Chapter 3
Research design and methodology

3.1   Introduction

The main focus of this chapter is to present a systematic flow of the entire design of the research process. I present a case study of the experiences of teachers as they conduct their daily pedagogic routine of using ICT to teach particular learning areas of the national curriculum. Simply stated, this study is an attempt to understand how teachers experience and respond to national ICT policy in their classrooms to improve teaching and learning.This chapter therefore seeks to clarify the research design, justify the methods selected for data collection and describe the manner in which the data was analyzed.

I begin by justifying my idiosyncratic theoretical affiliation to the social constructivism paradigm and the research methodology that will guide and underpin this bounded case study. Proceeding from my philosophical worldview, I provide an overview of the initial stages of the research and finally inform the reader of the more formal stages in which I describe the research strategies, design of the instruments for data capturing and how the data was be analyzed. I conclude the chapter with a description of the methods I employed to enhance the trustworthiness of the study, my autobiographical role as researcher and the limitations of the research.

3.2   Paradigmatical assumptions

3.2.1   Meta-theoretical paradigm

Bounded by my experience as a teacher, who over time adopted constructivist teaching methods, and as an academic using qualitative emphasis in my research programmes, my philosophical path and methodology for this study was predetermined. I have come to realise that developing expertise in various qualitative approaches and to become conscious of a particular philosophy of science take time,

often through a number of years of study. The idea that reality is socially constructed and "the dynamic interaction between the researcher and participant is central to capturing and describing the 'lived experience' (*Erlebnis*) of the participant" appeals to me as a "would be knower" (Ponterotto, 2005, p. 131). According to Guba and Lincoln (1994), issues of research methods are secondary to questions of paradigms, in that the paradigm (which is the worldview) guides the investigator in the choice of methods. Thus I focus the discussion on the epistemology that I affiliate to, which in turn provides the conceptual roots and underpins my study.

Many years of experience in the teaching fraternity (most in senior management positions) gave me the opportunity to observe teachers in my school as they attempted to make sense of government policy ranging over a variety of educational issues. The social constructivist paradigm supports my years of tacit observation that the teacher's experience is an active process of interpretation and teachers are not mere passive recipients of policy. In adopting the social constructivist epistemology, I acknowledge that actors are not mere describers of events, they also actively engaged in broader policy discourse and conflict (Jacobs & Manzi, 2000; Morgan& Smircich, 1980; Neimeyer, 1998). According to Burr (2003, p. 9), social inquiry is lodged in the "consideration of how certain phenomena or forms of knowledge are achieved by people in action".

My choice of social constructivism as a meta-theoretical paradigm in this study is based on the notion that it characterises knowledge as a set of beliefs or mental models people use to interpret actions and events in the world (Jackson & Klobas, 2008). In other words, social constructivists are concerned with the ways in which people construct knowledge. In social constructivism, it is the individual who imposes meaning on the world rather than the meaning being imposed on the individual (Karagiorgi& Symeou, 2005). In this regard the social constructivist research paradigm caters for an investigation into the constructions and broad meanings about how teachers appropriate policy. I observed the realities of lives of teachers as participants during the study and constructed ideas and meaning out of their voices in the field (Denzin & Lincoln, 2005). Hence, this study is an attempt to understand multiple realities constructed by participants in their natural setting (Creswell, 2003).

In this study teachers did not construct their interpretations in isolation but against an environment of shared understandings, practices and language(Denzin& Lincoln, 2000). According to Karagiorgi and Symeou (2005), meaning or knowledge is always a human construction and categories of knowledge and reality are actively created by social relationships and interactions. Using social constructivism as a theoretical paradigm in my study, I argue that teachers' appropriation of ICT policy on education is socially constructed. According to social constructivism, norms and shared beliefs comprise actors' identities and interests, for example the way people conceive themselves in relation to others.

I acknowledge that the social constructivist paradigm has some inherent limitations. First, I accepted that I would not be able to exclusively study the teacher because all individuals are always members of a greater society (Guba & Lincoln, 1994). In other words, as a researcher I could not (and did not intend to) isolate an individual from the environment in which he or she lives, but would still be able to interpret the findings within the social context of the teacher's world.I believed this limitation would have a minimal affect on the outcome since the study places the teacher's experience within a socio-cultural context and recognises the teacher as an integral part of that context. Another disadvantage of social constructivism is that it denies the existence of objective knowledge (Au, 1998, p. 299). That is, researchers are no longer researchers once they become involved in the research process because their deeper understanding of the research topic may distort the research results (Guba & Lincoln, 2000). In order to reduce this limitation, I applied self reflexivity, i.e. constantly acknowledging my subjectivity and bias. I constantly reminded myself that I may influence or be influenced by the research process.

In the systematic quest to push the boundaries of new knowledge, it is my philosophy of science that provides the 'conceptual' roots that underpins and guides this desire for knowledge. According to Filsted (1979), the research paradigm is the "set of interrelated assumptions about the social world which provides a philosophical and conceptual framework for the organised study of that world". The choice of social constructivism as a philosophical paradigm may explicitly guide my research assumptions, general research methodology and in particular the selection of the tools,

instruments, participants, and methods used in the research study (Denzin & Lincoln, 2000; Willig, 2001). The main data collection methods underpinning this social constructivism paradigm were the active processes of observations and interviews as an important means in trying to understand how actors perceive and make sense of the social world. It is primarily by "letting research participants speak for themselves" that we become conscious of their realities through the text created (Denzin & Lincoln, 2005, p. 209).Social constructivism also endorses the particular analysis methodologies that I applied to the garnered data, namely a grounded theory approach and narrative analysis (Ljungberg, Yendol-Hoppey, Smith& Hayes, 2009, p. 690).

3.2.2 Methodological paradigm

Researchers Robertson (2003) and Hoepfl (1997) support the notion that there is an over reliance on quantitative methods by researchers working with technology in education.It is not my intention to add to the academic debate that promotes one research methodology over the other, but rather to give credence to the fact that the research methods of choice are inextricably linked to my worldview as a researcher. A qualitative research methodology may offer another perspective on the meaning that ICT policy on education experience has for teachers, thus enabling thick and detailed descriptive analysis. By using a qualitative research lens in this study, I attempted to accurately represent the socially constructed realities of the participants as they perceive it to be (Creswell & Miller, 2000). Thus, a qualitative methodological approach allowed me to design empirical procedures, describe and interpret teachers' experiences as they implement education policy on ICT in their classrooms (Denzin & Lincoln, 1994; Pickard & Dixon, 2004). It was also my intention to use a variety of qualitative approaches reviewed in the literature to enhance my own development as a researcher.

The benefit of a qualitative approach to this study is that the research focuses on teachers' experiences and the meanings they attach to events, processes and structures in their schools as social settings (Berg, 2007; Skinner, Tagg & Halloway, 2000). Using a qualitative approach necessitates a prolonged and intense contact with teachers in their everyday situations, and in this way provides a holistic view, through

the participants' own words and perceptions of how they understand, account for and act within these situations (Miles & Huberman, 1994). A qualitative approach captures the essence of my research, to understand the real life experiences of teachers in their natural settings as they implementation the e-education policy in practice (Marshall & Rossman, 1999). A qualitative research methodology adds value to this study by offering a way of thinking about studying social reality (Straus & Corbin, 1990).

Qualitative research methodology is sometimes criticised for lacking scientific rigour (Mays& Pope, 1995). Numerous claims are made against qualitative research methods. The first is that qualitative research merely represents a collection of anecdotes and personal impressions of participants, with strong researcher bias. Secondly there is a lack of reproducibility because of researcher personal interest, suggesting that there is no guarantee that a different researcher would come to the same conclusions. Thirdly, qualitative research is criticised for lacking generalizability. Fourthly, qualitative research generates voluminous information about a small number of research settings (Mays& Pope, 1995). I address all these criticisms in this study and particularly in the section on touchstones of trustworthiness (3.7).

3.3   Research purpose

I selected a qualitative exploratory research design (Keaveney, 1995; Bowen, 2005) as I sought to gain new insights about how teachers construct meaning in their lives, which among other things is informed by their experiences,as they negotiate ICT policy on education in their teaching practice. An exploratory study, as in this research design, was promoted by making use of an open, flexible and inductive approach to understanding the actors' constructions of their experience. The principle of an exploratory approach is to add to the existing knowledge base, academic debates, understanding and perceptions of the implementation of ICT policy on education.

The ultimate goal of this exploratory inquiry was to gain new insights from which new assumptions can be developed (Gaeger & Halliday, 1998). In this exploratory study I did not try to confirm any relationships prior to analysis but instead allowed the methodology and the data to define the nature of the relationships (Boudreau, Gefen &Straub, 2001). This notion is supported by Lincoln and Guba (1985) who posit that in exploratory research, social phenomena are investigated with minimal *a priori* expectations in order to develop explanations of these phenomena. An exploratory approach is an attempt to investigate the "little-understood"(Marshall & Rossman, 1999, p. 33) phenomenon of ICT policy appropriation by teachers, a topic that has not been explored in the research literature.As an academic, I undertake this study primarily to inform knowledge on ICT policy and practice. My expectation is that insights can inform policy makers in their efforts to resolve ICT policy implementation problems within the education context.

3.4   Strategy of inquiry: A case study approach based on backwardmapping principles

According to Denzin and Lincoln (2005), a strategy of inquiry depicts the skills, assumptions and material practices that researchers-as-methodological developers use when they transfer from a paradigm to the gathering of empirical materials. Emerging from a qualitative methodological paradigm I positioned the investigations as a backward-mapping case study by implication relying on specific methodological practices. The strategy of inquiry in this study (case study design) made it possible for me to use specific approaches and methods to collect and analyse empirical data. In this case study, I relied mainly on interviewing, observing and document analysis as primary methodological approaches. I also planned to combine observation with asking questions by employing ethnographical research principles of 'non-obtrusive interviewing' (Lofland & Lofland, 1984).

I selected an instrumental case study approach (Stake, 2005). In this study the case is defined by schools with teachers implementing ICT in their teaching and learning practice. I elicited the experiences of the teachers as actors as well as other stakeholders (principals and district officials) through an instrumental case study. I

captured, analyzed and conveyed the experiential knowledge of the actors through situational descriptions (see reflections in Appendix C) and largely through thick and rich narratives. In instrumental case studies the case is of secondary interest (Berg, 2007). In this regard this case study is bounded (Stake, 1995) by its specificity to teachers and focuses particular attention on how teachers appropriate education policy on ICT to influence their teaching. I purposefully selected multiple cases (collective cases) as an approach to extend the instrumental case study (Stake, 2005) which yielded similar, variety and redundant findings which were all important in their own way. According to Merriam (1998, p. 19), case studies involving the study of a process have significant value for research and 'insights gleaned from case studies can directly influence policy, practice, and future research". Thus a case study approach is particularly significant for my study which sought to understand how teachers, who are critically positioned at the point where policy meets practice, appropriate education policy on ICT in their classroom practice.

The significant benefit of a case study method lies in its ability to open the way for discovery, in that it creates a platform for further inquiry that may be pursued in subsequent studies (Silverman, 2006). However, case studies also bring along scientific challenges of issues of objectivity and generalizability (Berg, 2007).I acknowledge some limitations of the research design in that it was an exploratory case study which employed subjective measures and limited generalization. First, is the criterion of objectivity, which is closely associated with the construct of reproducibility of the study. In this inquiry I attempted to reduce the effect of subjectivity and simultaneously enhance replication of the study by offering a detailed articulation of the procedures of the study so that other researchers may repeat the research if they so desire (Berg, 2007). Second, I approached this study with the intention of understanding the single phenomenon of how teachers appropriate education policy on ICT in their classroom practice. Although the results of this study may have important implications for both policy and practice, I did not purposefully intend to draw any generalizations from this inquiry. I thus reiterate that this inquiry is an instrumental case study to provide insight into teachers implementing policy.

