In Vivo Coding Qualitative Data Analysis methodology adapted, contextualized into 7 stages and applied to data from Interview, Focus Group and Case Study in School enterprises

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ABSTRACT:
It is a common misconception to believe that it is only Quantitative methodology that involves data analysis and manipulation of data. The purpose of this paper is to provide an understanding of In vivo Coding methodology in analyzing Qualitative data that has been collected through Interviews, Focus Group and Case studies. The coding system was detailed and explained in this paper. The In Vivo coding was adapted, contextualized and applied to a set of qualitative data. Saldaña (2013) stated that in qualitative research, a code is a word or short phrase that is symbolically assigned to a data that is very meaningful to the research. A code represents an idea. The papers also examined how the coding system is done and serves as a reference for any future work in research , in coding. The final number of major themes or concepts should be held to a minimum to keep the analysis coherent. Leadership was the final result of the coding system. It implies that the difference stakeholders found that the Leadership of a school has the most impactful influence on the academic performance of students in the education sector. The Leader is embodied by the Rector, principal of the school.
KEYWORDS: *InVivo, coding, Interview, Focus group, Case study, Qualitative data, Methodology, themes, Leadership, Education.*

I. INTRODUCTION

An organization or an enterprise consists of the infrastructure, the rules regulations, aims , objectives, the hierarchical ladder of personal and most important of all is the customer is put at the center. Students are at the centre of the school. A learner centered approach is adopted in teaching. School and colleges are no more just mere buildings where people coming to work , spend time and go to their homes. Schools have become organizations, enterprises with very distinct objectives, aims. School enterprises have the crucial role to prepare the leaders of tomorrow, the responsible citizen of the country and the labor force of tomorrow. Each employee has a definite role and designated duties. Even though the school does not work for profit, the outcome of the schooling is important. The outcome is in the form of academic performance and achievement. Unfortunately, good manners alone will not buy anyone a bread and will not fill anyone's stomach. Qualification and earning their lives decently will. The student needs to get out of the system with a qualification preparing them to survive the modern world. Studies in School organizations and enterprises are therefore very meaningful and involves a methodology that need to be examined with great care and diligence.

Any research involves a methodology, a research design and strategy to collect data. Data can be from various sources. There are basically two types of data, either Quantitative or qualitative and there are some data collection methods for each type. A previous research work focused on Quantitative method, Dimension Reduction, factor analysis and Scree plot as Quantitative statistical analysis. This paper is focused on Qualitative method of analyzing data. Ahmad et al (2019) discussed that Qualitative research being a process of naturalistic inquiry that seeks an in-depth understanding of social phenomena within their natural setting. Qualitative research is concerned about "why" rather than the "what" of social phenomena and believe in direct experiences of human beings as meaning-making. Quantitative research is more about logical and statistical procedures, qualitative researchers use multiple systems of inquiry for the study of human phenomena including biography, case study, historical analysis, discourse analysis, ethnography, grounded theory, and phenomenology. Qualitative research implies the collecting and analysis of narratives and/or open-ended observations through methodologies such as interviews, focus groups or ethnographies. The purpose of quantitative research is to generate knowledge and create understanding about the social world. Strauss and Corbin (1990) defined qualitative research as, any kind of study that produces results not based on quantitative approaches or different

forms of measurements. Qualitative research is a fundamental factor for understanding certain hypotheses. Quantitative explains the prevalence of attitudes and behavior but qualitative data also may seek to clarify and describe the causes that influencing behavioral perspectives (Lauri, 2019). Qualitative study aims to advance and improve the perception of how issues are handled in a social circumstance (Hancock et al., 2001). Qualitative research creates a detailed explanation of human attitudes, feelings, and perceptions (Tong et al., 2012). Creswell & Poth (2016) and Hancock et al., (2001) claims that Qualitative research is an umbrella term that is utilized for applying scientific frameworks such as phenomenology, narrative, action research, grounded theory, case study, content analysis, historical study, and ethnography.

