind mapping has been a frequently applied tool for both data collection within an interview (or focus group), and to replace data analysis via transcription. Mind mapping has been used in QDA studies in varying ways that will be discussed, but is it vital to address upfront that studies have shown that mind maps can be just as effective as transcribed data in terms of developing codes and themes. Greenwood et al. (2017) conducted a study whereby they compared data analysis of a focus group conducted with critical care nurses from Australia. Two team members analysed the transcribed focus group data, and two directly analysed audio recordings from the focus groups. As a result, the themes generated using each technique were consistent and no different themes or subthemes were identified. In conclusion, the direct analysis methods offer more cost-effective, trustworthy and possibly superior alternatives when used with focus group data (as long as the researchers are experienced and understand the relevant contexts). This study provides compelling evidence of the value that mind mapping can provide in QDA.

Mind mapping can be used in different ways for qualitative data collection and analysis. Four key methods and example studies are provided below:

1. **To visualise big data:** Gavrilova and Gladkova (2014) discuss the value of using visual structuring strategies of big data specifically using mind maps. Their ontology engineering was used to provide structures and mental models that support information understanding. They were able to represent around 7500 respondents to a cross-national project survey on entrepreneurial development in over 67 countries generating 218 variables. However, the data upon analysis could be simplified and "beautified" with the help of ontological engineering to generate a single mind map, demonstrating that visual techniques such as mind mapping to "present the data helps to understand the meaning embedded when collecting large amounts of data" (Kotob et al., 2016, p. 249). In a world where big data are a zeitgeist, mind maps offer a powerful tool to present analysis in a digestible form.

2. **To visualise notes and documents:** a study by Meier (2007) used mind maps to organise agendas, meeting notes and documents which became an integral part of the internal communication of their MAGNET project, a transdisciplinary study on modelling gun crime. Meier and his team also developed a separate mind map on the current literature that acted as a useful shared resource, which has also been made available to the project stakeholders. As such, the project demonstrated the effective use of mind maps to organise qualitative data.

3. **Focus groups:** Burgess-Allen and Owen-Smith (2010) conducted a detailed analysis of the use of mind maps in focus groups to facilitate a more in-depth understanding of the views of patients and service users. This was driven by the barriers of the significant resources required for transcribing and analysis, and the qualitative research expertise available within the organisation (NHS). Mind mapping was examined to provide a pragmatic solution to these barriers. Burgess-Allen and Owen-Smith used mind mapping in a variety of forms. First, in the public participation where a facilitator created a mind map during the focus groups discussions. This created significant value because the participants were able to comment on the evolving mind map and correct any misinterpretations. Second, a copy of the final mind map was sent to participants to highlight differences from the original map, and establish credibility. Third, a meta-map that brought together all the major themes that emerged from the research was devised. In the Meier et al.

study (2007) mind maps were used during focus groups that represented key literature to be used as a discussion guide, and in turn the mind maps evolved further during the discussions.

4. **Interviews:** There is a distinct shortage of studies on the role of mind maps to be used as an analytical tool for interviews, but three key studies have used mind maps in different ways. First, a study by Wheeldon (2011) highlights the role of mind maps to uncover the experiences of Latvians involved in a legal technical assistance project. Wheeldon found that those participants who completed mind maps identified "a greater number of unique concepts and provided more in depth resources about their experience in later interviews" (p. 509), essentially acting as a prompt to aid unlocking memories and experiences. Second, the study by Meier (2007) adopted mind maps as a replacement for conventional interview schedules to aid the interviewees in the exploration and fluidity of the information generated as the discussion evolved, rather than being too linear. This was in part to compensate for the challenges that skilled interviewers can find to address all the research questions without disrupting the flow of the interviewee. The questions were open ended to help define and explore the topic around gun culture. Third, Kotob et al. (2016) provide an overview of a methodology devised to use mind maps to analyse transcribed semi-structured interviews with employees of the Lebanese Association of SOS Children's Villages. They transcribed interviews using typical methods, but proceeded to highlight relevant areas and themes, and recording relevant interview data on a mind map that were then input into spreadsheets to represent the various themes that emerged from the research. This research project is the closest methodology identified to that proposed in this paper, although still starkly different. Kotob et al. do state that "researchers can avoid the need to create data transcripts in order to save time by listening to audio files and noting the theme that appear in interviews directly onto a mind map" (p. 251). The study concluded that the "mind mapping technique is useful for analysing research data" and "enables the organisation of thoughts, the analyses of large research data, the identification of concepts present within interviews, and the communication of findings with ease" (pp. 252–253). This is in line with the work of Buzan (2006) that mind mapping helps in organising thoughts and solving problems. Kotob et al. specifically state that this approach may be "especially valuable when analysing complex environments with large amounts of research data which is difficult to analyse using the transitional linear thinking methods" (p. 255). This study highlights that providing large data sets on a single page/mind map is much easier to analyse and communicate with others. Finally, in studies of nursing it has been suggested that "mind mapping can allow researchers to make rapid and valid transcriptions of qualitative interviews without the need for interviews to be transcribed verbatim" (Tattersall et al., 2007, p. 32). In this paper, maps were generated during the interview, rather than from recorded data to save time in transcription, aid quicker turnaround of health data, and may aid the researcher's analysis of the data by "giving the researcher the ability to "bracket" their own preconceptions" (p. 32).

