Chapter 3

Research methodology and research design

3.1 Introduction

In order to address research methodology and research design in a logical, programmatic manner, this chapter opens with a reconsideration of the research problem, the main research question and the derived sub-questions.

The literature review and conceptual framework presented in Chapter 2, together with the adherence to a particular research paradigm outlined in this chapter, inform the way in which the research problem and research questions were approached. The approach thus adopted informed the choice of strategy to follow and the design of the actual research process. The selection of a particular research design implied the use of certain sampling and data collection methods, as well as particular fieldwork practices, rather than others. These are discussed in detail below. This discussion leads naturally to a discussion of data capturing, data editing and data analysis techniques selected for this specific study. Finally, shortcomings and sources of error will be addressed.

3.2 Hypothesis, conceptualisation, definitions, key variables

Numerous studies document factors influencing the successful modelling and support of ICT (Information and Communication Technology) implementations at school level (Mooij and Smeets, 2001; NCET, 1994; Crawford, 1997; Veen, 1995). In the first place, the emphasis in each of these studies is placed firmly on the implementation of information and communication technology rather than on the sustainable use thereof. It is not clear whether implementation and sustainability can be treated discretely or whether the relationships between the two are complex and multi-causal. Secondly, the diachronic 'sustainability' of computer-based educational programmes, as construct, is never addressed, other than in a very cursory fashion. In this sense, the studies represent an account of static situations rather than dynamic processes. This study hypothesises the nature of such diachronic processes of sustainability as being essentially indeterminate, evolutionary processes characteristic of complex systems (Fullan, 2005). The definition of sustainability used in this study will thus be that drawn from Fullan's (2005) work on the sustainability of complex educational systems:

As it turns out, "sustainability" is at the heart of all these
dilemmas. Its definition is not straightforward. It is not how
to maintain good programs beyond implementation. It is not
how to keep going in a linear, sustained fashion. It is not how
to keep up relentless energy. For the moment, let's be
satisfied with a general definition: Sustainability is the
capacity of a system to engage in the complexities of
continuous improvement consistent with deep values of
human purpose. There is a lot packed into this definition. It is
not just the outcome of continuous improvement we need to
observe, but we must also understand the key characteristics
of systems that display dynamic sustainability (Fullan, 2005,
p.ix).

For the purposes of this study, dynamic sustainability and the evolution of ecological or viral
systems, as discussed in Chapter 2, are taken as being synonymous. The characteristics of
systems associated with dynamic sustainability are defined as follows:

1. Public service with a moral purpose;
2. Commitment to changing context at all levels;
3. Lateral capacity building through networks;
4. Intelligent accountability and vertical relationships
    (encompassing both capacity building and accountability);
5. Deep, learning;
6. Dual commitment to short-term and long-term results;
7. Cyclical energizing;
8. The long lever of leadership (Fullan, 2005, p.14).

Furthermore, ICT implementation programmes in schools are characteristically embedded in
a systemically significant context, such that Mooij and Smeets (2001) identify a complex,
multi-level systemic educational structure. These structural levels range from the
international, national, regional and administrative levels to the level of the individual pupil
and internalised learning processes. Such multi-layered contexts provide comprehensive
momentum and support for successful ICT implementation. The suggestion is also made that
the successful implementation of specific educational programmes is dependent on the
involvement of 'active participants' (Mooij and Smeets, 2001) at various structural levels of
the educational system.

 The first question that arises is whether the involvement of active participants is the same at all structural levels, or whether different structural levels demand different kinds of involvement? The second question is whether particular personal qualities, skill sets and attitudes might be associated with active participation at the various structural levels. This study proposes differentiated personal qualities, skill sets and attitudes at various structural levels of the educational system.

Thus far, the term 'structural levels', as used by Mooij and Smeets (2001), has been employed without comment. The impression created in their treatment of the educational system is consonant with a deterministic structural, hierarchical educational system characterised by unidirectional causation and functionality. As indicated in Chapter 2, this approach is essentially irreconcilable with the postmodernist-inspired view of educational systems as complex, often indeterminate systems characterised by multi-directional, mutual causation that is consonant with ecological or viral growth patterns (Cavallo, 2004). This study, therefore proceeds from the hypothesis that educational systems are complex systems that cannot be fully accounted for in deterministic structuralist terms (Fullan, 1999, 2001, 2005).

Furthermore, what is not clear is the effect of a change in the systemic situatedness of the individual educational programme. In complex educational systems, the effect of such a change is often unpredictable – and is often followed by systemic development in unanticipated directions. This study further proposes that the effect of such contextual perturbation is essentially unpredictable. Nor are such processes easily observed since initial contextual investments in terms of time and money normally preclude stable investors such as departments of education from withdrawing support and thus risking the success of the project.

In this respect, the CALIS (Computer – Assisted Learning in Schools) Project, initiated by the Orange Free State Education Department (OFSED) , provides a unique opportunity. The Project was originally designed to implement ICT in selected schools in the region. Deserving schools and deserving teachers were identified. Teachers were trained to support co-operative learning and teachers were supplied with a number of computers each, for use in their classrooms. The Project was officially set in motion with the first CALIS conference in 1993 and continued during 1994 and 1995. It was, however, officially abandoned by the OFSED in 1996 when the new government identified other priorities, thus paring down contextual support and exposing the individual institutions to the prospect of ensuring the sustained use of computers as isolated entities.

The opportunity afforded by this project lies in the possibility of investigating influences on the implementation of a computer-integrated education project, with a view to ensuring the sustainability of the project. It also presents the possibility of elucidating the multi-directional, mutual causal relations that define an educational programme as complex system. The existence of such complex systems in the no-man's land between chaos and regulation (Stacey, 1996) implies that deterministic predictability at the micro-level is impossible. What is possible, however, is the drawing of multiple inferences which may be identified with in terms of varying degrees of certainty at the macro-level.

Given this hypothetical background, the originally conceived influences on the Project as being essentially material, non-material and process influences had to be restated in the form of the following sub-questions.

