

## CHAPTER 1. INNOVATIVE TEACHING

*“The circumstances, conditions and the very status of knowledge, learning, teaching and researching are currently in a state of profound upheaval under the double impact of rapid and far-reaching technological changes and the massive assault on longstanding narratives of foundation and legitimation.”* Lankshear, Peters and Knobel (2000, p. 17)

### 1.1 INTRODUCTION

The purpose of this study is to generate a substantive theory that describes how innovative teachers' tacit knowledge manifests when they engage with emerging technologies to achieve pedagogical efficacy in a developing context. This study focuses on articulating the tacit knowledge teachers possess when they implement new strategies in their teaching and learning and how it manifests itself in their specific teaching and learning contexts. The substantive theory is based on the experiences of teachers participating in the annual *Microsoft Innovative Teachers Forum Awards* later to be known as the *Partners in Learning Program*.

This study evolved from the researcher's own involvement in the field of innovative teaching practice with the focus on teacher training and upliftment. The researcher's teaching career, that spanned a period of 25 years mainly in the field of sciences, provided many opportunities to guide and mentor fellow teachers in the integration of ICT in their own day-to-day teaching and learning practice. These interactions included informal instances of engagement as well as more formal workshops mainly in the Eastern Cape and Gauteng regions of South Africa. Observations done during this productive period affirmed the notion that teachers acquire a unique set of skills of a very practical nature over time when engaging with new technologies. Teachers further experience difficulty in articulating their tacit knowledge coherently enough to affect significant change in their own schools.

The process of knowledge building takes place on a predominantly instinctive level and it is through a journey of reflection and engaging with like-minded colleagues that teachers manage

to articulate, formalise and share their practical tacit knowledge with others. A direct result of explicating their understanding of their practical knowledge is that they continue to renew and grow their own practice and consequently this brings about greater change.

This study focuses on the latter context, of new tacit knowledge and further explores the phenomenon of teachers capitalising on the disruptive nature of emerging technology to introduce new and innovative pedagogies within their own contexts.

## 1.2 BACKGROUND INFORMATION

Cohen (1987, p.153) argues: *“Technology is an old educational enchantment.”*

Technological enhancement continues to resonate through time and change. This preoccupation dates back to the early days of the first printing machines when the promise of increased circulation of printed media held particular appeal to the field of education. The wider distribution of school texts would reduce the need of memorising everything and aid the spread of knowledge to a wider audience. New technologies of instruction emerged rapidly with the advent of paperback books, radio and later film. The age of the television and the microcomputer followed shortly thereafter. Early research conducted in the area of educational technology was of an evangelical nature, singing the praises and virtues of technologies and their attributes and affordances. Over time, information has become more widely accessible and this modern trend continues with the ability to publish uncensored material and media. Today ubiquitous computing penetrates every aspect of our life with the promise of learning – anywhere and anytime (Kukulaska-Hulme & Traxler, 2005; Vavoula & Karagiannidis, 2005).

Teaching and learning did not remain entirely unaffected by the changing times. Technological thinking followed psychological thinking and computer programmers rooted their instructional design in the learning theory of their time. Behavioural theories formed the basis for the first innovative teaching machines with the drill and practice techniques in the late 1970 and early 1980. In these instances the relationship between a learner's actions and response did not acknowledge the cognitive learning process (Burton, Moore, & Magliaro, 1996).

In response to limitations observed in behavioural theories, the cognitive theory came into being as an extension to the behavioural theory with activities which focused on introspection and the development of the mind (Winn & Snyder, 1996). The field of educational technology evolved to include computer based training (CBT), multimedia and content packaging such as the CD-rom. Computer programming became less of a specialized field and instructional designers entered the programming fray creating training and learning material. The early 1990 saw the start of internet-based training (IBT) with the corresponding constructivism orientation supporting the notion that knowledge construction in an active process (Duffy & Cunningham, 1996). This gave way to the e-learning phenomenon in the late 1990 and early 2000 which was informed by the socio-constructivist learning theory where knowledge is constructed in collaboration with others and learning is supported with software content that was mainly licensed and readily and cheaply available. In the last few years there has been a move towards free and open content held in large repositories. An example of this is the Digital Learning Africa Online resources for Educators and Students in Africa available online at <http://digitallearningafrica.org/>. Contemporary learning theory is moving in the direction of distributed cognition where knowledge must be shared to be constructed in the sphere of massive electronic gaming (Leadbeater, 2008).

Web 1.0<sup>1</sup>, has given way to Web 2.0<sup>2</sup>, with Web 3.0<sup>3</sup> in the design process with practitioners already engaged in a collaboration process defining its parameters. The initial development of the Internet offered users an avenue to source information and this later came to be known as Web 1.0 and it can be simply defined as a read-only medium. Only authorized developers and writers could contribute to this form of knowledge where a few select individuals decided on the quality and the quantity of knowledge available. This eventually gave way to Web 2.0 principles that can be defined as a read and write medium (Thompson, 2007). No longer is it the prerogative of a few individuals who understand the programming language to determine the content, but anyone with access to a computing device spanning all connected instruments can

---

<sup>1</sup> Web 1.0 - Web 1.0 refers to the state of the World Wide Web before the Web 2.0 craze, and included most websites in the period between 1994 and 2004

<sup>2</sup> Web 2.0 - A term that refers to a supposed second generation of Internet-based services. These usually include tools that let people collaborate and share information online.

<sup>3</sup> Web 3.0 - "Web 3.0" has been introduced to hypothesize about a future wave of Internet innovation comprising services that might be called "the intelligent web".

participate in the creation of knowledge. Connecting with each other through social networking tools is bringing about a fundamental shift in how learning is auctioned and it is profoundly impacting current trends in teaching and learning practice (Dillon, 2004; Oblinger & Oblinger, 2005) .

Additional opportunities for co-operation amongst individuals sharing common interests and skills are created through crowdsourcing techniques. Users can band together to build and share knowledge and create collaboration opportunities for tasks that are too complicated to undertake alone. The emphasis here is on mass innovative participation and collective creativity (Leadbeater, 2008). Problems are broadcasted to the web and an open call for solutions announced. Users responding to the call are known as the crowd, submitting their solutions in the form of online communities. Together these communities review the submitted solutions and decide upon the most promising ones. The crowd does not only share in the labour but also in the rewards when contributing to the collective (Daren, 2008). Distributed cognition is a form of community involvement which is still deemed too advanced for our current pedagogical practice or teaching ecology.

Pedagogy for this study is seen to be when a teacher follows an instructional strategy that brings about the acquisition of knowledge, or the use of teaching techniques that influence learning. Therefore, effective teaching entails principles that promote student learning and identifies that which students gain by doing problems, using content and criteria directed toward learning. Anderson (2004) views the concept of efficacy in its relation to pedagogy as a dynamic construct that includes an entire range of content, skills and performances that may be deemed desirable in achieving learning. He notes that pedagogical efficacy is to be treated as an attribute of a group and is not to be treated as self-efficacy that is commonly used in psychology. The resultant transformative direction for education is described as pedagogical efficacy. The active construct of pedagogical efficacy shapes the concept of innovation in relation to other pedagogical strategies. Anderson (2004) deems any kind of creative departure from the traditional methods as innovative, however, in the context of this study innovative teachers are seen as teachers that design, develop and implement changes to their everyday teaching and learning practice through the use of emerging technologies and thus act as agents of change within their particular

environments. The rapid advance in technology and the multitude of devices with differing capabilities require a continuous renewal in education and this only serves to emphasise the quandary teachers experience when they incorporate technologies in their classrooms.

In an effort to address the rapid development of new technology solutions, the 2010 World Economic Forum Global Agenda Council invited a select group of scientists and forward thinkers to draft a definition of emerging technologies in the domain of the natural sciences. The selected group members established the Emerging Technology Governance Council that highlighted the following points to be considered when dealing with emerging technology concepts:

- They are technologies which arise from new knowledge, or the innovative application of existing knowledge;
- They lead to the rapid development of new capabilities;
- These technology concepts are projected to have significant systemic and long-lasting economic, social and political impacts;
- They create new opportunities for and challenges to addressing global issues; and
- They have the potential to disrupt or create entire industries.

The above points are not only pertinent to the world of natural science but cross over into the world of learning as they require a rapid response from educational systems to develop new capabilities. The implications of increased technological advances affect human development in various ways. Not only is our view of learning impacted but also the part teachers need to play within their own pedagogical practice to accommodate the innovation process when considering the use of the emerging technologies.

As emerging technologies relevant to education are rooted in the domain of the social sciences, it is difficult to restrict the inquiry to technological tools only. Veletsianos (2010) urges academics and practitioners of the learning sciences to marry concepts, ideas, theories and approaches to learning with the use of these technological tools. He views emerging technologies, concepts,

innovations and advancements as tools to be utilized in diverse educational settings to serve varied education-related purposes. Veletsianos, in his groundbreaking work (2010, p. 17) makes the following 5 points regarding emerging technologies:

1. May or may not be new technologies.
2. Could be described as evolving organisms that exist in a state of “coming into being.”
3. Experience hype cycles.
4. Satisfy the “not yet” criteria of (a) not yet being fully understood and (b) not yet being fully researched or researched in a mature way.
5. Potentially disruptive, but their potential is mostly unfulfilled.

Knowledge construction with the use of these emerging technologies thus considers the embryonic stages of concept development and corresponding research to support new fields of interest. Our understanding of knowledge construction and the role of educational technologies is constantly changing. Somekh (2007, p. 160) captured the implications of technological advancement to education by stating: “As they become more easy to access, these new tools change the very fabric of the culturally patterned ways in which we undertake scholarship and work”. Consequently the field of pedagogy has become complicated and teaching with technology has been labelled a wicked problem (Mishra & Koehler, 2006). Nevertheless, this wicked problem is not without solutions as teachers at the cusp of the early adoption curve are starting to experiment and engage creatively in contemporary activities to explore temporary solutions in their practice resulting in a new set of challenges to solve. Pioneer teachers and early adopters are responding to the challenges in that they are transforming their teaching practices. They are the agents of change and therefore often regarded as being responsible for the innovations they champion (Fluck, 2003). Being an innovative teacher which forms part of the focus of this research thus means having the critical knowledge to deal with a teachable moment, effectively applying it in the process of designing and implementing instruction with the use of emerging technologies. The challenge remains to learn from these teachers and their innovative solutions and to utilise their new practices to build capacity in the education profession.

### 1.3 PROBLEM STATEMENT

The trend persisted for many years to prepare future teachers with as much knowledge as possible before going into practice (Ben-Perez, 1995). A disconnect has developed between what has been learnt during teacher training and the actual teaching practice. Teachers were equipped with mainly theoretical knowledge and their practical expertise subsequently became fragmented with little connection to their classroom experiences. This model of expert-knowledge, where knowledge was often provided by a few subject matter experts, dominated the education domain for many decades. As teachers moved from their pre-service training environments and engaged in the profession of teaching, they started to expand their knowledge and began to question formal teaching and learning theory (Korthagen & Kessels, 1999). The tension created between known *theory* of teaching and learning and the actual *practice* of it in the classroom, offered opportunity for new knowledge creation (Jorgensen, 2001).