3.4 | Challenges of using mind maps

It could be argued that non-linear research on non-linear topics must beget non-linear analysis methods. There are lots of pros presented in the above four methods, particularly of interest is the use of mind maps to analyse interviews. However, there are also some concerns with their use that are highlighted below (Kotob et al., 2016, p. 256):

1. The need for more academic scrutiny to assess the suitability of the technique in qualitative research (Burgess-Allen & Owen-Smith, 2010; Wheeldon, 2011).
2. The need to academically define what detail and depth mean in order to properly assess mind mapping research findings (Wheeldon, 2011).
3. Choosing biased research participants who may not deliver the full picture (Kollock et al., 2012) or may not provide the depth of research responses (Wheeldon, 2011).
4. The possible non-suitability of using the technique for conducting exploratory inquiries (Burgess-Allen & Owen-Smith, 2010).
5. The suitability of the technique for answering "what" questions but not necessarily "why" questions (Burgess-Allen & Owen-Smith, 2010).
6. The possibility when using the technique to find it difficult to capture contradictory comments which would result in overlooking these comments for the purpose of retaining coherent research findings (Burgess-Allen & Owen-Smith, 2010).

Many of these concerns are addressed in the methodology adopted in my own PhD research discussed in Section 4, but a summary table provides an overview of using mind mapping in qualitative data analysis (see Table 1).

TABLE 1 Pros and cons of using mind mapping in qualitative data analysis (Burgess-Allen & Owen-Smith, 2010, p. 413)

Pros	Cons
Speed and cost effectiveness	Limited analytical depth and opportunity for interpretation of data
Generate codes 'live'	Harder to get beyond the why
Cost effective	Less suited to relatively unstructured inquiries
Pleasing graphical summary of themes/findings	Comments that don't fit or are unclearly expressed are harder to represent
Helps stimulate and galvanise discussion and keep it on track	
Participants can have ownership of the process	
Allows rapid dynamic between data collection and feedback	
Results in broadly similar themes to traditional qualitative techniques	

Transcription is inherently interpretative, shaped by the assumptions and biases of the transcriber (Jaffe, 2007); two different transcribers may hear differently and select relevant spoken material differently (Stelma & Cameron, 2007). There are also a number of ethical considerations that McMullin (2021) highlights in using transcription and qualitative research methods, including challenges of ethical representation (Kvale, 1996), representing slang, colloquialism and accents (Oliver et al., 2005), and seeking approval from the interviewee of the transcript which can either empower or embarrass the interviewees (Mero-Jaffe, 2011). These problems are also relevant to mind maps but are less prevalent because rather than focusing on the detailed discourse, the mind maps capture the essence of what is being said. No additional ethics requirements are needed beyond that required for transcription, and arguably if mind maps were not used to obtain specific quotes, ethical approval may not need to be as stringent due to anonymity, although normal ethical standards would be required for the interview process itself, along with appropriate ethical behaviour by the interviewee (Crowe & Sheppard, 2012).

In summary, there are numerous methods and values to using mind mapping in qualitative data collection and analysis, but studies on the use of mind mapping to analyse interviews remain scarce. If a verbatim transcription is not necessary, as discussed above, then using mind maps to code interviews provides an additional method of analysis, without the need to transcribe the interviews. Mind maps have proved to be a highly effective way to represent data either in their collection or analysis, as well as providing a systematic tool to capture the interview content captured in audio recordings, be it interviews or focus groups. In addition, using mind mapping rather than transcription appears to not deter the quality of the data analysis (themes and codes identified), is more time and cost efficient, and provides a tool to bridge the divide between data and analysis more directly. The mind mapping methodology presented in Section 4 highlights how this was conducted in a research project, demonstrating that whilst some of the "cons" and concerns highlighted above are valid, they can be addressed by devising a robust and standardised approach to the use of mind mapping to analyse interviews.

