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Using qualitative data analysis tools 'fit for purpose' for making sense of teacher educators' use of digital technologies in their pedagogical practices

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ABSTRACT *This article describes the analysis process associated with an ethnographic study in which data were generated through interviews, observations, focus groups and hanging out techniques. The purpose of the study was to make sense of how teacher educators' specific technological and pedagogical practices were formed, with particular focus on the possible influence of their culture. The researcher used various analysis strategies involving the integration of a number of digital data tools (NVivo-10, Mindjet, Inspiration-8-IE, and Microsoft applications) that served different purposes at different times. The article argues that researchers should consider using an integration of different digital tools, applying them as 'fit for purpose' at various times during data analysis. It suggests doing this will assist researchers to seek a deeper understanding of qualitative data and manage the 'messiness' of analysis, while assisting with the complexity of the meaning making process.*

KEYWORDS *Qualitative data analysis tools, teacher educators, fit for purpose, digital technologies, padagogical practices*

Introduction

For many years, researchers have been developing computer-based techniques and strategies for managing and analysing data, however until recently, they were largely confined to working with quantitative data. Denzin and Lincoln (2011) argue that historically qualitative researchers have limited the use of digital tools to manual functions such as highlighting, cutting, pasting, sorting, and shuffling (checking through) cards. However, in the 1980s and 1990s, computer-based qualitative data analysis (QDA) programmes emerged. Some of these tools such as AQUAD (Analysis of Qualitative Data), QUALOG, QUALPRO, NUDIST (Non-numerical unstructured Data Indexing, Searching, and Theorising - later known as Nvivo), LISPQUAL, and The Ethnograph, were used for analysing textual and other qualitative data. Most of these tools simply enabled the numbering of textual data to assist with identifying patterns or trends. Some researchers raised concerns regarding the computerisation of qualitative data analysis, claiming that the resulting outcome distorted or diminished the richness of meaning inherent in qualitative data (eg., Gasaway, Elder, & Campbell, 1984; Kelle, Prein, & Bird, 1995). Welsh (2002) noted that there are two schools of thought on the use of digital tools in qualitative research. One is those who consider the use of digital tools central to the analysis process, and the other who claim the use of these tools is unimportant, with the potential of generating a "wrong kind of analysis" (Welsh,

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2002, p. 5). However, Welsh further asserts that it is unhelpful to restrict oneself to either of these thoughts, but rather seek the best result possible from both forms of analysis. Bazeley and Jackson (2013) argue that opposition towards using QDA tools among researchers, results from those who have doubts about using any form of digital tool for qualitative analysis. For example, Kelle et al. (1995) argue that qualitative analysis should not concentrate on using digital tools, when the desire is to mine for deeper meaning. Their main argument is that computers cannot assume the researcher's role of generating accurate understanding from textual data. Their concerns also relate to the researchers' dependence on computer programs to capture the logic of the whole meaning-making process. However, Bazeley and Jackson (2013) claim that such perspectives are based on often incorrect perceptions - that automated coding processes are based entirely on systems that use complex dictionaries and semantic rule books to guide the analysis process. However, they comment that this is not the case, and that such programs are generally designed for quantitative analysis purposes.

Further critique comes from Weitzman (2000), who argues that using digital tools can lead to researchers' 'false hopes' of relying on the tools for generating deep meaning from data. Supporting this perspective, Roberts and Wilson (2002) state:

The data are fuzzy, with slippery boundaries between meanings, and not ideally suited to categorisation and classification using digitally based software. Employing a digital tool …has the potential to destroy any understanding arrived at. (Roberts & Wilson, 2002, p. 2)

They further argue that the nature of qualitative data and the importance of capturing contextual meaning and participants' experiences, are not well catered for, through QDA tools. However, their concerns were mainly associated with a researcher's dependence on a single digital tool for analysing data. Weitzman (2000) asserts that analysing qualitative data depends on selecting appropriate strategies and tools according to the nature of data the researcher has, the type of analysis that he/she seeks, and the outcomes desired. Accordingly, to manage these issues, researchers should not restrict themselves to one way of conceiving data analysis, or limit themselves to using a specific tool. However, ultimately it is the researcher who must decide the most appropriate tools for undertaking the analysis. Bazeley and Jackson (2013) comment that the effectiveness of data analysis can be influenced by the way a specific tool is used. However, it is pertinent to note most literature in this regard reported on the use of a single digital tool for data analysis, rather than an integration of multiple tools used at different times for different purposes.