In terms of my design choice I was able to elicit the experience of every-day life of the local actors (teachers) and try to "make sense from the point of view of another"

(Agar, 1986, p. 12). I infused the instrumental case study with Charmaz's (2001) constructivist approach to grounded theory as a systematic guideline for collecting, analysing and explaining the garnered empirical material. This decision is supported by Denzin and Lincoln (2005, p. 382), who posit that grounded theory "may be the most widely employed interpretive strategy in social science today".

3.4.1   Backward mapping principles

Elmore (1980, p. 601) challenges researchers to write case studies that focus on a "particular sequence of events and a specific set of causes and consequences" in such a manner to offer guidance to policymakers on how to anticipate policy implementation problems. I designed my research strategy for this study by drawing on the work of Elmore's (1980) policy implementation research. I firstly explain forward mapping and backward mapping as two contradictory policy analysis approaches, and then I follow through to explain how and why I opted for a backward mapping strategy of inquiry in this research study.

In order to understand Elmore's (1980) "backward mapping" approach it is necessary to differentiate it from the traditional "forward mapping" approach. Forward mapping is the strategy that policy makers attempt to pursue in order to affect the implementation process from a top-down approach. This strategy is initiated at the highest level in the policy making process. The implementation process begins with the statement of the policy maker's intent and then cascades down through the hierarchical structures of the provinces and districts and eventually to schools. At each level the policy intent is translated into more specific implementation steps to define what is expected (such as regulations, responsibilities, administrative actions and mission statements consistent with the policy intent) of the implementers. Finally the forward mapping process elicits an observable effect in the form of an outcome on the actor who is the target of the policy. The level of achievement of the outcome is measured to determine the success or failure of the implementation process. Elmore (1980) suggests that forward mapping is a classical "textbook approach" to policy implementation studies. However, there are major flaws and limitations associated with forward mapping as an analytical approach to policy implementation. Most

important is the notion that in the forward mapping approach, policy makers have control of the "organizational, political and technological processes that affect implementation". This assumption is substantiated by acknowledging that administrators at each hierarchical level exercise a delegated authority which is controlled by the policy maker. In other words the assumption is that policy implementation is controlled from the top. Another weakness of forward mapping as an analytic strategy is that it offers a limited range of implementation explanations for policy implementation failures.

I turned my attention to the "backward mapping" approach as proposed by Elmore (1980). Backward mapping and forward mapping share the same notion that the focus of policy makers is on affecting the implementation process and in so doing hope to positively influence the outcomes of policy intent and decisions. However, backward mapping challenges the assumption that policy makers have control over what happens at the point of policy implementation. Backward mapping also disputes the assumption that "explicit policy directives, clear statements of administrative responsibilities and well-defined outcomes" will necessarily foster successful policy implementation. Backward mapping is firmly grounded in assumptions that are contrary to forward mapping. First, backward mapping does not take for granted that policy is the only or major driver on the behaviour of the target of the policy. Second, backward mapping does not rely on compliance with the intent of policy makersas the standard of success or failure, but rather on the ability of actors at one level of the implementation process to influence actors at other levels in the system (Elmore, 1980). Third, in backward mapping the assumption is that if one is close to the source of the problem, the greater is one's ability to influence it. This is where I chose to focus my research, at the smallest unit in the system where change is expected, namely the teacher.

Backward mapping describes a significantly different approach by analysing policy implementation at the point where policy meets practice. Elmore (1980, p. 604) explains that backward mapping is an analytic approach that is positioned to observe specific behaviour at the "point at which administrative actions intersect private choices". Contrary to forward mapping which begins with the policy makers' intent,
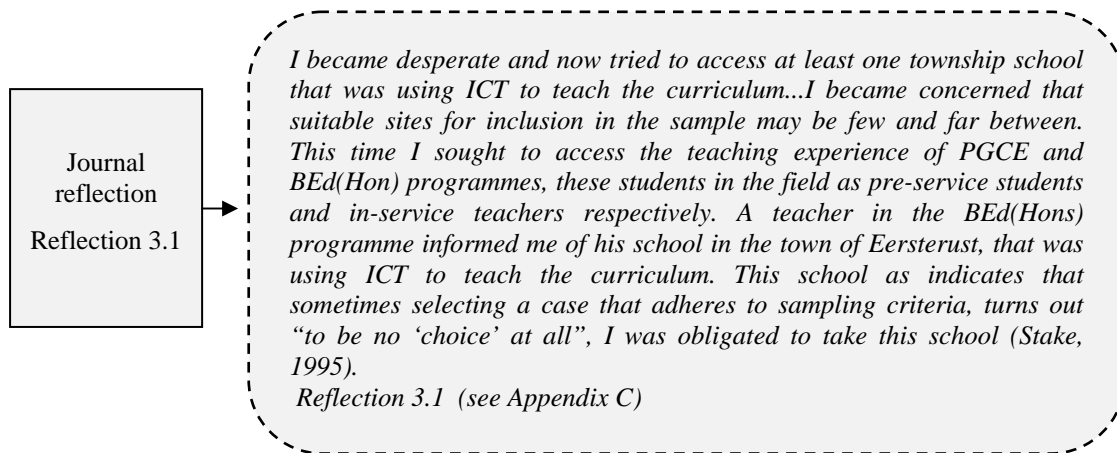
backward mapping begins to describe specific behaviour of the policy implementer at the "lowest level of the implementation process that generates the need for policy". Once the exact target of the policy at the lowest level of the system is established and the behaviour is described as a set of effects, the backward mapping analysis back-tracks through the structure of the "implementing agencies" posing at each level two questions; What is the ability of this unit to affect the behaviour that is the target of the policy? and what resources does this unit require in order to have that effect?

In this study the target of the ICT policy on education are the teachers who are positioned at the intersection of policy and practice, who thus constitute the main focus of this inquiry. Once the behaviour of the teacher that is the target of the policy was described (through observations and interviews), the inquiry backed-up through the implementing agencies of the school, to the local education district and then to the provincial education department. The experiential knowledge of the actors was captured, analyzed, interpreted and conveyed through situational descriptions (see reflections in Appendix C1) and largely through thick and rich narratives of the case study. I now give a detailed account of the data collection strategies.

3.4.2   Selection of cases

The selection of information-rich research sites occurred prior to determining the participants as units of analysis. My expectation of finding suitable sites to conduct the field work waned from the selection of typical sites to selecting exemplary sites (Glesne, 2006). I assumed that the practice of using ICT to teach national curriculum exists to varying extents in all schools (typical sites), ranging from highly affluent independent schools to township schools in the heart of impoverished communities. However the reality of accessing data-rich sites to conduct research led to identifying exemplary schools across various socio-cultural contexts rather than typical schools. Stake (2005) suggests that sometimes atypical cases offer greater opportunities to learn as compared to typical sites. In this regard the search for information-rich research sites compelled me to engage purposeful sampling (Stake, 1995). The process of purposeful selection yielded an opportunity for an in-depth study to understanding and gaining insight on issues of central importance to this study. I

reflect on my experience of trying to access information rich research sites that at the onset I assumed would be an easy task.

| Journal reflection Reflection 3.1 | *I became desperate and now tried to access at least one township school that was using ICT to teach the curriculum...I became concerned that suitable sites for inclusion in the sample may be few and far between. This time I sought to access the teaching experience of PGCE and BEd(Hon) programmes, these students in the field as pre-service students and in-service teachers respectively. A teacher in the BEd(Hons) programme informed me of his school in the town of Eersterust, that was using ICT to teach the curriculum. This school as indicates that sometimes selecting a case that adheres to sampling criteria, turns out "to be no 'choice' at all", I was obligated to take this school (Stake, 1995). Reflection 3.1 (see Appendix C)* |

In order to achieve significant understanding of the phenomena under study, I had to choose cases according to particular criteria that may yield information rich cases. For instrumental and multiple case study design a formal method of sampling was required that may yield a representative selection of cases (Stake, 2005). I wanted to select three urban primary schools from different socio-cultural settings in an attempt to make use of maximum variation sampling (Patton, 1990; Lincoln & Guba, 1985). The rationale for using maximum variation sampling was that it would enhance the value of this study by capturing common patterns from great variation that may emerge from diverse socio-cultural contexts. I selected cases that cut across varied socio-cultural and socio-economic situations (see table 3.1), in order to identify shared patterns and yield detailed descriptions of each case. At this point in time, I acknowledge that a limitation of maximum variation sampling as a method for small samples is that high heterogeneity can be a problem because individual cases may be significantly different from each other.

I also note that while balance and variety in a case study approach is important, 'opportunity to learn is often more important' (Stake, 2005, p. 451). Accordingly, I identified three research sites based on the socio-cultural contexts of these schools. A well resourced former model C[7]public primary school, a poorly resourced

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[7] Former model C schools were public schools (classified prior to 1994) catering mainly for white learners

township[8]public primary school and an independent[9] school were selected according to preformed and particular criteria (See Appendix C1 to C4 for journal reflections). I excluded rural schools from the sampling criteria based on my assumption that rural schools have many other significant challenges to basic educational needs. These challenges range from the lack of basic services such as water and electricity supply to substandard classroom infrastructure (Roodt & Conradie, 2003; Mbelle, 2008). I assume that the use of ICT in teaching and learning would be far removed from the agenda of schools thus disadvantaged.

I used Stake's (2005, p. 451) view that the selection of cases should offer 'opportunity to learn', and proceeded to select cases from which I could learn the most. I based the purposeful selection (Berg, 2007) of possible information-rich research sites on numerous criteria. Some criteria were formulated with reference to the framework of the international study (Kozma, 2005), while others were determined and modified to accommodate local circumstances within the context of this study.

- First, I wanted to select schools with stable ICT infrastructure. I qualify the meaning of 'stable' in that computers must be functional for effective teaching and learning to occur. ICT technical problems should not compromise day-to-day curriculum delivery.

- Second, schools had to have effective administrative management of ICT computer laboratories. Good management implies that the computer facilities and equipment should be functional and effectively maintained for optimum use of the technology resources.

- Third, and to my mind most important, schools had to integrate ICT in the curriculum as an accepted practice in teaching and learning. This criterion became evident through a scrutiny of the prospective school's timetable and by observing whether the use of the computer labs or ICT centres was indicated as a dedicated curriculum delivery activity (Kozma, 2000).

- Fourth, the schools had to be sufficiently well resourced in order to facilitate and sustain the use of ICT in teaching and learning (Kozma, 2000). In this

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[8] Township schools are schools that are currently situated within 'black' communities
[9] Independent schools are autonomous private schools that receive minimal state subsidy and target affluent communities.

regard the school should have the means (financial or externally supported) to be able to maintain the use of ICT laboratories or equipment for teaching and learning to take place.

- Fifth, sites were selected by identifying ICT-enabled practices (for example participation in e-learning seminars, community involvement, competitions, etc.) that each school values and wanted to hold up to others in their community and within the school's district (Kozma, 2000).

- Sixth, selected schools had to adhere to and implement education policy on the National Curriculum Statement (NCS) (Kozma, 2000).