4 | A METHODOLOGY FOR THE USE OF MIND MAPS TO ANALYSE RECORDED INTERVIEWS

4.1 | The case study: Research rationale and context

Conducting interdisciplinary work is both a challenging and rewarding experience, but one of the significant challenges faced whilst conducting my PhD research was the ability to use effective methodological tools in order to analyse vast and diverse research data. In this particular case, I examined the space between the study of volcanoes and the communication of these hazards as part of a volcano early warning system. I was interested in tracing the purpose, implementation and effectiveness of volcano alert level systems (VALS), as used at volcano observatories to address my overarching research question: To what extent is a linear, standardised VALS an effective warning tool for volcanic hazards in different contexts of complexity, uncertainty and risk?

A volcano observatory is essentially a facility wherein monitoring data are assembled and analysed in order to better understand a volcano's behaviour so as to provide warnings to populations that allow them to be better prepared for

volcanic hazards. They range from small offices, operated by one person and with limited monitoring equipment, to highly sophisticated offices with a wide range of state-of-the-art monitoring equipment. The functions of a volcano observatory can be broken down into: (i) data collection via the process of volcanic activity detection using various monitoring techniques; (ii) data analysis: assessment and interpretation of data; (iii) forecasting: establishing the volcano's status from the data analysis, that is, quiescent, restless or building to eruption; and in the latter case the likely timing, duration and climax of the eruption and the nature of associated hazards; (iv) providing an alert level for the volcano's behaviour based upon discussion and consensus; and (v) research relating to volcanic behaviour and the applicability and effectiveness of monitoring techniques, amongst other areas. A volcano observatory forms a central focus for the monitoring of volcanic activity and communication, including with civil authorities and local government through emergency plan coordination, the media via interviews and press releases, and the public via education and outreach events. As well as the often legal duty to provide warnings, a volcano observatory also provides a research environment.

A volcano alert level system can be defined as a warning level that provides different stages of alert that correspond to levels of volcanic unrest and activity to a number of users, including civil protection, landowners and the public, among many others. It is in many cases issued by the volcano observatory. The case study I selected was the United States of America, where the United States Geological Survey operates five different volcano observatories. Prior to 2006 four of the observatories had developed and devised a VALS that was particular to the volcanic hazards and social contexts in which they operated, but after 2006 these systems were standardised and each observatory adopted the new VALS, including one observatory that had never used alert levels before. This case study provided the opportunity to trace this process of standardisation, along with the adoption of the new VALS at each observatory and by the various user groups, albeit within the United States. This enabled the opportunity to conduct a multi-sited research project (Marcus, 1995, 2016), using the issue of the VALS standardisation as the "flag" to be examined in each location and by the various and numerous stakeholders. This in turn enabled the black box of VALS to be examined (Fearnley, 2013; Fearnley & Beaven, 2018; Fearnley et al., 2012).

4.2 | Research methodology: A multi-sited approach

There were several approaches available to address the research questions: the traditional and well-tested option of conducting a detailed case study in one location providing an in-depth ethnographic examination, or even potentially comparing two locations to investigate these issues, or to adopt a multi-sited approach (Marcus, 1995, 2016). Traditional ethnographic research involves "the study of groups and people as they go about their everyday lives" (Emerson et al., 1995, p. 1), involving an immersive study where the researcher must live with the group studied and become part of the group, either actively or as acknowledged background (Hammersley, 1991). Ethnographic conventions claim that "a detailed, in-depth picture of a group, organisation and its members can be developed", so that the "social, cultural and political issues which other methods find intangible are at the centre of analysis" and that "ethnography is strongly participative, allowing for members of groups to comment on the data and data gathering as it occurs" (Neyland, 2007, p. 160). Acknowledging its colonial lineage as a purportedly "outside", "critical" observation of "other", apparently autonomous cultures, ethnography has been reworked as a reflexive exploration of late-modern cultures in ways that give attention to their poly-vocal, reflexive, and "multi-sited" nature (Marcus, 1995). In multi-sited ethnography, the researcher moves between and betwixt sites of observation and participation, noting and calling into question dichotomies such as the "local" and the "global", the "lifeworld" and the "system" (Marcus, 1995, p. 95). At the core of multi-sited ethnographic research is the tracing of social formations across multiple sites of activity; following connections, associations and putative relations that can enhance a sense of connectivity between sites, to be sure, but that can also lead to the active construction of borders and boundaries and the fulmination of difference (Jokela-Pansini, 2019). Multi-sited ethnographies thus can be argued to define their objects of study as the material linkages between sites, and their particular form and effect as manifest in the circulation of an object or idea, for example, but also in the transformation of a person or object's capacity for actions when participating in that circulation, as discussed extensively in the edited collection on multi-sited ethnography by Falzon (2009). Multi-sited approaches thus eschew the dense geolocation of people and things as a mode of understanding the world, and the notion of site as a topographical feature, and instead emphasise the conjunctions and conjugations that allow for the contours of sites—their insides and outsides—to emerge (which as outlined in 3.1 has been criticised as being against the very core of what ethnography is). It was decided to adopt a multi-sited approach where the five observatory sites are connected through the circulation of