> *1. How did personal qualities, possessed by people directly or tangentially involved in implementing the Project, influences the implementation and sustainability of the Project?*
>
> *2. How did elements of programmatic design (those elements of programmatic design specifically embodied in the goals of the Project) influence the implementation and sustainability of the Project?*
>
> *3. How did the availability of physical resources during implementation influence the sustainability of the Project?*
>
> *4. How did the larger systemic environment in which the Project was implemented , influence the sustainability thereof?*
>
> *5. How was the further development of the Project affected by the animated, interactional interrelatedness of the complex system infused by all of the influences mentioned above?*

The inferences drawn from answers to these questions would then provide evidence from which further inferences could be made, with varying degrees of certainty, regarding the main research question:

> ***How did influences on the implementation of the CALIS Project affect the sustainability thereof?***

As has been suggested above, this question cannot be addressed in a vacuum. My own worldview and philosophical orientation, as researcher, determined how the research question was approached and how it shaped the subsequent design of a particular research strategy.

3.3 Research approach

The philosophical dichotomy outlined in Chapter 2 informs, to a large extent, the difference between the dominant research paradigms in modern Western scholarship, namely quantitative and qualitative research. Quantitative research, as the name implies, seeks verification of scientific hypotheses through measurement of a unitary exterior reality. Qualitative research, on the other hand, allows for inferential interpretation of narratively-constructed, plural and interior realities (Miles and Huberman, 1994, p.41). In this sense, the choice of a broadly-characterised qualitative approach was the natural choice in terms of examining a complex, educational system. I have consciously avoided the use of the term 'paradigm'. It is impossible to conduct research on an indeterministic and unpredictable complex system under the banner of a particular 'paradigm', the tenets of which the system does not adhere to. Rather, the postmodernist-inspired approach to research values multi-vocality, narrative, culturally-inspired mythology, and the value of minority or previously disempowered voices (Woods, 1999; Schostak, 2002). In this way, the 'master narrative' of the selected 'paradigm', is discarded in favour of a plurality of narratives. My own narrative, in the form of this research report, is inescapably an interpretation of narratives produced by participants (Kvale, 1996). Such narratives, in turn, are an interpretation of an individual reality, shaped partly by cultural mythology and metaphor. For this reason, narrative, religious and cultural mythology, and metaphor play a central role in this research project.

3.4 Research design

The design of this particular research project was thus deeply influenced by the three interrelated aspects outlined above:

1. research problem: how do a plurality of influences affect the sustainability or evolutionary further development of a complex system such as an educational project;
2. philosophical underpinnings (research unparadigm): indeterminate complex systems are embodiments of postmodernist plural, interior realities;
3. Broad research approach: complex educational systems demand a broadly-defined qualitative, rather than quantitative approach.

The CALIS Project appeared to have many of the characteristics of a case study. It appeared to be 'bounded' (Yin 2003, Merriam, 1998); it appeared to be a 'unique' occurrence (Yin, 2003, p.40; Merriam, 1998;); it appeared to demand an answer to a 'how' question (Yin, 2003, p6); it appeared to be situated very clearly in the past and thus fall essentially beyond my control or the control of the participants (Yin, 2003, p.7); it appeared to involve a

programme or process that was inextricably linked to organisational change (Yin, 2003, p.23). In Yin's view (2003, p.8), the case study research design adds two tools to the researcher's repertoire that are not available to the historical researcher, namely direct observation and the possibility of interviewing participants. I therefore, selected the case study design as the most appropriate way of eliciting the information that I needed.

Furthermore, the situatedness of the CALIS Project within a wider complex systemic context accorded well with views expressed in the literature regarding the possibility that cases could be situated within larger cases (Yin, 2003, p.14), on the one hand, and the view that the embeddedness of cases provides the researcher with "an even deeper understanding of processes and outcomes of cases…" (Miles and Huberman, 1994, p.26) on the other. It was clear, from the outset, that an examination of sustainability or evolutionary development would demand a process-friendly research design. The selected research design would also have to take cognisance of the influence of a multiplicity of contextual influences on the evolutionary development of the Project. Yin (2003, p.13) is of the opinion that the case study design does just that: "In other words, you would use the case study method because you deliberately wanted to cover contextual conditions – believing that they might be highly pertinent to your phenomenon of study".

3.5 Issues of measurement and data capturing vehicles

One of the overriding difficulties of attempting to capture the influence of a wide array of evolving contextual influences on a Project that had been officially abandoned a decade ago was selecting the most effective data-capturing vehicles. Initially, I envisaged the use of the following range of data capturing vehicles: individual semi-structured interviews; focus group discussions, participant observation; content analysis (as defined by Yin 2003, Merriam, 1998) of formal project documentation, informal communications, media articles, personal diaries and the paper trail associated with the process of project management. Supplemental evidence would have been collected in the form of physical evidence, namely processes of erosion and accrual, as defined by Merriam (1998). The latter evidence would relate specifically to material resources in the form of computer hardware and related material objects.

On further investigation and reflection, however, it became patently clear that the proposed data capturing approach would not be optimally effective, or even possible. In the first place, semi-structured personal interviews would provide a fairly narrow range of stock replies to questions that reflected a narrow range of researcher-anticipated influences on the Project. If

I wished to obtain a wide range of complex contextual influences on the Project, I would have to provide participants with the opportunity of identifying wide-ranging influences not anticipated by myself. This implied the use of unstructured interviews, or even better, the eliciting of narratives that captured culturally determined networks of symbolic situatedness. Secondly, focus group discussions would tend to do exactly what the name suggests: they would channel responses in such a way that they focused on a narrow range of consensually agreed upon influences – rather than allowing for the expression of a very wide range of disparately perceived influences. Thirdly, the fact that virtually a decade had elapsed since the official termination of the Project meant that no significant documentary evidence, either electronic or paper-based, was still in existence. Furthermore, participant observation, *in situ*, was similarly impossible since many of the participants had changed careers and all but lost contact with the original settings within which the Project had been implemented. Clearly, the passage of virtually ten years also precluded any meaningful examination of processes of erosion and accrual in terms of physical resources.