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Qualitative data coding and analysis

Qualitative data analysis is often described as an arduous task for researchers, as it usually involves making sense of a large volume of data from diverse sources (Basit, 2003). The main objective of analysis is to answer the research questions. It should also inform the reader about the participants' experiences, stories, events, assumptions, or perspectives in an orderly and intelligible manner. This process involves making sense of collected data in relation to participants' situated contexts. Dey (2003) comments that it is important for "situating peoples' action, and of grasping its wider social and historic import" (p. 33). In order to make sense of data, qualitative researchers often adopt a grounded theory approach (Glaser & Strauss, 1967). Grounded theory is an approach to qualitative analysis where researchers use strategies to inductively generate ideas by adopting specific coding strategies for generating themes, and applying constant comparison to validate their understanding (Strauss, 1987). Grbich (2013) argues that using grounded theory helps the researcher to capture an in-depth understanding of data useful for theorizing new knowledge.

Qualitative analysis comprises specific strategies and techniques that help the researcher make sense of data. Some of these strategies relate to technical aspects such as recording, transcribing and managing data (Bloor & Wood, 2006). The primary purpose of analysis is making sense of data by treating it 'bit by bit', and assigning categories or codes (Dey, 2003). Auerbach and Silverstein (2003) argue that the main purpose of coding is identifying patterns and themes, as this is an essential part of organising and making sense of qualitative data. Seidel (1998) describes coding as noticing relevant aspects of data, collecting examples for understanding, and examining the relevance of those aspects to identify the commonalities, difference, patterns and structure. Although there is no one definition or set of guidelines that can explain the coding process, it basically comprises a process of grouping, categorising, and labelling, to identify themes and patterns (Grbich, 2013).

Using digital tools in QDA

Bazeley and Jackson (2013) assert that new digital tools such as Nvivo can support the research process by assisting researchers to write memos, track ideas, index and code data, create conceptual labels, categorise, group and examine patterns and themes, and develop visual representations and reports. Creswell (2007) claims that technology-assisted analysis enables researchers to code data

understand data because of their ability to assist with analysis in a systematic manner. Use of a digital tool such as Nvivo, allows researchers to check coded data and the sources without any confusion, and continue until the completion of coding the whole set of data. However, countering this, Roberts and Wilson (2002) claim that using tools such as NVivo can cause researchers to lose "contact with the context and meaning of raw data by too much data manipulation" (Roberts & Wilson, 2002, p. 11). Their concerns relate to not being able to capture the in-depth story embedded in data, due to researchers' over dependence on participants' verbatim responses, ignoring the context in which the conversation was expressed. García-Horta and Guerra-Ramos (2009) argue that researchers need to be mindful of issues (such as leaving the topic aside or ignoring the context) that could be associated with the use of QDA tools, such as Nvivo. It may offer "great help and can enhance interview data analysis … [however, its] capabilities must not be overestimated" (p.151) in terms of managing the meaning making process.

Notwithstanding such critique, García-Horta and Guerra-Ramos (2009) comment that digital tools may help researchers to evaluate the consistency of themes and patterns in data. Seidel (1998) suggests that when seeking consistency in themes, researchers can identify unexpected or surprising things by using topographical maps, which he defines as:

[A] way of coding the landscape so that it shows you the physical features of the landscape. It shows you the hills and valleys, forests and clearings, and other features and details of the landscape in relationship to each other. (Seidel, 1998, p. 10)

While referencing that Seidel's idea of topographical map is not necessarily related to the use of digital tools per se, there are a range of mind mapping tools that can help researchers achieve similar outcomes. However, our argument is whether tools such as Nvivo or similar, could allow researchers to use the idea of a 'topographical map' in conjunction with other digital analysis tools, when seeking unexpected or unpredicted knowledge.

This article describes and explains a process carried out in a doctoral study, which applied a range of strategies and an integration of digital tools for organising, analysing and generating understanding from diverse qualitative data. The use of different digital tools at different times for different purposes, was valuable for managing and analysing the substantial volume of data generated in the study, and helping the researcher identify patterns and themes existing within it. It explains the use of multiple tools including NVivo, was highly beneficial for analysis, particularly for managing the 'fuzziness' and 'vagueness' of qualitative data. It argues limiting analysis to the use of one specific tool or predetermining use, would have lessened the likelihood of extracting accurate meaning across multiple datasets in a manageable way.

The next section provides the research background, explaining the analysis process used in this study, and argues the value of utilising such an approach.

Research Background

The aim of this research was to unpack any relationship that may have existed between teacher educators' pedagogical practices and cultural aspects that are embedded in their context of practice. In order to better understand their practices, the researcher adopted Bourdieu's (1977) notion of habitus as a lens for exploring what teacher educators do in relation to their use of ICT in their pedagogical

practices and how that associated with cultural dispositions in their context. The researcher investigated the pedagogical practices of a cohort of eleven teacher educators in a teacher education institution located in the Maldives (a small country, comprising a chain of 1196 coral islands distributed vertically from north to south in the South Asian Region). Data gathering occurred in four phases. The first three phases were undertaken in the teacher educators' professional context. During these phases, the researcher spent five working days per week over eleven weeks with the participants. The last phase was carried out by distance, whereby the researcher conducted follow-up interviews via Skype and Viber (free applications for phone calls). Data were gathered using a range of methods such as interviews, classroom observations, focus groups, and "hanging out" with participants (Bloor & Wood, 2006, p. 85).