policy, as well as personnel, and revolve around a particular physical feature/s (volcanoes), yet are singular sites, each with their own context.

4.3 | The methods adopted and devised

The research methodology was designed not to enumerate the measurable properties of social characteristics and contexts, as is often the case in behavioural research on risk, but instead to explore the constitution of shared meanings or contested moments through attention to language and practice, taking seriously the complexity of human sense-making within a particular situation (Kurtz & Snowden, 2003). The study took place in two phases, a pilot fieldtrip during 2008, and then the main research phase in 2009. The main research phase was undertaken at all five of the USGS' volcano observatories, including Yellowstone (YVO) and Hawaii Volcano Observatories (HVO) following additional approval from the USGS. The five observatories are located in Anchorage and Fairbanks (AVO), Vancouver, Washington State (CVO), Big Island, Hawaii (HVO), and Menlo Park, California (LVO and YVO—now the California Volcano Observatory).

A total of 12 weeks was spent researching across the five observatories primarily conducting 93 semi-structured interviews (Baxter & Eyles, 1997; McCracken, 1988) that were completed with a number of actors involved in the VALS: scientists within the USGS Volcano Hazard Program (VHP); with users of the VALS at other federal agencies, such as the National Weather Service, US Forest and National Park managers; and with collaborative partners, such as universities and state officials. In addition, a multi-sited ethnographic study was conducted that encompassed attending observatory meetings, workshops, open days, educations events, and working in the everyday office environment.

This methodology generated a vast amount of mixed data including recorded interviews (from 30 min to 6 hours per person), journal notes, diary notes, documents and archives. The volume of the data made the use of traditional qualitative analytical processes such as transcription and coding unviable due to time constraints, and costs to outsource the transcription, and would generate vast amounts of text to analyse, potentially over 1,500 A4 pages of text. In response, a methodology adopting mind maps as a tool to visually "transcribe" and capture the essence of the 93 interviews conducted was devised that enabled appropriate management of the data, provide a record of analysis, and also enable a streamlined coding and transcription process that is somewhat similar to that adopted by Kotob et al. (2016) but differs by directly using mind maps from the audio recordings to generate the mind maps, rather than develop them from transcriptions. This is more akin to the studies by Meier (2007), Burgess-Allen and Owen-Smith (2010), and Greenwood et al. (2017), although in the use of interview recordings rather than focus groups. Mind maps provide the ability (as discussed in Sections 2 and 3) to manage a wide diversity of data that can be easily sorted and sifted such that expected linkages are apprehended, but also unexpected ones. Whilst research projects can be locally specific and often quite technically focused, the mind mapping technique devised facilitated interviewing a significant number and range of stakeholders over a large geographical area providing a richness of data that can be relevant to a wide range of research studies, even those not multi-sited in nature.

4.4 | Preparing for the interview data collection

In the preliminary fieldwork, open-ended interviews were conducted to gain insights into the role of the scientists and the function of the volcano observatory from the interviewee's experience. These initial enquiries then formed the basis for the development of a more systematic interview schedule that was then used during the main research phase. The interview schedule was centred around a set of core questions or themes, repeated with different respondents to explore the issues raised by the standardisation of the VALS in more detail, and to follow up questions around meaning, understanding and context (Baxter & Eyles, 1997). In this study, the majority of interviewees were interviewed twice, first during the pilot research and then as part of the main study, thus adding insights into the stability and diversity of views, as well as building rapport and trust. Following a brief introduction, a review of the recording and ethics form and anonymity, the interview commenced, structured around seven key themes, namely:

1. Contextual information about the interviewee such as what their job is, in what way they are involved in VALS, and what they consider as the purpose and definition of VALS.
2. A review of their understanding and involvement in the standardisation process.
3. The implications of the application of the standardised VALS.