It was thus clear that the participants in the study would become informants in the true sense of the word (Taylor and Bogdan, 1998, p.89). Data in the form of narratives relating individual experiences of the CALIS Project would serve as the primary data to be analysed. This data would then be supplemented by the production of a research journal that would provide my own impressions of the interviews conducted and the narratives produced – as well as a form of reflection and documentation of the research process itself.

The open-ended gathering of qualitative data from participants is described, variously, in the literature as unstructured interviewing, the eliciting of narrative, and life story research. The ensuing discussion will demonstrate how qualitative one-to-one interviewing is seen as the data gathering vehicle of choice in each of these cases.

Life story or life history research is an approach that is employed in a wide range of disciplinary settings, "from sociological to anthropological to linguistic to literary" settings (Atkinson, 1998, p.2). It has also been employed very successfully in educational settings (Goodson and Sikes, 2001; Muchmore, 2002). Goodson and Sikes point out that life history research was abandoned by many researchers under modernism's insistence on objectivity testing and the concurrent production of statistical aggregation and arguments relating to representation (2001, 14). Current postmodernist approaches, however, have meant that life history research is able to play a fundamental role in capturing data that elucidates the "social production of individualism" (Goodson and Sykes, 2001, p.14) and the creation of shared knowledge and meanings that inform professional practice (Witherell and Noddings, 1991).

Goodson and Sikes argue that life historians use the life history method for the following reasons.

1. It explicitly recognises that lives are not hermetically compartmentalised into, for example, the person we are at work (the professional self) and who we are at home (parent/child/ partner selves), and that, consequently, anything which happens to us in one area of our lives potentially impacts upon and has implications for other areas too.

2. It acknowledges that there is a crucial interactive relationship between individuals' lives, their perceptions and experiences, and historical and social contexts and events.

3. It provides evidence to show how individuals negotiate their identities and, consequently, experience, create and make sense of the rules and roles of the social worlds in which they live (Goodson and Sikes, 2001, p.2).

The evidence revealing negotiated personal identity, mentioned above, is inextricably tied up in the construction (see Bruner, 1986, 1987, 1990, 1991) of narratives that give metaphorical and symbolic expression to cultural mythologies (Ricouer, 1991; Dannefer, 1992; Nielsen, 1999). In this way, the perceived weaknesses of life history research under modernism, namely lack of representation and subjectiveness, have become its greatest strengths under postmodernism (Munro, 1998, p.8).

In short, it was apparent to me that my approach to interviewing should be informed by the exhortation of Goodson and Sikes:

> … a researcher can never know for certain which
> experiences have been influential and relevant in a particular
> sphere of life, for sometimes connections are apparent only
> to the individual concerned. Conversely, it may be that
> events, experiences or personal characteristics, which the
> researcher expects to have been important, are not seen in the
> same way by the informant. Too tight a structure and
> schedule, and relevant information may be lost or,

alternatively, may be given disproportionate emphasis by the
researcher (2001, p.27).

It was also apparent that tight control over the course of the produced narrative was not only
undesirable, but, quite conceivably, impossible. The undesirability thereof is eloquently
argued by Goodson and Sikes above, whilst the conceivable impossibility of tight control lies
in the fact that "life historians have to accept that people tell the stories that they, for whatever
reason, want to tell to the person who is listening" (Sikes et al., 1996, p.51).

But the narratives produced in this study, besides focusing on evolving historical processes,
were also "narratives through which people described their worlds" (Holstein and Gubrium,
1997, p.127; Silverman, 2000, p.122). A number of authors further point out that such
descriptions should not be treated as participants' attempts at trying to produce accounts that
are true reflections of an external reality; rather, such descriptions are to be approached in a
way which opens them up for 'culturally rich analysis' (Silverman, 2000, p.123) and, in so
doing, plausible accounts of the world, generated by interviewer and interviewee in tandem
(Richardson, 1990, p.24; Miller and Glassner, 1997, pp. 103-104; Silverman, 2000, p.123).

One of the wider definitions of narrative is provided by Connelly and Clandinin:

> Narrative refers to the making of meaning through personal
> experience by way of a process of reflection in which
> storytelling is a key element and in which metaphors and
> folklore take their place (1988a, p.16).

The enculturated nature of reflections upon experience suggested in this definition mediate
the process of narration, and it is exactly this mediation that precludes the 'true reflection' of
reality alluded to above. A further mediation occurs once the narrative is 'performed'
(Goffman, 1975, p.26), since the audience/listeners/researchers must needs engage with the
proffered enculturated enactments in terms of their own enculturated, enacted experience. For
this reason, Hastrup suggests that what characterises such fieldwork is not the "unmediated
world of others but the world between ourselves and others"; and thus, "our results are deeply
marked by this betweenness and there is no way, epistemologically, to overcome its
implications (1992, p.117).

Rather than inspire terror at the inability of our results to produce 'slices of reality', such
epistemological ambiguity reminds us that we are dealing with negotiated realities that find

expression in complex systems. Goffman, echoing one of the assumptions underlying postmodernist practice presented above, reminds us further that narrative involves the conception of 'multiple-selfing' (Goffman, 1975, 1981). Not only are we confronted with the self as author or relater of events, but there is also the self as protagonist and the self as animator or 'performer' (Goffman, 1975, p.517; 1981, p.144). For this reason, narratives as 'strips of personal experience' (Goffman, 1981, p.174), are performances that present the transformation of complex reality into a single strip for replaying (Labov, 1972, 1981; Cortazzi, 1993).Such transformation is informed, not by the actual historicity of events, but rather enculturated knowledge structures or scripts that provide meaningful frameworks describing the nature of specific generic events and sequences of action (Schank, 1975, p.264; Cortazzi, 1993, p.63). Because these frameworks are culturally negotiated and shared structures, it is also the case that tellers may intend that which is not explicitly communicated or said to be "understood as part of a frame, script or plan" (Cotazzi, 1993, p.66). In this regard, Rogers et al., besides identifying what they call languages of negation, revision and evasion, identify a language of the "unsayable" in terms of which silence may hint at a fear of addressing that which is unspeakable in a particular interview (1999, p.89).

