TECHNOLOGY ENCOUNTERS AND THE SYMBOLIC NARRATIVE

Localising the 'technology for development' experience in South African education settings

A dissertation presented by
Izak van Zyl

Supervised by
Prof. Lorenzo Cantoni

Submitted to the
Faculty of Communication Sciences
Università della Svizzera italiana

for the degree of
Ph.D. in Communication Sciences

October 2013

Abstract

The under-resourced primary school community in the Western Cape of South Africa has become entangled in national discourses that endorse technology-supported teaching and learning. In this context, school administrators, principals, teachers, and learners alike are encouraged to use and adopt information and communication technology (ICT) for education. These directives are embedded in the broader pragmatism of ICT for development (ICT4D), in which digital technologies support social and economic priorities. On the back of a three-year experimental research project, this dissertation explores the technology-for-development experience at six disadvantaged primary schools in the Metro Central Education District of Cape Town. In particular, this study reflects on some of the predominant experiences as voiced by teachers.

The use and adoption of technologies by teachers create recurring technological encounters. In light of the engagement with digital media as an everyday educational practice, these encounters become embedded as instrumental and utilitarian objects and processes. This defines much of the educational technology experience in the immediate school context. Beyond the utility of such encounters, however, we observe a symbolic narrative. This constitutes other, mediating properties of technology interaction, and represents the *evocative* engagement with digital objects. Much of this narrative is implicit, but is gradually enacted as meaningful reality or as social logic. This both contains and constructs – or, endogenizes – the interactional practices and notional frameworks of individual teachers.

By invoking theoretical perspectives from symbolic interactionism, grounded in naturalistic inquiry, the author then argues for an interpersonal ICT4D agenda. This advocates for the theoretical and practical significance of a symbolic narrative, localising it at the heart of the technology-for-development landscape. In doing so, the author argues for the emancipation of ICT4D, and considers the extent to which teachers' local knowledges and interactions with technologies can be incorporated. This study adopts a convergent methodology that is the outcome of rapid ethnography, thick description, and critical self-reflection. This allows for an interpretive journey, in which the author can explore those meanings and nuances that characterise the local engagement with digital technologies.

Keywords: technology encounters, symbolic narrative, localisation, meaningful reality, ICT4D

Acknowledgements

I would like to acknowledge all the persons who have supported me throughout this journey. It was a long and hard-fought adventure, starting with my move to Switzerland in March 2010, 8905 kilometres away from my family and friends. I settled in nicely, though, thanks to my 'boss' and co-supervisor, Isabella Rega. I extend special thanks to her for her pragmatic attitude, her superb mentorship, and her extreme commitment to her (and others'!) work.

Lugano is the most picturesque town I have ever visited, and I am especially grateful to all my lovely colleagues and friends who I encountered over the years. First off, NewMinE, eLab, and webatelier – these were my homes away from home! To Stefano Tardini who dared stay over at my parents' house in Cape Town (what an adventure that was!); to Christian and Goran for good laughs during Wii tennis matches; to Elisabetta for her precise scheduling; to Anna for falling asleep in ethnography class; to Sara React-nini for being the most loyal person in the world; to Chiara for her unimaginable friendliness; to Francesca (and Jimmy) for the great cordon bleus; to Chrysi for not letting us have too much fun; to Paolo for his presentation skills; and to the great many others I met.

To Ele Lobbie Fedele – you guys are the three special-most people ever; always keen for a good laugh and an Asian lunch. I enjoyed every single minute of your company, and hope we can remain friends for a very long time. To my dear friend Lukasz – your friendship and fantastic accent was really a highlight during my short stay in Lugano. To my dear friend Alessandro 'Ingrasini' – man, I could not have survived in Lugano without you!

Most importantly, to my supervisor, Lorenzo Cantoni, a wonderful thank you. You are an inspirational mentor – I would like to emulate your career, and become the youngest Dean and full professor in South Africa! Thank you for believing in this work.

To my family and friends back in Cape Town – even though you could not understand half of what I tried to explain about this thesis, you stood by me. Thank you!

Finally, I dedicate this work to my best friend and favourite person in the world, my wife Jandri: jy het dit uitgestick deur dik en dun. Hierdie was 'n moerse proses, maar ons het dit oorleef. Ongelooflik baie dankie. Lief vir jou tot die bitter einde!