Terms such as *theory* and *practice* are frequently used in the education space; however, they are rarely accompanied by a thorough analysis of the range of meanings they carry. Carr and Kemmis (1986) regard *theory* as a source of principles that can be applied in practice as a matter of professional judgment which can be developed at the wisdom of practitioners. In the context of this study the meaning of *practice* can be defined as the “conversion of knowledge into action to transform life” (MacLaren, 2000, p. 20) and *theory* as an organised system of accepted knowledge that applies in a variety of circumstances to explain a specific set of phenomena (Malara & Zan, 2002). Therefore, the notion carries forward that *practice* holds the capacity to transform, and it is up to *theory* to find and explain the generalities embedded within these practices across differing conditions. Teacher knowledge is fluid and even though theory and practices constantly engage with each other, knowledge remains anchored in the tenets of expanding our understanding of knowledge awareness and knowledge creation. Teachers’ knowledge reflect in the intellectual richness of their practical experience and Shulman comments that “practitioners simply know a great deal that they have *never tried to articulate*” (Shulman, 1987, p. 12). Literature suggests that teachers hold personal theories, cognitive constructs and guiding principles which determine their instructional decisions and technology integration (Churchill, 2006). These decisions are often made without one being able to justify



oneself to others and Rosiek and Atkinson (2005) surmise that these tacit insights will need to be translated into accessible forms to make them publicly available.

Thomas Kuhn (1996) mentions the work of Polanyi in which scientists' success is said to depend on tacit knowledge acquired through practice. He continues by explaining that tacit knowledge cannot always be articulated explicitly. Polanyi's straightforward explanation of tacit knowledge as "that we know more than we can tell" is confirmed by Winn and Snyder (1996, p. 115) and can appear intuitive, making tacit knowledge difficult to measure.

It is the task of the teacher to grapple with these disruptive forces and to grow their learners with the tools at their disposal to acquire the skills needed to navigate the 21<sup>st</sup> century. Teachers do not articulate these new practices and consequently their actions are not well understood by their colleagues or transferred to differing teaching and learning contexts.

Integrating ICT in education is a complex issue which takes on many forms with different purposes. It can range from replicating existing educational practices through digital media with technology as tools, to transforming education to bring about new learning goals, new teacher knowledge and skills development which results in innovative pedagogies (Law, 2008). Manifestations of new knowledge and the cognition of the innovative teacher in the process of adopting new practices form the pivotal point of this study.

Eraut (2003) calls for the relations between theory and practice and their actions, context and outcomes to be clarified and Thornton (2006) requests that a comparison needs to be made between existing theories and new theories to determine whether they can better explain a phenomenon to further theoretical progress. The aim of this constant comparison is to improve the fit between *fact* and *theory* and this equally applies to *practice* and *theory*. Thus, the purpose of this study is to provide a theory of how innovative teachers' tacit knowledge manifests when they engage with emerging technologies to achieve pedagogical efficacy in a developing context.

## **1.4 MOTIVATION FOR THIS RESEARCH STUDY**

In the early 1990s Selfe (1990) called for a theoretical perspective to examine the impact of Information Communication Technologies (ICT's) in education and warned against the

continued viewing of cases in isolation. He encouraged a systematic analysis to give our everyday classroom efforts direction and meaning. Sixteen years later Mishra and Koehler (2006) supported this call and suggested using good case studies, detailed examples of best practice and the design of new tools for learning to build greater understanding in the field of education and technology use in schools for teaching and learning purposes. Only once this has been accomplished can unified theoretical and conceptual frameworks be created that would allow researchers to develop and identify themes and constructs that would apply across diverse cases and examples of practice.

Bridget Somekh cautions that without evidence of new ways of doing things, speaking primarily towards ICT in education, a “distinct lack of imagination can result in fossilised patterns” being reinforced (Somekh, 2007, p. 160). These patterns refer to embedded cultural orientations and structures of power and authority involved in drafting policy and putting practice into effect. This resonates with a warning from De Bono:

“Culture is concerned with establishing ideas. Education is concerned with communicating those established ideas. Both are concerned with improving ideas by bringing them up to date. The problems arise when new information can only be evaluated through an old idea. Instead of being changed the old idea is strengthened and made ever more rigid” (1970, p. 9).

Researchers should not neglect to focus on episodes of changing pedagogical practice to suit the *tools of our time* with a proliferation of new technologies and ideas that impact current teaching and learning theory. Instead of strengthening existing theories, our calling as researchers is to seize the opportunity to amend the *fossilized patterns* by expanding and amending existing teaching and learning practices.

Somekh (2007) identifies the lack of fully technology integrated schools as a very real hurdle standing in the way of understanding how knowledge is constructed with ICT in teaching and learning. She argues that it is only in scenarios where technology has permeated every part of the human activity that the impact in the changing cognitive process can be studied. Offering an alternative perspective, this research study would argue that fully technology integrated schools

are not required and cognitive growth manifest with the sharing of available technologies. The South African reality is that there is an apparent lack of computers in classrooms (Blignaut & Howie, 2009), however, the availability of a multitude of untethered digital devices gives rise to different types of innovations. Innovative teachers exploit a host of ICT tools and their affordances, which have become almost ubiquitous to their teaching and learning. These teachers display exemplarily understanding of innovative pedagogy and use it to transform their processes of learning (Plomp, Anderson, Law, & Quale, 2009).

Litchfield, Dyson, Lawrence and Zmijewska (2007, p. 591) argue that there is an urgent need for a body of knowledge about learning and teaching principles and strategies which can inform teachers wishing to utilise innovative technologies. This knowledge store can also inform and guide the development of policy and pedagogical approaches about emerging mobile devices. Introducing emerging technologies into the classroom can have an impact on traditional teacher and learner roles, learning situations, patterns of interaction, learning spaces and assessments (Mioduser, et al., 2002a).

For the past 15 years the domain of ICT have supported learning environments has been studied. Voogt and Knezek (2008a) find it unfortunate that despite this long history, ICT have found their way to so few innovative teachers. Developing a theory for the innovative use of technology in education is difficult as it requires a detailed understanding of complex relationships that are contextually bound. In employing ICT in the classroom, whether it be through e-learning or m-learning instances, Conole et al. (2004) encourage a more theoretical approach in designing learning events with the intent of enabling practice to reflect an underpinning theory.

The International Association for Evaluation of Educational Achievement (IEA) Second International Technology in Education Study (SITES) module 2 projects recently gave birth to a new research field. This emerging research area was aptly called the Emerging Pedagogical Practices Paradigm (Kozma, 2003). During the study schools were selected based on their innovative pedagogical practices using technology (IPPUT). The data collected during this study informed and helped sculpt the parameters of this emerging field.

Personal tacit knowledge is created by experienced practitioners who test information through practice, reflect on its worth and then either integrate it into their actions and thoughts or reject it (Jarvis, 1999). This valuable learning process of knowledge creation aligns with the three intellectual traditions of the Emerging Pedagogical Paradigm (EPPP) namely:

- Lifelong learning which leads to autonomous learning;
- Constructivism, emphasising collaborative learning, and real-world projects with authentic assessments where students accept responsibility for their own learning and
- Information literacy, especially gathering data and analysing information.

Up to now the EPPP has addressed many requirements posed by the knowledge society, but there is much more work to be done in the full range of ICT knowledge-based skills. Little is understood about the ICT conceptualisation of the teacher who is not yet integrated into this paradigm. Essential skills such as deep understanding, critical thinking and high-performance learning still need to be fully understood in their relation to ICT use in the classroom and beyond.

Theory has to follow practice to enable the growth and maturation of a study field which is still in its infancy. Theory can offer coherent explanations of learning activities and practice. This is why it is time to move away from largely practice based models and start to generate theories that cover the use of emerging technologies in teaching and learning and in particular, how these can contribute to the field of Emerging Pedagogical Practice Paradigm from the teachers' perspective.

Selwyn (2002) reports on numerous attempts to introduce theoretical perspectives to an education technology audience without much success. His findings indicate an avoidance and mistrust to advance theoretical approaches when formulating research direction on the role of new technology in education. He redirects prospective research to seek out a more balanced angle and to move away from the more utopian outlook as characterised by research agendas. The reticence to reflect on negative, or less successful aspects of educational technology, has long been seen as a fundamental restriction in the field. More recently Selwyn (2010) calls for

the adoption of a more objective perspective in the academic engagement with educational technology and encourages the asking of awkward questions in order to highlight both the advantages and disadvantages of engaging ICT in education. He requests a change in the framing of educational technology research to reflect a more theoretical perspective in the formulation of research questions.

This call to advance theoretical perspectives to deepen our understanding of ICT usage in education resonates with this research study's proposed desire to uncover and illuminate the complexities in the field of knowledge creation with emerging technologies. Teachers are central to this challenge in their attempts to incorporate ICT in their everyday teaching and learning and confront the tensions between theory and practice on a daily basis. Accordingly, the research endeavour is to investigate the way in which innovative teachers develop and implement their novel knowledge in relation to their choices and justify their use of emerging technologies in their everyday practice for teaching and learning purposes.

## 1.5 RESEARCH QUESTIONS

In the current literature the voice of the innovative practitioner teacher is barely audible. This voice is rich in practice and experience and can aid us in our understanding of the best practice models. Innovative teachers offer an unique perspective on the use of emerging ICT in their everyday practice and can inform contemporary teaching and learning theories. Therefore, the ultimate aim of this research is to understand more clearly the relationship between practice, practical knowledge and theory in relation to emerging technologies. Investigating innovative teachers' personal theories and practice based models can pave the way for developing meta-theories to inform future practice.

The following primary research question was formulated to guide and frame the inquiry:

How does tacit knowledge manifest when innovative teachers engage with emerging technologies to achieve pedagogical efficacy?

In order to answer the main research question a set of sub-questions were initially formulated but they were changed as the study progressed. The initial questions were:

- I. What are the characteristics and affordances of new and emerging ICT that are used by innovative teachers and what are they doing to succeed in their use of ICT to change their teaching and learning practice?
- II. What personal theories/ beliefs/ practical knowledge do they exercise and how do they draw on existing theory in their innovative uses of ICTs in their teaching and learning?
- III. What other contextual factors influence knowledge building and innovative practices contributing to their success?
- IV. How are patterns of teaching and learning changing in the face of ICT integration both in and out of the classroom and what can policy-makers and other teachers learn from these innovations to inform future practice?

The initial sub-questions were found to be inadequate and too narrow in their focus to fully explain the phenomenon and they were revisited once the literature review delivered a framework appropriate to thinking about the factors that might influence innovative teachers when they conceive and act on their new tacit knowledge. The framework presented in Figure 2-1 (*cf.* Section 2.2) considers how people interact with their natural world, with other people and with the artificially man-made technical world. Innovative teachers are subjected to all three areas of influence and Gardiner (Gardiner, 1989) identifies these influences as the technosphere, ecosphere and the sociosphere. The initial data that was collected was analysed using this framework and yielded the main themes around which the final sub-research questions were formulated. The purpose of the sub-questions was to reveal the relevance of contexts and practice within a school environment.

Given the differing circumstances within which teachers innovate and the reflexive adaptation of their own practice within their work environment, the progressive *invivo* sub-questions that were revealed during data structuring aided the researcher in understanding how innovative teachers articulate their tacit knowledge in their quest for pedagogical efficacy.