 "InterViews", pointedly chosen by Kvale (1996) as the title of a work on qualitative interviewing, provides evidence of the 'betweenness' that characterises a negotiated, plausible account of the way in which the world works (see also Cicourel, 1964, p.68). This conception of what constitutes knowledge is a basic tenet of both complex systems theory and of the worldview that underlies it: "In post-modern thought there is an emphasis on knowledge as interrelational and structural, interwoven in webs of networks" (Kvale, 1996, p.44).

 In short, open-ended interviews that elicited a narrative account of personal involvement in, and interpretations of, the CALIS Project would provide me with exactly the finely-nuanced, enculturated wide array of perceived influences on the sustainability of the Project which I sought; and they would do so in a manner consistent with my own worldview and theoretical positioning.

3.6 Sample design and sampling methods

The broad approach outlined above also informed my approach to sampling. Just as the focus on the functionality of complex systems informs the overarching research design of this study, so also it informs the sampling procedures followed. Miles and Huberman point out that approaches to sampling are deeply influenced, not so much by whether one conducts quantitative or qualitative research, but rather whether one seeks an understanding of a

limited range of controlled variables or whether one seeks an understanding of a wide array of interactional variables that are active in a complex system (1994, p.41).

As indicated above, the intention in this study was to elucidate the interactional nature of a wide array of interrelated variables or influences in an evolving, complex system. This system takes the form of an educational project that was abruptly officially terminated, even as plans for the evolution of the project were being formulated. In this sense it represents a unique case. As Yin points out, the veracity of single case study research is validated by research studies such as Graham Allison's 30-year long study of the 1962 Cuban missile crisis (2003, p.4). Also, and perhaps more importantly, case study research should not be equated with research that demands samples as representations of universes. Such an analogy breaks down because the latter relies on statistical generalization, where samples are generalized to universes, whilst the former relies on analytic generalization, where a particular set of results are generalised to some broader theory (Yin, 2003, p.37). In this particular study, the results obtained from the examination of a single, unique case are generalized to the approach towards the sustainability of complex, evolving educational systems advocated in the conceptual framework presented in Chapter2.

Given the nature of the case, coupled with the fact that the Project had been officially terminated virtually a decade before this study began, it was clear that decisions relating to sampling strategies and sampling design would be constrained by the circumstances surrounding the case. Goodson and Sykes (2001, p.24) enumerate a number of sampling techniques, indicating that one or more of these techniques are often used in qualitative case studies involving the production of narrative accounts. In terms of these types, the sampling techniques employed in this study might be identified broadly as purposive, snowball, homogeneous and extreme case.

In the first instance, sampling might be seen as purposive in that all participants were selected on the basis of their active involvement in the CALIS Project, either as part of the OFSED management team or as educators who implemented the Project in their classrooms. Secondly, and most importantly, as indicated by the following entry in the research journal, one participant provided the contact details of the following:

> Remember the kind of sampling mentioned by Merriam:
> Hercules Dreyer put me onto Dr Peet Venter and Johan
> Badenhorst. Dr Venter put me onto Ronel Calitz, and
> Maureen Dale. Ronel Calitz put me onto Sarie du Plessis.

Johan Badenhorst put me onto Igno van Niekerk (10
February 2005).

This sampling technique is referred to by Goodson and Sykes as 'snowball sampling' (2001,
p.24) and is referred to by Glaser and Strauss (1967) and Merriam (1998) as theoretical
sampling.

Thirdly, it might be argued that sampling in this study was 'homogeneous' since all the
participants were selected on the basis of a common experience, namely participation in the
Project.

Finally, it might also be argued that the selection of Maureen Dale as participant might be
viewed as an 'extreme case' since she is the only participant who is a mother-tongue speaker
of English, whilst the rest are all Afrikaans mother-tongue speakers.

But this is exactly where the traditional conception of sampling breaks down. Postmodernism
and complex systems theory opposes the view that any two accounts of an experience can be
the same. In this sense, homogeneity is impossibility. Even if participants were nominally
involved in the same Project, their unique circumstances, worldviews, systemic situatedness
and cultural/personal mythologies (coupled with the unique 'performances' mentioned above)
meant that I would be confronted with individually unique experiences that might or might
not correspond in unpredictable ways. Furthermore, extreme case sampling becomes
irrelevant when one assumes that experiences and the associated narratives are unique, and
thus all participants are extreme cases. Given the philosophical and theoretical difficulties
associated with these sampling techniques, I decided to make use of 'snowball' or
'theoretical' sampling. The similarities between the sample constitution and the sampling
techniques critiqued above are purely coincidental.

The selection of 'snowball' or theoretical sampling also meant that I could follow the
approach to sample size suggested by Taylor and Bogdan (1988, p.93). Their view is that the
sample size should not, and cannot, be determined at the outset but that it should be
determined towards the end of the data gathering process. Miles and Huberman (1994, p.29)
concur by drawing attention to the fact that within-case sampling has an 'iterative' or 'rolling'
quality, working in progressive 'waves' as the study progresses.

But this begs the question: how does one know when to terminate the data-gathering process?
Goodson and Sikes argue that if the aim is to reveal "shared patterns of experience" amongst
a group of people who have that experience in common, then the sample size will be adequate
when:

sufficient data have been collected and saturation occurs and
variation is both accounted for and understood … In
qualitative research, the investigator samples until repetition
from multiple sources is obtained (Morse, 1994, p.230).

The first problem associated with this approach is the fact that complex systems cannot be addressed with reference to a small number of consensually-constructed data; rather, gathered data has to reflect, in the case of this study, a wide array of interrelated influences on the CALIS Project. Secondly, eliciting this wide array of influences through the production of participant narratives implies that individually –constructed narratives should reflect individually-constructed experiences that will tend towards diversity, depth and richness of description, rather than 'repetition'. As noted above, the emphasis on 'repetition' here presupposes the ability to validate a unitary exterior reality. This approach would be contradictory to the philosophical and theoretical positioning of this study.