4. How the interviewees dealt with uncertainty and how they created meaning within the VALS.
5. Interviewees were asked if they could provide examples (case studies) from their experiences that illustrate how VALS worked before and after standardisation, in an attempt to prompt contextualisation to the elements of knowledge, uncertainty, risk and communication involved.
6. In the final section, the interview opened out to review the changes the standardised VALS has brought, what the future challenges are, and whether in their opinion it is feasible to globally standardise VALS.
7. At the end, interviewees were asked if they had any other comments or questions.

These seven themes were carefully selected as they formed the seven key branches in each interviewee mind map, thereby providing an initial level of sorting and analysis to help manage the data generated, independent of the order or detail addressed in each interview. Producing the mind map helped develop the initial descriptive process into a classificatory and connective one, providing an immediate visual comparison between interviews and observatories. This type of analytical preparedness made the mind mapping template easy to develop and reproduce, and provided a standardised way to manage all the data presented. This provided a level of consistency and fairness to the sorting of the data, whilst also enabling the ability to capture emerging topics or themes from the interviews under the various branches of the themes.

All interviews were one-to-one to encourage in-depth discussion of complex issues, remove potential bias due to organisational hierarchies that may be apparent in group interviews, and enable interviewees to express personal opinions. The same interview schedule was repeated with each scientist, returning to the issues from different angles and perspectives. A group interview was not seen as suitable for this study as these can be difficult to organise and facilitate within organisational settings where there are existing group dynamics, which are not known to the researcher and may inhibit certain viewpoints. One of the most valuable questions asked to each participant was "what is your definition, and understanding of the purpose of VALS?" The variety of answers across all stakeholders was fascinating, and whilst a simple question, got to the heart of what a VALS is.

4.5 | Analysing the interview data: the mind mapping method

As commonly seen in multi-sited research, the interview data collected was rich and vast. To organise the data sets, all recorded interviews were uploaded into the QDA software package, Atlas-Ti. The interviews were played back via freeware called Express Scribe v.4.2.3, written by NCH Software, which enabled the interview to be played back at different speeds, to aid quote transcription, but also enabling the simultaneous construction of a mind map (see Figures 3 and 4). Research memos and original field notes for each interview were also uploaded into Atlas-Ti so that all files, audio, visual and written materials relating to a single interview were stored together, including the mind map. In Atlas-Ti different Hermeneutic Units were used for each observatory, so keeping all the related information for an observatory case study together. This method enabled the data to be organised in a manageable form.