The sub-questions are:

1. What role does moral cohesion play within the sociosphere of the innovative teacher?
2. How do teachers negotiate innovation within the technosphere context?
3. How do structures of governance respond to the innovative teacher within their ecosphere?

This study therefore needs to be appreciative of the relative role of the innovative teacher within the community; the pedagogical aspects that influence innovation and the way in which a school responds to an active innovative teacher within their midst. Thus the researcher endeavours to examine and better understand how the innovative teachers' knowledge manifests itself within their context.

Consequently the purpose of this study is to provide a theory on how innovative teachers' tacit knowledge manifest when they engage with emerging technologies to achieve pedagogical efficacy in a developing context. Emerging from the above purpose, the following objectives were set:

- To investigate personal convictions; social structure and relationships within the wider community that can hold sway over the innovative teacher;
- To describe areas of teacher innovation and engagement when using emerging technologies in their practice and
- To consider the response of governance structures when harnessing the skills of the innovative teachers within the school environment.

This research will therefore describe the phenomenon where teachers innovate within their own practice and employ emerging technologies to extend their pedagogy within the South African context.

The intellectual puzzle is presented in Table 1-1 below and contains the main research question, as well as the research objectives with matching formulated subsidiary research questions.

**Table 1-1: The intellectual puzzle for this study**

Research Question	Objective	Subsidiary research questions
How does tacit knowledge manifest when innovative teachers engage with emerging technologies to achieve pedagogical efficacy?	1. To investigate personal convictions; social structure and relationships within the wider community that can hold sway over the innovative teacher.	1. What role does moral cohesion play within the sociosphere of the innovative teacher?
	2. To describe areas of teacher innovation and engagement when using emerging technologies in their practice.	2. How do teachers negotiate innovation within the technosphere context?
	3. To consider the response of governance harnessing the innovative teachers within the school environment.	3. How do structures of governance respond to the innovative teacher within the ecosphere?

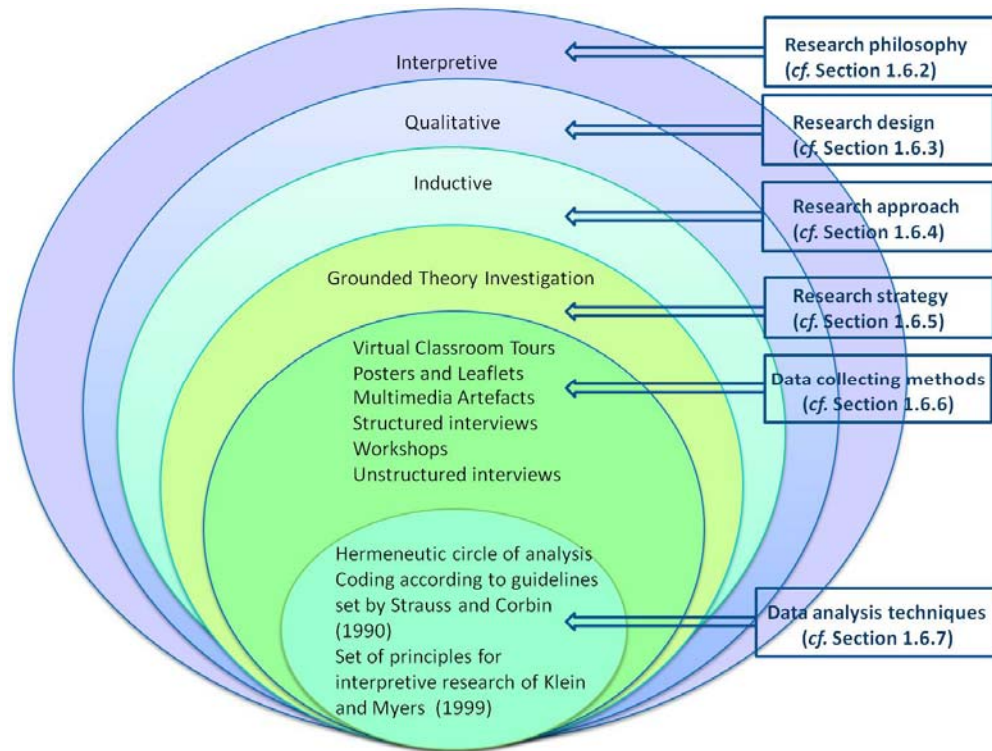
## 1.6 RESEARCH PROCESS PRESENTED

In the previous section, the background and the motivation for this study were presented along with the research problem and research questions. This section will put forward the research methodology including aspects of the research philosophy, design, approach, and the strategy employed in this study.

Using the self-styled 'research onion' model as proposed by Saunders, Lewis and Thornhill (2000, p. 85) Figure 1-1 below represents the research design for this study. This model symbolizes the research design as an onion, consisting of various layers, namely the research philosophy, design, approach, strategy, data collection methods and analysis techniques. According to this model, data collection and analysis forms the heart of the research design around which all the other layers are structured. The choices made in each layer influence and to an extent predetermine the options and decisions for the next layer. The onion needs to be



considered in totality before any research is undertaken in order to ensure synergy between the various layers.



**Figure 1-1: The Research Process 'onion' derived from (Saunders, et al., 2000, p. 85)**

In subsequent sections, each layer of the research union is peeled away and discussed starting with the outer-most layer and moving closer to the heart of the onion. The first aspect to be investigated is the research philosophy which encapsulates the researcher's considerations as regards the development of knowledge. This first layer will therefore influence the subsequent research process.

### 1.6.1 Paradigms or worldviews

This research study adopts a post-modernistic approach and leans heavily on the tenets of Paolo Freire's (1974) consciousness-raising pedagogy and the communicative ethics that emerge from Jürgen Habermas (1987). Post-modernism has been described as a *thorn in the flesh* and can be viewed as a "prism which refracts multiple images of *reality*, reflects complexity, and fractures certainty" (Atkinson, 2003, p. 39). Her conjecture is that a post-modernistic approach may raise

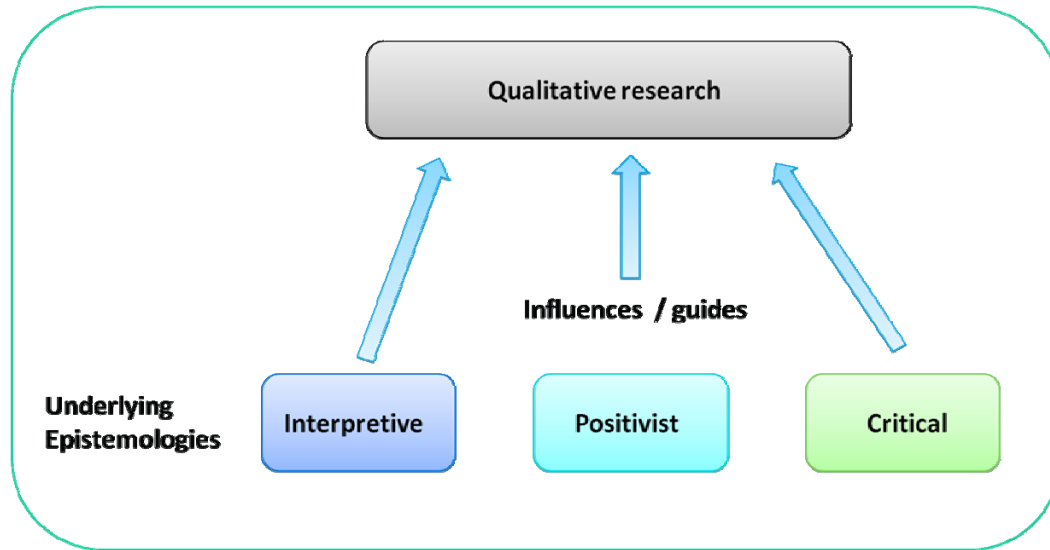
more questions before, during and after research than provide answers and therefore it allows researchers the opportunity to rethink assumptions about focus, methodology and interpretations. Atkinson (2002) acknowledges the contradictions and uncertainties inherent to all research and describes post-modern text as refusing to *tidy up*, pointing to a set of characteristic features as follows:

- Resistance towards certainty and resolution.
- Rejections of fixed notions of reality, knowledge or method.
- Acceptance of complexity, lack of clarity and multiplicity.
- Acknowledgement of subjectivity, contradiction and irony.
- Irreverence for traditions of philosophy or mortality.
- Deliberate intent to unsettle assumptions and presuppositions.
- Refusal to accept boundaries or hierarchies in ways of thinking.

Atkinson regards post-modernism not as a method, but as a way of becoming entangled in research. It is neither comfortable nor predictable, but it is productive and provocative.

### **1.6.2 Research philosophy**

Research philosophy concerns itself with the development of knowledge and informs the practice of research. Epistemology, according to Leedy and Ormrod (2005), refers to the assumptions about knowledge and how it can be obtained. In qualitative studies, research can be defined as interpretive, positivist and critical as illustrated in Figure 1-2 below.



**Figure 1-2: Philosophical assumptions (Myers, 1997)**

Positivist research strives for objectivity, measurability, predictability, the constructions of laws and rules of behaviour and the attribution of causality (Saunders, et al., 2000). Reality is seen to be independent of the researcher and can be tested through hypothesis and theory.

The critical perspective is explicitly prescriptive and judges what behaviour in a social society should be like while seeking to empower the disempowered and to redress inequality in an effort to provide democracy to all members of society (Leedy & Ormrod, 2005). The intention of critical theory is to be transformative and, within the field of education, to interrogate the relationship between school and society and how schools perpetuate or reduce inequalities and the ideological interests they serve. Critical philosophy emphasises the practical over the theoretical and even though there is a persistent dialogue between theory and practice; the two cannot be separated from each other as they are intertwined and influence each other (Nichols & Allen-Brown, 1996).

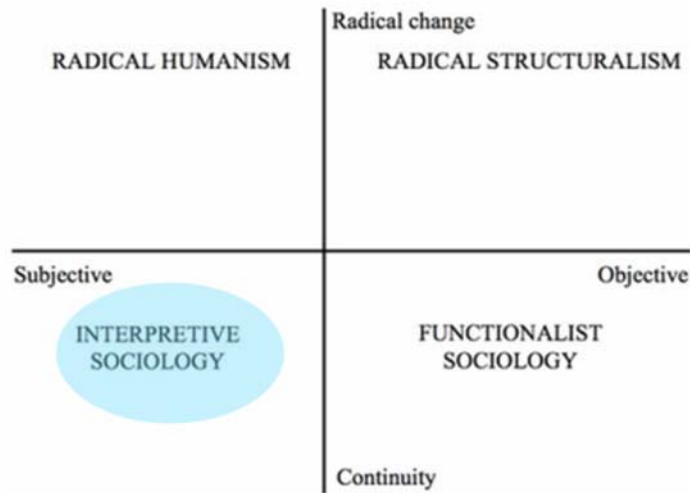
The interpretivist perspective entails the study of social phenomena including mental states which are not embodied in physical form. This perspective is in contrast to the field of natural sciences where scientists use physical entities and construct their own theoretical constructs to explain and interpret the natural world (Mack, 2010). Social scientists study a world that has already been interpreted by the research participant within it and they have to make sense of it in

a new way (Swann & Pratt, 2003, p. 204). Cohen, Manion and Morrison (2000, p. 21-22) ascertain that Interpretive studies possess a set of particularly distinguishing features namely:

- People are deliberate and creative in their actions; they act intentionally and construct meanings in and through activities.
- People actively construct their social.
- Situations are fluid and changing rather than fixed and static; events and behaviours evolve over time and are richly affected by context.
- Events and individuals are unique and cannot be generalized.
- A view that the social world should be studied in its natural state, without manipulation by the researcher.
- Fidelity to the phenomenon being studied is fundamental.
- People interpret events, contexts and situations, and act on the basis of those events.
- There are multiple interpretations of, and perspectives on, single events and situations.
- Reality is multi-layered and complex and
- Many events are not reducible to simplistic interpretation; hence *thick descriptions* are essential rather than reductionism.