Contents

Acronyms

ANT	Actor-Network Theory
BET-K12	Brazilian eLearning Teacher Training in K-12
BRICS	Brazil, Russia, India, China, South Africa
CAPS	Curriculum Assessment Policy Statement
CDA	Critical Discourse Analysis
CEAP	Centro de Estudo e Assesoria Pedagogica
CPUT	Cape Peninsula University of Technology
CSE	Computer self-efficacy
DBE	South African Department of Basic Education
DBR	Design-based Research
DoC	South African Department of Communications
DoE	South African Department of Education (formerly known as)
EFF	Electronic Frontier Foundation
FET	Future Education and Training
GDP	Gross Domestic Product
GII	Gender Inequality Index
GNI	Gross National Income
HDI	Human Development Index
ICT	Information and Communication Technology
ICT4D	Information and Communication Technology for Development
IDI	ICT Development Index
IPB	ICT Price Basket
IS	Information Systems
ISAD	Information Society and Development
IT	Information Technology
ITU	International Telecommunication Union
LMS	Learning Management System
M2M2H	Machine-to-machine-to-human

M4D	Mobile telephony for (international) Development
MDGs	Millennium Development Goals
MELISSA	Measuring E-Learning Impact in primary Schools in South African disadvantaged areas
PNC	South African Presidential National Commission
NEPAD	New Partnership for Africa's Development
NIEO	New International Economic Order
NRF	National Research Foundation (South Africa)
NRI	Networked Readiness Index
OBE	Outcomes-based Education
OERs	Open Educational Resources
OLSET	Open Learning Systems Education Trust
PAR	Participatory Action Research
RDI	Research, Development, and Innovation
RLabs	Reconstructed Living Lab(s)
SCOT	Social Construction of Technology theory
SER	Swiss Secretariat for Education and Research
STS	Science and Technology Studies
TLI	Teacher Laptop Initiative
TSE	Teacher self-efficacy
UCT	University of Cape Town
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNDP	United Nations Development Programme
USI	Università della Svizzera italiana
WCED	Western Cape Education Department
WEF	World Economic Forum

List of Figures

List of Tables

It is the symbol which transforms the infant of Homo sapiens into a human being…

Without the symbol there would be no culture, and man would be merely an animal, not a human being

The thesis that we shall advance and defend here is that there is a fundamental difference between the mind of man and the mind of non-man. This difference is one of kind, not one of degree.

White (1949:22-39)

Chapter I – Technology encounters in a hyperconnected world

This chapter lays the early foundations for the topic of technology encounters and symbolic narratives in a hyperconnected world. Initially, this is done by clarifying the global movements of communication technologies and its local implications, especially in the domain of ICT for education and development. This latter section moves to introduce a research initiative in South Africa, on the back of which the author conducts an exploratory study.

The introductory section serves as a contextualisation of the 'grand role' of digital technologies in society, blurring traditional divides between human experiences and functional artefacts. The author presents his research considerations, arguing for a symbolic responsiveness on the part of ICT implementation in educational development settings.

The author then sets out his theoretical objectives, and offers his rationale for conducting the analysis. The combination of these assertions ground the relevance, utility, and significance of the topic.

The aforementioned elements have been presented and discussed in the following papers (co)authored by Izak van Zyl:

- Chigona, W., Bladergroen, M., Bytheway, A., Cox, S., Dumas, C., Van Zyl, I.J. 2011. Educator discourses on ICT in Education. *ReSNES'2011: E-Skilling for Equitable Prosperity and Global Competiveness.* East London, South Africa.
- Fanni, F., Rega, I., Van Zyl, I.J., Cantoni, L., & Tardini S. 2010. Investigating Perception Changes in Teachers Attending ICT Curricula through Self-Efficacy. In *International Conference on Information and Communication Technology and Development (ICTD 2010).*
- Fanni, F., Van Zyl, I.J., & Rega, I. 2011. The value of measurement in research practice: Evaluating ICT training in education. *Community Informatics Research Network (CIRN) 2011, "To Measure or Not to Measure? That is the Question"*, 9-11 November 2011, Monash Prato Centre, Prato, Italy.
- Van Zyl, I.J. 2011. Mutual Isolation and the Fight for Care: An Ethnography of South African Home-based Healthcare Contexts. *Journal of Health Informatics in Developing Countries*, 5(1): 15-37.