- Seventh, in addition I selected schools that had at least two of the main phases (foundation phase, intermediate phase and senior phase) in the General Education and Training (GET) band within the South African schooling system. The rationale for selecting primary schools as research sites was two-fold. First, primary schools have been in the process of implementing the revised National Curriculum Statement (NCS) (Department of Education, 2004) fundamental policy for more than four years (from 2004) and thus may have overcome curriculum implementation milestones.

Secondary schools, however, have only initiated the new curriculum policy from 2007, and then only in grade seven. My assumption was that secondary schools were still in the throes of negotiating changes required by the new national curriculum policy statement (Department of Education, 2003). Second, unlike secondary schools, primary schools are not compelled to use ICT because of the national NCS curriculum policy statement (Department of Education, 2003). In this way, secondary schools use ICT in teaching and learning because of the curriculum policy requirement for subjects like Technology and Computer Assisted Technology (CAT) (Department of Education, 2003). My assumption was that primary schools using ICT in their curriculum would be doing so by virtue of their own intention, whether driven by the e-education policy (Department of Education, 2004) or not. This method of sampling would elicit a more realistic understanding of the appropriation of education policy on ICT by teachers.

Journal reflection 3.2	→	*Based on my perception and experience of primary schools within educational district in which I taught and the fact that the provincial government has been active in the roll out of computer centres through the Gauteng-On-Line (GOL) project since 2004, I assumed that obtaining information-rich township school, that satisfied the selection criteria as a research site would be fairly easy and uncomplicated. But in reality this did not unfold as expected.* *Reflection 3.2 (See Appendix C)*

3.4.3   Identification and selection of participants

As stated previously, the case constituted schools with teachers implementing ICT in their teaching and learning practice. I purposefully (Glesne, 2006; Berg, 2007) selected the teachers at the schools according to preset criteria. First, the teachers had to be professionally qualified. I qualify this criterion because many schools tend to appoint ICT qualified persons as teachers without any formal teacher training. This information was determined from my initial introductory interview with the principals. Second, the identified teachers were selected by their willingness to participate in the study and not by their level of ICT competence, qualification or experience. Third, the participant teachers had to be teaching the national curriculum using ICT. I did not expect that every curriculum delivered lesson to be an ICT infused lesson, but that the teachers were using ICT as part of their daily teaching practice. Fourth, I excluded those teachers that taught ICT as a standalone learning area without curriculum integration. Fifth, I selected teachers from the junior, intermediate and senior phases without any restriction on the choice of the learning area. I preferred teachers from the intermediate or senior phases with the hope to include teachers from various learning areas. Sixth, selection of participants was not based on language of instruction, race, gender or age as these criteria were irrelevant to the study.

I had initially decided on one teacher at each research site as my unit of analysis. Drawing on my personal experience, most members of school management did not use their mainstream curriculum deliverers to teach ICT, but relied on a separate dedicated teacher to do this (often employed by the school governing body). Thus I expected to find at most one teacher at each school that may be identified as the 'ICT

integration' teacher. However at both public schools a different scenario played out, contrary to my expectations as reflected in the following excerpt from my diary:

Journal reflection 3.3	→	*I subsequently, requested if both of them would be willing to be interviewed and observed in their daily routine of teaching. My observation was that the technology teacher was reluctant to be part of the study, although he did not say this openly, he referred to me as an 'inspekteur'[8] in his casual talk to other teachers in my presence. His utterance gave me an opportunity to allay his concerns about the object of the research.* *Reflection 3.3 (See Appendix C)*

At the township school (school A), a school from a low socio-economic suburb of Eersterust[10] east of Pretoria[11], two teachers (teacher 1 and teacher 2) were actively engaged with ICT in their delivery of the national curriculum. The first teacher readily agreed to participate in the study, while the second teacher had some reservations but eventually agreed to participate in the study (see Journal reflection 3.3). At the second research site, a former model C school (school B) which is situated in a middle socio-economic sector of the city centre, both teachers (teacher 1 and teacher 2) were identified by the principal and enthusiastically agreed to participate in the study. At both public schools, School A and School B these teachers (teacher 1 and teacher 2) were the only two teachers using ICT to teach the curriculum. However at the independent school (school C), a school within a high socio-economic community, many teachers were using ICT in their classroom practice. However, only two teachers (teacher 1 and teacher 2) were using ICT more often than other teachers and thus selected as units of analysis (Refer to Appendix C5for journal reflections). Table 3.1 gives a detailed summary of the research sites, the socio-economic status of schools, the demographics of the participants and the research question that is being investigated.

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[10] Eesterust – a township previously designated for people classified as coloured.
[11]Pretoria – capital city of Gauteng Province (one of nine provinces in South Africa).
[12]Inspekteur – Afrikaans term for inspector (of schools).

Table 3.1: Summary of participants – Schools and teachers

System Hierarchy Level	Institution	Unit of Analysis	Participants	Profile of participants	Research Question
School A	'Township' Public School Low socio-economic sector	Teachers	2	**Teacher 1**: Coloured male. Age: mid 40, married**Designation**: Head of Department- Natural Science**Currently teaching**: general science grade 6 **Qualification**: Teacher Diploma, Bed(Hons) **Teaching experience**: 23 years	RQ1
				Teacher 2: Coloured male. Age: 43, married **Designation**: Teacher **Currently teaching: T**echnology grade 6&7, grade 7 – computer literacy **Qualification**: Teacher Diploma **Teaching experience**: 18 years	
		Principal	1	**Principal**. Coloured, male age 55. Married **Designation**: Principal for past 10 years **Qualification**: Teacher Diploma **Teaching Experience**: 30 years	RQ2 RQ3
School B	Former model C school. Medium Socio-economic sector	Teachers	2	**Teacher 1**: White male. Age 40, Married **Designation**: Deputy Principal **Currently teaching**: EMS and Afrikaans 5&7 **Qualification**: Teachers Diploma **Teaching experience**: 20 years	RQ1
				Teacher 2: White female. Age 28.Unmarried **Designation**: Teacher **Currently teaching:** Maths and EMS Grade 6&7 **Qualification**: BA, PGCE **Teaching Experience**: 6 years	
		Principal	1	**Principal**: White Male. Age 58. Married **Designation**: Principal for the past 5 years **Qualification:** Teacher diploma, BA **Teaching experience**: 33 years	RQ2 RQ3
School C	Independent School. High socio-economic sector	Teachers	2	**Teacher 1**: White male. Age 35. Married **Designation**: Head of Department for Afrikaans **Currently teaching**: Afrikaans grade 6&7 **Qualification**: Teacher Diploma, BA, Bed(Hons) **Teaching Experience**: 18 years	RQ1
				Teacher 2: White male. Age 27 **Designation**: Teacher **Qualification**: BEd Teaching experience: 6 years	
		Principal	1	**Principal**: Male. Age 45 **Designation**: Acting Principal **Qualification:** BEd **Teaching experience**: 23 years	RQ2 RQ3

Applying a backward mapping (Elmore, 1980) approach I had to select participants at various systemic levels as I backtracked through the system. At school level the principal is apparently the gatekeeper of policy implementation and was conveniently selected (Berg, 2007). At each of the research sites principals voluntarily agreed to participate in the study. Beyond the schools' boundaries, I purposefully (Berg, 2007; Glesne, 2006) selected participants at various system levels namely, district and provincial e-learning officials. The schools that were identified determined the selection of the relevant hierarchy district systemic unit. At district level, the e-learning chief education specialist (CES) was identified as a participant based on the function of this unit with respect to e-education policy implementation. This district office is situated within the Gauteng[13] Province. I selected the head of the e-learning directorate at the provincial education department to be a participant in this study. However on the day of my planned interview with her I was informed that two other e-learning officials within this directorate will participate in the interview, namely the deputy chief education specialist (DCES) and the chief education specialist (CES). All officials at both district and provincial levels were keen to participate by virtue of their interest in the study. Table 3.2 illustrates the demographics of the systemic participants.

Table 3.2: Summary of participants – Systemic

System Hierarchy Level	Institution	Unit of Analysis	Participants	Profile of participants	Research Question
Local Education Authority	**District E-learning directorate**	**District E-Learning Official**	1	**District Official**: Black, female. Married, Age 43. **Designation:** Chief Education Specialist: E-learning **Qualification:** Teachers diploma + Currently studying Bed(Hons)	**RQ2 RQ3**
Provincial Education Department	**Province E-learning Directorate**	**Province E-Learning Official**	2	**Official 1:** Black male, Age 36. **Designation:** Deputy Chief Education Officer **Qualification:** BSc + Teachers Diploma **Official 2:** Black female, Age 43. **Designation:** Chief Education Specialist **Qualification:** BA + Hed	**RQ2 RQ3**

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[13] Gauteng province - one of nine geographical regions in South African

3.5 The research process

Paradigmatic Lenses:
Social Constructivist
Qualitative methodology

Case Study Design:
ICT policy implementation in three schools

Pilot Study
Three teachers, n= 3: Female (2) Male (1)

Data Collection
Unit of Analysis:
Two teachers from each school, n = 6: Female (1), Males (5)
Principal of each school, n = 3: Male (3)
District Official, n = 1: Female (1)
Provincial Official, n= 2: Female (1), Male (1)

Data Gathering Technique and Instruments

Technique	Research Question	Participants	Documentation
1. Semi-structured interviews	RQ1, RQ2, RQ3	Teachers, Principals, District & Province	Digital voice recordings (verbatim transcript)
2.Observations	RQ1	Teachers	Video recording, photographs, field notes, researcher journal
3.Informal Conversational interviews	RQ1	Teachers	Digital voice recordings, researcher journal
4.Content analysis of documents	RQ1	Teachers, Principal, District & Province	Policy documents, lessons, official documents, digital images

Data Analysis
- Constructivist grounded theory research methods
- Transcribing, coding and identification of core themes
- Member checking