On the basis of the argument presented above, I decided to let the theoretical sampling technique run its course, and, in the process, identify the participants as they became known to me. In terms of sample size, I decided that I would be guided by the extent to which the data gathered provided confirmatory or contradictory evidence of the theoretical hypotheses adopted at the outset. If the CALIS Project was a complex educational system, as defined by Fullan (1999, 2001, 2005), situated within yet larger and larger complex systems, then it followed that influences on the Project would range from the macro-systemic international level to the micro-systemic level of the individual educator and the individual learner. Data gathering would thus have to take place until influences on the Project involving all structural levels (Mooij and Smeets, 2001) of the larger educational system had been accounted for.

3.7 Data collection methods and fieldwork practice

As I prepared for my first interview, I was painfully aware of the premium placed in the literature on the skills of the qualitative interviewer as key determinant of successful qualitative enquiry (Miles and Huberman, 1994). I was also painfully aware of my own inexperience. I resolved, however, that the eliciting of a wide array of influences on the Project would demand of me as interviewer the ability to be flexible and adaptable (Kvale, 1996) in terms of interaction with the participants. Bearing this in mind, I designed an interview schedule in English (Appendix A) consisting of a number of questions that I perceived to be open-ended.

I had been informed that Hercules Dreyer had played a very important part in the planning and implementation of the CALIS Project. I subsequently telephoned him and explained the nature of the research project and the modus operandi that I wished to follow. On being asked to participate, he willingly and enthusiastically agreed to take part.

Armed with the interview schedule, an audio tape-recorder and writing materials, I conducted the first interview of the research project with Hercules Dreyer at the offices of the software company for which he works in Pretoria on 09 July 2004. Within the first five seconds of the interview I was reminded of Kvale's (1996, p.84) warning that the qualitative interviewer has to make many "on-the-spot" decisions.

I ceremoniously asked the first question from the interview schedule, whereupon Hercules asked me whether he could answer the questions in Afrikaans. It was clear that the use of his mother tongue would make him feel more comfortable and effective in communicating potentially sensitive and emotional personal experiences. Also, I would gain access to his own situatedness within social and cultural networks that had no doubt influenced his own experience of reality. Furthermore, my own bilingualism and the fact that I had formally studied both languages at university level gave me the confidence to believe that I would be able to identify finely-nuanced meanings of words in Afrikaans. I decided there and then, that all other participants would be able to answer questions in either English or Afrikaans.

Within the next second of the interview, I had to make another major decision concerning my approach to the research project. Hercules began answering the first question with the words:

> "Laat ek begin by die begin."
> Let me begin at the beginning.

It immediately struck me that he wanted to tell me his story. He wanted to narrate, so that he himself could make sense of his own experience. I decided that the kind of narration that he was likely to produce would provide clues to influences on the CALIS Project that I had not foreseen. I thus decided to let him narrate for as long as he chose to do so. At the end of the narration, I would then ask the questions on the interview schedule that he had not covered. At the end of the narration, all proposed questions in the interview schedule had been covered. I decided that all subsequent participants would be shown the interview schedule before the interview so that they would be aware of the major concerns of the research project. They would then be invited to 'tell me the story of their own involvement in the

Project'. I would give them the floor, only interrupting in order to clarify or extend my own understanding of their involvement in the Project.

As indicated above, the decision to elicit narratives from participants was based on the belief that this would provide evidence of a wide array of interrelated influences on the CALIS Project. I also felt that the keeping of a research journal would provide me with the opportunity of documenting insights and decisions made as the research project progressed. In this regard, I undertook to enter into the research journal my own impressions of each interview directly after the completion of the interview itself. I further undertook to complete the electronic transcription from the audio tape directly after each interview, so that I would be able to follow any leads, produced by such transcription, in subsequent interviews. Detailed entries made in the research journal, directly after interviews with participants had been conducted, are presented in Chapter 4.

3.8 Data capturing, data editing and data analysis

The realization, gained at the beginning of the first interview, that participants were likely to present me with narratives rather than answers to questions embodied in a semi-structured interview format, convinced me to adopt the approach outlined below.

Firstly, I decided, on the basis of views expressed in qualitative research texts (Yin, 2003; Miles and Huberman, 1994; Merriam, 1998), that I would transcribe all of the audio-taped interviews myself. If, as is suggested, the researcher is the most important instrument in qualitative research, then it follows that the researcher, having conducted the face-to-face interviews, would be in the best position to transcribe these interviews in a manner consistent with the philosophical and theoretical presuppositions that underlie the research study. Furthermore, transcription and analysis are not to be thought of as discreet, linear processes. As Goodson and Sikes (2001, p.33) point out, researcher transcription of the interview data enables the researcher to become familiar with the data and aids analysis in that initial ideas and themes emerge with repetitive, intensive interaction with the data.

Secondly, participant production of narratives meant that listening to the audio-taped interviews and transcribing only those expressions that I deemed to be relevant would not be the most effective approach in the case of this study. Not only would I be precluding the emergence of relevant ideas and themes on a second or third examination of the complete set of narratives, but I would also be precluding an examination of those heuristic qualities that characterise both the individual narratives and the multiple narratives as the bulk of the data

set. Such heuristic qualities of narrative embody key characteristics of complex systems, as suggested by Rodriguez:

> Compelling narratives push us to look holistically at the
> world by urging us to make connections and identify
> complex and nonlinear relationships. They force us to
> understand how our ways of being bear upon the condition of
> the world (2002, online).

On the basis of this reasoning, I decided to transcribe the audio-taped narratives *in toto*. I also decided to conduct the transcription in such a manner that it would capture my own perception of the narrator's intended meaning (see Atkinson, 1998, p.56). The following entry in the research journal elucidates the reasoning behind this decision:

> I must be careful to document all decisions made in the
> transcription from audio to written – initial transcription
> captures all spoken language as accurately as possible –
> pauses and actions only indicated if they are related to the
> discussion or might be held to provide extra insight into the
> interviewee's motivations, state of mind or levels of
> emotional reaction to the question (19 January 2005).

I thus attempted to capture as much of the spoken narrative as faithfully as possible, only adding punctuation marks and separating paragraphs to aid the reading of the transcribed material.