Global movements: evolution of a technological landscape

"By technoscape, I mean the global configuration, also ever fluid, of technology and the fact that technology, both high and low, both mechanical and informational, now moves at high speeds across various kinds of previously impervious boundaries." (Appadurai, 1996:34)

Pointing out the continuous and often irrevocable surge of globalisation, which gained economic prominence around 1985, may be considered a cliché. However, contemporary apologists and opponents alike acknowledge this cosmopolitan era, marked by the gradual integration of economies and societies and driven by new technologies (Giddens, 2000; Gunter & Van der Hoeven, 2004). Over a decade ago, renowned sociologist Anthony Giddens discussed an important shift in the globalisation debate, away from the question of its existence towards consideration of its consequences (ibid.). Although these consequences are immeasurable, they do serve as a valuable point of departure. The well-known quotation that begins this chapter, in which Appadurai speaks of a 'technoscape', is included to illustrate this perspective.

Essentially, the technoscape is the widespread arrangement of technological forces and instruments that drive industrial and informational development, historically through trans-national corporations and government agencies (Appadurai, 1996). Mechanical and informational technologies are both relevant in this context. However, as a pursuing communication scientist, I am interested in the latter, which can be classified as information and communication technology (ICT): the electronic means for communicating information (Heeks, 1999). As Appadurai correctly claimed, the technoscape – or *digital* technoscape for the purposes of this study – now extends across boundaries that were previously believed to be impenetrable. Beyond these boundaries lie the under-resourced and 'exoticised other' social strata that were, in the time of Malinowski (1932), perceived as being outside the realm of Western societal progression.

Yet the technoscape has also taken a foothold within this peripheral context, where McLuhan's Global Village has also (as yet unequally) been built and populated (McLuhan, 1962). For example, the rapid diffusion of the internet and global directives in addressing the Millennium Development Goals (MDGs) have recently contributed to the rise in ICT activity in developing countries (Heeks, 2008). In this context, ICT 'activity' refers not only to an increase in literal digital resources – for example, through economic growth and investment. It also refers to the re-prioritisation of digital technologies for widespread regional development. From 1956, when the first digital computer was used in a developing country (Kolkata, India), to modern ICT innovation models, there has been a compelling call to apply new technology to our planet's

mega-problems (ibid.). This movement, both as an academic discipline and as a civil undertaking, may be referred to as ICT for development (ICT4D). The use of digital technologies within the development domain is alternatively located in the broader movement of ICT and development (ICTD) or development informatics (see Peña-López, 2009). A more detailed discussion on this theme will follow in Chapter II, in the section titled *ICT for Development: discipline and practice.*

Ultimately, the digital technoscape has become multi-dimensional and multi-accessible, although disproportionately so. And it is precisely within this context that I ground my dissertation. Acknowledging that the majority of the world's population did not have internet access in 2012, I am not making claims of ubiquitous use. But one cannot ignore recent global trends, especially concerning developing nations: the increase in internet uptake, the rapid rise of mobile-cellular subscriptions, increased home ICT access, growth in bandwidth, and the drop in fixed broadband prices (Bilbao-Osorio et al., 2013). This presents an opportunity for ICT4D, gradually moving from a supply-driven to a demand-driven focus (Heeks, 2008; Sahay, 2013). The global movement, then, of information and communication technology, provides the modern breeding ground for local development engagements.

Local implications: meaningful engagement with digital technologies

In light of this rather lengthy (but necessary!) pre-amble, I arrive at the imminent task. In this dissertation, I reflect on a three-year experimental research initiative that was conducted in the Western Cape Province of South Africa, the southernmost country on the continent. This project has responded to the global trends mentioned thus far. It has experimented with and evaluated conditions in which disadvantaged primary schools may utilise ICT to drive local educational development. This project is action research oriented, moving beyond a "moral obligation" of stimulating ICT opportunities (Heeks, 2008), but also toward an academic objective of evaluating these.

The project that forms the basis of our discussion is titled MELISSA – Measuring E-Learning Impact in primary Schools in South African disadvantaged areas. MELISSA, now in its extension phase, has applied a mixed investigative approach, merging qualitative and quantitative methodologies (Fanni, Rega, & Van Zyl, 2011). Since the project's inception in November 2008, the MELISSA team measured the impact of ICTs in teacher training and learning in terms of Bandura's self-efficacy theory (see Bandura, 1977). The purpose here was to understand changes

in attitudes to the use of digital technologies by teachers in resource-limited pedagogical contexts (Fanni, Rega, Van Zyl, Cantoni, & Tardini, 2010).