After deciding of the research method, that is Qualitative method, the appropriate data collecting instruments needs to be used. In this paper, Interview, Focus Group and Case study method. Data collected from these instruments are not numerical data but words, paragraphs, conversation, notes, point wise comments. The paper illustrates what is done with that collected data.

II.   METHODOLOGY
a) Instruments od Data Collection
Data was collected from 3 different Qualitative instruments, namely
 (i)   Face to face interviews with Senior Educators, Deputy Rectors, Rectors and Educators,
  (ii)   Focus group with Educators and Students,
  (iii)   Case study of the Teaching learning environment, in classroom and school life settings

All ethical considerations were taken into considerations such as informed consent, purpose and aim of study, consent from responsible parties, and confidentiality of name of school, students, educators, Senior Educators, Deputy Rectors and Rectors. No gratification, gift nor any financial reward were provided to any respondents due to PoCA (ICAC ,2002) that as a Researcher I abide to, but feedback of the research was provided to them.

b) In Vivo Coding Technique
Unlike quantitative data whereby the collected data is in form of ratings, numbers, usually from Likert Scales, in Qualitative research, the collected data was in form of unstructured notes, paragraphs and writings. This where In Vivo Coding comes into play. Any researcher who wants to master qualitative analysis must learn to code well and easily. Strauss (1987:27) states that the excellence of the research relies mostly on the mastery of the coding. A code in qualitative inquiry is infact a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data. The data can consist of interview transcripts, participant observation field notes, journals, documents, drawings, artifacts, photographs, video, Internet sites, e-mail correspondence, literature, and so on (Saldaña,2013). In vivo's root meaning is "in that which is alive," and as a code refers to a word or short phrase from the actual language found in the qualitative data record, "the terms used by [participants] themselves" (Strauss, 1987:33). Coding is done for pattern. A pattern is defined as a repetitive, regular, or consistent occurrences of action/data that appear more than twice. According to Stenner (2014:136) a pattern is the relationship between unity and multiplicity. A pattern suggests a multiplicity of elements gathered into the unity of a particular arrangement. The InVivo Coding process methodology proposed Saldaña (2013) was adapted and contextualized to obtain of 7 major stages as explained in the Figure 1 Pyramid Coding and Table 1 below.

Stage 1. The collected qualitative raw data
2. Meaningful Quotes paragraphs Extraction
3. First order codes development
4. Refinement into Second order Codes ,Subcode
5. First output, Major categories
6. Refinement into Themes /concepts
7. Theory formulation, Most impacting Theme
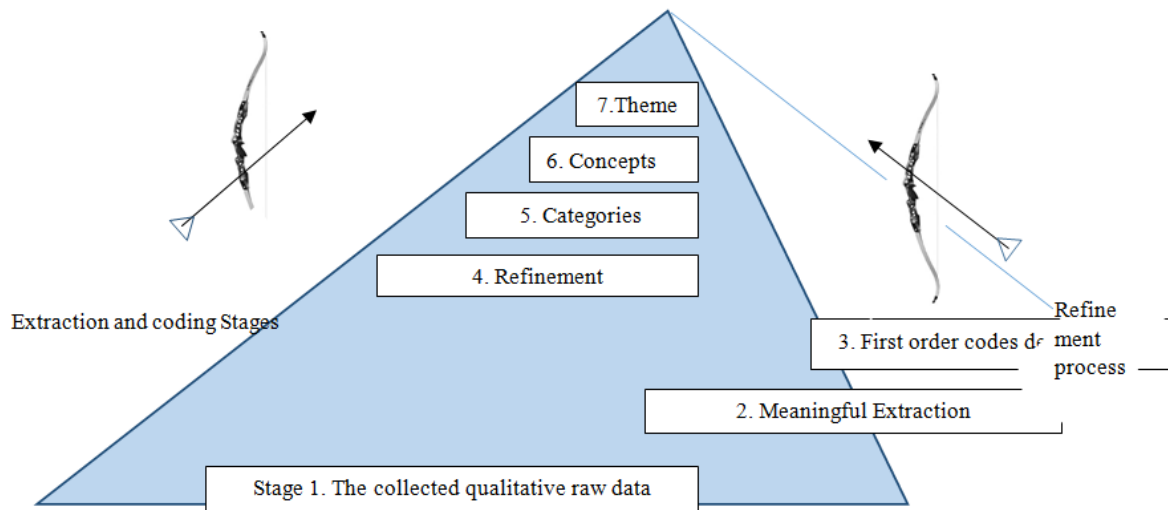
Figure 1 Showing an Adapted contextualized model of InVivo Coding and Saldaña (2013)