As mentioned earlier, data collection, data editing and data analysis took place simultaneously. In my addressing of these interrelated activities, I followed the postmodernist-inspired approach of Kvale:

> A first step is when subjects describe their lived world during
> the interview … A second step would be that the subjects
> themselves discover new relationships during the interview,
> … In a third step, the interviewer, during the interview,
> condenses and interprets the meaning of what the interviewee
> describes, and "sends" the meaning back … In a fourth step,
> the transcribed interview is interpreted by the interviewer,

> either alone or with other researchers. Three parts of this
> analysis may be discerned; first, structuring the often large
> and complex interview material for analysis; … The next
> part consists of a clarification of the material, making it
> amenable to analysis; … The analysis proper involves
> developing the meanings of the interviews, … When the
> researcher has analyzed and interpreted the completed
> interviews, he or she may give the interpretations back to the
> subjects (1996, pp. 189-190).

Having completed the initial transcription of the audio-taped interviews, I carefully reviewed the completed transcriptions. It was immediately apparent that the decision to capture the spoken language as accurately as possible, whilst providing accuracy of expression, also provided narratives that were disjointed and were difficult to evaluate heuristically. The following entry in the research journal documents the data editing decision made after this first appraisal of the completed transcriptions:

> After a first rebooking at the data I have decided to punctuate
> and divide stream-of -consciousness dictation into
> grammatically correct sentences – ums and ahs have been
> omitted since I am interested in communication at
> propositional level and beyond in terms of pragmatic theory,
> and Relevance Theory in particular. I will also divide into
> paragraphs only where there is a very clear transition in
> terms of the subject of discussion. – the actual smaller units
> for categorisation will take place during a second reading –
> possibly utilising Relevance Theory (for metaphor) – not
> only in actual analysis of data but also in the process of
> choosing what constitutes the individual units of
> communication and analysis – propositional level (25 July
> 2005).

The paradoxically of data analysis in studies such as this one is embodied in the contradictory notions that qualitative researchers analyse data with minimal commitment to *a priori* theories and assumptions (Glaser and Strauss, 1967; Taylor and Bogdan, 1998) on the one hand, and the notion that all researchers bring background knowledge and assumptions to their research (Miles and Huberman, 1994; Kvale, 1996), on the other. Miles and Huberman,

in fact, argue that "not to 'lead' with your conceptual strength can be simply self-defeating" (1994, p.17). But, if an essentially postmodernist, complex approach is adopted, paradox is something with which one must be comfortable. Ever aware of my own presuppositions in approaching the analysis of the transcriptions, I was comfortable with the idea that these presuppositions were consonant with the characteristics of complex educational systems.

As I thus edited the transcriptions, I was also involved in seeking substantive statements (Gilliam, 2000, p.71); "identifying themes and developing concepts and propositions" (Taylor and Bogdan, 1998, p.141); and, "noting regularities, patterns, explanations, possible configurations and causal flows" (Miles and Huberman, 1984, p.22). In this way, an initial coding schema (Taylor and Bogdan, 1998; Giorgio, 1985; Moustakas, 1994; Price, 1999) was established in the form of a matrix of perceived categorised influences on the CALIS Project. This initial matrix was documented as follows in the research journal:

Matrix of perceived influences after initial reading and sentence shaping of raw data. (02/08/2005)								
	INT	NAT	REG	DIS	INST	CLA	EDU	LEA
PHILOSOPHICAL (PHI)								
STRUCTURAL (STR)								
PROGRAMMATIC (PRO)								
HARDWARE (HAR)								
SOFTWARE (SOF)								
PERSONAL (PER)								
RELATIONAL (REL)								
WORLDVIEW (WOR)								
INT=INTERNATIONAL								
NAT=NATIONAL								
REG=REGIONAL								
DIS=DISTRICT								
INST=INSTITUTIONAL								
CLA=CLASS								
EDU=EDUCATOR								
LEA=LEARNER								

Table 1

The categories documented from left to right essentially constitute the structural levels identified by Mooij and Smeets (2001) as influential in shaping an educational system. The categories documented from top to bottom emerged from an initial analysis of the transcribed narratives. Initial coding of the data revealed that the emergent categories were in need of editing. Firstly, the categories 'philosophical' and 'world view', originally designed to elucidate differences between formal educational philosophy and informal, individual world views, overlapped considerably. It was clear that both could be subsumed under the category 'philosophical'. Secondly, the categories 'personal' and 'relational' were originally intended to enable differentiation between personal qualities possessed by participants, on the one hand, and the way in which they interacted within social networks, on the other. Once again, the degree of overlap and uncertainty in terms of boundary prompted me to subsume both under the category 'personal'. It further struck me that the categories relating to the availability of 'hardware' and 'software' were too specific and that these could be subsumed under the category 'physical', relating to the availability of physical resources. Lastly, I wanted to draw a fairly clear distinction between influences on the successful implementation and sustainability of the CALIS Project that had been envisaged as outcomes of the Project, and influences on the Project that were elements of the larger system, but which had not specifically been envisaged as outcomes of the Project. In order to make this distinction clearer, I decided to recast the categories 'programmatic' and 'structural' as 'programmatic' and 'systemic'. A second, improved version of the influences matrix was documented in the research journal, as follows:

Matrix of perceived influences after second reading and sentence shaping of raw data. (02/08/2005)									
Revised 11/08/2005									
	INT	NAT	REG	PROJ	DIS	INST	CLA	EDU	LEA
PHILOSOPHICAL (PHI)									
SYSTEMIC (SYS)									
PROGRAMMATIC (PRO)									
PHYSICAL (PHY)									
PERSONAL (PER)									
INT=INTERNATIONAL									
NAT=NATIONAL									
REG=REGIONAL									
DIS=DISTRICT									
INST=INSTITUTIONAL									
CLA=CLASS									
EDU=EDUCATOR									
LEA=LEARNER									
PROJ=PROJECT									

Table 2

I proceeded with the second attempt at coding the data. Although the improved categories seemed to accommodate the data more effectively, the improved matrix was still not altogether satisfactory. I realised that the category 'philosophical' was redundant:

> Have been using the second version of the coding system and
> it seems to work much better than the first but the category
> "philosophical" does not work – too much overlap and have
> thus decided to scrap it for the next version of the coding
> schema (Research Journal, 14 August 2005).