The overarching goal of MELISSA was to experiment with ICT as a developmental tool for teachers, and subsequently, to evaluate its effects. This was seen as a 'research response' to the well-known Khanya Project – an ICT access initiative, commenced in 2001. Khanya had the universal goal of distributing computer facilities to all schools in the Western Cape, thus bridging the perceived digital divide in the province. For the purposes of this discussion, digital technologies (or, ICT) is delimited to desktop computer systems, with internet-enabled functionality, and preloaded with software applications for use in educational contexts. These were the primary technologies as provided by Khanya, in the model of computer laboratories. As such, I do not extend a discussion in this dissertation to mobile technologies, despite being ubiquitous in emerging contexts. I confine the focus, rather, within the MELISSA enterprise, which studied the experience with computer laboratories.

Experiences from the MELISSA study revealed many opportunities and challenges in terms of the ICT-for-education model as propagated by Khanya and provincial authorities. Overall, the introduction of ICT generated mixed expectations and certainly produced mixed results. In light of MELISSA reflections, and with specific focus on the dissertation at hand, I also explore other less salient but equally important avenues. For one, beyond the immediate research lens, 'technological encounters' are emerging. These represent the teacher's daily engagement with digital media as an everyday practice. I will discuss technological encounters as being complex phenomena in teachers' interactions with digital technologies. This complexity is evident in these encounters being of not only material value, but also being *meaningfully embedded*.

I shall reflect on these notions by both relying on and diverging from the theoretical underpinnings of symbolic interactionism. This framework has a strong grounding in communication science, and I will approach it accordingly. Symbolic interactionism is, as any theory, limited in its application. I converse with its foundational principles, disrupt these, and propose converging narratives. My 'observational arguments' are then built through a simultaneous deduction of theory and an induction of empirical experience. The overall thread of argument continues to ground technological encounters as part of a broader symbolic narrative. This contains the mediating properties between users and technologies, and represents the *evocative engagement* with digital objects.

Much of the symbolic narrative is implicit, but is gradually enacted as meaningful reality. This reality both contains and constructs the interactional practices and notional frameworks of individual teachers. Henceforth, I shall argue for an interpersonal ICT4D discourse, one that *localises* a symbolic narrative at the heart of the technology-for-development landscape. As these encounters – a term I will be employing liberally – manifest, they undoubtedly influence the environments of those teachers relevant to this analysis. It is important to consider them within local, regional and global technoscapes: landscapes that are not merely the loose arrangement of technological forces, but also the interpersonal engagement between people and their digital environments.

Towards an intellectual puzzle

"The medium, or process, of our time — electric technology — is reshaping and restructuring patterns of social interdependence and every aspect of our personal life. It is forcing us to reconsider and re-evaluate practically every thought, every action, and every institution formerly taken for granted." (McLuhan, 1967:8)

The well-known quotation above is a prelude to our research problem, or as a colleague so fondly refers to it, the "intellectual puzzle". McLuhan could not have predicted the grand scale of the technoscape today, but he certainly recognised its significance. Following this line of argument, electric – and now digital – technology has emerged as an inevitable change agent. This agency has its origins in the electronic revolution, which has seen the rise of mass communication media: the telegraph, photography, cinema, radio, and most recently (and perhaps more profoundly), the internet (Cantoni & Tardini, 2006). In keeping with the widespread influence of the industrial revolution, McLuhan affirms the restructuring of traditional social dynamics in the new context of electric technology.

The latter revolution – that now forms the basis of our technoscape – has allowed for a convergence of traditional media. Images, sounds, and texts are integrated, seamlessly, in a multi-directional communication domain that allows for vast information transfer. This reconfiguration of media has bred, in Jenkins' terms (2008), a "convergence culture". Jenkins looks beyond the new media hype, and instead analyses cultural transformations as a result of converging technologies. He goes on to detail several case study analyses, pointing to notable cultural shifts in the face of converged communication: transmedia storytelling, crowd-sourcing, new intellectual property movements, and knowledge formation in spontaneous online communities (ibid.). Although the views of McLuhan and Jenkins are not groundbreaking in contemporary

media studies, they do remind us of the transcendental impact of digital technologies and new media.