In Figure 1-3 below, Burrell and Morgan's (1979) present four quadrants which can be used to consider different sociological paradigms when conducting research. They present *interpretive* researchers to believe the world of human affairs is interconnected and commit themselves to explaining why society functions in a cohesive manner. In contrast researchers approaching the subject matter from the *radical humanist* perspective critically assess the status quo and highlight issues of radical change. *Functionalists*, on the other hand, view the social world as consisting of concrete artefacts and relationships that can be identified, studied and measured through natural sciences from an objectivist point of view. *Radical structuralists* focus on structural relationships

in the social world and view the social world from an ideographic perspective, focusing on overthrowing the limitations of existing social structures.



**Figure 1-3: Plotting the study situated within in the interpretive sociology quadrant (Burrell and Morgan, 1979).**

The choice of utilising the interpretive research approach in this study rests with the attempts to explore situated personal experiences and, in particular, to investigate professional practice. This approach explicitly expects the researcher to engage in the act of *interpreting* from the beginning of the research process to the end and thus it allows for opportunities to offer illuminating insights into contextualised customs and actions in the real life experiences of research participants (Radnor, 2002). Critics of interpretivist research maintain that researchers can never give a completely accurate account of another individual’s reality and therefore they must make their own assumptions clear before engaging in any subjective interpretations (Cohen & Crabtree, 2006). This notion is supported by Creswell who recommends that one makes these assumptions explicit in the writing of a study. He states:

“These assumptions consist of a stance toward the nature of reality (ontology), how the researcher knows what she or he knows (epistemology), the role of values in the research (axiology), the language of research (rhetoric), and the methods used in the process (methodology).” Creswell (2007, p.16)

In adopting an Interpretivist research philosophy, the basic set of beliefs that guide the study are made explicit and reflected in Table 1-2 below. This table is taken from Creswell (2007, p. 18) who based his work on that of Guba and Lincoln (1988).

**Table 1-2: Philosophical Assumptions with Implications for Practice (Originally adapted from Guba and Lincoln 1988 by Creswell 2007)**

Assumption	Question	Characteristics	Implications for Practice
Ontological	What is the nature of reality?	Reality is subjective with multiple dimensions, as seen by participants in the study.	Researcher uses quotes and themes in the words of the participants and provides evidence of differing perspectives.
Epistemological	What is the relationship between the researcher and that being researched?	Researcher attempts to lessen the distance between her/him and that being researched.	Researcher plays a dual role of participant and researcher and collaborates during workshops. The researcher has an integral understanding of the experience under investigation and holds an insider's view that is accepted within the innovative teachers' forum. The researcher, having met with some of the participants during facilitation workshops, is subsequently engaged in data collection exercises.
Axiological	What is the role of values?	Researcher acknowledges that research is value laden and that biases are present.	Because of the interpretive nature of the study the researcher's presence is apparent in the text and s/he admits that stories voiced represent an interpretation and presentation of the author as much as the subject of the study. The intertwining of both the researcher and the participants' material is a valuable voice to previously unheard opinions and perspectives as regards knowledge issues and processes pertaining to teaching and learning with emerging ICT.
Rhetorical	What is the language of research?	Researcher writes in a literary, informal style using the first person voice and uses qualitative terms and limited	Researcher uses an engaging style of narrative, the first-person pronoun and employs the language of qualitative research. Terms as defined by participants and invivo coding is used to reflect that phrasing is of primary importance and therefore a glossary list is avoided and unfolds naturally within the parameters of the study.

Assumption	Question	Characteristics	Implications for Practice
		definitions.	
Methodological	What is the process of research?	Researcher uses inductive/deductive logic, studies the topic within its context and uses emerging theory grounded in the data.	Qualitative studies are characterised as inductive, emerging and shaped by the researcher's experience in working with the data. Research questions can change throughout the study if required to better the understanding of the unfolding research problem (Creswell, 2007, p.19). This subsequently has an incidental effect on the data capturing strategy that needs to be amended to account for the new direction. During data analysis the researcher is guided by the data to develop an increasingly detailed knowledge of the topic being studied. Researcher works with particulars (details) before generalizations, describes in detail the context of the study and continually revises questions from experiences in the field.

### 1.6.3 Research design

Seeing that this study is concerned with the perspectives of innovative teachers in their practice of employing ICT in their teaching and learning, a qualitative research approach is followed. The main purpose of qualitative research is to describe, understand and interpret human or social phenomena (Hayes, 2004). The researcher proceeded with an investigation that allowed for in-depth probing and therefore the study provides sufficient space for personal reflection and contains a rich description of the individual teachers' consciousness as well as my perspectives as researcher.

Qualitative researchers draw their data from multiple sources including a variety of people, objects, textual materials, and audiovisual and electronic records. All qualitative approaches have two things in common namely that they focus on phenomenon occurring in natural settings and they study these occurrences in all their complexity. This approach can also be described as "exploring the world from the perspectives of the cultural insiders" (Hatch, 2002, p. 65). Qualitative research methods are designed to get them close to their participants and may require

some form of active involvement with their research participants. The focus of their research is often multifaceted and in their investigations they attempt to uncover and portray all the layers central to the phenomenon. Qualitative researchers may also use multiple forms of data in an effort to help them explain their research question and it is noted that data collected early in a study often influences the subsequent data collection strategies. Therefore qualitative studies are characterized by an emergent design (Leedy & Ormrod, 2005, p. 133, 143).

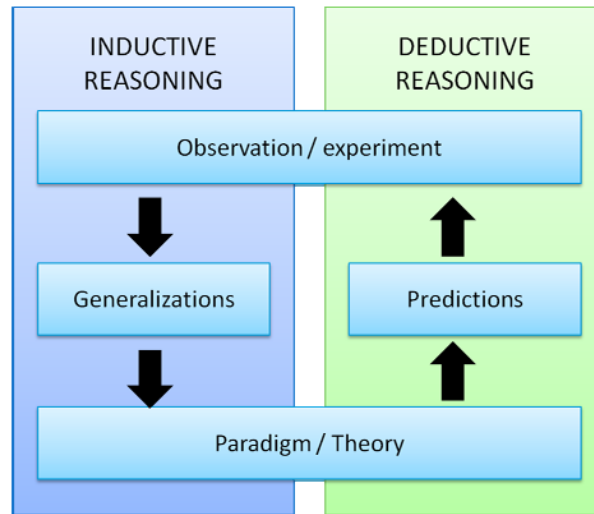
Qualitative researchers believe the strength of their methodology is the ability of the researcher to interpret what he sees as integral to the understanding of the phenomenon. Qualitative studies are characterised as inductive, emerging and shaped by the researcher's experience in working with the data (Leedy & Ormrod, 2005). The researcher therefore becomes the instrument through which all data was selected and filtered. Furthermore the data analysis is more subjective in nature and the dataset is scrutinized for patterns that reflect concept formation. It is thus of paramount importance for researchers to articulate their own predisposition and to clarify any preconceived ideas or notions of knowing surrounding the area of study, thereby revealing alternative perspectives (Creswell, 2009; DeMarrais, 2004). In this regard the use of bracketing interviews to articulate the preconceived notions of the researcher in relation to the inquiry is an integral instrument in the arsenal of the researcher and can increase the rigor of the process (Finlay, 2008). Research questions can change throughout the study if required to better the understanding of the unfolding research problem (Creswell, 2007, p. 19). This subsequently has an incidental effect in the data capturing strategy that needs to be amended to account for the new direction. During data analysis the researcher is guided by the data through interpretation and analysis to develop an increasingly detailed knowledge of the topic being studied.

#### **1.6.4 Research approach**

When applying logic to reasoning in research, there are two basic approaches namely inductive or deductive research. Deductive reasoning moves from the general to the specific and is known as the top-down approach. In contrast, inductive reasoning moves from a narrow angle to a wider perspective and begins with the observation of specific instances and then draws inferences



about larger and more general phenomena (Trochim, 2006). The difference in approaches is illustrated in Figure 1-4 below.



**Figure 1-4: Inductive and deductive reasoning**

Inductive reasoning is more open-ended and exploratory in nature and contrasts with deductive reasoning which is more concerned with testing or confirming a hypothesis. Another consideration to take into account is the aspect of time. The process of deductive reasoning can be completed in a relatively quick time and it is also quite predictable. It can thus be actioned according to set schedules. In contrast inductive reasoning is protracted and proceeds at a much slower pace due to the much longer period it takes to collect and analyse the data. This process proceeds at a much slower pace and ideas emerge gradually. The path of deductive research is seen as a lower-risk strategy whereas research dependent on inductive reasoning carries a greater risk as the researcher cannot guarantee that useful data patterns and theories will emerge from the collected data (Saunders, et al., 2000).

This study follows the inductive path of reasoning in an attempt to explain the phenomenon where innovative teachers use emerging technologies to improve their practice. The researcher took cognisance of the reservations connected to inductive research and steps were taken to mitigate the perceived risks through a carefully considered research strategy.

### **1.6.5 Research strategy**

A research strategy is a clear plan of how to go about answering the research questions. Because qualitative research is a collection of several forms of inquiry there is no single method of doing qualitative research and the process requires a degree of flexibility which is imperative to the study. Grounded Theory was selected as the most appropriate method to investigate the research question as it has the ability to generate descriptive and explanatory accounts of teachers' contemporary innovative uses of ICT in their teaching and learning practice. Grounded Theory, as a research method, is particularly suited to study situated interactions and meanings as related to the social context in which they occur. This method lends itself to identifying components critical to the processes under investigation and to formulate a resulting theory grounded in the data. The net outcome of Grounded Theory research is that it contains a central phenomenon, describing the causal and intervening conditions along with the consequences (Dunican, 2005).