Iterative and Interactive
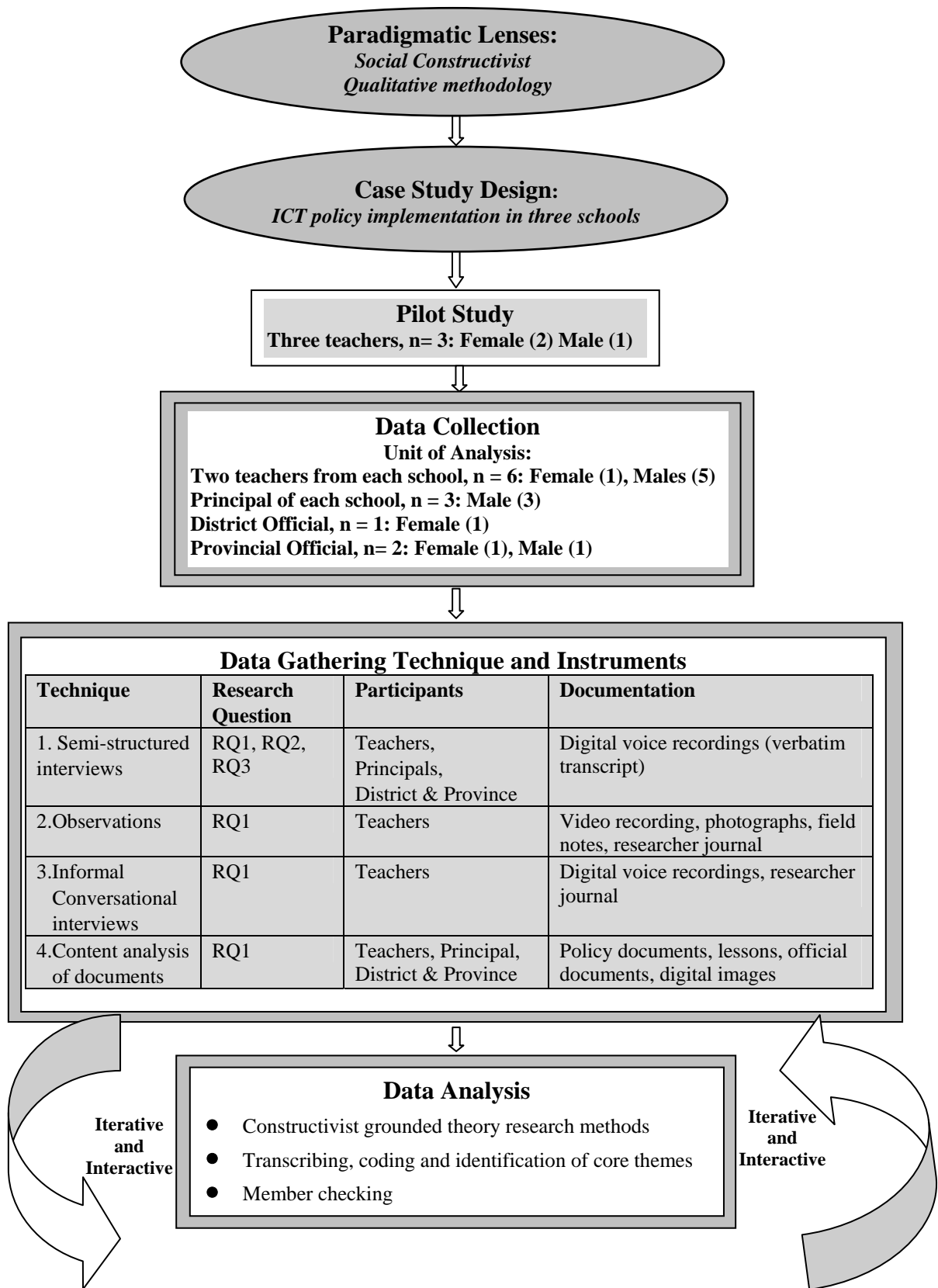
Iterative and Interactive

Figure 3.1: Research process

The flow chart above (Figure 3.1) gives a schematic representation of the research process that unfolded in this study.In this section I give a detailed account of the data collection instruments and methods.

3.5.1 Phases of inquiry: Data collection methods andinstrumentation

3.5.1.1 The pilot study[14]

Social researchers Teijlingen and Hundley (2001, p. 1), suggest that pilot studies are crucial elements of a good study design. Teijlingen and Hundley (2001) list numerous reasons for conducting a pilot study. Of primary importance to this study is their notion that a pilot study may assist in the development and testing of research instruments, designing a research protocol, assessing whether the research protocol is realistic and workable and collecting preliminary data. In this study I used a pilot study to pre-test (Berg, 2007) the semi structured face-to-face interview protocol with three teachers. This data gathering instrument had to elicit appropriate responses from participants in my target population. Glesne (2006), suggests that pilot studies should be as close as possible to the realities of your actual study, not merely for the sake of data collection but with the idea to learn about the research process.

In this study, I used the principles of pilot studies as espoused by Teijlingen and Hundley (2001) and Lancaster, Dodd, Williamson and Pract (2004) to test the interview protocol schedule in a pilot study. After several iterations of critically designing and redesigning the interview protocol with my supervisor, I tested the interview protocol (Berg, 2007; Glesne, 2006) with three teachers in three primary schools in Laudium[15], a western suburb of the capital city of Pretoria. I piloted the interview protocol with the teachers of the three primary schools, as this sample represented the general target population of my sample (Glesne, 2006). The schools were easily accessible and thus convenient (Berg, 2007), through my level of collegiality as a teacher and my previous position as a principal of a public school in this suburb. Two of the teachers were Indian female, one of which was from the

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[14] See Appendix B16 (Exemplar of pilot study transcripts view protocol)
[15] Laudium - a suburb previously (prior to 1994) designated for people of Indian decent.

foundation phase teaching literacy, numeracy and life-skills and the other from the intersen phase[16] (*inter*mediate and *sen*ior) teaching languages and social science. The third teacher was a male teacher also from the intersen phase that taught mainly mathematics and natural science. All teachers were conveniently selected based on their level of expertise in using ICT and the fact that they knew me as a teacher and ex-principal. The interview lasted at least forty five minutes and was conducted immediately after the teachers completed their scheduled lessons for the day. The table (Table 3.3) below gives the demographics of the pilot study sample:

Table 3.3: Summary of participants - Pilot study

School	Type of School	Gender	Age	Teaching phase	Learning areas
School 1	Public primary school	Female	42	Foundation phase	Literacy, numeracy and life skills
School 2	Public primary school	Male	34	Intersen phase	Mathematics and Natural science
School 3	Public primary school	Female	40	Intersen phase	Afrikaans

Teijlingen and Hundley (2001), raise concerns that certain limitations of pilot studies may lead to 'contamination' of the study. One important issue raised was the tendency of making inaccurate predictions or assumptions on the basis of the pilot data. The experience I gained from the pilot study was that my own preformed assumptions would be more easily challenged in settings that are not familiar and thus open to new understandings. I reflect on my experience of piloting the interview protocol below:

Journal reflection 3.4 →

The findings from the pilot study made me feel very uncertain for a number of reasons. First, although the teachers responded to my questions very openly and honest, the teachers used the opportunity to use me a 'sounding board' for their general grievances about their real experiences and frustrations with regard to ICT use in the school. Issues such as the lack of training, denial by management to use the computer centre, lack of software and numerous other issues surfaced. I wondered 'Is this a worthwhile study?'

Reflection 3.4 (See Appendix C)

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[16] Intersen phase is a combination of two phases , the intermediate and the senior phase that are positioned within the primary schools in the South African school system.

Working from the findings of the pilot study, I reflected on my sample of schools and on the questions in the interview protocol. I reconsidered whether questions in my interview protocol were structured to elicit the appropriate responses, and began to fine tune some of the questions. For example, I reduced the total number of questions to twenty focussed questions, added more prompts to certain questions that required responsesand minimised simple 'yes' and 'no' responses. (See Appendix A9 for pilot study interview protocol). The main experience gained also compelled me to reflect on the manner in which I selected my sample of schools and the units of analysis for the study. In this regard I identified specific criteria for purposeful sampling that would yield information rich participants. According to Glesne (2006, p. 31);

> "*When studying in your own backyard, you often already have a role-as teacher or principal or case worker or friend. When you add on the researcher role, both you and those around you may experience confusion at times over which role you are or should be playing*"

Additional limitations of pilot studies suggested by Teijlingen and Hundley (2001) are that the data from the pilot study should not be included in the main findings. I avoided this obvious concern based on the fact that since the interview protocol was moderately modified after the pilot study, any data used from the pilot study would be inaccurately represented in the main study. Kvale (2005, p. 155) suggests that the wording of a question 'inadvertently shapes the content of an answer'. Although the interview protocol was tested in the target population, I precluded all participants from the main study to limit the effect of 'contamination' of data. In so doing I prevented participants in the main study that were already exposed to the interview protocol and the novelty lost through familiarity with the instrument culminating in compromising data integrity.

The pilot study also made me aware that my own preconceived views on certain issues could influence the behaviour of the participants and thus the integrity of the data through my own body language, tone of voice, expression and utterances. Though difficult to implement in reality, I attempted to make minimal use of these verbal and non-verbal cues, except to indicate to the participant that what he or she had to say was important to me.

Most data collection methods and instruments were formal and rigid whilst others were less formal in nature but integrated into the data gathering process. I used six instruments to collate data (See Table 3.4), with the intention that each may inform the research question in a particular manner and crystallize (Settlage, Southerland, Johnston & Sowell, 2005) the data collection method. The instruments ranged from interviews, observations, researcher journal, field notes, document reviews, informal conversational interviews and participant diaries.

Table 3.4: Research questions in relation to data sources and interview questions

Research questions		Source of Data					
		Observation	Field Notes	Participant Diaries	Document reviews	Informal conversational Interviews	Interview Questions Relative to research questions
How do teachers Appropriate educationpolicy on ICT in schools?	△ Triangulation	△	△	△	△	△	△
	Instrument	Digital video recording + Observation sheets	Reflective Journal and Field notes	Transcripts	Policy documents; Schemes, Preparation, Websites	Digital Voice Recording	E1,E2,E3,E4,E5, E6,E7,E8,E9,E10, E11,E12,E13,E14, E15,E16,E17,E18, E19,E20, P1,P2,P3,P4,P5, P6,P7,P8,P10,P13
	Trust-worthiness	Prolonged observation, Pilot study, Member checking, Multi-site, Multiple participants					
	Conducted by?	Researcher					
	When conducted?	July '08 to September 09		After transcribed	July'09 to September '09	July '08 to September 09	August '09 to July '09
What is the ability of the hierarchical unit (principal, district and province) within the education system to affect the behaviour of the teacher that is the target of the policy?	After teacher interviews			△	△		△
							Teacher Responses + P15 D4,D6,D7,D8, D10,D14,D15, D16,D19, Pr4,Pr6,Pr7,Pr8, Pr10,Pr14,Pr15,Pr 16,Pr19
What resources does this unit (principal, district and province) require in order to have that effect?	After teacher interviews			△	△		△
							Teacher Responses + P16 D7,D11,D20, Pr7,Pr11,Pr20
Key to Codes		E=Teacher ; P=Principal; D=District official; Pr=Provincial official					

3.5.1.2   Semi-structured face-to-face interviews[17]

Interviews are important in situations when we cannot observe behaviour or when we do not know how participants experience their world (Merriam, 1998). Face-to-face semi-structured interviews afforded me an opportunity to explore the meaning participants attach to their experiences *"erlebnis"* (Ponterotto, 2005, p. 131). Face-to-face allowed me to observe non-verbal cues and appropriately react or modify my inquiry in response to non-verbal cues (Holbrook, Green & Krosnick, 2003; Lee 2003) of participants particularly when they elicit confusion, uncertainty, or waning motivation. In this regard I was able to constructively react to these cues by reducing task difficulty and reinforce interest by skipping selected questions which I felt were adequately answered previously. The process of personally conducting the face-to-face interviews was crucial as I could modify my line of inquiry by probing into unanticipated, interesting or unique participant responses (Lee, 2003; Suchman & Jordan, 1990).

Although I designed the interview protocols[18] as a set of open-ended questions, I was free to modify and change the sequence of the questions according to the manner, appropriateness and context in which conversation flowed (Fontana & Frey, 2005). The design of the interview protocol ensured that I make effective use of the limited interview time, interview multiple participants in the same systematic and comprehensive manner, and keep focus. In designing the interview protocol, I created an opportunity to change the way the questions were worded, gave the interviewee additional prompts or rephrased the question(s) when the need arose (often evident when interviewees are silent after a question is posed). Furthermore, I kept a resource of planned prompts and additional questions that could be included as follow-up to probe into particular responses or to supplement the interview (McCracken, 1988). The pilot study I conducted alerted me to be cautious of creating interviewee fatigue through prolonged interviews and being sensitive to this phenomenon I remained focussed on observing any cues of fatigue and offered participants an opportunity to rest or continue with the interview at some other time. In the process of data

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[17] See Appendix B for verbatim transcripts of interviews
[18] See Appendix A6 to A9- Interview protocols

collection I also attempted to be reflexive by reporting on exactly what transpired. Thus I employed 'bracketing' (Ahern, 1999) in an effort to set aside my researcher assumptions and influence in order to elicit the reflected experiences of respondents.