Some of the foremost impacts of digital technologies are certainly quantifiable in socio-economic, environmental, and even political terms. These may take the shape of conventional indicators that measure ICT infrastructure, access, and use (see Lacroix, 2007; Bilbao-Osorio et al., 2013). Leading global bodies like the International Telecommunication Union (ITU) and the World Economic Forum (WEF) expend significant energy to depict the 'world in ICT'. These institutions have developed key benchmarking tools to this effect. The ICT Development Index (IDI), the ICT Price Basket (IPB), and the Networked Readiness Index (NRI) are noteworthy examples. These capture the level of ICT developments in more than 150 economies worldwide, and monitor the diffusion of ICT services (ITU, 2011; Bilbao-Osorio et al., 2013).

Whilst it is useful to "measure" the global penetration of ICTs, plotting its impacts, and mapping general discrepancies, ICT proliferation is perceived as something that is inherently good or desired:

> The full ICT development impact will only be felt, however, once people are using the technologies effectively…To ensure that the information society will be truly global and inclusive, much needs to be done to bring its benefits to the poorest in our societies. (ITU, 2011)

> There are clear signs that the digital revolution is set to transform virtually every institution in society, from science, health care, and education, to the way we produce and consume energy, to the very nature of government and democracy. In fact, millions of connected citizens now play active roles in their workplaces, communities, national democracies, and global forums, and there is mounting evidence that we can harness the explosion of social innovation to lead richer, fuller lives and create prosperity and social development for everyone. (World Congress on Information Technology, 2012)

The 'effective utilisation of technologies' in creating 'prosperous social development for everyone' is also in line with restoring a global technology imbalance, often framed as 'the digital divide'. This label, coined in the early 1990s, generally encapsulates the inequalities in access to and use of ICT (Gudmundsdottir, 2010a). Disparate access conveys the lack of securing necessary material, human, and social resources in employing digital technologies in meaningful ways (ibid.). This oversimplifies much of the academic discourse around the topic, addressed in detail in Chapter II, in a section titled *The Great Divides.*

The sentiments expressed above by leading information society bodies are certainly in line with the doctrine of the 'technological imperative' (see Bates, 2000; Chandler, 1995; Leff & Finucane, 2008). This is the widely held perception that technology is fundamentally good for us, and that we should not be excluded from its use. The global discourse on ICT suggests its many alluring properties, especially in the development realm. Proponents here argue that digital technologies can improve educational quality, enhance quality of life, develop critical thinking skills, increase economic competitiveness, and facilitate inclusion in a rapidly expanding global information society (see Taylor & Zhang, 2007; Shields, 2011; Olivier, 2010). Incidentally, some believe the tech imperative to be an out-dated concept, "mainly restricted to some of the dustier corners of our universities" (P. Brunello, pers. comm., June 2012). I will return to this argument in due course.

Despite its allure, and certainly in South Africa, ICT as development tool still operates in a limited domain of practice. Here, innovative technological application does not, of necessity, lead to substantive change (see GeSCI, 2011). Moreover, grand claims of development impact are idle in absence of rigorous empirical data, which certainly must account for the myriad social and cultural differences, practices, and desires that impede or promote (technological) development under adverse conditions (Shields, 2011; Ginsburg, 2008; Sahay, 2013). Governments and development agencies around the world are continuing to invest deeply in ICT as facilitator of change, as evidenced by the ITU and WEF indexes described earlier. But the conceptual challenges remain clear, historically:

> When a technology is regarded as the prime initiator of change in society, measuring the changing technology might seem to be enough – we just "count the number of connected computers" and then we can tell from that how advanced a society is. However…society is not exclusively driven by technology; thus, measuring computers, cables, and connections tells us very little about [its] actual state…in order to understand the information society, we must go beyond measurements of the diffusion of pieces of hardware and even increases of information in stocks or flows and investigate the social context within which these developments are taking place. (Pruulmann-Vengerfeldt, 2006:303)

The assertion that technology is socially grounded is certainly not a novel idea in academic discourse. Theories of social technology, stemming from the disciplines of science and technology studies (STS) and communication studies, include systems theory, actor-network theory (ANT), and social construction of technology theory (SCOT). These address the (inter)relationships between technologies (typically ICT and digital media) and societies, prompting questions of agency, belonging, cultural production, and determinism (see Latour, 2005; Kuhn, 1996; Bijker, Hughes, & Pinch, 2012).