The researcher used multiple strategies and tools for analysing data collected through the various methods. However, precise strategies or steps followed during analysis emerged as the analysis evolved, and accordingly the analysis tools were decided upon depending on the purposes and nature of understanding needed to reach robust answers responding to the research questions, at each stage.

Data analysis and the use of digital tools

The analysis process that evolved adopted a variety of digital tools and loosely followed five steps, as depicted in Figure 2. In each step the digital tools served different analysis purposes. These steps, tools, and related epistemology (guiding principles of analysis) are outlined in Figure 1.

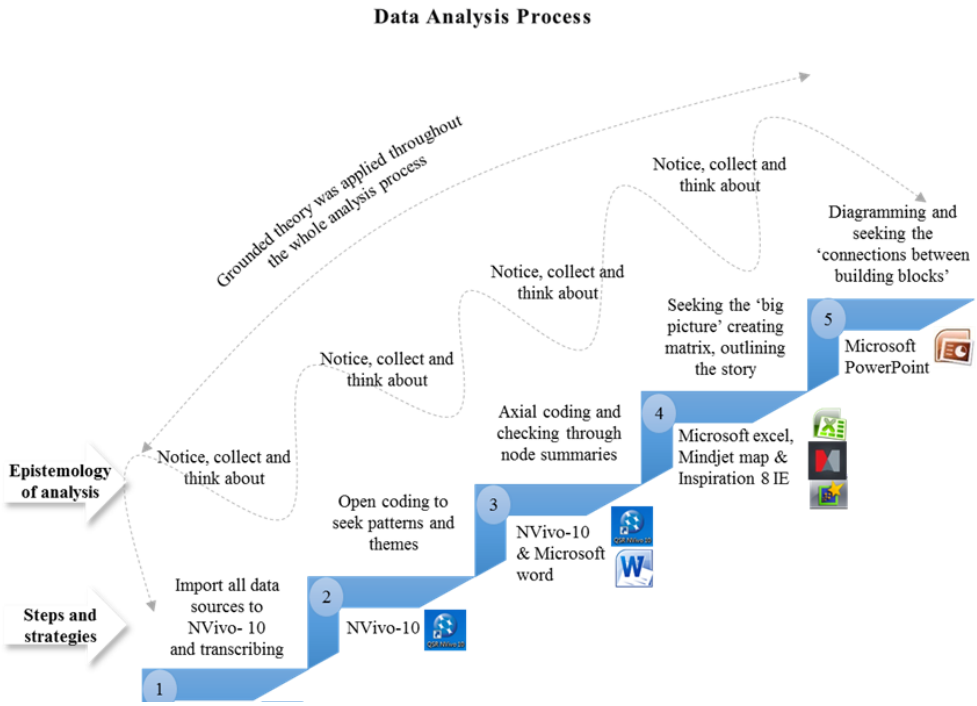

Figure 1. An outline emerged throughout the researcher's analysis process

Step-1: Import data sources to NVivo-10 and transcribing

The analysis process commenced by importing all data sources, both written and digital audio format. These sources included written field notes, observation notes, digitally recorded interviews, and digitally recorded focus group discussions. Importing these data into NVivo-10 helped to manage everything in one space. NVivo-10 also enabled the researcher to transcribe as she listened to audio recordings. The researcher also wrote memos on what she was learning as she transcribed. Transcribing is a crucial step in data analysis because it is where the primary analysis starts, and it allows the researcher to become very familiar with the data, by repeatedly listening to participants' conversations, expressions, tones, and pauses that are encompassed in their conversations. Eleven individual interviews, five focus group sessions and five follow-up interviews, were transcribed. An iterative process of listening and transcribing assisted the researcher to gain preliminary ideas for coding the data.

Step-2: Open coding for seeking patterns and themes (NVivo)

An open coding technique was applied as the transcripts were processed line by line, and code nodes were created in NVivo-10. Initially, the researcher started coding interview transcripts, then observations, followed by focus groups and the reflective journal. Evaluating these data led to the development of free nodes (initial ideas for coding) relating to what was found to be relevant to the focus of her research. These included challenges, early experiences, perceived benefits, ways of using technologies, and so on. The initial node folders and some created nodes are illustrated in Figure 2. The process of reading through each piece of data and creating nodes helped identify the 'commonness' amongst participants. At this stage, a considerable number of nodes useful for understanding teacher educators' pedagogical practices were developed.