Drawing the mind map was fairly straightforward. At the centre, an image to represent each of the five volcano observatories was developed with the interview code (to protect anonymity). The image represented key aspects of each site, for example Alaska volcano observatory largely deals with volcanic ash and issuing warnings to the aviation sector, hence the image had a large ash cloud and an aeroplane (see Figure 3). Mammoth Lakes volcano monitored by Long Valley Volcano Observatory has a ski resort and so the image has a skier and cable car to represent the location (see Figure 4). This enabled instant identification as to which observatory the participant was associated with. The "mapped" interview was represented by seven branches representing the seven different questions in the interview schedule: background and involvement of interviewee with VALS, process of VALS, use of VALS, implications of standardisation of VALS, case study examples, future of VALS, and an additional branch for other information. Each branch in every mind map had the same colour, and certain symbols and acronyms were used throughout the mapping process, for example use of VALS was always in red, the individual involvement in blue. Consequently, the time taken to map an interview was usually around the time of the interview (as often played back at a fast speed). The benefit of doing this from a recording rather than during the interview have been discussed in Section 3, but essentially frees the interviewee to concentrate on the questions and answers process, particularly in a semi-structured interview.
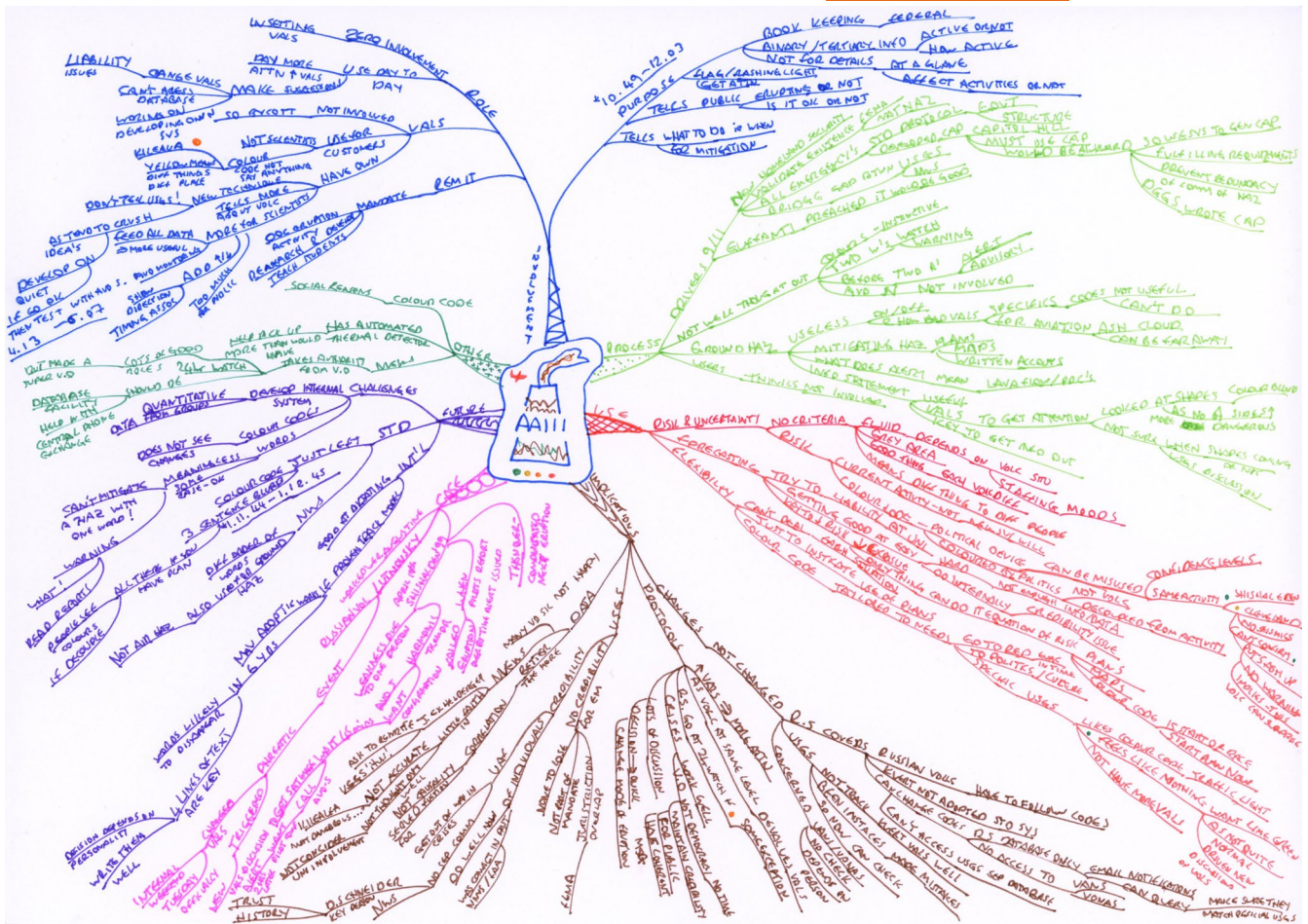
FIGURE 3 Mind map from an interview at Alaska Volcano Observatory. Note the image in the middle represents the issues of ash impact to aviation at the observatory (Fearnley, 2011, p. 272)

As the interview recording played, the points addressed would be added to the core seven branches where appropriate. Each major point or subpoint created a new branch, with the points made forming subbranches. Not too much thought was put into the development of the sub-branches; it was easier to go with the flow of the dialogue. However, it is in this process of developing the branches that a secondary level of analysis was taking place, for example, in the use of VALS a branch may capture issues in relation to the design, criteria and implementation that then help when viewing these exact themes in each interviews. Some of these first order branches became standardised unwittingly but this provided an additional level of coding and sorting. Generally, one to three words were used to address the point made—as mind maps are about key words and connections; the context was already developing in my mind from my research experience, the interviews, and then listening to them again for analysis. Any new point was captured in a new branch, or added to a previously drawn branch the topic had connection to, even if in a different major branch. The mind map gives the flexibility to make the data fit to the themes and connect to points from different parts of the interview. In so drawing the mind map, the boundary between transcribing and analysis becomes blurred, as this process inherently combines the process. At the time of drawing the interview it was not possible to establish which connections or data were important and therefore the focus was to capture all the data on the mind map.