Recognising, then, the complex relationship between technologies and societies, it is only pertinent that this be considered in the advancement and subsequent evaluation of an ICT4D pracademic discipline. ICT4D is after all a twofold endeavour: a pragmatic (practicing or applied) activity – i.e. instituting digital technologies in certain contexts – and an academic narrative, whereby the conceptual order around the role of technologies in development is established. This classification is further explored in Chapter II, in a section titled *ICT for Development: Discipline and Practice.* Recent trends in the discipline that Heeks now terms ICT4D 2.0 (2008) have followed suit with the introduction of new innovation models and multi-disciplinary development approaches (Parmar, 2009; Gallivan & Tao, 2013). These continue to facilitate the entry of previously marginal groups and communities into the local and global knowledge society. However, a number of such practices veil assumptions of both ethno- and techno-centrism:

> [T]he unexamined ethnocentrism that undergirds assumptions about the digital age is discouraging; indeed, the seeming ubiquity of the Internet appears a façade of First World illusions. I am not suggesting that the massive shifts in communication, sociality, knowledge production, and politics that the internet enables are simply irrelevant to remote communities; on the contrary, such technology might be of considerable interest if it can be incorporated on indigenous terms. (Ginsburg, 2008:4)

I will explore the aforementioned claims in due course, reflecting on our South African research initiative. For now, the incorporation of information and communication technologies on *indigenous terms* marks the birth of our intellectual puzzle. The validity of ICT diffusion is essentially the question of moving beyond the technological imperative. And its "measurement" requires that we move beyond quantitative evaluation frameworks and infometric assessments (see Taylor & Zhang, 2007). Some of the foremost findings in MELISSA suggest that digital technology wields more power as a symbol of modernity, progress, and cultural ambition than any utilitarian value, in both policy and practice (see Shields, 2011). It is at this intersection of socio-cultural responsiveness and meaningful engagement that I ground my research problem.

Avenues of exploration

I am building towards the very fundamental recognition in the ICT4D realm that there need to be other ways of understanding and justifying technological diffusion. That the mere power of digital technology as a propeller of modernity and progress does not warrant its distribution at the grassroots. That its potential benefit as economic enabler does not supersede its meaningful engagement, no less its symbolic narrative. Anriette Esterhuysen, prominent South African ICT4D practitioner and former anti-apartheid activist, shares this sentiment:

> For me, that is often what is missing in the ICT4D movement: not dealing with people as whole human beings. There's a lot of emphasis on uses of ICTs that can empower people economically, but not really looking at people as social beings, as creators, as cultural beings. (Interview with Esterhuysen, Sturm, 2009)

Considering this perspective, and in keeping with Ginsburg's fundamental assertion (2008), the hegemonic order of the Digital Age tends to comb over (disregard, veil, underrepresent) experiential nuances. I am hesitant to assume this as a theoretically inferential position, however. I am unable to deny, nonetheless, that it has informed my early perspectives in building this analysis. I did presume or deduce a need for more attention to experiential issues in the practice and study of technology in a development context. This presumption is also supported by recent literature and scientometric analyses of ICT4D studies (Gomez et al., 2012; Gallivan & Tao, 2013). As I proceeded with the ethnographic canvassing of a local context, in which teachers encountered digital technologies daily, several experiences and observations framed my eventual thinking. I developed a set of questions through these fieldwork involvements. They constitute and accompany our central research considerations, and can be structured along two paths of inquiry (not in any order of significance):

The manifestation of meaning

- What are some of the meanings and experiences associated with digital technologies?
- How do individual teachers frame and create their experiences with digital technologies?
- What are some of the interpretive dimensions of 'meaningful' encounters?
- (How) do these encounters acquire materiality and permanence within an institution?

The emancipation of ICT4D/E

- How are the 'impacts' of ICTs accounted for?
- How does a local ICT4D endeavour consider and incorporate teachers' local knowledges, interactions, and experiences with technologies?
- To what extent is 'participation' a necessary and inevitable action here? What is the nature and degree of participation?
- What is the nature of the research relationship?
- To what extent do the 'goals of empowerment' typify the research process?
- What are some of the methodological issues produced by this type of inquiry?

In the pursuit of answering said research questions, I followed a process of interpretive, axial, and ethnographic exploration, in which I developed a number of empirically based arguments. This pursuit grounds an argument for an increased symbolic responsiveness on the part of the pracademia of ICT4D. The exact nature of this responsiveness will be explained accordingly. Moreover, the motivations for selecting the respective ICT4D case and the epistemological approach for interpreting it will become clear as we progress. For now, the chief arguments in my examination (as it emerged) can be structured as follows:

- Beyond the immediate research lens and implementation context, we observe the emergence of technological encounters. These represent the meaningful engagement with digital objects;

- The study of these encounters helps to reveal a series of operations and symbolisms that mediate between the teacher and the digital object;

- Collectively, these operations and encounters converge within a symbolic narrative – appropriations, representations, conventions – that transpires as a meaningful reality;

- ICT4D can be emancipated via the critical engagement with issues of meaning, symbolic narrative, and deep empirical engagement.