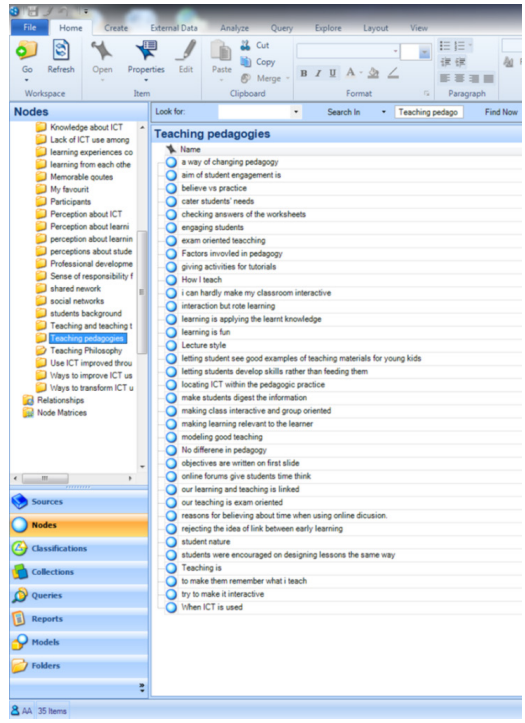

Figure 2. Example of node folders and initial open coding

The codes that the researcher created in this initial stage helped reveal more ideas as data from other sources, including the focus groups, observations, and field journals were incorporated. However, greater consistency in these codes from and across the data was required. To achieve this, data were further analysed using NVivo's memo links that enabled elaboration on what was being discovered relating to the participants' pedagogical practices. In NVivo, memo links are often used for adding researcher notes in order to better understand what participants express. During this process the researcher iteratively worked back and forth to seek better understanding of the data, and accordingly, codes kept changing and new codes emerged. Applying Seidel's (1998) three processes of analysis (notice, collect, and think) throughout open coding, allowed the researcher to realise several changes to previously created open codes. For example, when summary reports were checked through, significant changes emerged.

During the process of open coding, memos on different nodes were also created. These memos linked to what was learned during the 'hanging out' time with the participants, and from the written reflections in the field journal. An example of this is while coding conversations related to 'early experiences' (a node), memos on what was written in the field journal about some particular incidents were added. This frequently linked with informal conversations that had been completed with the participants and other colleagues in the institution. The writing of memos was thus helpful for developing an in-depth understanding of the conversations.

According to Charmaz (2008), memo writing is an important strategy for analysing qualitative data, particularly when coding. One needs to identify the reasons for selecting particular codes for particular conversations. During the initial coding, NVivo's memo option was frequently used to record developing thinking regarding how teacher educators' specific pedagogical practices were formed.

Through writing memos, 'gaps', inconsistencies, incongruences, and possible 'loopholes' in data were identified. For example, a node created earlier was teacher educators' 'belief of Information and Communication Technology's (ICT) potential' for increasing student learning engagement and interaction. However, later through memo writing it was realised that the meaning of 'interaction' was not necessarily linked to teacher educators' understanding of how ICT can help students' thinking, but rather use relating to ICT merely increasing students' rehearsal of the content delivered by them, as illustrated in Table 2.

Writing memos also assisted the researcher to identify many things that appeared inconsistent with the interviews. For example, in an interview, one participant mentioned that she used many types of digital tools in her practices. However, while reading through the reflective journal created when 'hanging out' with participants, it was discovered that the conversation during the interview was not necessarily what they use, rather the tools they know. In the reflective journal it was written that this particular participant displayed very limited activity in the use of Facebook or Twitter, despite interview data suggesting her common use of Facebook or Twitter. NVivo-10 has the capacity to support writing memos 'on the go'. This can help researchers to create memos on thoughts and reflections while data are being analysed. Writing memos helped the researcher in this study to clear doubts, reach consistency, and learn more about what was recorded in the interviews and from other sources of data, as she created codes. Open coding and memo writing assisted with identifying initial categories for axial coding.

Table 1
An example of using memo in NVivi-10

Codes	Participants' conversations	Memos written
Interaction but 'knowledge-centrism'	When ICT is used, it's easier to open discussion, and it can make the classroom much more interactive (Focus-group). It makes the classroom more alive. Students become more interactive, involved, engaged, they get more opportunities to open their mind (Interview). We can make our classrooms much enhanced and rich conversations can take place (Focus-group).	I noted in my observation of classroom teaching, where participants try to interact and engage students during their lessons. However, the interaction and engagement was more on discussion of the knowledge learnt or explained. This was evident in some participants› teaching as they discussed answers to the questions and definitions that students need to be familiar with. I asked some participants about this. What I learnt from their clarification is that participants often tried to engage students in order to make them learn the knowledge they delivered.
ICT makes teaching easier	Instead of writing all notes on the board, my teacher writes approximately 4 A4 sheets of writing on the board (Focus-group). The best thing is that we go to the classroom having all that in our slides (Focus-group). When just Google something or a topic which I need, I will get a huge amount of materials relevant to my lesson (Focus-group).	Often my participants talked about technology and how it helps them to teach in classes. They believe that I CT makes everything easy in their teaching. This in fact is evident in all my participants› talk. Perhaps they adopted ICT because it helps them teach more easily. I wonder the meaning of 'easy' in these comments. Does that mean only what they need to do is dragging the materials into slides and delivering them?