Cycle no.	Description	Form	Optimum amount: Narrowing process		
1	The collected qualitative raw data	Raw data	8 Interviews until saturation (Guest et al, 2006, Grady 1998, Legard et al. 2003)	7 member focus groups (Casey& Krueger, 1994; Vanderstoep & Johnson, 2008),	One Case study of the teaching learning environment
2	Meaningful Quotes paragraphs Extraction	Brief lines	50 paragraphs. A paragraph consists of at least 4 phrases.		
3	First order codes development	One to two words	Pattern Search Repetitive meaning	3 codes per paragraphs	150 codes Friese (2012:73)
4	Refinement into Second order Codes ,Subcode	One-word codes	Pattern Search Repetitive meaning	Combined wordings and meanings	Halved into Regrouped into 75
5	First output, Major categories	One-word codes	Pattern Search Repetitive meaning	Narrowing of concepts	35 codes of one word each
6	Refinement into Themes /concepts	One-word codes	Refinement into Themes /concepts	15 themes Lichtman (2010:194)	
7	Theory formulation , Most impacting Theme	One-word codes	Refinement into Themes /concepts	One major Theme	

Table 1 Showing Tabular form of the Adapted contextualized InVivo Coding and Saldaña (2013)

The data which are notes texts, paragraphs are grouped into Codes. Friese (2012:73) stated that research projects should have between 120 and 300 codes total are recommended. Lichtman (2010:194) suggested 80–100 codes that will be organized into 15–20 categories and subcategories which eventually synthesize into five to seven major concepts . Creswell (2013:184) started with a shortlist of five to six Provisional Codes to begin the process of "lean coding' and that expanded to not more than 25–30 categories that then combine into five to six major themes. MacQueen et al (2009:218) proposed 30–40 codes at one time for a study, especially if they are using a system developed by someone else.

III. DISCUSSION

The instruments used to collect Qualitative data were Interview, focus groups and Case Study.

a) Focus Group around a table

Focus group implies a group of people, Educators, students , sitting around a table, in a comfortable situation, and talking about a specific topic. There is a moderator who gives them clues, re-focus them into the topic and keeps a record of the conversation. The Focus group was not camera recorded due to the presence of

minors but noted on paper, in the form of notes, texts and paragraphs for later analysis. Sometimes even snacks and drinks can be provided to the participants to encourage discussions and ease of conversation. Confidentiality of the names of protagonist and area of activity were maintained. Confidentiality was agreed by both sides. The participants also were not allowed to reveal of the content of the exercise and no details were allowed to spread until final publications . No participants were harmed, injured shocked during the exercise. The purpose and importance of the research was explained, and the participants and responsible parties consented to be part of that activity. No financial gratifications were provided due to the PoCA (ICAC,2022). The protagonists were informed they could leave the exercise at any moment and they could benefit from the research at its completion.

Dilshad & Latif (2013) stated that a focus group interview has been one of the most significant gathering techniques in qualitative research and researchers should not have more than 7 members in the focus group (Casey& Krueger, 1994; Vanderstoep & Johnson, 2008). Focus group must have a moderator for presiding the focus group meeting whose responsibilities are initiating the debate, inspiring participants and noting the discussions (Krueger, 2014). The technique for recruiting participants would depend on the kind of participants that the researcher needs and the chosen respondents should be equipped with relevant information to debate the topic of research (Richardson & Rabiee, 2001). Glaser and Strauss (1967) were the pioneers in the use of qualitative interviews as a research method .Brinkmann & Kvale (2015:15) explained that interviewing is used to gather knowledge in various areas of study. According to Dichter (1960) qualitative interviews have also been conducted within focus groups to better understand the motivations of consumers. Dichter's (1960) use of focus group "depth interviews" was based upon the interview techniques used in psychanalysis and nondirective therapy (Rogers, 1945; Brinkmann & Kvale, 2015).