Four waves of formal face-to-face semi-structured interviews (Fontana & Frey, 2005; Glesne, 2006) were planned. The interviews were conducted with teachers, school principals, e-learning district official and provincial e-learning directorate leaders. Interviews were scheduled for a period of approximately 45 to 60 minutes and the interview data sets were classified as follows:

First wave of interviews

The first wave of inquiry was to gather data by conducting face-to-face semi-structured interviews with the teacher participants. Since the schools in the sample did not occur concurrently I began to conduct interviews from July 2008 at the three selected schools, as and when schools came onboard in this research study. In planning and preparation to conduct the interviews, I had to consider various aspects and conditions for data collection such as the identification of the participants, pre-meetings with participants, permission to conduct the interview, duration, location and the constant scheduling and re-scheduling for each interview (McKinnon, 1988). I conducted semi-structured interviews with each of the six teachers at their respective schools and during the course of their normal professional activity. Since this study was exploratory in nature, an open-ended interview protocol was deemed appropriate (Devers & Frankel, 2000; Fontana & Frey, 2005). I designed all the interview protocols (Leece, 2002) with the first section briefly probing for establishing background context of the participant, and in so doing rich and thick data pertaining to the participant's life history was captured. The second section of the teacher interview protocol probed into teachers' experiences with regard to ICT for teaching the curriculum, student learning, administrative task, official documents for planningand, institutional and system support. Central to the design of the interview protocol was to avoid the pitfall made by McLaughlin (1987) in pursuing a top down strategy in designing the categories for the interview protocol. In this study a backward mapping approach sought to reflect the realities of teachers' classroom practices and not the policy system (Research question 1).

Second wave of interviews

The second wave of semi-structured face-to-face interviews was directed at the principals at each research site. The interviews with the principals occurred only after teacher interviews and lesson observations were completed. To garner data of each case with the goal of seeking the particular and the common, I designed the principal's interview protocol according to Stake's (2005, p. 447) six criteria for probing each school's particularity (see Appendix A7). The interview protocol design focussed on three sections namely, history and background context of the school, principal's vision of the role of ICT in education, implementing policy and institutionalising the use of ICT in the school (Research question 2 and 3).

Third and fourth waves of interviews

The third and fourth waves of semi-structured face-to-face interviews were conducted with district and provincial officials tasked with e-education policy implementation at schools. The interview was designed to probe the district and province's level of understanding of ICT policy and their role in facilitating the take up of education ICT policy in schools. The interview protocol was designed (Leece, 2002) based on four sections namely, leadership and background context, policy planning and implementation with the system, capacity building and effective practice, and professional development (Research question 2 and 3).

Data capturing and recording

I relied on digital recording equipment to preserve the answers of the interviewees, which proved to be useful during the subsequent categorising and data analysis(see Refection 3.5). Patton (1990, p. 348) suggests that a tape recorder is an 'indispensable' tool for capturing data, while Lincoln and Guba (1985, p. 241) do not recommend it because of intrusiveness and technical failure reasons. Immediately after the interviews, I downloaded each voice recording and converted it to particular file formats for ease of playback during transcription. These interviews were transcribed and the transcriptions became the data source for analysis.

Journal reflection 3.5	→	I am a traditionally a 'technology junky' and could not imagine doing research on ICT without a using technology affordances such as a digital voice recorder: Also, I prefer to keep eye contact with the interviewee to show that I am interested in what s/he says: Thirdly, I do not write fast enough to be able to transcribe and make notes of the participant's body language as well. Ref: Reflection 3.5 (see Appendix C)

Limitation of face-to-face interviews

A possible limitation of this method of data collection is that participants may tend to provide responses that they presume the researcher wants to hear (Glesne, 2006), as indicated in the excerpt below:

Journal reflection 3.6	→	This is evident as one of my participants indicated "you know Mr Vandeyar, I am not very good at interviews." I gathered that he felt that the purpose of the interview was to determine correct or incorrect responses from him. Ref: Reflection 3.6 (See Appendix C)

In an attempt to reduce the Hawthorn effect, I made regular visits to the schools to mingle with the participants in their natural setting, in order to gain their trust and confidence before formal interviews began. I also maintained various communication channels such as e-mails, sms's, and telephonic means to develop a relationship of trust with the participants, before scheduling the interview meeting.

The semi-structured interviews allowed for generated data to be used to compare and obtain common issues and experiences of the teachers which could lead to codes and themes for data analysis (Merriam, 1998). The semi-structured interviews were used as one of the principal data collection instruments as a means to cross check my observations, journal reflections and field-notes.
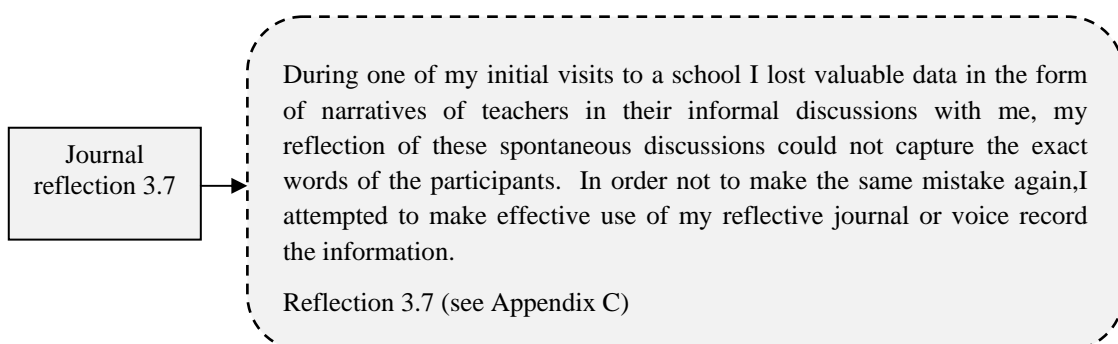
3.5.1.3 Informal conversational interview[19]

The informal conversational interview, as the name implies, is relaxed in nature, and the generation of questions is spontaneous arising from the natural flow of

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[19] See Appendix D8 (Example of an informal conversational interview)

conversational (Peräkylä, 2005). In this study informal conversational interviews were conducted with teachers on many different occasions and in various contexts. I had the advantage of exercising maximum flexibility and modified questions depending on the context of the investigation.The main advantage of the use of an informal interview approach is the depth of information gathered compared with the more structured approach. One disadvantage of this approach however is that data collection tends to be less systematic and analysis may prove problematic. To overcome this limitation I made notes of pertinent issues discussed to initiate further discussion or gain clarity on the issue.Another limitation was that informal conversational interviews were often conducted in the field and digital audio taping was not practical or convenient, thus it was necessary to resort to taking field notes.

In order to capture relevant data related to my observations I often resorted to conducting casual conversations with the participants (Peräkylä, 2005, p. 869). Although I carried the digital recorder, I chose not to record the informal conversational interviews (Patton, 1990, p. 113) as this could spoil the spontaneous 'moments' of conversations as they occurred in corridors, staff room and between lessons. I documented informal conversations as field notes, which were later used as a source for data analysis. I reflect on my experience of being unable to recall exact conversations:

| Journal reflection 3.7 | | During one of my initial visits to a school I lost valuable data in the form of narratives of teachers in their informal discussions with me, my reflection of these spontaneous discussions could not capture the exact words of the participants. In order not to make the same mistake again,I attempted to make effective use of my reflective journal or voice record the information.

Reflection 3.7 (see Appendix C) |

3.5.1.4   Classroom observations[20]

Emerging from a constructivist paradigm, I used unstructured observation to foreground the importance of 'context and the co-construction of knowledge between

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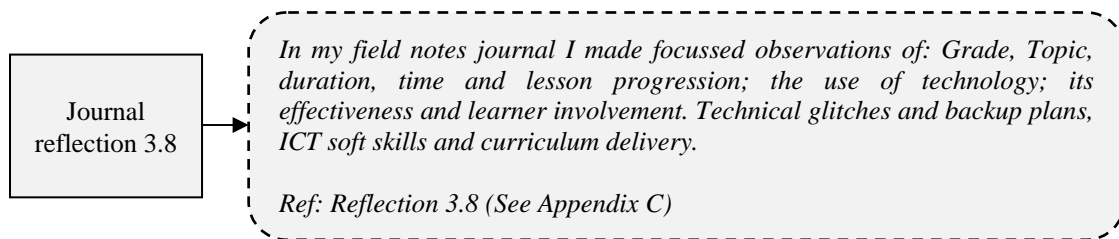
[20] See Appendix F (CD Videos, path = D:\Videos\)

the researcher and the researched' (Mulhall, 2003, p. 306). The reason for using classroom observational methods in this study was to determine whether what participants' say they do is the same as what they actually do in practice. Unstructured observation (Mulhall, 2003) allowed me to capture not only the process of policy implementation but also the context. In using unstructured observation I adopted a role as a reactive observer (Angrosino, 2005, p. 732). I acknowledged that in my role as a reactive observer I was part of the social setting under study (Giacomini & Cook, 2000). Reactive observations are controlled settings and assume that participants are mindful of being observed and are 'amenable to interacting with the researcher only in response to the elements in the research design' (Angrosino, 2005, p. 732). I purposefully chose this role as a researcher because of the useful source of data that this approach may yield. As I was positioned as a reactive observer (Angrosino, 2005, p. 733), some teachers would engage in communication with me during the lesson (whilst students were occupied), giving me a window of opportunity to ask questions about 'what is really going on in' their lessons. After observation, I noted the discussions in field notes so that I could later reflect on what was said.

I am however, not oblivious to the potential source of bias that may surface due to my presence in the research setting. While a dual reactive observer role creates opportunities for observation, it also brings along challenges as to whether the observed social interactions among other participants are natural. In order to capture more detail, I pursued more than one mode of documenting my observations[21]. In this regard I used field notes, reflective journal (discussed in a following section), video recording and digital photographs. Angrosino (2005, p. 74) suggests that 'technology makes it possible for the ethnographer to record and analyse people and events with a degree of particularity that would have been impossible a decade ago'.

I structured my observations by using three procedures as delineated by Angrosino (2005, p. 733) inherent in observational research. In terms of descriptive observation (Angrosino, 2005) I tried to eliminate preconceptions and noted (field notes) detailed descriptions of everything that was taking place. Then, I employed focused observation (Angrosino, 2005) in which I chronologically documented field notes on

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[21]See Appendix D – D1(Field Note - Classroom Observations)

the observations[22] and materials that were significant to the study, focussing on well defined categories of pedagogy, policy, student involvement, ICT skills, time management and specific ICT use in the classroom. Lastly I performed selective observation (Angrosino, 2005) of a general nature recording field notes on classroom layout, discipline, teacher control and classroom management issues. The reflection below indicates some aspects relative to the design of the observation field notes.