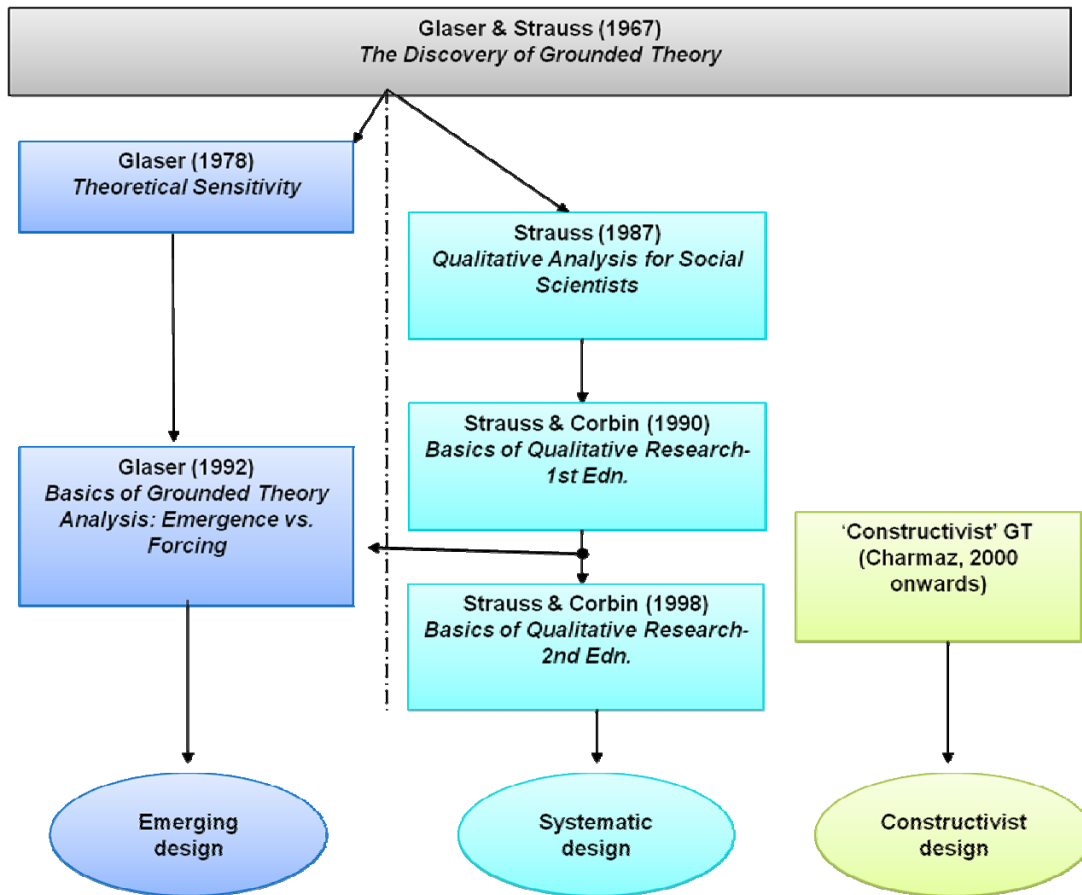
#### ***1.6.5.1 Grounded Theory***

According to Trochim (2001) Grounded Theory can be viewed as an extremely well-considered explanation for some experience of interest. Patton (2004) takes the view that it discovers and conceptualizes the essence of complex interaction. It is helpful to this process when existing theories about a phenomenon are inadequate or nonexistent or when grey areas exist and need greater clarification or require deeper understanding. The generated grounded theory can be explained in words and is usually presented with much of the contextually relevant detail collected. The self-defined purpose of developed Grounded Theory is to begin with data and use it to develop a theory about phenomena or a process. Data were generally collected in the field rather than taken from research literature and ideas are based on the notion that the researcher is informed and ready to make decisions about individual pieces of data. The researcher is thus ready to recognise the "plausible relationships proposed among concepts and sets of concepts" (Strauss & Corbin, 1994, p. 278).

### ***1.6.5.2 The history of Grounded Theory***

There are three discernable Grounded Theory designs with each one emphasising different facets of the grounded theory (Creswell, 2005). The **systematic design** of Strauss and Corbin favours prescriptive procedures and preselected codes that make explicit the relationship amongst categories in the axial coding phases. The **emerging design** of Glaser prefers theory to emerge from the data in the generation of categories that can be compared in the explanation of basic social processes. Charmaz (2006) stresses a more **flexible approach** emphasising the use of active codes to best capture the experiences of the participants and focus on their views, values and beliefs rather than gathering facts and describing acts.

Key stages in grounded theory development, as illustrated in Figure 1-5 below, provide a schematic representation of the main events and publications through which this theory evolved into three distinctly different designs. These designs emerged as a response to inadequacies experienced within practice and valuable feedback from peers. Each of these designs had their own advocates and a lively debate ensued in the form of publications as a riposte to delivered criticism. These publications were used as a vehicle to refine and deepen the understanding of the specific approach within the academic circles.



**Figure 1-5: Key stages in grounded theory development (adapted from Harwood, 2002, p.67)**

Grounded Theory is a qualitative research approach that was originally developed by two sociologists Barney G. Glaser and the late Anselm L. Strauss in the 1960s to be used in the field of nursing. This theory was developed in response to a need to better understand phenomena in healthcare and to articulate a theory which would make certain medical concepts accessible to others. Glaser and Strauss received wide acclaim for their method and were inundated with requests by others to learn more about their research methods. They responded by writing a pioneering book detailing their grounded theory procedures in the *Discovery of Grounded Theory* (1967). Both authors subsequently authored several books to better explain their early methods. It is at this point where their philosophical orientation separated. Glaser (1978, 1992) stayed true to the earlier methodological versions and expanded the stance of letting theory emerge freely from data.

In contrast, Strauss (1987) progressed a more regulated form of grounded theory teaming up with Corbin (1990, 1994) and suggesting a more prescriptive code for analysing data. This approach to grounded theory is popular within educational research circles and is associated with a rigorous approach to data analysis. It aims to ultimately present a visual picture of the generated theory.

This systematic approach drew extensive criticism from Glaser (1992) for he felt the approach would not allow theory to emerge from the data and therefore limit the research to describing acts rather than conceptualize new patterns in the data. Entering the field at a much later stage Charmaz (1990, 1994, 2006) advanced her own approach namely the *constructivist* method as she felt both Glaser and Strauss were too inflexible in their procedures. Charmaz (2003) argues that grounded theory methods evolve in different ways depending on the perspectives of the researcher and that by exploring the underlying ontological and epistemological perspectives one can help researchers acknowledge the limits of their studies.

Two critical factors for consideration when employing a Grounded Theory study is to select the type of Grounded Theory Method (GTM) and to decide whether to conduct a literature review at the start of the research process (Avis, Pauw, & Van der Spuy, 1999; Mavetera & Kroeze, 2009). Both these issues are highly contentious and are vigorously debated in the academic community. For the purposes of this study a Straussian GTM was selected as the researcher found it to be a far more structured approach when considering the methods proposed by Glaser or Charmaz. This method also provides an opportunity for the creation of a framework prior to collecting data and it further provides guidelines to the analytical procedure of data examination. Further motivation as to the choice of this theory is provided in Section 3.2.3.

Integrating literature in the initial stages of a Grounded Theory inquiry is controversial and has divided academics in their approach to research. The early integration of literature has given rise to much confusion especially for those novice researchers new to the Grounded Theory and wishing to embark on their own research journey (Mavetera & Kroeze, 2009; Pidgeon & Henwood, 1997). Notwithstanding contradictory statements and in spite of different opinions

relating to the literature review, there is nonetheless agreement that the Grounded Theory remains an intensive and rigorous method of research (Mcghee, Marland, & Atkinson, 2007).

Proponents of the Classic Grounded Theory (CGT) believe that conducting a literature review prior to entering the field of study as a violation of the basic premise of the CGT. The literature review can potentially dull theoretical sensitivity which can then result in the researcher overlooking key aspects of the emergent categories. Glaser and Holton (2004) also warn that a review can become futile if the area under survey proves to be of less relevance than the researcher originally deemed. This violates the basic premise of the Grounded Theory and valuable time would be wasted. Creswell (2003) suggests that literature should only be consulted once the independent theory starts to emerge. He takes a strong stand against an extensive literature review before core categories start emerging pertaining to the phenomenon under investigation.

Opposing the blank slate idea of Glaser and Strauss (1967), Avis (1999) is of the opinion that if a particular research field and topic are of interest to a researcher then s/he would already have preconceived ideas and values about the field of study and will enter the research field along with these impressions. Dey (1999) recommends entering the study field with an open mind and not an empty head. He thus deems an awareness of the literature as a crucial prerequisite in order to identify the dearth of existing knowledge. This pre-knowledge also helps the researcher to ascertain what areas of concern could be appropriate for further investigation and to view the literature as part of the dataset to be incorporated in the dissemination of the findings. Cutcliffe (2000) warns against restricting access to existing knowledge as it will limit the understanding of the phenomenon and the interplay that occurs between researcher knowledge, values, beliefs and data. This interplay adds to the rich descriptions of emerging substantive theories. Gasson (2004) proposes to acknowledge the influences of literature and to make use of the accumulative tacit knowledge of the researcher. Urquhart and Fernandez (2006) supporting Glaser and Strauss (1967) declare the notion of entering the research field with a blank slate as a myth and Thomas and James (2006) suggest that it is impossible to free oneself from preconceptions, not only in the entering of the field but also during data collection and analysis.

Leedy and Ormrod (2005, p. 141) suggest the use of literature to provide a rationale and a context for a study where Diaz and Andrade (2009, p. 46) encourage researchers to take previous experiences into account and draw from existing literature to structure a preliminary theoretical framework. This framework should then be utilised as a *sensitizing device* that can be elaborated on and modified by actual findings in the field. Tan (2010, p. 102) describes theoretical sensitivity as “the researcher’s knowledge, understanding, skills and ability to see data with analytical depth, be aware of the subtleties of meaning of data, generate concepts from the data, relate the concepts, and develop theory”. The main consideration is to continuously stay open to underlying issues that may provide disconfirming evidence to existing data and therefore extend emerging theory (Ng & Hase, 2008).

Lakatos (1970), the acclaimed philosopher of science, offers a reflection of scientific discovery in general:

“... for classical empiricists the right mind is *tabula rasa*, emptied of all content, freed from all prejudice of theory. But it transpires from the work of Kant and Popper – and from the work of the psychologists influenced by them – that such empiricist psychotherapy can never succeed. For there are and can be no sensations unimpregnated by expectations and therefore there is no natural demarcation between observational and theoretical propositions” (Lakatos, 1970, p. 99).

Taking all of the above into account the researcher, for the purpose of this study, decided to use the relevant literature to construct an initial literature framework in an effort to become more sensitized to the research domain before entering the field. Henceforth, literature is used to contextualise the space in which innovative teachers create new knowledge in their teaching and learning, resulting in transformed pedagogies. Literature frames the study of the phenomenon and sets boundaries for further discussions specifically in activities mediated with the use of emerging technologies in a developing world context. Literature will also be reviewed continuously throughout the data collection and dissemination process in a constant comparative analysis as concepts and finally theory start to emerge from the data set. Thus literature will be added to theory as it emerges throughout the study.

### 1.6.6 Data Collecting Methods

The context of the inquiry is limited to the participants in the Microsoft Innovate Forum Awards, an annual international competition which seeks teachers to enter their innovative projects in their use of ICT in their own teaching and learning (*cf.* Section 4.3). In this context, innovative teaching refers to a constant engagement in activities which stimulate learning in creative new ways that stretch beyond the limits of the classroom and traditional teaching methods. Great emphasis is placed on context, collaboration and content throughout the competition. The Microsoft Initiative, called *Partners in Learning*, <http://africa.partnersinlearningnetwork.com> works with governments, ministries of education and other key stakeholders in more than 100 countries. This annual competition receives support from the highest offices of government. The innovative attributes of the teachers and their finalist status in the Microsoft Innovate Teachers Forum Competition determined their consideration for this study.