But my discomfort with the perceived categories was deeper than this. The categories provided a useful way of isolating individually perceived influences on the various structural levels of the educational system. What the categories did not do was indicate the way in which individual influences were interrelated within categories and across categories. If the Project represented a complex educational system, these connections existed. I had noticed,

having read the transcripts a number of times that the metaphoric patterning across narratives had been strangely consistent. I was reminded of Schostak's characterisation of metaphor as 'stealth object':

> The metaphor of the iceberg can be reconceptualized as a stealth structure, part seen, part hidden. Stealth architecture occurs if there is something to be obtained in a context of contesting and concealing voices. Stealth technology and architecture hides more than it reveals. There is thus a surface which is open for observation but also a bar or barrier to seeing the whole of the stealth architecture. For the architect or designer, the object is to present a misleading surface. One may think of those glass-coated skyscrapers which reflect the buildings opposite and the sky and clouds above, thus at least partially disguising their own shape …
> (2002, pp.109-110).

It also appeared to me, however, that the perceived 'bar' to understanding the stealth structure *in toto*, at least within the inferentially-determined Relevance Theory approach to the interpretation of metaphor, was none other than the self. If interpreting metaphor is a matter of inference, based on an individually constructed, conceptually determined context or world view, then the stealth structure, as complete whole, is unknowable. But, just as the behaviour of individual elements in chaotic or complex systems does not necessarily make the system as a whole chaotic and totally unpredictable, so also the seemingly unknowable use of a metaphor as stealth structure does not mean that metaphoric patterning within and across narratives is similarly unknowable. Although 'knowability' of the stealth structure as whole is precluded by individual interpretability, socially and culturally negotiated inferences may be arrived at.

Very similar metaphors had been used across narratives to describe certain events and affective reactions to events. On examining these metaphors from a Relevance Theory perspective (Sperber and Wilson, 1986, 1995; Pilkington, 2000), it appeared that these metaphors could be grouped together in emergent patterns relating to 'personhood', 'journeying', 'ecology' and 'energy'. Taken together, the patterning provided a cultural-mythologically inspired meta-narrative that interrelated the individual categories across structural levels of the system. The networked complexity of the system had been captured in what I have termed the language of complexity.

In this way, the very act of coding was simultaneously an analysis and interpretation of the data, as predicted by Miles and Huberman (1984, p.22), Taylor and Bogdan (1998, p.141), and Silverman (2000, p.143). The final version of the matrix of perceived influences on the Project was reflected as follows in the research journal:

Matrix of perceived influences after third reading and sentence shaping of raw data. (02/08/2005)									
Revised 11/08/2005									
Revised 15/08/2005									
	INT	NAT	REG	PROJ	DIS	INST	CLA	EDU	LEA
SYSTEMIC (SYS)									
PROGRAMMATIC (PRO)									
PHYSICAL (PHY)									
PERSONAL (PER)									
METAPHOR(MET)									
'Personhood'									
'Ecological'									
'Journeying'									
'Energy'									
INT=INTERNATIONAL									
NAT=NATIONAL									
REG=REGIONAL									
DIS=DISTRICT									
INST=INSTITUTIONAL									
CLA=CLASS									
EDU=EDUCATOR									
LEA=LEARNER									
PROJ=PROJECT									

Table 3

3.9   Validity, reliability and generalizability

Given the approach to data capturing, data editing and data analysis outlined in the sections above, potential questions relating to the validity, reliability and generalizability of findings need to be addressed. As outlined above, the study was approached from a point of view termed "moderate postmodernism" by Kvale whereby the "notion of an objective universal truth" is rejected, while the possibility of "specific, local, personal, and community forms of truth, with a focus on daily life and local narrative" is accepted (1996, p.231). This philosophical position necessitated the use of a broadly qualitative, case study design with a focus on the use of unstructured interviews and researcher observation as the data-gathering instruments of choice. Only then could I elicit narratives that would illuminate a wide array of influences on the sustainability of the CALIS Project.

Kvale argues that modern approaches to "the legitimation question of whether a study is scientific tend to be replaced by the pragmatic question of whether it provides useful knowledge" (1996, p.42). I, similarly, find the term 'scientific' to be 'loaded' with connotations or associations relating to quantitative methodology specifically, and the positivist-inspired enquiry that characterised the Enlightenment Project, more generally.

One is confronted with concepts such as the 'triangulation' of data, itself a metaphor implicating the plotting of a course on a two-dimensional map. Tied to such a metaphor is the assumptional world view that comprehends the world as flat and that understands travel as the traversal of two-dimensional space. The map becomes a key to enabling the exact measurement of a universal exterior reality. But if there is no universal exterior reality such triangulation becomes meaningless. Richardson as quoted by Woods   replaces the two-dimensional metaphor of the map with the three-dimensional metaphor of the crystal:

> The emphasis here is not so much on 'getting it right' (in the
> sense of representing one objective reality) as getting it
> 'differently contoured and nuanced' (Richardson, 1994b,
> p.521). There is not one truth, not one single explanation of
> anything, but many overlapping truths operating at different
> levels and constantly subject to change. Richardson
> consequently feels that 'crystallization' is a more useful
> validating concept than triangulation. The latter assumes a
> fixed point, a single truth; it is too rigid and two-dimensional
> for the many-sided complexity of social life. The crystal, by

> contrast, 'combines symmetry and substance with an infinite
> variety of shapes, substances, transmutations,
> multidimensionalities, and angles of approach' (Richardson
> 1994b, p. 522) (Woods, 1999, p.5).

But, the 'crystal', as stealth metaphor, readily renders up for interpretation multi-faceted surfaces, whilst concealing it's compacted and solidified materiality. These surfaces cannot represent 'the many overlapping truths operating at different levels and constantly subject to change' since these surfaces themselves are precision-patterned in such a way as to provide a mechanistic Lego-like fit. This metaphor, as embodiment of societal complexity, implodes because it seeks to figure forth multiplicity in the form of the solitary and unitary – multi-faceted though it might be.