Journal reflection 3.8	→	*In my field notes journal I made focussed observations of: Grade, Topic, duration, time and lesson progression; the use of technology; its effectiveness and learner involvement. Technical glitches and backup plans, ICT soft skills and curriculum delivery.* *Ref: Reflection 3.8 (See Appendix C)*

I commenced with classroom observations at each school as soon as the interviews with the respective teachers were concluded. The period of observations at the schools began in July 2008 and ended in October 2009. However, there are periods whenpublic schools were not accessible to researchers(by regulation), especially during the first and fourth school terms and when independent schools were closed for vacation. I refrained from data collection during these periods and did not impose on the hectic schedule of public school teachers during these periods. The observational data gleaned was for the purpose of giving a description of the socio-cultural settings, classroom activities, teaching and learning, and most important the meaning of what is observed from the perspective of the participants (Silverman, 2006). Classroom observations not only afforded me an opportunity for deeper understanding of the interviews (particularly to observe issues that participants are not willing to discuss or participants themselves are not aware of), but also provided knowledge of the context in which policy implementation unfolds.

Though several observational strategies to reactive observation (Angrosino, 2005) are available, I chose to locate myself within the classroom to engage in limited interaction and intervening only when further clarification of actions was needed (Schatzman &Strauss, 1973). Where and when possible, provision was made to setup the equipment prior to children entering the class, allowing me to record all

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[22]See Appendix D – D1 (Classroom observation)

observations from the commencement of the lesson. I usually positioned myself at the back of the classroom so that I could be as unobtrusive as possible, yet observe the full effect of the technology being used for teaching but viewed from the same angle as the children. This observation position also presented the opportunity to collect data that satisfied ethical issues of data collection, as I could capture the images of children without compromising their identity. Armed with the curriculum time-table of each school I composed a composite roster to track schools, teachers and lessons for observations. During school visits for lesson observation I relied heavily on a composite lesson schedule of all the school research sites, which prevented double booking on any particular day (See Appendix B14 for a schedule of class visits).

Observation as a data collection technique provides a lens to view the 'experiences' of classroom life over a period of time. Observation as one of the main data gathering techniques used in this study, posed some challenges. Observational data is subject to interpretation by the researcher (Mulhall, 2003). In an attempt to minimize investigator bias and 'maximize observational efficacy' I used standardized observational procedures as outlined above (Angrosino, 2005, p. 732).I also attempted to reduce observer bias by eliciting feedback from participants whose behaviours were being reported. This process brought forth two distinct benefits, firstly by showing the participants my observation notes I could establish a 'self correcting investigative process' (Angrisino, 2005, p. 733). Secondly, the disclosure of my observational notes to the participants improved 'rapport' (Glesne, 2006, p. 110) as a 'distance-reducing', 'anxiety-quieting' and 'trust-building' mechanism. Another limitation of intensive observations at a small number of schools is that it could be seen as instructive and illustrative, and not as representative of all schools.

Documenting observations: Field notes, audiovisual data and reflections

I utilized field notes in accordance with Bodgan and Taylor's (1998) view that field notes are a primary source of recording conversations and observations. Using their suggestions for writing up field notes, I addressed two significant issues that had implications for the credibility of the study. First, I had to make certain that my note-taking was thorough and detailed in describing the situated context. Second, I had to

reflect and differentiate between what was actually said or observed as opposed to my interpretations of what was said or observed. This difference is evident from an excerpt from my reflective journal (see Appendix C14).

<table>
<tr>
<td>Journal reflection 3.9</td>
<td>

The deputy principal, in his enthusiasm to assist me in my research, suggested 'why don't you prepare the curriculum lessons using ICT, and I will get my teachers to deliver the lessons'. I informed him that it is my intention to observe the way ICT is integration in the curriculum in its natural process and not through my facilitation or influence. It was evident that ICT was not used to deliver the curriculum. He agreed to contact me when the computer centres would be functional, and that was the last I saw or heard of this school.
Ref: Reflection 3.9 See Appendix C

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I used the two basic approaches to field observation as espoused by Giacomini and Cook (2004) namely, direct and indirect observations. I spent sufficient time (See Table 3.4) in the context of the social milieu under study for direct observation and to record direct observations in the form of detailed field notes or journal entries. During indirect observation I used audiotape, video recording and still photography to capture data.

I relied on the use of mental notes while interacting with participants and when the situation did not allow for full note taking (Glesne, 2006), later I transformed these mental notes into jotted notes (Glesne, 2006; Berg, 2007) as a reminder to write more complete field notes. The rationale for jotted or cryptic notes was to capture events as they unfolded during in-classroom and out-of-classroom activities, serving as a memory aid for constructing more substantial field notes (Glesne, 2006). Often on leaving the research site, I also digitally audio-recorded my own reflections of observation and events; this lapse in time allowed me a different gloss on the actual events. I transcribed these recordings into my reflective journal as detailed descriptions (Berg, 2007), attempting not to engage in discussion with anyone before this was done. I also pursued my personal subjective reflections and comments by writing emerging thoughts on a notepad for future use and data analysis (Berg, 2007).

To record classroom lesson observations, I used a pre-designed observation sheet (Mulhall, 2003, p. 311) to make notes and record my observations of both verbal and non-verbal cues (See Appendix D1 to D6). I also used the observation sheet as a formal structure to record field notes *in situ* during classroom observations of anything that was noteworthy, interesting unusual, or 'most telling' (Wolfinger, 2002, p. 89). I made temporal notes to track the teaching processes of: introduction, content, time on technology, assessment and conclusion of lesson. Where an opportunity arose I took note of indicators of best practice in respect of using ICT in the teaching learning situation. Angrosino (2005) posits that true objectivity emerges from observational research when there is agreement between the participant and the observer 'as to what is really going on in a given situation'. In order to achieve this I made detailed notes on discussions with teachers immediately after each lesson to validate my observations and perceptions.

3.5.1.5   Reflective journal[23]

I drew on my ownexperience of keeping a research journal during this studyto deepen my understanding of the research processes (Janesick, 1998). In this regard the use of a reflective journal was twofold; first as a benefit to me as a writer, and second to make my work more public (from a reader's perspective). By reflecting and documenting my experience, I invited an enhanced awareness of myself as a person and made for more informed decisionmaking during the research experience (Holly, 1989). From a reader's perspective, access to my reflective writing provides insight into my perspective on some professional activity. Initially I did not think of a reflective journal as a methodological tool to generate data, (as compared to the way I requested participants to do in their participant diaries) but rather as a form of reflective writing which I engagedin during the research study. However, as the research progressed and the value of keeping a reflective journal became evident, I began to realize that itwas in fact another source of data about my research(Thomas, 1995).

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[23] See Appendix C – Reflective journal

From the outset, I documentedmy behaviour and thoughts in a journal which by the end of the research included writtenreflections about many aspects of the research from inception tocompletion. I incorporated excerpts from my journal into the writing of the research report, by identifying extracts that are salient in some way (to me and the reader). I made significant reflective notes, especially when I struggled with a difficult problem, for example in gaining access to research sites, or some aspect of field work (for example the pilot study). Such extracts conveyed personal significance which the research process has had for me, and also allowed me to share a personal–professional experience and an awareness that my ownjournal had made some relevant contribution to my work (Yinger & Clark, 1981). A reflective journal allowed me to engage in a form of self-inquiry, grounded by my own experienceas a researcher, through which I could identify and understandspecific ways in which I benefited through the journal. Janesick (1998, p. 24), views journal writing as "*a type of connoisseurship by which individuals become connoisseurs of their own thinking and reflection patterns and indeed their own understanding of their work*"and argues that journal writing is "*a tangible way to evaluate our experience, improve and clarify one's thinking, and finally become a better . . . scholar*"(p. 3).

I used Borg's (2001) "process benefits" to document my reflection in the journal by noting that each extract was prefaced by a short description of the contextin which it occurred, and has a title which identifies the key aspectof the research process it highlights.

3.5.1.6   Researcher participant diaries[24]

Bolger, Davies and Rafaeli (2003, p. 579) put forward the view that participant diaries give the researcher an opportunity to capture the events and experiences of the participant (teacher), that in essence it "captures life as it is lived". The basic benefit derived from participant diaries is that they promote the examination of reported events and experiences as they occur in their natural and spontaneous context (Julien & Michels, 2004). The advantage of this method of data collection was the reduction of distortion that may occur when reflecting on past events or experiences (Clayton

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[24] See appendix D7 (Example of participant diary format)

&Thorne, 2000). This method of data capturing also provides complementary information to the research study. Bolger, Davies and Rafaeli (2003) propose various diary designs and numerous formats that may be used in research studies. I opted to use a "paper and pencil" participant diary format, because it is simple and effective, but also because I did not want to burden the teachers with additional tasks. I requested that teachers note their reflective experiences on the ICT-integrated lessons that they delivered. Teachers had to record in their diaries the date, curriculum learning area, topic, ICT tools used, whether they perceived ICT enhanced teaching and learning, the problems they experienced (if any) and the nature of support (if any) they received from school management (Charmaz, 2001).

Although diaries are an excellent source of data, some limitations occurred during the course of this research study. First, from a practical application participants required training on the use of this protocol and its value, I assumed that teachers will naturally "know how to do this" (Charmaz, 2001). Secondly, keeping a diary by its very nature is a demanding task that requires participant discipline, commitment and dedication. Although I designed a very simple diary format, I realise that teachers are overburdened with paper-work and did not document this data. Hence, researcher participant diaries were envisaged, but did not realise, as data source.

3.5.1.7 Document analysis[25]

The final phase of inquiry was to use document analysis to supplement other data gathered. The goal of document analysis was twofold, first to determine whether elements of the e-education policy could be traced in these documents and second, as an additional source of data. According to Giacomini and Cook (2000), the analyses of documents are particularlyuseful in policy, history and organizational studies. I employed the method of interpreting text in artefacts with the particular notion of seeking meaning and context relevance for qualitative interpretative analysis (Charmaz, 2001; Glesne, 2006). The table (Table 3.5) below gives an indication of artefacts that were sought for data capturing, namely policy documents, curriculum documents, lesson plans, learner outputs and web-sites.

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[25] See Appendix E (Snap shots of documents: National and school policies, learners work etc.)

Table 3.5: Document analysis

Policy Documents	School ICT policy; National Curriculum Policy (Department of Education, 2002); White Paper on e-education (Department of Education, 2004); District and Province ICT circulars, policies, mission and vision statements. (See Appendix E7)
Curriculum Documents	School's meso and macro planning/ Worksheets/School syllabi and schemes of work
Lesson Plans	Teacher lesson plans
Learner's outputs	Learners written notebooks/Assessment/ICT work
Web-sites	School websites/teacher's resources and websites
School artefacts	Newspapers/portfolios/ICT presentations/photographs

The documents that were collated from the various schools were mostly ICT syllabi, school portfolios, school ICT policy, newspaper information and learners work. Documentation about ICT integration or teacher ICT-integrated lesson plans was almost non-existent or teachers were not required to illustrate this in their planning (See Appendix B, CD[26], B6 - school C Teacher 2 interview transcript). At school level, very little reference was made to the national e-education policy, while district and province levels only mentioned the e-education policy. In some cases there was sufficient detail of a school's ICT policy (as in the case of the independent school), whilst in other instances documents were virtually scarce or non-existent (as in the case of the two public schools).

Over and above documents collected at school sites, I used content analysis of school policy documents, national policy documents, circulars, photographs, newspaper accounts, web-sites, while brochures and official education policy on ICT for were used to supplement data. According to Silverman (2006), documents represent social constructions and need to be treated seriously. Document analysis is also unobtrusive, and interaction errors between researcher and participant are avoided (Mouton, 2001). Although documents cannot be used to report on what actually took place, I used document analysisto identify its intended purpose of use (Giacomini & Cook, 2000).