The target group of this study was the participants to the annual Microsoft Innovate Teachers Forum competition. This study spanned the period from 2007 up to 2010. Even though some of the entrants left the teaching profession in this time, they were still approached to reflect on their entries into the competition.

Microsoft Innovative Teachers Forum is an annual competition that is presented at Microsoft Head Office in Johannesburg every year. All the competition entries are whittled down to 20 finalists by 10 judges who hail from a wide variety of backgrounds and interest. Judges come from diverse areas such as academia, government, independent consultants and industry.

All the competition finalists gather for 2 days to exchange ideas and share best practice examples of using technology in the classroom. Four winners are announced at a prize giving ceremony where the deputy minister of education usually does the honours. Winners are chosen in the following categories: community, content, collaboration and a peer review award. This competition has been running since 2005 with the local winners participating in the annual World Forum held on a different continent each year. Capitals hosting past events include Atlanta – USA(2006), Helsinki – Finland (2007), Hong Kong – China (2008), and Salvador – Brazil (2009), Cape Town – South Africa (2010). South Africa has been very successful in the



past on the world stage, winning one or more of the categories every year. This underscores the fact that there is a prevalence of local teachers exploring innovative ideas and practices in the use of ICT in education.

For the duration of this competition, there is time to view and engage with the teacher participants. This time together is used to exchange ideas with each other in unstructured and structured sessions. Initially the competition was only one day long but the participant teachers felt the time allocated for informal engagement with each other contributed greatly to their exchange of ideas and they requested additional time to be added to future competitions in order to enhance the opportunity for face to face deliberations and discussions. The organisers supported this notion and extended the competition to include another full day during which teachers could engage with each other in their transfer of skills. This change in the program allowed the researcher additional access to all other participants which accounts for more than 50 of the most innovative teachers in our country.

#### ***1.6.6.1 Sampling methods***

Two different methods of sampling were used during this study and they are discussed in greater detail in Section 3.4. “Initial sampling in grounded theory is where you start and theoretical sampling directs you where to go” (Charmaz, 2006, p. 100). Initial sampling was used to present a point of departure through purposive sampling followed by theoretical sampling that allowed for elaboration and refinement. In this study theoretical sampling was applied in accordance with grounded theory methodology. In other qualitative research settings, theoretical sampling means gathering data until the same pattern reoccurs pointing towards empirical themes. In contrast, grounded theory employs theoretical sampling to develop emerging theoretical categories in an effort to construct conceptual categories (Creswell, 2009).

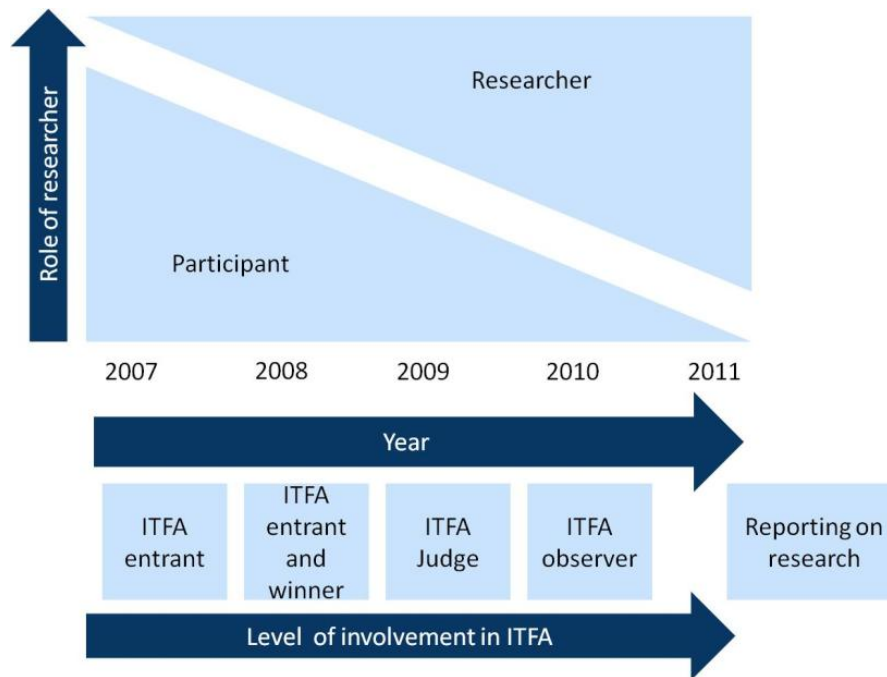
During the initial sampling phase, selection criteria were established before entering the field and it included entries in the form of virtual classroom tours (VCT). Artefacts such as reflective video, photographic images and materials produced during the period of competition were also considered for analysis. Subsequent theoretical sampling targeted specific teacher participants in the competition who displayed the needed knowledge and skills to inform the study further. In

subsequent sessions, workshop activities and focus group discussions were used as a means to gather more definitive data (*cf.* Section 3.6, Table 3-4).

With relevance to this study the following data sources were used in constructing a theory towards better understanding the practice of the innovative teacher in their quest to incorporate ICT into their classrooms: Data sets include Virtual Classroom Tours (VCT), multimedia artefacts, structured interviews, semi-structured interviews, observations, focus group interviews, reflective research diaries, expert reviewers and workshop events.

#### ***1.6.6.2 Role of the Researcher***

Over the years of conducting this study the role of the researcher changed gradually from being a participant in the early days of this study to participant-researcher for a lengthy period and finally to researcher in the latter part of the study. This study is not entirely participatory in nature but the approach is consistent to building intellectual capacities and enabling people to articulate their own thought processes and thereby enhancing their own knowledge base so that they can pursue independent actions (Collins, 1998; Tilakaratna, 1990). The investigative process is viewed as educative and emancipatory in that it stimulates the development of self-knowledge for the participants as well as the researcher in fair exchange of knowledge where all are seen as experts. The evolving role of the researcher was fully acknowledged by the participants. A visual guide to the researcher's involvement during the course of this study is presented in Figure 1-6 below.



**Figure 1-6: The researcher's involvement with the participants during the course of the study**

Although the researcher originally participated in the competition as an entrant in 2007, the participatory nature of the involvement is acknowledged and viewed as providing additional opportunity to immerse oneself in the research field. Gradually, in time this role shifted to reflect levels of achievement within the competition as reflected in 2008 when the researcher won the content category and participated in the worldwide event in Hong Kong. During this time the researcher developed a deeper understanding of the complexities involved in articulating the new knowledge attained and disseminating it for a wider audience. The researcher changed roles in 2009 moving away from interacting so closely with fellow teachers to become part of the judging panel giving further insight into the application of judging criteria in selecting entrants. In 2010 the researcher adopted the role of observer during the competition and subsequently engaged with participants after the fact with follow up interviews.

Entries to this competition are rich in visual material including multimedia artefacts, illustrations and images as well as text based evidence of learning practice including lesson plans and learning artefacts. Learning contexts are well defined and motivating factors and influencing

parameters richly described resulting in rich pickings for analysis. Comments and criticism from judges on each entry is posted on the competition website to inform future practice and entrants to the competition. Once the initial coding was completed and some of the concepts started to develop the focus turned to unedited, in-competition candidate structured video interviews that were made available on request by the organisers of the competition. In these interviews the participants reflect on their entries and elaborate on their personal views, teaching strategies and the future of instruction and criteria guiding their selection of educational technology in the design of blended learning events. Post competition radio interviews and transcripts were also obtained. The analysed data from this interview phase was used to refine the sub-research questions and formulate additional research objectives leading to further theoretical sampling.

Teachers that attended the workshops organised by Microsoft were also targeted as part of the theoretical sample as prescribed in GTM. My quest during this time was therefore to interact with and observe teachers in an exchange of ideas during formal and informal sessions. In addition to the data collected via the entries and the interviews and interactions during the workshops, the sampling turned to the actual competition event.

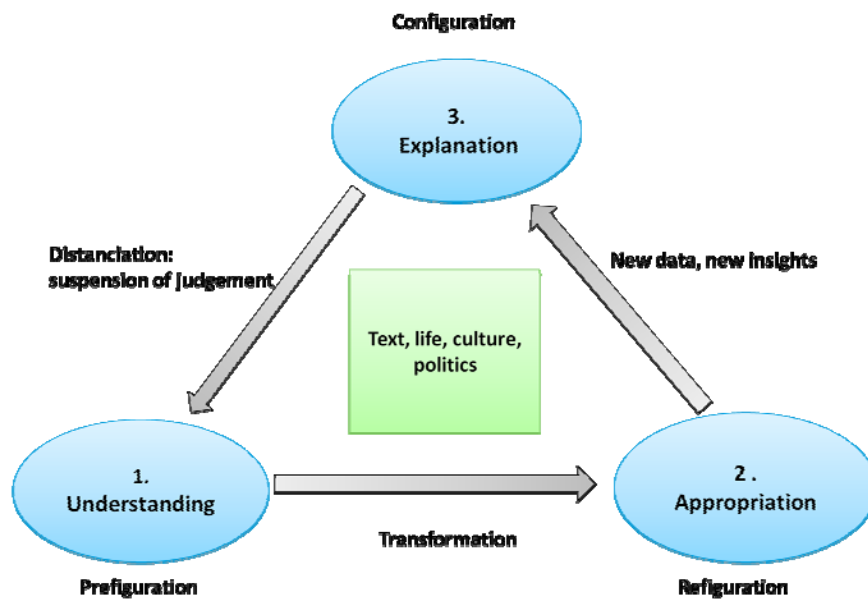
Qualitative data analysis software ATLAS.ti was used for its capacity to handle and organise the large amounts of data that was collected throughout this study. The upgraded version of the software package 6.1 was very useful and capable of treating documents in pdf format, successfully handling multimedia recordings and graphic illustrations.

### **1.6.7 Data Analysis Techniques**

Analysis of data consists of taking the data apart to determine individual responses before putting it together again in an effort to summarise it. Interpreting data involves exploring the general sense of the data before identifying patterns as they emerge before drawing them together in themes in an effort to answer the particular research questions (Creswell, 2005). This study requires a flexible method of analysis based on interpreting data and hence the choice to analyse data by means of hermeneutics.

Hermeneutics can be viewed as a philosophical approach to human understanding and therefore finds itself as part of the interpretative research family, but it can also be considered as a method of analysis, in the understanding of data that has become obscured in some way (Bleicher, 1980; Radnitzky, 1974). The act of interpreting is not only restricted to the researcher but is also the responsibility of the reader of the research findings as documented in this study.

Abulad (2007) recognises the existence of a hermeneutic cycle that guides the process of gaining a deeper understanding. The hermeneutic circle presented in Figure 1-7 below, presupposes the researcher appreciates how understanding can be developed. As new data emerge, new insights form resulting in a continuous circle ensuring that meaning and biases are eliminated in data analysis. Phases of analysis, synthesis and realisation form part of each individual loop typical of a hermeneutic cycle before the researcher moves on to the next iteration.