Step-3: Axial coding and checking through node summaries

Axial coding comprises techniques for intense analysis of data categories, however it is unlikely to take place during the early analysis or in the initial data analysis stages (Strauss, 1987). Axial coding is an important element of grounded theory analysis. During this process a researcher examines each code for deciding the categories through constant comparisons (checking through the data back and forth) (Bloor & Wood, 2006). In this study, axial coding involved constantly evaluating the categories through which the researcher sought understanding about teacher educators' pedagogical practices, such as early learning, school learning, their use of technologies, and the purpose of different pedagogical orientations with technologies. The process involved evaluating previously created codes and checking through node summaries in order to identify sub-themes. This was assisted by an option in NVivo-10 that gives a summary of created codes aligned with participants' conversations. An example of category and sub-themes is provided in Table 3.

Harding (2013) claims that when commonalities, patterns, and themes are identified, it is necessary to employ a constant comparison between different

needed to seek a holistic understanding of teacher educators' journeys of forming a specific practice. Responding to this, reading through codes by using the node summary reports (NVivo option) and drafting some parts as Word documents, enabled the identification and collection of more ideas about the aspects that were consistent and congruent, in terms of generating better understanding of teacher educators' pedagogical practices. This process helped to identify the discrepancies, contradictory ideas, surprising features and characteristics in data, informing the next analysis stage.

Table 2
Example of axial coding

Main category	**Sub-categories**	**Participants' conversations**
Early learning experiences	Accepting the knowledge as transmitted by teachers	We obey our teachers' instructions. We quietly listen to what teachers explain. Thus, we learn, rehearse the knowledge until we become fluent in the reading of the whole text (Interview).
		Teachers' instructions whether written or verbal are normally copied as they are because we don't doubt about the knowledge he/she explains. We know that they are always right (Interview).
	Note taking	…teacher dictates or writes notes on the board. We [her classmates] have to write sometime A٤ size ٥/٤ sheets in every class (Interview).
		She normally writes the notes on the board, and we will copy them in our exercise book (Interview).
	Text book teaching with exam-oriented approach	In English the teacher will give parts from text books to read, and reading comprehension in a worksheet. Students don't get many choices even answering them (Interview).
		Sometimes the teacher will allocate parts to read aloud during teaching. When we read she will explain the parts (Interview).

Step-4: Seeking the 'big picture' (using Microsoft Excel, Mindjet, and Inspiration 8 IE):

Dey's (2003) concept of data 'fuzziness' emerged in a number of themes and sub-themes generated from data in this study. Although the previous analysis steps enabled commonalities to be identified, they did not fully support the generation of an 'entire story' about the teacher educators' journeys in forming specific pedagogical practices. Hoping to achieve a more consistent understanding of their

journey, it was decided to use other digital tools including Microsoft Excel to create a teacher educators' matrix, Mindjet to generate a 'landscape representation', and Inspiration 8 IE to develop a visual overview.

a) Creating a 'teacher educators' matrix' in Microsoft Excel (Figure 3)

This process comprised developing a matrix within Excel spreadsheets of teacher educators' backgrounds (age, teaching experience, qualification, and schooling), the tools they use, classroom pedagogies, and many other aspects related to individual cases. The matrix enabled the researcher to see more clearly differences and similarities regarding adopted tools and teacher educators' backgrounds (age, schooling, qualifications, and teaching experience). It also enabled the identification of some institutional barriers that may have influenced the shaping of their pedagogical practices. For example, using this technique helped clarify understanding of some conversations shared about institutional factors, such as the difficulty and challenges that participants experienced when using different digital technologies. The matrix graphically summarised data relating to the most and least used tools, which helped identify which tools were adopted over others, across all participants. This information, in turn, helped identify the influence of institutional factors on teacher educators' tool adoption, and hence their formed pedagogical practices.