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[26] Refer to CD (Path=interviews\schoolC-Teacher2\teacher2.txt)

Chamaz (2001, p. 37) notes that the researcher does not affect the construction of extant text (organizational documents, government and school policy etc.) and that though extant text 'may mirror reality' there are limitations. For example, school management may develop their policy documents for the sake of compliance with education regulations but may not exhibit the practices defined in the document. However, documents of extant texts often complemented interview and observation data garnered in this study.

3.6   Data analysis: from research questions to findings

This section profiles analytic methods employed to make sense of the mass of qualitative data that was collected over a period of time. I attempted to provide in-depth explanation of the analysis process in order to bring meaning, structure and order to the data. The main focus of data analysis will be to yield congruency between the reality of the phenomena studied and the emergent themes. This study is situated within a qualitative paradigm which entrenches the concept that the form of data capture, is ultimately in the form of text. Most data was converted into text, and the text was the primary model for the object of interpretation (Schwandt, 1999).

As indicated in a previous section, the data was collected through a variety of methods (face-to-face semi-structured interviews, classroom observation, informal conversational interviews, field notes and researcher journals and document reviews). In the final analysis, the data sources for analysis included interview transcripts (Appendix B), digital video (Appendix F), my research diary (reflections and field notes) (Appendix C), field notes of informal conversational interviews (Appendix D), document reviews and observation schedules (Appendix E). However, photographs and participant journals were not used for analysis. As indicated previously (see 3.5.1.6), participants did not submit diary data. Photographs were also not used as data sources since the audiovisual data capture sufficed. Each of these data sources were analyzed separately and then integrated according to the emergent themes.These forms of data formed part of 'a procedure involving the simultaneous andsequential collection and analysis of data' (Creswell, 2002, p.449). I now expand on the data analysis methods employed for each of the abovementioned documented data sources.

3.6.1 Data analysis: Interview data

All the empirical data garnered through semi-structured interviews were coded and analyzed through techniques adapted from grounded theory methods as espoused by Charmaz (2005). The goal was *not* to develop grounded theory but to present a viable interpretation of the findings collected. The following sections describe the detail phases involved in the analyses of this data. (Refer to Appendix G, for data analysis phases for various data sources).

3.6.1.1 Data reduction: Bringing meaning, structure and order

The garnered digital interview data needed to be processed before analysis could begin and this was achieved through typing, editing and transcription so that the data would emerge as words or text. I used the method of data preparation and transcription as explicated by McLellan, MacQueen and Neidig (2003). I also followed their guidelines and instructions on how to prepare a transcript as well as track and store the digital audio recordings. Eleven interviews were conducted in total; six with teachers, three with principals and two with education department officials. A total of 350 pages of interviews were transcribed.

By personally transcribing each interview I could reflect on my experience of the interview as I listened again to the voice of the participant, and I could immediately reflect on the conversation and make contextual notes in the transcription. This allowed me to place text emphasis on the experiences of the participant (Fontana & Frey, 2005). Another advantage of transcribing the interviews personally was that as I progressed through the transcription, I immediately took note of possible codes that emerged as units of meaning (Miles & Huberman, 1994). On completion of each interview transcript I cleaned the document in terms of anonymity, printed it and hand delivered it to the participant for member checking(Creswell & Miller, 2000). The participant was requested to make amendments to the text if the interview transcript was not correctly captured, or make additions to the text if they felt that their ideas were not appropriately captured.

I utilized Miles and Huberman's (1994) data-reduction methodology as a means to reduce the mass of raw data into a manageable form ready for analysis. Drawing on their "components of data analysis" (p. 23), I subjected raw text data to refinement as a distinct process in the data analysis process. During the data reduction phase the qualitative data was reduced by selection, summary and paraphrasing of text. The main purpose of data reduction was to reduce the data into a form that could be examined for patterns and relationships.

3.6.1.2   Qualitative data analysis

As a novice researcher, I found the welter of garnered data overwhelming and realised that a manual analysis of the mass of data may not suit my needs. The use of a Computer Assisted/Aided Qualitative Data Analysis Software(CAQDAS) appealed to me as a tool for transcription analysis, coding, text interpretation and content analysis (Stemler, 2001; Silverman, 2006; Pope, Ziebland& Mays, 2000). I chose to use Atlas.ti™ which appealed to me for a number of reasons. Other than having the ability to perform qualitative analysis on text, graphic and audio data and being able to perform multiple coding on multiple cases, it has a user friendly interface for open-coding, searching, retrieving and network-building features (Weitzman, 1999). I took note of the fact that using software for data analysis may elicit the effect of distancing me from my data, by focusing on small chunks of text or text locations thus opposing the 'Gestalt' principal of 'keeping the whole picture'. Fortunately, Atlas.ti™ reduces this effect by keeping you in touch with all your data files on screen, and codes can be assigned within the context of the interview. The software appeared to elicit the same effect as manually flipping through pages of the transcripts, thus keeping you constantly immersed in the data.

Before importing all text files (transcriptions) into an Atlas.ti™ project, a number of steps required to clean the data for consistency had to be performed. This was achieved by firstly changing all actual participant names and school names to pseudonyms (for ethical reasons). Second, a document naming protocol (refer to Appendix B12) had to be devised that would indicate the pseudonym of the school or participant (for example, School A or Teacher 1). The document naming protocol had

to be simple enough to provide a means of identifying the participant or school by means of the file name. On establishing a research project in Atlas.ti™ the program creates a 'hermeneutic unit' which Muir (1997, p. 8) refers to as an 'idea container', in which all associated material of a research study is placed. Thus all garnered interview data such as text are treated as a single project, which I named as 'PhD Data'. This method ensured that did not strip the data at hand from the context in which they occurred. Addendum B15 is screen snapshots of the hermeneutic unit created for this research study.

3.6.1.3   Coding and categorization of data

I adopted the two main phases of a grounded theory approach (Charmaz, 2001, p. 46) for coding and categorising the data, namely initial and focussed coding. The initial phase involved the coding of the data. According to Charmaz (2001) coding is the first step of progressing beyond the interview transcripts and towards making analytical interpretations. The coding scheme was accomplished through a combination (Weitzman, 1999) of *a priori* and open coding. The three main themes (theoretical categories) were determined *a priori*guided by the three research questions, while subsequent analysis was guided and modified through interaction with the data and developed inductivelythroughopen-coding (Freeman& Richards, 1996). Coding was done by labelling segments of the data in order to simultaneously categorise, summarise and account for each piece of data (Charmaz, 2001).

According to Merriam (1998), Glesne (2006) and Patton (1990), categorization of the data begins with the first transcript of the first set of transcribed data; interview transcript, field notes, document analysis or informal interview transcripts. Through several reading iterations of each transcript I began with open coding of the data and simultaneously created a cumulative working electronic (word document) copy 'running list' of all open codes for quick access and to facilitate the open coding process for the CAQDAS software (Merriam, 1998, p. 181).

During the *first iteration* of the data, initial coding was done by gradually progressing through all the interview data, reading the entire transcript. I constantly checked

whether the codes that appeared in the first transcript were also present in the second and so on. New codes were added by open coding. This method of constant comparing of transcripts was strictly adhered to, in order to yield a master list of all codes reflecting 'recurring regularities' Merriam (1998, p. 181). These patterns of recurring codes emerged as conceptual categories that were created defining what we see in the data (Charmaz, 2001; Glesne, 2006; Patton, 1990).

The culmination of the first iteration through a process of surface content analysis (Silverman, 2006) was that 43 codes were generated. Table (3.4) indicates how the raw data was coded during the first iteration. In the *second iteration* of the data, focus coding was done to synthesize and refine the data, by comparing the data within categories and between categories. In other words "constant comparative analysis" as espoused by grounded theory proponents (such as Glaser and Strauss) was utilized in this study to compare data with data, to identify similarities and differences and categorise findings (Charmaz, 2005). In this process some categories were merged, while others were collapsed or eliminated because of irrelevance in response to the research question. According to Peräkylä (2005, p. 870), analysis of text takes place through a number of reading iterations of the empirical data and then "try to pin down their key themes and, thereby, to draw a picture of the presuppositions and meanings that constitute the cultural world of which textual material is the specimen."

During the *third iteration* of the data, axial coding was done to relate categories to subcategories, and specify the properties and dimensions of a category. This process (see Table 3.4), brought the data analysis to a level of interpretation. The categories that emerged had some congruence with the reality of the phenomenon under study. Underlying patterns that form theoretical constructs about how teachers appropriate education policy could now be investigated. In order to maintain conceptual congruence (Merriam, 1998) and to make sense of the emergent categories, I subjected the emergent codes and culminating themes to a hierarchy scheme as indicated in Table 3.6.

Table 3.6: Code Mapping: Three iterations of analysis

(*to be read from the bottom up*)

Code Mapping for appropriation of educationpolicy on ICT

(Research sub-questions 1, 2 and 3)

RQ#1:	**RQ#2:**	**RQ#3:**
How do teachers appropriate education policy on ICT in schools?	What is the ability of the hierarchical unit (principal, district and province) within the education system to affect the behaviour of the teacher that is the target of the policy?	What resources does this unit (principal, district and province) require in order to have that effect?

(Third Iteration: Application to data set)

The appropriation of education policy on ICT in South African Schools

(Second Iteration: Pattern Variables)

Themes by de-contextualization and re-contextualization

Code	**Code**	**Code**
1A. Teachers Interpreting Policy	2A School capacity	3A School resources
1B. Teachers implementing Policy	2B District and province capacity	3B District and province resources
1C Teachers practice		

(First Iteration: Initial Codes/Surface Content Analysis)

Code	**Code**	**Code**
1a Policy readerly teachers	2a Institutional Practice	3a ICT curriculum resources
1a Policy writerly teachers	2a Institutional Leadership	3a ICT competent teachers
	2a Transforming the institution	3a ICT policy and implementation guidelines
1b Teacher beliefs and attitudes	2b ICT Administrative directives	3b ICT policy institution policy, guidelines, and communication
1b Emerging pedagogies		3b ICT Curriculum integration guidelines and ICT standards
1b Teachers as innovators		
1b Collaborative learners		3b Systemic capacity and competence
1b Drivers of implementation		3b Common vision and strategy
1b Teachers' will		3b Lack of directorates cohesion
1b Administrative agents		3b ICT Willing schools
1b Developing learners		3b ICT Teacher training
1c Multiple learning styles		
1c Learner participation		
1c Integrative and interdisciplinary learning		
1c Learning with and about ICT		
Raw Data	**Raw Data**	**Raw Data**

3.6.2 Data analysis: Informal conversational interviews

The analysis of data captured from information conversational interviews was coded in the same manner as that of the interview data. The audio recordings of informal conversations (where this was done) and the field notes of the conversations were transcribed and subjected to the same analysis process as the data of the face-to-face semi-structured interviews. However, since this data source did not yield voluminous data, I performed a manual process (Basit, 2003) of coding and categorization of the data. (Refer to Appendix D8)

3.6.3 Data analysis: Classroom observation

In this data collection method, the use of video to document observations ofteachers' ICT-integrated classroom practice in three diverse schools proved helpful in generating data on the implementation of the e-education policy and about teaching methodology. The rich images of the classroomsprovided an opportunity to analyse teaching and learning issues with particular attentionto the manner in which teachers used ICT in their teaching practice and the explicit teaching strategies they adopted in ensuring learning outcomes were achieved (Grossi, 2007; Ebersöhn & Eloff, 2007).