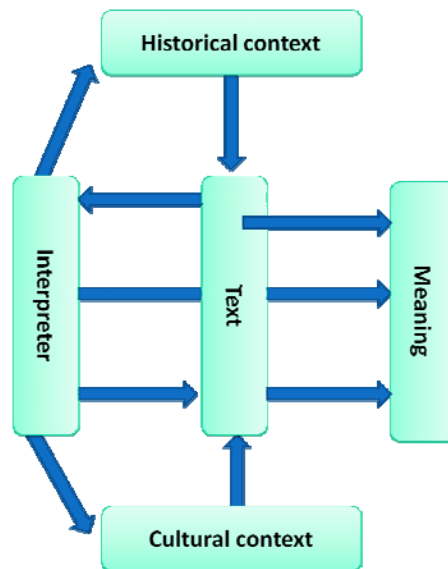


**Figure 1-7: Hermeneutic cycle**

This cycle extends to include interactions between the researcher and the participants which establishes the need for a dialectic interaction until a shared understanding is reached where the researcher can choose to revisit earlier encounters in search of greater clarity (Klein & Myers, 1999).

Within the realm of hermeneutics we see a diversity of approaches. Demeterio (2001) categorizes these approaches into five hermeneutic systems namely: romanticist, phenomenological, dialectical, critical and post-structural hermeneutics. Each one of these presents a unique system, conception of subject and object, goal and interpretive act which is either truth or meaning.

Among the group of five hermeneutic systems, there is no *best system*, as each has its own advantages and disadvantages. To select the best system for this study, it is necessary to look closely at the particular research problem that needs to be explored. This research study makes use of the post-structural hermeneutics system that draws upon several of the other interpretive systems such as the romanticist, phenomenological, dialectical and critical systems. Hermeneutics is the most powerful instrument that can be applied in this study as it not only explores the parameters of textuality, but also the institutional, social and political structures which define the relationships between truth, meaning and power. Other post-modern interpretive theories, such as feminism, also fall within the cadre of this type of hermeneutic system. Figure 1-8 below illustrates a post-structural hermeneutic system of interpretation.



**Figure 1-8: Post-structural system of interpretation (Demetrios, 2006)**

Multiple arrows originate from the interpreter which suggests that s/he takes into account historical and cultural contexts when considering data analysis in the process of meaning

making. With regard to this study the data were not only limited to text in the form of interview transcripts and other textual documentation as depicted in Figure 1-6 above, but also include multimedia artefacts and observations. Artefacts can contain a myriad of meanings and it is up to the researcher to engage and carefully consider the cultural historical context before ascribing specific meaning to it. To this end Klein (1999, p. 72) proposes a set of principles which can be used to conduct and evaluate interpretive case research based on the philosophical perspective of hermeneutics and which mostly apply to studies of an interpretive nature. Table 1-3 below indicates these principles and how they have been applied to this research study.

**Table 1-3: Fundamental principles for conducting interpretive studies (Klein & Myers, 1999, p. 72)**

<b>Fundamental principle for conducting and evaluating interpretive studies.</b>	<b>How and where they are applied in this study.</b>
1. The Fundamental Principle of the Hermeneutic Circle. This principle suggests that all human understanding is achieved by considering the interdependent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.	During data analysis the data were initially fractured into units when coding before restructured into related concepts. This technique was applied in the data analysis in Chapters 4, 5 and 6.
2. The Principle of Contextualization. Requires critical reflection of the social and historical background of the research setting so that the intended audience can track the emergence of the situation under investigation.	Inter-relatedness between codes was established after taking the individual contexts into account and this is reflected in the construction of themes and sub-themes. Contexts are richly described.
3. The Principle of Interaction Between the Researchers and the Subjects. Requires critical reflection on how the research material (or "data") was socially constructed through the interaction between the researchers and participants.	The role of the researcher is initially that of participant and evolves over time to participant-researcher as reflected in Section 1.6.7.
4. The Principle of Abstraction and Generalization. Requires relating the idiographic details revealed by the data interpretation through the application of principles one and two (listed above) to theoretical, general concepts that describe the nature of human understanding and social action.	An attempt is made towards generalization in establishing the interrelatedness of concepts and categories into emerging themes.
5. The Principle of Dialogical Reasoning. Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings ("the story told by the data") with subsequent cycles of revision.	There is an ongoing comparative analysis between emerging data concepts and existing literature in an effort to reconcile data concepts.
6. The Principle of Multiple Interpretations.	Disconfirming evidence was sought to

Requires sensitivity to possible differences in interpretations among the participants which are typically expressed in multiple narratives or stories of the same sequence of events being studied.	illuminate the findings and added additional dimensions to the interpretations.
7. The Principle of Suspicion. Requires sensitivity to possible “biases” and systematic “distortions” in the participants’ narratives.	The voice of the researchers forms an integral part of this investigation and is supported in the grounded theory method.

In addition to the above principles, researchers are not only encouraged to document all their findings, but to also provide a logical reason for their decision making in ascribing meaning when engaging in hermeneutics. The act of interpreting is not only restricted to the researcher but is also the responsibility of the reader of the research findings as documented in this study. The creative spirit of the interpreter is lost if he/she becomes too mechanical in their interpretation. The same idea applies to the reader of this research text that is also engaged in an interpretive act. Abulad (2007) elaborates:

“... hermeneutics is the art of interpretation. Because it is an art, we are hereby not constructing a set of fixed and rigid guidelines for a valid interpretation of a text. In a way, method kills the art, especially since art requires a creative spirit. Each creation is a free process whose source is the interplay of faculties unique to each artist. The author thus follows a procedure which cannot be mechanically reproduced inasmuch artwork and interpretation. An interpreter follows his or her own inspiration, and mechanical rules are hereby out of the question. The encounter of both reader and text is an event that one can neither foresee nor define. Here are two worlds that fuse, even collide, in a way that creates a world that surpasses even the author’s expectation such that the text now takes a life of its own” (Abulad, 2007, p. 22).

The flexibility of analysing the data through the use of hermeneutics and not by means of a mechanistic process offered the researcher the opportunity to develop her thought processes along a natural path.



## 1.7 STUDY DEVELOPMENT PHASES

In the previous section, the *research process* was presented in terms of *the research design* and the *data collection strategy* that would best enable the researcher to investigate the tacit knowledge innovative teachers hold when engaging with emerging technologies and in doing so answer the main research question. This section will put forward the phases describing how the research was accomplished.

This study was divided into phases to accomplish the final deliverable of presenting a substantive emerging theory on the pedagogical efficacy of innovative teachers in their use of emerging technologies as reflected in Figure 1-9 below.

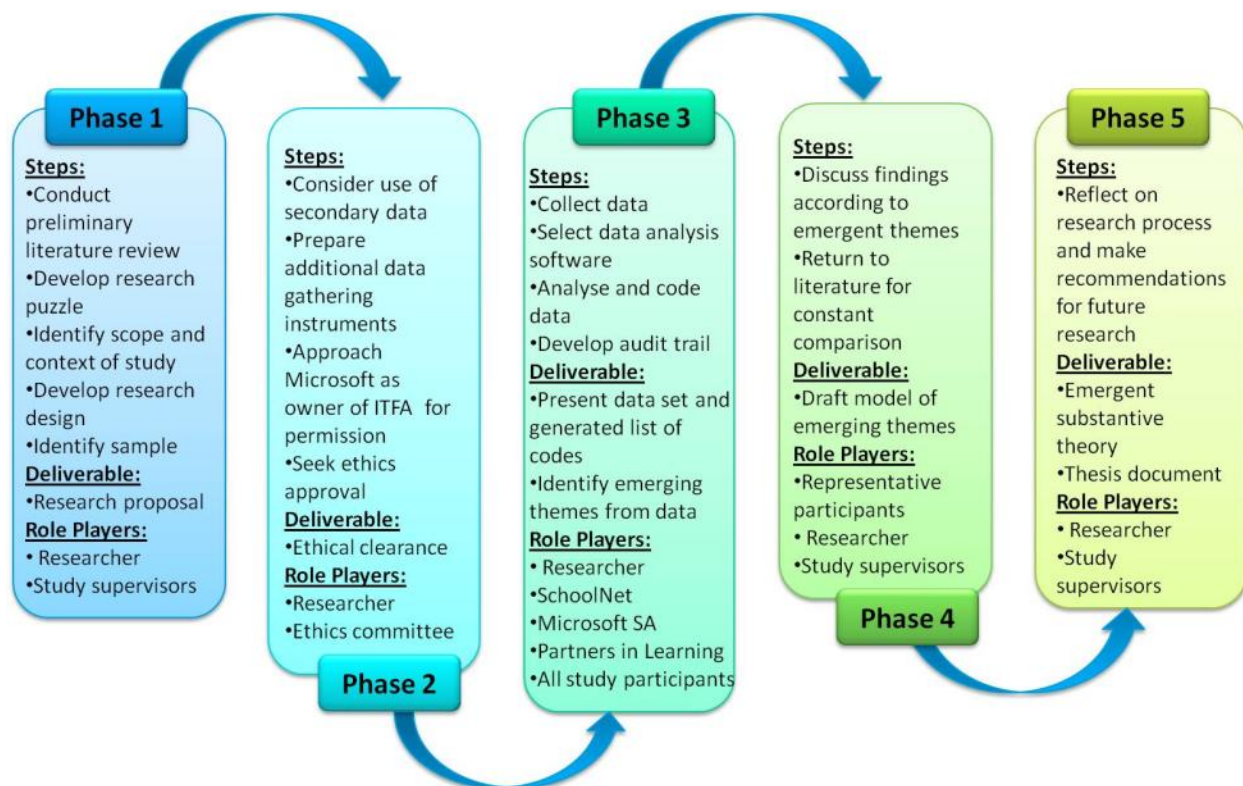


Figure 1-9: Research phases

The *first phase* concerned itself with defining the research interest. Once an initial literature review was conducted, the initial research puzzle was designed and formulated. This phase

culminated in the successful defence of the research proposal pertaining to this study at faculty departmental level.

*Phase two* centred around the preparation of data collection instruments and additional documentation in compliance with ethic standards as set out by the ethics committee of the University of Pretoria. Documentation required for ethical consideration included letters of permission from Microsoft South Africa as well as letters of informed consent to participant teachers and school principals. Appendix A contains the ethical clearance certificate and Appendix B the relevant letters to organisations and participants.

*Phase three* focussed on data collection and analysis. Secondary data were obtained from SchoolNet South Africa and these competition entries were initially coded to help direct further purposive sampling. Upon analysis of additional data, other themes started to emerge driving further data collection and analysis to the point of theoretical saturation.

During *phase four* of the research the emergent themes were presented and discussed. Literature was revisited and used as a constant comparative mechanism to help develop an emergent theory and tentative model.

Finally, *phase five* put forward a substantive theory that emerged during the study and this phase also reflects on the research process.