Focus group process
- The topic and goals of the focus group was determined, namely academic performance, students, factors impacting.
- The potential participants (educators and students) were identified.
- The moderator prepared Guides that outlines the focus group activity
- The location, a classroom was chosen as area for the activity
- The participants were formerly invited and all ethical standards abided to.
- No financial incentives were provided and informed in advance due to the PoCA (ICAC ,2002)
- Conduct of focus group
- Analysis

Anderson et al. (1998) argued that to get valuable data from the Focus group, the researcher must keep a record of the participants and their seating arrangements. There are several comments during the discussions that need to be kept in records. The on spot grammatical mistakes need to be corrected for later use while analysis. Leaving the mistakes might cause confusion at later stages. An analysis , a summation of the accounts must be made for each statement. These statements will then be easy to be sued for analysis and coding at later stages.

b) Case Study Method : Case of a Teaching and learning environment
The case was examined during a period of 5 months , studied without disrupting the normal activity of the teaching and learning environment. The characteristics of the Case was noted, and a detailed records of major happenings and repetitive issues were noted. Problem arising and areas to analyze were recorded. Confidentiality of the names of protagonist and area of activity were maintained. Confidentiality was agreed by both sides. The participants also were not allowed to reveal of the content of the exercise and no details were allowed to spread until final publications. No participants were harmed, injured shocked during the exercise. The purpose and importance of the research was explained, and the participants and responsible parties consented to be part of that activity. No financial gratifications were provided due to the PoCA (ICAC,2022). The protagonists were informed they could leave the exercise at any moment and they could benefit from the research at its completion. Sturman (1997:61) defined a case study as a general concept for the exploration of an individual, group or phenomenon. It is a detailed descriptive account of an individual case and its analysis. The characteristics of the case and the events, its description and features, the what and the why of that case is infact the process of research itself (Mesec1998:45). The purpose remains to identify variables, structures, forms and orders of interaction between the protagonist and their interaction with the area of happening. Sagadin (1991) states that a case study's purpose is to analyze and describe individuals and their problems around them.

c) Interview

Face to face structured interview was used in the process.

6-12 interviews seem to be common agreed number of qualitative interviews needed to reach saturation.

Saturation has reached widespread acceptance in qualitative research and Grady (1998:26) defined saturation as new data tend to be redundant of data that has already been collected. It means that when the researcher begins to hear the same comments again and again, data saturation is being reached. It is then time to stop collecting information and to start analyzing what has been collected.

Probing needs to continue until the researcher feels they have reached saturation, a full
understanding of the participant's perspective (Legard et al. 2003: p. 152).

IV.   FINDINGS

The 7 stages adapted coding was applied to the data. (Adapted contextualized InVivo Coding and Saldaña, 2013)

1.   The collected qualitative raw data
2.   Meaningful Quotes paragraphs Extraction
3.   First order codes development
4.   Refinement into Second order Codes ,Subcode
5.   First output, Major categories
6.   Refinement into Themes /concepts
7.   Theory formulation , Most impacting Theme

A Sample of a data collected in March 2019 is used to show the process by which the coding took place
As per ethics, name , class, and details of school are kept confidential.

Extraction from a response of a Participant X is taken as example.
Excel software by Microsoft is used for the coding process.

Stage	Description	
One	The collected qualitative raw data The transcript of focus group	*I agree with what you said, some come to study, whereas some disturb the class, but I focus on my studies. The other day I watch a movie on the topic. My teacher at school motivates me to work harder. I have the syllabus and I have downloaded past exam papers that I work. Some of them are done at school and some at tuition. The Rector is a role model for us in class and encourages us to do our classwork, home work and revision. He gives us some advice, during the morning assembly like for example to practice our Maths, revise and read our Language subjects. He believes in our potential to be among the best students in the country and even tells us that after our Sc we can be Laureates at HSC. A good School leadership influences us , inspire to perform better in our studies. Sometimes we do groupwork. There are some subjects that are too bulky but I have to concentrate on all subjects.*