To demonstrate how the interview audio was translated into the mind map, Figure 5 shows the pink "Case Study" branch of the mind map that represents the story of the challenges of Mt Redoubt erupting in 1989 based on the below quote:

> At one point we had an eruption, a big ash cloud goes up, winds were blowing to the west, so all the ash went off to west. A number of the people who were very plugged into the managers at the Anchorage airports said, well, we don't need to worry about this one, cause ash is going all over there it is not going to impact at

FIGURE 4 Mind map from Long Valley Observatory (now California Volcano Observatory). The skier and ski lift represent the threat to the Mammoth Mountain ski resort from volcanic unrest (Fearnley, 2011, p. 275)

Anchorage airport, let's just go to orange. Then a number of other people said "but the ash cloud is going to close in on the Bethel airport, they are going to have to close the school in Bethel, we need to go to red, red is what this means." So you have different people who get used to working differently, and so there are some people more keyed into the aviation side (AVO Senior Scientist 5, 8 April 2008).

During play back, if a key point was made that clearly represented an emerging issue or point that the quote could provide evidence for in the write up of the research, the time of the quote was noted and written above the relevant branch in the mind map. These quotes were subsequently fully transcribed using the recorded times to easily find the quote, to form written quotes for more detailed analysis and as supporting evidence, thereby following more closely the typology that Kitchin and Tate (2000) outline, and as commonly used with coded transcriptions. The quotes were selected on the merit of articulating or representing key points that emerged from the interviews, many of which were already established following the fieldwork from notes and ethnographic observations. Once completed the maps were scanned into the Atlas-Ti database.

Once the mind maps had been completed, a number of emerging themes were identified, which were explored by reflective writing. The quotes were then reclassified under more specific classification codes by hand (not using Atlas-Ti) that involved printing out each individual quote and sorting into labelled envelopes to place quotes that dealt with a specific issue or topic. These quotes were later used to address specific aspects of the themes emerging from the data, and are presented in the empirical chapters under the research questions they address directly. Whilst it was possible to use Atlas-Ti to do this electronically, my preference was to do this physically and move the quotes between themes as they emerged. Ten years on, coding software in packages such as Atlas-Ti are more sophisticated but with such a large number of relevant quotes (making the PhD thesis empirically rich) there is still value with having a visual and tangible relationship with data that software packages cannot fully replace.

FIGURE 5 Case study section of mind map of Interview AA101, AVO Senior Scientist 5 (Fearnley, 2011)

In summary, the process adopted can be summarised in the following 10 stages:

1. Develop a considered interview schedule with the key themes.
2. Conduct the interview and record it.
3. Make any concurrent notes during and reflexive notes after the interview.
4. Import the interview and notes into a QDA software package (e.g., Atlas-Ti, NVivo).
5. Listen to the recorded interview (often at a slightly higher speed).
6. Draw the mind map (based on a template devised from the interview schedule).
7. Note the times of quotations during the interview onto the mind map.
8. Upload mind map into the QDA software package.
9. Transcribe the relevant quotes across the interviews and upload into the software and code either using the software or print and sort by hand.
10. Use the themes and codes to help devise the key narrative and arguments, supported by the evidence (quotes).

5 | DISCUSSION AND CONCLUSIONS

This paper has addressed key studies on the use of mind mapping in qualitative data collection and analysis, highlighting that transcriptions are not necessary for many types of qualitative research, and that other methods can be adopted without any loss in data analysis quality. Subsequently a methodology to use mind maps to capture and analyse audio recordings of interviews (applicable also to focus groups) has been outlined that enables the time saving benefits of not

fully transcribing each interview, but also enabling the value of transcription for key quotes particularly relevant for writing up the research.