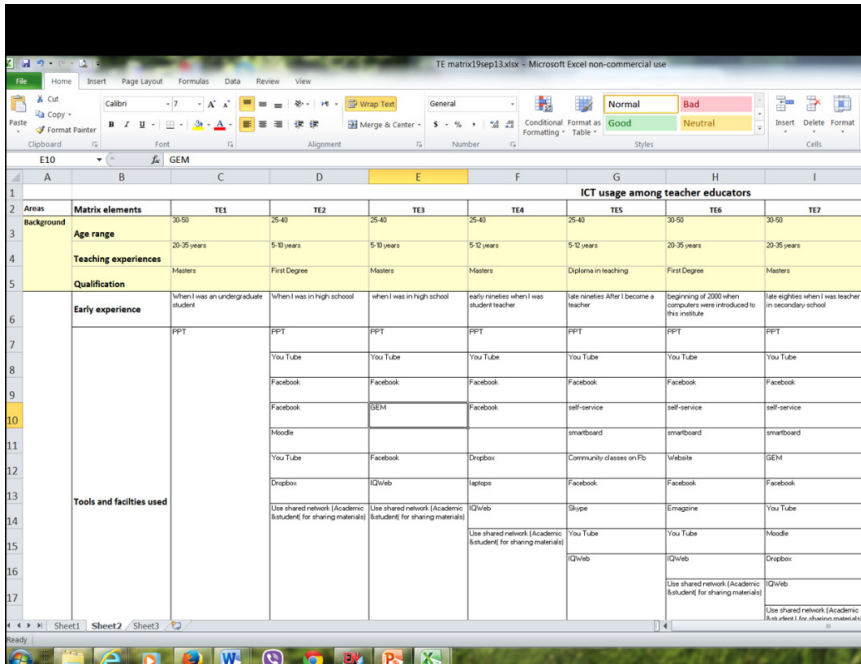

Figure 3. Example of using Excel matrix

b) Demonstrating a 'landscape representation' of data in Mindjet (Figure 5):

Due to the continuously changing patterns in data categories another digital tool was applied to support clarity. This was decided upon due to NVivo's inability to show the conversations and codes together in one space. A tool that demonstrated the interconnection of these was needed. For this reason, Mindjet (a mind mapping tool) was chosen due to its capacity to link the themes with conversations, and its compatibility with Microsoft Word. When Mindjet is installed, Microsoft Word will

will have a specific button in the toolbar ribbon to transfer the writing into Mindjet. During this process, data which was exported from NVivo-10 to Microsoft Word can easily transfer to Mindjet. Using Mindjet supported the iterative checking of themes in relation to conversations, and if needed, the re-organisation of these into different arrangements on the analysis space, as shown in Figure 5. This process helped to unfold some concepts related to participants' forming of specific pedagogical practices, while seeking the connection between their backgrounds and cultural dispositions. In this study, when data were sorted into themes, patterns and categories in one space, it more clearly represented key parts of teacher educators' pedagogical practices, and the relationships between them. However, Mindjet only served the purpose of making textual data and its codes and themes visible in one

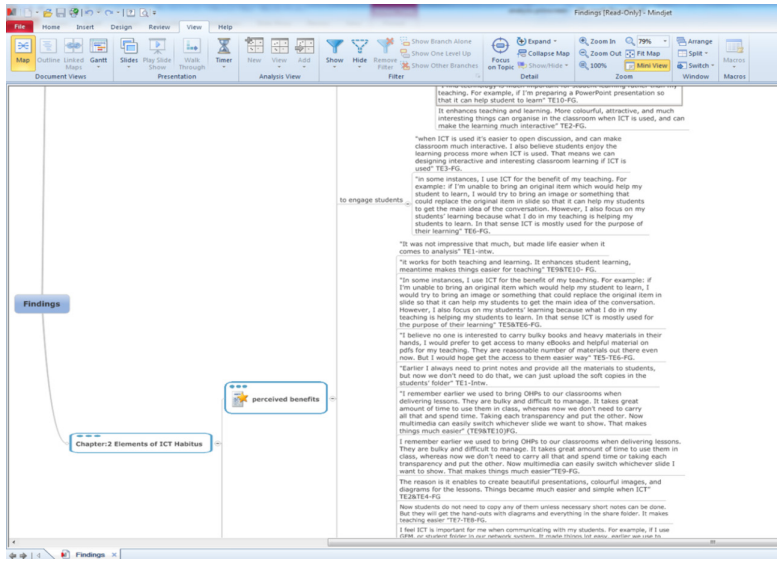

Figure 4. Example of using Mindjet

There was also a need to create a visual overview of individual participant's stories for making sense of the entire journey of forming their pedagogical practices. For this purpose, the researcher decided to use Inspiration 8 IE.

c) Developing a visual overview in Inspiration 8 IE (Figure 5):