Video data as an information source tends to be relatively unaltered through the eyes of the researcher and has a number of distinct advantagesover other types of data(Pirie, 1996; Jacobs, Kawanaka & Stigler, 1999). Video data as observational datacan more easily be brought back from the research sites and analyzed thought 'new lenses'. I was interested in understanding how teachers use ICT in their classroom practice and thereby illustrate how they appropriate the e-education policy. In this study video was used to capture the teaching pedagogy, learning activity, ICT-integrated curriculum content, classroom events and activity including visual (such as the writing on the blackboard, smartboard) as wellas verbal communication and content.

The analysis of video materialthat was collected in this study included watching, analysing and coding it. As Jacobs, Kawanaka and Stigler(1999) suggest a major

advantage of a qualitative approach to video recordings is that it more easily allows for thediscovery of new ideas and unanticipated occurrences. I applied Jacobs, Kawanaka and Stigler's (1999) qualitative video analysis approach to my observation data. The first step of the analysis began as the video data werewatched, critiqued, analyzed and then recorded as supplementary observational notes that were made *in situ*. In this kind of controlled setting, I used my classroom observational notes and searched for any additional codes or categories that may have emerged. I then made a second repeated viewing of a particular video and applied the open coding scheme that was developed and applied to the interview transcripts. (Refer to Appendix D1 to D6 for examples of observation analysis.)

3.6.4 Data analysis: Field notes

Spradley (1980) suggests that observations that are only descriptive are both time-consuming and ineffective. In this study documented field notes were immediately followed by a period of analysis that led to more focused fieldwork. According to Mulhall (2003), any writing, both in the field and hereafter, is a representation or a construction of events by the researcher. Field notes often tend to govern where they are constructed, and I often attempted to make notes at the research site before leaving. Many of the jotted phrases or words in the field notes were used to remind me of key events and dialogues. The field notes were then written up in more detail in a private space. Although this technique relies on an accurate memory and a recall of events, it does avoid some of the problems of confidentiality and participants being sceptical about the note-taking in their presence.

I used both field notes and the reflective journal as an analytic approach to re-construct the accounts of participants or salient events within context. Data sources such as field notes and reflective journals enriched and enlighten my writing (Ellis& Phelps, 2002). Although the experience of the researcher in the field is subjective, the field notes and researcher journals were not set aside as irrelevant information (Ellis& Phelps, 2002).

One practical issue of concern was how the data wererecalled and whether the field notes and reflective journal would inform the study. During the writing up of notes specific critical incidents or exchanges were related to other similar or contrasting events. Moreover, I wrote up events as they happened in real time, distinguished between descriptions that portrayed the physical environment, participants, other people and actions which make up a setting. I also noted dialogue (or transcriptions) which werea written representation of what was said (Mulhall, 2003). (Refer to Appendix D for examples of field note analysis.)

3.6.5 Data analysis: Reflective journal

In this study I engaged in reflective writing by presenting and analysing extracts from a research journal, with the purpose of doing research and to develop as a researcher (Borg, 2001).The journal was not just a place where I recorded events or documented existing thoughts, but more importantly, as Maxwell (1996) suggests, a forum for reflection where ideas were generated and explored and discoveries made in and through writing. The analysis below is concerned primarily with these processes. In addition the reflective journal is viewed as an"evidential store" (Thomas, 1995, p. 5) or "educational archive" (Holly, 1989, p. 71) which provides a record of the researcher's experiences during a project and which can be retrospectively analyzed. An analysis of my journal identifies several ways in which I benefited by periodically returning to entries I had previously made.

As I explained earlier, myfocus was on providing an account of my personal experiences of the research process. I applied content analysis (Glesne, 2006)to the research journal as an analytic method that is commonly applied to narrative data(Miles& Huberman, 1994, p. 9). The analytical process involved reading the journal, identifying and labelling reflective processes occurring in the data, identifying relationships between these processes, and searching for common sequences amongst them. The examples I present in Appendix C illustrate recurrent patterns of reflection occurring in the research journal that were established as a result of this analysis. I used Borg's (2001) 'product benefits' to analyse the reflective journal. (Refer to Appendix C for examples of reflective journal analysis.)

3.6.6   **Data analysis: Document analysis**

According to Stemler (2001), content analysis is also useful for examining trends and patterns in documents. Using this research method Stemler (2001) conducted a content analysis of school mission statements to make some inferences about what schools hold as their primary reasons for existence. I used content analysis of schools' ICT policy, teachers' lesson plans, learners'written work, school ICT attainment standards, ICT related policy documents; school newsletters and portfolios, school and teacher web-sites to determine if national policy mandates related to e-education have manifested themselves in school ICT policies. Textual analysis (Charmaz, 2001) allowed me to place the analysis within the social context of the school. Although I used textual evidence to corroborate other evidence, I also used Charmaz's (2001, p. 39) questioning technique as a means for analysing the extant text in order to gain insights into 'perspective, practices, and events not easily obtained through other qualitative methods'. (Refer to Appendix E for example of document analysis)

3.7   Touchstones for trustworthiness

Floden (2007) and Malterud (2001) describe the tenets of quality and rigour as distinct dimensions of the evaluation of quality research. Floden (2007, p. 505) suggests that judgement made on quality focuses on whether the study addresses a "question of broad interest and social significance". In my understanding it determines whether a study addresses an intellectual puzzle that is "important to scholarly knowledge or to policy and practice, or preferably, both". My assumption is that this exploratory study will make a contribution to the body of scholarly knowledge that is significant for policy implementation and significant for practice. Floden (2007, p. 505), explains that issues of rigour are those that the study employs to "guard against many threats of validity". To address touchstones of rigour in my research study I attempted to clarify and provide a clear justification for the methods used and to respond to the trustworthiness of the findings. It is my intention to provide adequate evidence in order to give credence to this study as one that pursued sound methodological rigour and can withstand an analytical defensibility of qualitative research.

3.7.1 Audit trail

The research design also attempted to pursue an audit trail by showing detailed, transparent and reliable methodological processes. I provide extensive access to all processes of documenting this study: raw data, analyzed data, data-collection instruments, research methods, decisions and activities in the relevant appendices (Sandelowski, 2000). Thedetailed audit trail enhances qualitative issues of credibility, transferability, dependability and confirmability and places the study firmly beyond verisimilitude perceptions (Tobin & Begly, 2004).

3.7.2 Case-to-case transferability

The focus on selected sites could raise validity issues with respect to the transferability of the findings. To overcome this threat, I adopted the strategy of selecting different schools from socio-culturally diverse settings for in-depth study. I also made a concerted attempt to use various data collection methods and instruments that would strengthen the notion of triangulation and thus yield findings that would suggest that the study investigated what it was meant to (Multerud, 2001; Berg 2007). In the previous sections I made an in-depth account of the various methods of data collection which, coupled with elaborate and detailed reflections, provides ample description of the context of each site and the description of the units of analysis. This in-depth account, coupled with the advantage of using maximum variation sampling, may facilitate and promote case to case transferability (Yin, 2003).

3.7.3 Credibility

Yin (2003) refers to credibility as the extent to which the researcher captures and represents the reality of how things really are from others' (informants and fellow researchers) standpoints. Credibility through triangulation of the descriptions and interpretations was continuously accomplished throughout the study. Credibility of the findings was also accomplished through in-depth data collection that was sought from a wide range of different, independent and different means; pilot study, interviews, observations, field notes, informal interviews or casual discussions and

document analysis. The prolonged engagement in the research field allowed for data to be captured in the natural settings of the participants, but more important is that valued judgements that are made were due to the level of consistency at the research sites over a period of time. This allowed for observed similarities and differences, and judgements that are made remained the same over time and thus supporting the notion of dependability of findings.

3.7.4 Confirmability

The trustworthiness construct of confirmability was achieved by employing a strategy in which the interview transcripts and the findings were fed back to participants. The process of member checking was to ensure that the findings represent a reasonable account of the participant's experience (Graneheim & Lundman, 2004).

3.7.5 Width and depth of study

Hoepfl (1997) and Patton (1990) state that sampling errors may occur due to distortions caused by insufficient depth, lack of breadth, and changes over time in the data collection process. I attempted to address these issues of distortion (Mouton, 2001), first through the triangulation of various sources of data whereby greater research depth was achieved; second, greater breadth of the research was achieved through a variety of sampling sites and the inclusion of a greater number of participants at each site in the study; third, as participant observer I attempted to prolong my visits to school beyond the intermitted scheduled visits by extending school visits and observing lessons through more than one school term. According to Gerring (2004), "a single unit observed at a single point in time without the addition of within-unit cases offers no evidence whatsoever for causal proposition". I also understand that my observations as a single researcher are limited to my own perceptions and introspection, and my presence in the research field may influence the behaviour and speech of the participant. However the prolonged engagement at each research site may help to reduce this effect (Mays& Pope, 1995).

3.7.6   Retest reliability

To promote retest reliability I meticulously maintained records of interviews, observations, field notes and a detailed explication of the process data analysis (Tobin & Begly, 2004). I also indicated above that my role as a researcher is to produce a plausible and coherent explanation of the phenomenon under focus. The use of qualitative software analytical tools (CAQDAS), digital video and audio recording enhanced the accuracy with which the analysis of data was achieved. More significant is that the electronic transcripts, reports generated by Atlas.ti™, digital formats of video observations and audio recordings are available for subsequent analysis by independent observers.

3.7.7   Researcher reflexivity and researcher role

I turn to the work of Multerud (2001), who describes a criterion for validity as researcher self-disclosing their basic biases, beliefs and assumptions. I also understand that in trying to understand the 'other' we learn about 'ourselves' (Fontana & Frey, 2005). It is the researcher's personal value system that is under scrutiny and that shapes the inquiry. Without having to repeat myself here, I refer to the reflections in the appendix (Appendix C13) in which I acknowledge and describe my beliefs, biases and preconceptions as I enter the research process. I also suggest that where possible I attempt to 'bracket' those biases and preconceptions as the research study proceeds (Ahern, 1999).

My role as a researcher is described most succinctly by Glesne (2006), as that of a researcher as learner. Having this view in the research field culminated in my ability to reflect on all aspects of research procedures and findings. Glesne (2006, p. 46) posits that 'as a learner you are expected to listen'. This is supported by Ponterotto (2005, p. 131) as he refers to the researcher as a "would-be knower". Often there were days in the research field when I was unsure that my reflections of what I was observing or hearing would lead to anything significant. However, there were more days that I felt optimistic of my reflections but not certain of how they would all fit together - (data collection; audio; video; transcripts; coding; reflections; analysis).

Getting mixed messages about my progress from my supervisor and co-supervisor, accompanied by feelings of guilt about family neglect, all created immense anxiety in my role as a researcher (Glesne, 2006). I took solace in understanding that this is "normal" and my supervisor's words that"things do get messy".

3.8 Summary

In this chapter, I describe the meta-theoretical and methodological lenses that guide and underpin this study, namely the social constructivism theory and the qualitative paradigm respectively. I also describe the qualitative methods and instruments that I employed to garner data. Furthermore I explicate why I succumbed to a grounded-theory data method to analyse data content as text in an attempt to explore how teachers respond to ICT policy on education. Finally I proffer criteria that attempt to enhance the trustworthiness of the study.

In chapter four I turn my attention to the findings and interpretation of the data. I also engage with the literature to elucidate my findings in the context of international debates.