Table 2 Showing Stage one of adapted new Coding Model

Stage	Description	
Two	The meaningful paragraph extraction	*My teacher at school motivates me to work harder. Some of them are done at school and some at tuition. The Rector is a role model for us in class and encourages us to do our classwork, home work and revision. He give us some advices, during the morning assembly like for example to practice our Maths, revise and read our Language subjects. A good School leadership influences us , inspire to perform better in our studies. Sometimes we do groupwork among friends.*

Table 3 Showing Stage Two of adapted new Coding Model

Stage	Description	19 Codes extracted					
Three	First order codes development	Code number		Code number		Code number	
		1	Teacher	8	home work	15	School leadership
		2	motivates	9	revision	16	influences
		3	tuition	10	advices	17	inspire

		4	Rector	11	morning assembly	18	perform
		5	role model	12	practice	19	groupwork
		6	encourages us	13	revise		
		7	classwork	14	read		

Table 4 Showing Stage Three of adapted new Coding Model

Stage	Description	9 Codes extracted				Remarks
Four	Refinement into Second order Codes ,Subcode	Code number		Code number		Teacher was refined to Educator, rector , influences, inspire, leadership has been grouped under School leadership.
		1	Educator	6	Tuition	
		2	School Leadership	7	Homework	
		3	Motivation	8	Classwork	
		4	Tuition	9	Groupwork	
		5	Revision			

Table 5 Showing Stage Four of adapted new Coding Model

Stage	Description	4 Codes extracted				Remarks
Five	First output, Major categories	Code number		Code number		groupwork has been recoded to Peer Pressure.
		1	Educator	3	Revision	
		2	School Leadership	4	Peer Pressure	

Table 6 Showing Stage Five of adapted new Coding Model

Stage	Description	2 Major Themes				Remarks
Six	Refinement into Themes /concepts	Code number		Code number		Educator and school leadership has been combined
		1	School leadership	2	Revision	

Table 7 Showing Stage Six of adapted new Coding Model

Stage	Description	Most impacting theme Theory Formulation	After further refinement School leadership has been chosen and refined to Leadership
Seven	Theory formulation , Most impacting Theme	Leadership	The importance and pattern of revision in the Extraction is considered but from responses the Leadership englobes much more than a simple characterization like revision factor. Leadership is a theme, a concept and an umbrella term.
			This process is an example of one paragraph of response. 50 paragraphs were encoded and decoded. The result was refined as the specific example taken and Leadership was the Major Theme chosen due to the pattern and impact in the responses.

Table 8 Showing Stage Seven of adapted new Coding Model

V. CONCLUSION

The concept of Leadership had been on the majority of the respondents' conversation. The leader is the most influential character in the institution. A good leader brings positive impact, and a negative leader brings negative impact. The Coding system allows words, paragraphs, texts, noted data to be classified into a set of patterns. Quantitative analysis such as Factor Analysis involves manipulation of numbers and qualitative analysis, coding system involves manipulation of words. One flagrant limitation of Coding system is that it is very time consuming, and some conversations involve a very large number of codes. The other limitation is the researcher needs to infer into the conversation hints about certain concept and topic otherwise some vague conversations will be collected and the coding will be difficult. The code will be too far from the paragraph texts and it will become the researchers word rather than the collected data. At some point many codes need to be combined together to decrease the number of codes. Words take much more space than digits, and therefore coding system has the disadvantage to take a lot of space in research. An unprepared, unequipped researcher ,

lacking certain tools such as software, recording devises, can find coding system very complex, thus useless. The leader, being codified as the most repeated word in the series of pattern also imply that a leader is a scrutinized personality in the education institution and has to be a role model. The leader must influence the students, motivate, communicate and provide the necessary guidance to them to succeed. The leader will also be on frontline whenever the school institution.

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Dedication: This research was put to paper while I was recovering from a head surgical treatment. I, Mr Yudhistir SMF Jugessur, dedicate this paper to my mother who has been my only support in these difficult times, as well as in all these years solitude, harassment, denigration and prejudice.