5.1 | Pros and cons to using the mind maps as a substitute for transcription

Applying mind mapping techniques to transcribe has a significant number of benefits. Using an interview recording it is always possible to sense and record verbal emphasis or hesitation, which a written transcript does not provide. Listening to the interview again and producing a mind map provides instant "closeness" and familiarisation with the data that facilitates an understanding of the context of the comments, rather than just using text. The process of transcribing using a mind map allows creative thinking between the themes and aids in identifying common themes that emerge. This method of research is likely to be something that will be addressed more during multi-sited studies where the researcher is doing exploratory work relating to one research area, but in many locations and thereby must conduct a significant number of interviews to develop a "fuller", more holistic picture. Concise methods of description and analysis such as the mind map offer a tool to get the data into a form that is usable for analysis quickly. However, there are limitations to using a new untested technique, but it is important to note that all forms of analysis are ultimately interpretative, requiring a workable combination of researcher creativity and accountability to the data. In addition, the mind map records less textual detail than a full transcription, and may only make sense to the researcher; it would be difficult for someone to read a mind map and make the connections between the branches without actually knowing the information, or to replicate the study, as it could be regarded as tacit knowledge. To the researcher the mind maps provide an astonishing mnemonic tool of each interview enabling easy recall of the content and materials discussed. Of course, mind maps do not preclude the opportunity to go back and conduct further in-depth analysis (perhaps via full transcription). Mind maps are also unlikely to be of significant value to those conducting a conversation, discourse and narrative analysis. However, they are highly suited for those conducting multi-sited, interdisciplinary interviews with large data sets, trying to establish themes or issues, or viewpoints.

5.2 | What does Mind Mapping offer to QDA and beyond?

Mind maps do not necessarily work well for all people, but it is possible that mind maps can capture vast information (e.g., big data) in a succinct manner as seen in Gavrilova and Gladkova (2014), for interview analysis as presented in Section 4 (Fearnley, 2011), to generate a mind map during interviews (Tattersall et al., 2007), and be used during focus groups to generate information or to analyse recordings (Burgess-Allen & Owen-Smith, 2010; Meier 2007). The potential to expand on applications is significant, particularly in the interdisciplinary and multi-sited research fields such as climate change, disasters, health, urbanisation, development (sustainability and resilience), migration, conflict and resources, to name a few interdisciplinary topics. However, there is scope to apply the methodology proposed in innovative ways, including in focus groups, or recording of other debates/events, for example at conferences or workshops via audio or video recordings, enhancing commonly adopted methods. Whilst this paper addresses the role of mind mapping in qualitative data analysis, there is also scope to apply it in different contexts, such as mapping out historical data or interviews to help identify key issues and themes. It is also possible to apply the methodology to secondary data by applying this technique to materials that may or may not be already transcribed, to aid the analysis process and establish key themes. The role of mapping helps to model and visualise data and therefore would likely be able to be used in the computer sciences further as a representational and analytical tool of data, alongside being integrated in GIS and other visualisation methods. The most significant value of mind mapping is the method's simplicity in managing complex data that are typically multidisciplinary. However, the method can also be applied in more traditional case study projects, and open or closed interview styles where a close discourse reading is not required. Finally, mind mapping could help map out and demonstrate in a short-hand visual manner data for key policy decision-makers where time is often limited, and the problems are complex, or post-normal (Carolan, 2006; Ravetz & Funtowicz, 1999). For example, there is clear potential in using mind mapping during interviews and other focus groups as part of multi-criteria mapping (Stirling & Mayer, 2001) or in deliberative mapping (Bellamy et al., 2016; Davies & Burgess, 2004).

Mind mapping also offers a pathway to find order in a complex data set without silencing the various voices or points raised by using a "standardised" structure to the key branches, but enabling flexibility to build on those branches where needed. This standardisation helps provide a fairness to the analysis process for each interview, and a template from

which to examine the data providing direct comparisons from which insights can emerge. Any form of QDA is an interpretation of the world and development of categories, but mind maps enable the researcher to capture ontologies whilst developing understandings of the associated epistemologies. This method provides an eloquent balance between standardisation, adaptivity, time and resources management, and transparency.

This paper has demonstrated how using the suggested mind mapping method in place of transcription is a useful tool to save time, manage vast and complex data, and enable a close relationship with the data that is more tactile, bringing different tacit knowledges together. The method helps provide bigger picture insights to review framings, or issues across multiple sites or perspectives, and as such is an ideal interdisciplinary tool. The ability to generate analysis and build the connections in developing the mind map is also a very useful process. Even 10 years after the PhD research, a quick glance at the mind map is enough to know who I interviewed and what was said. Mind maps work because they use all your brain, whether note-taking or note-making. We should embrace the power of these tools as part of the QDA toolkit, and beyond, if only to understand our own comprehension of data.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTE
[1] Can be watched at: https://youtu.be/e4FtHbpRl-Y, Buzan's video resources.

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