## **1.8 CONSTRAINTS**

There is always the possibility of bias and subjectivity being fellow competitors vying for the same accolades, however, all forms of data are considered relevant in a Grounded Theory study. Initially, fulfilling the role of participant researcher was of considerable value as it added an interpretive nature to the study which provided an insider's view into the thought processes of the innovative teachers. Another limiting factor to consider is that competition entries can be skewed to reflect the positives and not the negatives of the entered projects as they may not go into the required depth in their description. The last aspect to consider is that fellow competitors might not be as forthcoming during peer judging and that they may hedge some information for formal competition judging. This only proved to be the case in the first year of this study as the

role of the researcher changed to other capacities including those of participant, observer and judge in subsequent years (*cf.* Section 1.6.6.2).

## 1.9 ETHICAL CONSIDERATIONS

Maintaining good ethical practice is pivotal to gaining the respect of participants and the research community. A sound ethical foundation also endows the study with legitimacy in the eyes of other research institutions and fellow practitioners. It is therefore imperative to adhere to prescribed standards and to gain the informed consent of participants in advance. The researcher, however, responsible for all possibilities at all times and sometimes ethics have to be negotiated in situ as unforeseen circumstances arise (Tisdale, 2004).

This study subscribes to the Kantian approach to ethics. This approach is based on the rational abilities of humans to regulate their engagement and therefore to determine principles that respect autonomous actions and decisions. The principles are forged regardless of whether our own convictions and values are in conflict with those of others (Tisdale, 2004), however, in this study there were no unusual ethical considerations as learners and vulnerable participants were not actively involved in the study. The rights of minors were therefore not infringed upon in any way. The ethical clearance certificate for the scope of this study is attached in Appendix A.

There are three main ethical issues which needed consideration in this study:

1. Permission from the organisers of the Microsoft Innovate Teachers Forum competition to conduct research presented in Appendix B.
2. An informed consent form was obtained from all teachers prior to engagement.
3. Protecting the identity of the learners as visible in images during construction of Virtual Classroom Tours (VCT's).

As most of the data, in the form of multimedia artefacts and digital documents, is available in the public domain, the only data needing verification was the interview transcripts and the workshop data.

According to Hatch (2002) teachers have relatively little power or status and often see themselves as being secondary to an educational researcher as they may feel coerced into participating in studies that school principals have already agreed to. Consequently they may feel inclined to refuse individuals which they perceive to be “experts” in the field. To overcome these reservations it was essential for the researcher to be sensitive to the educators’ potential vulnerability. Full disclosure of research intentions eased their concerns and clear undertakings were given to release them from the study if they so requested.

In the context of this study, the teachers involved are less vulnerable as they are well respected in their own communities and recognised as leaders in their particular fields. The added recognition of *finalist status* in such a competition ensured equal footing between the researcher and the participants. It is also worth noting that they were initially self-assured enough to enter the competition of their own volition.

The following principles were kept in mind when conducting grounded theory research:

- *Informed consent.* Participants and organisations involved were informed as to the role of the researcher and the objectives of the investigation. Where written consent could not be obtained from relevant authorities the data were limited to what was made accessible through the Microsoft databank and in the open domain.
- *Voluntary participation.* As part of the initial purposive sample and subsequent theoretical sample some teachers resigned from the teaching profession subsequent to entering the annual Microsoft Innovative Teachers Forum Awards. These teachers pursued careers in other sectors, including higher learning and the private sector, having demonstrated their potential on a wider platform. These participants were asked to continue their participation in the research in their private capacity.
- *Analysis and reporting.* This research strives for academic rigour in its reporting and a full disclosure of all methods and techniques used during data analysis is given.
- *Researcher’s role.* The role of the researcher as researcher-participant was communicated to all role players before data gathering commenced.

- *Researcher bias.* Because of the interpretive nature of the study and the premise of *all is data* underpinning the Grounded Theory Method, the beliefs, value system and pre-existing ideas and concepts held by the researcher are articulated and used as data in the form of a structured interview and research memos written whilst analysing and coding data.

This research strictly complies with all guidelines as prescribed by the University of Pretoria in order to protect the rights of all parties concerned. This process ensures that the research is conducted in a fair and just manner according to guidelines set out by Marshall and Rossman (2006). The results were subjected to reflection from peers and supervisors and published in peer reviewed conferences and journals and discussed in workshop formats.

## **1.10 ANTICIPATED BENEFITS AND SIGNIFICANCE OF THE CONTRIBUTION**

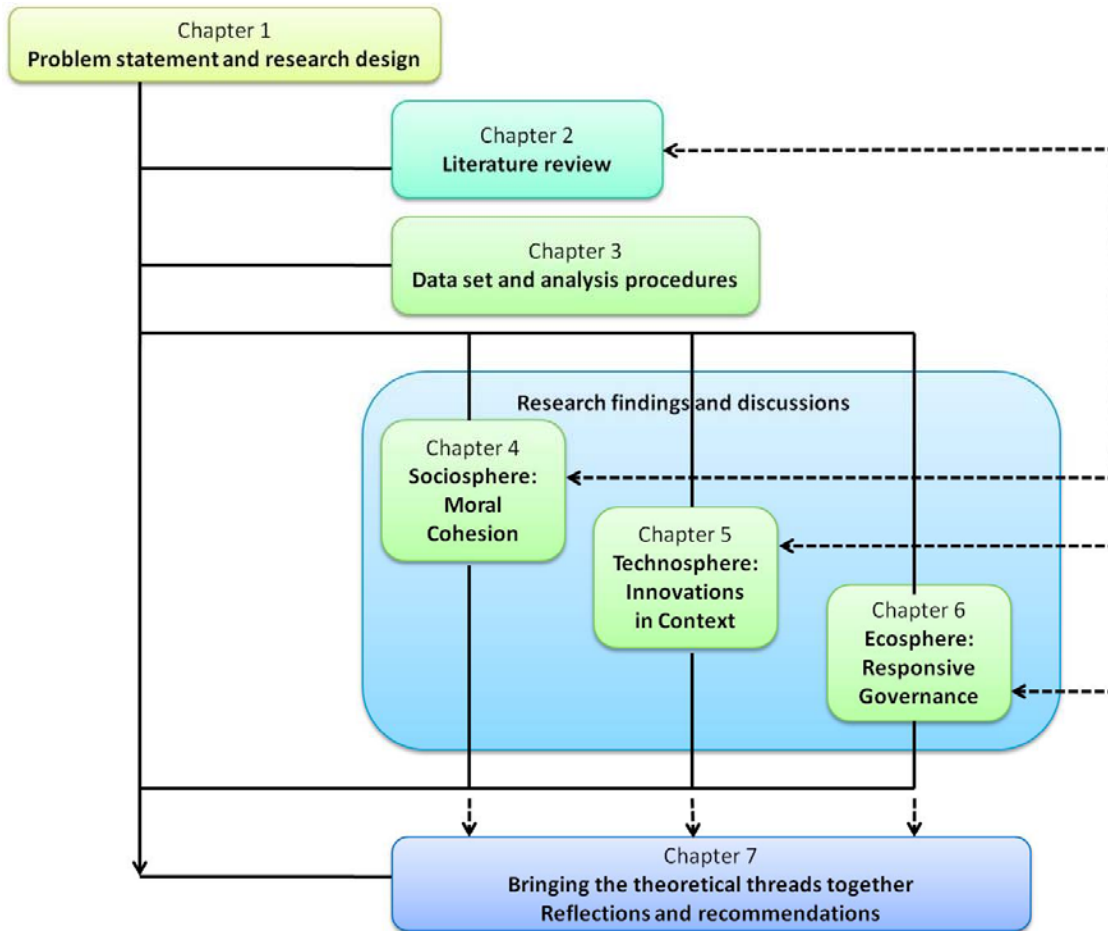
Teachers in South Africa are generally viewed as a dispirited workforce and have long suffered under the banner of incompetence as a result of learners' low pass rates. Within the broader context of teachers' dismal performance, the innovative teacher offers a glimmer of hope and their practice is worth exploring in pursuit of realistic and best practice guidelines for a developing context (Souter, 2011).

This study in educational research illuminates the complexities within the South African context and contributes on a theoretical, practical and methodological level to the educational domain. Throughout this study the focus has remained the examination and articulation of the tacit knowledge innovative teachers hold and to make recommendations regarding teacher training and development in order to foster a culture of innovation amongst practitioners. The substantive theory is presented visually using text and diagrams where necessary. The benefits of this research are not limited to the theoretical but also include comments on the evolving nature of GTM specifically when applied in an educational setting (*cf.* Chapter 7).

## **1.11 MAP OF THESIS**

Even though the research was conducted in phases, this study is structured in chapters to conform to conventional ways of thesis presentation. The research phases and chapters do not

correspond directly. This research study is documented in eight chapters. Figure 1-10: Thesis outline below reflects the structure and captures the main components of this study.



**Figure 1-10: Thesis outline**

*Chapter 1* provides an overview of the research background and purpose statement leading to the formulation of several research questions. This Chapter also gives the philosophical underpinnings of this research, an outline of the research design and the historical backdrop and evolution of the Grounded Theory Method (GTM). Chapter 1 further provides reasons for selecting the Straussian GTM to investigate the phenomenon under scrutiny. Knowledge gaps are identified which in turn leads to the formulation of the research puzzle.

*Chapter 2* reviews the literature and examines contemporary studies for details of the processes that may be at work when innovative pedagogical activities are developed and new knowledge articulated when teachers use emerging ICT in school classrooms.

*Chapter 3* details the research process, the implementation strategy for the study as well as the dataset. Incidents of theoretical sampling, as demanded from the unfolding data, crystallize as categories and themes start to emerge.

*Chapter 4* addresses the first sub-research question which is the role of the innovative teacher within the sociosphere. This Chapter also presents the initial formulations of categories. The main theme of moral cohesion is disseminated.

*Chapter 5* focuses on the second-sub research questions that explore the pedagogical shift within the technosphere. The Chapter also articulates further developments of the emergent theory relating to teachers' innovative practices using ICT. The emerging theme of innovation in context is examined.

*Chapter 6* presents the findings of the last sub-research question and centres around the implications for organisational change related to aspects of governance. This Chapter completes the last phase of the emergent theory development.

*Chapter 7* attends to the subsequent substantive theory as developed in this study in an effort to answer the main research question and demonstrates how data and literature were used to develop and illuminate critical aspects of the subsequent substantive theory. Finally, the researcher reflects upon the contributions made to the existing body of knowledge on a theoretical as well as methodological level. Considerations for future research opportunities are presented.

## **1.12 SUMMARY**

Chapter 1 introduced the concept of tacit knowledge in relation to innovative teachers in their use of emerging technologies. The research problem of translating the practice into theory in order to create a better understanding of the ongoing relationship between technology and

education was presented. The research questions directing the research were presented within the research puzzle and a detailed overview of the research methodology was given. The history of the Grounded Theory method was documented and the different approaches to this method were fully explored before finally settling on the Straussian Grounded Theory method. Key analytical strategies to consider when conducting the Grounded Theory were discussed. A brief explanation of the current discourse surrounding the relevance of a literature review when following a Grounded Theory Method was given and a motivation for the literature review as a contextual frame for the study was supplied. Furthermore sampling methods, ethical considerations, anticipated benefits and significance of this research were presented.

In Chapter 2 the literature relevant to the issues pertaining to the implementation of ICT in education is reviewed. This is done in an effort to present the contextual framework that bounds the study. A historical glance which investigates the technology solutions in education is presented along with a chronological view of teaching and learning theory.