Inspiration 8 IE (a mind mapping tool) was used as a convenient means for graphically laying out individual participant's pedagogy-forming journeys. It supported graphic representation of the main episodes of each journey, and allowed the linking of these to each other in forming a complete but succinct story. Creating this graphical overview for each participant was also important to create the vignette of the individual teacher educator's journey. Through using these visual stories, the researcher could just bring those important episodes of their life as sub-headings in each teacher educator's vignette. It also enabled the researcher to

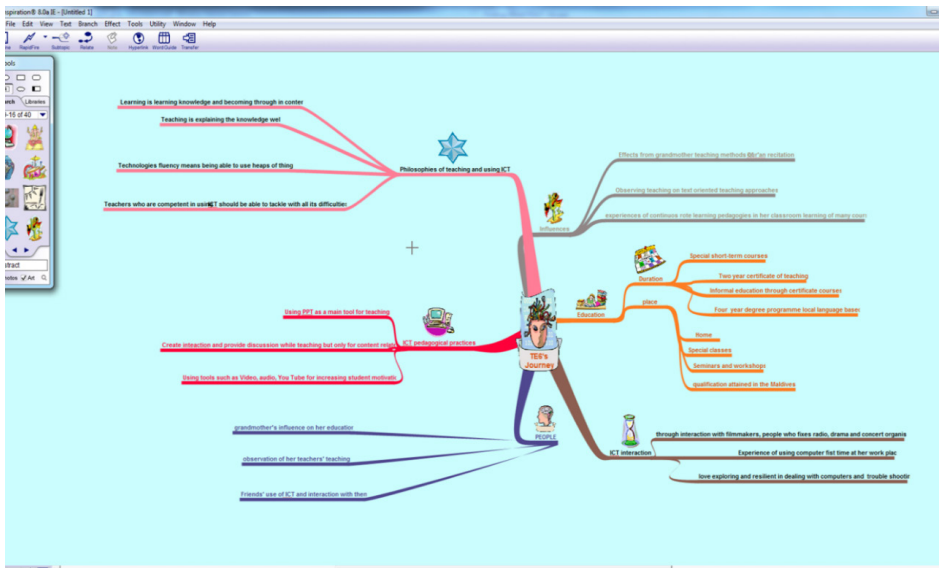

Figure 5. Example of using Inspiration 8 IE

Carrying out three main analysis activities using different digital tools helped identify the 'building blocks' (or main concepts) that influenced the teacher educators' shaping of their pedagogical practices. However, conceptualisation and building connection between the blocks was essential to comprehensively understand each teacher educator's specific pedagogical habitus.

Step-5: Diagramming and seeking the connections between the 'building blocks':

In this study the researcher found most tools that she had previously used did not help her conceptualisation of the participants' pedagogical habitus. Since the researcher used Bourdieu's habitus lens for exploring teacher educators' practice, a diagramming strategy was useful for portraying teacher educators' practice and its associated aspects, with their cultural context.

Interestingly, one of the most commonly available applications, Microsoft PowerPoint was found to be a very useful tool for helping with this conceptualisation. It assisted with visualising and diagramming the concepts that were identified from previous analysis steps, such as cultural influence, early learning experiences, and institutional factors. These concepts by themselves did not explain much about the entire process of shaping pedagogical habitus. They needed to be put together in order to generate a more holistic understanding of how each participant's pedagogical habitus was shaped. Consistent with Dey's (2003) claim, doing this was important to build connection between the concepts in order to theorise and conceptualise an in-depth understanding of the research phenomenon.

The goal of this step was to refine understanding of how teacher educators' pedagogical habitus of using digital technologies was shaped. Through diagramming, a visual representation of concepts that emerged from the different analysis steps, was created. Diagramming was found to be an effective way of representing thoughts visually in a space where it was easier to seek a better understanding of data. Each teacher educator's pedagogical habitus was

diagrammed, focusing on the four different aspects identified through the coding process as being influential. In each diagram, the researcher had a focus question that enabled her to conceptualise participants' journeys in forming their specific pedagogical habitus. For example, is teacher educators' pedagogy influenced by their backgrounds and their institutional context? (Figure 6).