Where does that leave my approach to postmodernist inspired qualitative research? As mentioned above, with reference to case study design, case studies cannot be expected to provide findings that can be generalised to other cases. Rather, the findings relating to single case studies must be generalised to theory (Kvale, 1996). So, rather than paying lip service to 'scientific' rigour as envisaged above, I concur with Caelli, Ray and Mill, for whom rigour in qualitative research is a deeply theoretical issue, rather than a technical one:

> Our position is that qualitative researchers need to (1)
> articulate a knowledgeable, theoretically informed choice
> regarding their approach to rigor [sic], and (2) select an
> approach that is philosophically and methodologically
> congruent with their enquiry. Researchers' approaches to
> these two issues must reflect an understanding that rigor [sic]
> is a deeply theoretical issue, not a technical one (2003,
> online).

Against this backdrop, the issue of validity in this study is approached from the point of view expressed by Kvale, where validating involves: adopting a critical outlook on the analysis of data (1996, p.242); clearly establishing the content and purpose of the investigation at the outset (1996, p. 243); and, addressing the theoretical questions raised about the nature of the project investigated (1996, p. 244). Such a general validatory approach is supplemented by an approach to the validity of narrative that emphasises the internal coherence of a person's (narrator) experience (Atkinson, 1998, p.61), and the extent to which the narrator agrees that the transcribed and edited narration conforms to or supports what was said originally (Lincoln

and Guba, 1985; Atkinson, 1998, p.61). Both Dentin (1970) and Skaggs (1994) point out that narrators often disagree with, or fail to understand, the interpretation of their narratives. This is not strange since, as pointed out above, the transcribed, edited narrative is the researcher's interpretation of the participants' interpretations of their individual and collective experiences.

 After all is said and done, I was still the primary instrument and issues of instrument validity and reliability (Miles and Huberman, 1994, p.38) would have to be addressed by way of the rigour with which I documented not only the presuppositions and world view that I brought to the study, but also the decisions and interpretations made as I gathered and analysed the data. If the reliability of the study refers to the consistency of the research findings, as suggested by Kvale (1996, p. 235), then the study is reliable. If reliability refers to the way in which the research findings strike a resonant chord in terms of my own experience (Atkinson, 1998, p.61), then the research findings are reliable. But, perhaps the best indicator of reliability, in my own view, was the fact that I attempted at all times to allow for findings not specifically envisaged by me; furthermore, I was determined to remain flexible throughout the data gathering, data editing and data analysis stages of the research study in order to prevent the kind of rigidity that would preclude me from gaining access to a wide array of influences on the CALIS Project. The kind of indeterminacy that characterises complex educational systems had alerted me to the fact that I could not possibly have foreseen all of the potential influences on CALIS Project at the outset of the research study.

Adherence to theoretical rigour throughout the data gathering, data editing and data analysis stages of the study meant that it was easy to achieve the kind of generalizability referred to by Kvale as analytic generalization (1996, p.232). Analytic generalization is a kind of naturalistic generalization that is informed by theory (in this case, the theoretical propositions contained in the proposed conceptual framework).It is predicated on "a reasoned judgement about the extent to which findings from one study can be used as a guide to what might occur in another situation" (Kvale, 1996, p.232; see also Kennedy, 1979). Such inferences are guided by an analysis of the extent to which different situations exhibit similarities and differences. A striking example of the way in which a single case study can be generalised to a number of situations is Graham Allison's (1971) study of the 1962 Cuban missile crisis, the findings of which have been generalised not only to "foreign affairs … broadly, [but to] a whole variety of complex governmental actions (Yin, 2003, p.4). If, as Fullan suggests (2005), educational systems are complex systems, then generalisation in the case of this study involves the generalisation of findings to this theoretical approach, and by extension, to situations that can readily be seen as involving complex educational systems.

3.10 Shortcomings and sources of error

One of the potential shortcomings identified in qualitative research is that the success of the research project relies heavily on the skills of the researcher (Yin, 2003; Taylor amd Bogdan , 1998). The reason for this state of affairs is the fact that the qualitative researcher is the primary research instrument. Consequently, researcher inexperience and researcher bias potentially affect the reliability of the findings. Whilst admitting to inexperience, every precaution has been taken during the course of this study to ensure that my own world view and preconceptions are clearly stated and accounted for. Furthermore, every precaution was taken to ensure that no predetermined approach to either inteviewing or data analysis would constrain the data to reflect a particular point of view or approach. In fact, the use of theoretical sampling, in conjunction with the elciting of narratives, was purposefully employed in order to allow for the widest possible identification of influences on the CALIS Project.

A further potential shortcoming, seen from the point of view of quantitative research, is the fact that qualitative case study research focuses on a very limited number of cases (often, as in this study, only one case). Quantitative research seeks to generalise from samples to populations. Such generalisation is impossible in single case studies. As Kvale (1996) points out, however, the expectation that single case studies should be able to generalise in this fashion is based on a very limited conception of generalisation. In effect, the findings of single case study research enable us to generalise from case study to theory. In this particular study the findings of the research study are generalised to the theoretical position outlined in the conceptual framework (Chapter 2).

Finally, qualitative research renders findings which are subjective, rich and thick. Arguing that such findings are not as useful as measurements of an exterior reality denies human agency in the world. In the first place, the existence of a single, monolithic, extrior reality is contested. Secondly, as the title of Kvale's (1996) study ("InterViews") aptly demonstrates, the dynamism of complex systems is determined by the nature and quality of systemic inter-subjectivity, rather than the static nature of discreet subjects or objects.

3.11 Conclusion

The research method and research design outlined in this chapter rendered the analysis and presentation of findings possible. An examination of Chapter 4 will reveal whether the chosen method and design have enabled the identification of a wide array of influences on the CALIS

Project. Furthermore, the evidence presented in Chapter 4 will reveal whether the study has been successful in elucidating the dynamic processes that integrate influences on complex educational systems.