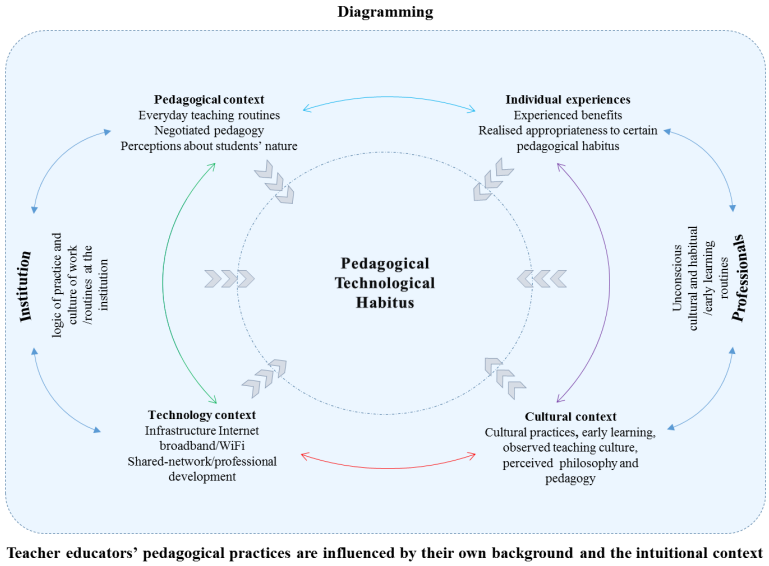

Figure 6. Example of a diagram

Figure 6 demonstrates that teacher educators' formed practice was involved in two aspects: their own backgrounds, and other, their institutional context. Teacher educators' background encompassed their individual and cultural context in which they had specific learning experiences related to cultural practices in the Maldives. The institutional context included pedagogical and technological factors where their present practice was influenced by the available facilities and the institutionalised routines in their workplace. A point to be noted is that this diagram was created based on emerged concepts at the early stage of diagramming. More diagrams were created as the analysis progressed. The process of diagramming helped to refine and build more connection between the ideas that emerged in the early stages of analysis, and draw together effectively the main concepts revealed using the other digital tools.

Implications and conclusion

This article provides valuable insights for integrating various digital tools for analysing qualitative data. In this study, the researcher sought more than just generating themes through traditional coding techniques. In this case, different strategies and digital tools were used to seek connections between concepts and then to link these with the underpinning theoretical 'lens' of the study. The strategies used helped to manage the 'messiness' of analysis, and assist with the complexity of the meaning making process.

Moreover, the process adopted has supported a deeper understanding of data by enabling movement backward and forward iteratively, thereby helping the researcher to conceptualise teacher educators' formed pedagogical practices and the associated cultural influence on these. Although the steps of analysis are drawn as a linear process (Figure 2), the bidirectional-arrows indicate the iterative nature of this analysis within and across steps.

This study suggests qualitative researchers would benefit from mastering a range of skills in using different software applications that they could use to help them more easily build meaning across and within data. It could also be that the more strategies researchers use, the more iterative comparisons can be undertaken when seeking understanding. Researchers should not restrict themselves to the use of a single digital tool for making sense of qualitative data. They should think openly and reflect on a number of strategies and tools that may suit the analysis, the nature of the desired understanding to be gained from analysis, and accordingly, the best form of analysis to respond to their research questions.

Recent studies have acknowledged the use of NVivo as a comprehensive analysis tool for qualitative data (Bazeley & Jackson, 2013; Edwards-Jones, 2014; James, 2013; Leech & Onwuegbuzie, 2011). Notwithstanding this, this article suggests that merely adopting a specific digital tool does not guarantee a comprehensive analysis, rather the way a range of tools are used and integrated for analysis purposes can be beneficial. While in this study the researcher used NVivo for creating codes, seeking patterns, and identifying themes and for categorising data, it did not completely enable her to fully understand her data. Limitations included Nvivo's inability to form a topographical map to help clarify conceptualisations and make connections between key ideas. This was important as the researcher needed to validate her understanding of any connections existing between concepts. Using multiple tools (Mindjet, Inspiration 8 IE, Microsoft Excel, and PowerPoint) allowed sufficient flexibility to create diagrams that supported cross-checking and linking of concepts within and across data. This helped the researcher generate more holistic understandings about the diversity of influences on the formation of each participant's pedagogical habitus.

Using multiple tools (Mindjet, Inspiration 8 IE, Microsoft Excel, and PowerPoint) allowed sufficient flexibility to create diagrams that supported cross-checking and linking of concepts within and across data. This helped the researcher generate more holistic understandings about the diversity of influences on the formation of each participant's pedagogical habitus.

In addition, this study illustrates that researchers do not necessarily need special and expensive software tools designed specifically for qualitative analysis. Using a basic presentation tool (PowerPoint) or mind-mapping tool (Inspiration 8 IE and Mindjet) may, in some instances, adequately support researchers' analysis work. However, it is important that each tool or technique be selected in terms of the nature of understanding that researcher seeks from their data, ultimately enabling more robust knowledge to be generated responding to the research goals.

This article has described how one study used a variety of digital tools and analysis strategies in a structured and organised manner, suited to its research purpose. It presents an approach involving an integration of strategies, tools, and techniques for making sense of data, building connection between concepts, and generating a 'big picture' of the research endeavour. While acknowledging that

approach may not suit all studies, it tentatively suggests benefits from the creative use of different digital tools 'fit for purpose', to yield deeper meaning from rich and diverse qualitative data.

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