From our ethnographic journey, it becomes apparent that the symbolic narrative is integral to understand and facilitate ICT in educational development contexts. As an overarching and concluding position, I present an engaging ICT4D framework where this narrative is localised at the discipline's core. This perspective describes an interpersonal narrative between formerly excluded communities and their newly integrated digital environments. These claims are further espoused in recent literature (see Sassen, 2013), practical familiarity with ICT4D programmes, an

extensive period of fieldwork in South Africa, and a process of open data analysis. The culmination of these experiences has shaped a conceptual framework, which I shall present empirically.

Essentially, the central research questions, and their overarching arguments, are rooted in three fields of academic discourse:

- ICT and development: technological and utilitarian imperatives as drivers of modernity (Bates, 2000; Ginsburg, 2008; Shields, 2011)
- Social anthropology and technology: the production of human values in a Digital Age (Schiffer, 2002; Albirini, 2006; Sellen, Rogers, Harper, & Rodden, 2009)
- Symbols as socio-cultural expressions: ICT as a functional and symbolic agent in sustaining selfhood and participation in the "glocal" community (Wellman, 2004; Ojiako & Aleke, 2011; Sassen 2013)

I have briefly touched on the aforementioned theoretical strands, considering how they relate to and enforce my argument. I shall proceed to address each in greater depth, noting its relevance to the central concepts employed throughout. To reiterate, these assertions can be ascribed to a framework I take to be an overarching conceptual paradigm: symbolic interactionism. As theoretical framework, it is considered in this analysis as a guiding perspective that synthesises the mentioned theoretical strands. I employ it not as a universal, absolute, or rigid framework, but as a fluid, multi-dimensional perspective, that lends structure to my analysis. Indeed, our ethnographic journey also challenges the interactionist paradigm, and reengages its fundamental underpinnings. Ultimately, I attempt to rethink the contributions from this theory in terms of those insights gained through empirical interaction.

Purpose of inquiry

The goals of this exploration are twofold. From a global or a broad viewpoint, I intend to argue for the *theoretical significance* of meaningful interactions in the general application of an ICT4D pracademic discipline. I will contribute to what Krauss (2012) terms, "the emancipation of ICT4D research", by emphasising narrative, personal experience, and socio-symbolic meaning. Krauss refers specifically to the self-emancipation of the ICT4D practitioner through respect, traditional leadership, and networks of friendships. His core argument, however, should oblige the practitioner (or 'expert') to rethink how ICT may address the emancipatory interests of the 'developing community' according to local understandings, assumptions, and needs (ibid.). Much of this objective has depended on continuous and emerging reflections of the MELISSA experience (Chapter V, in particular).

From a narrow or a local viewpoint, I intend to explore the *manifestation* of meaningful interactions as they relate to technological encounters in educational development contexts. The reflections in Chapter VI, in particular, will ground this objective. A number of authors have studied the meaningful influences of technology, particularly in the field of STS (Pinch & Bijker, 1984; Grint & Woolgar, 1997; boyd, 2009). However, we remain largely unaware how the diffusion and adoption of digital technologies are symbolically negotiated in ICT-for-development settings, especially in education (see Stewart, 2002; Smith, 2006; Lycett and Dunbar, 2000; Sassen, 2013). As part of this narrowly defined objective, I illustrate the arrangement of meaningful encounters amid a local ICT4D context (i.e. through MELISSA).

The goal here is to challenge the way ICT is conventionally introduced. I do this by addressing the schemas of communicative interpretation that the fathers of interactionism – Blumer, Goffman – and their contemporaries were devoted to discovering. Even in Blumer's heyday, the simple premise of 'meaningful interactions' was ignored or played down in the social sciences (1969). These schemas may constitute valuable narratives, and fluid, varied accounts of different engagements with technology. The aim here is to transcend what Nigerian author Adichie terms "a single story"; one that represents a distinct power narrative, and tends to veil aspects of diversity and meaning (see TED, 2009). I build instead towards a story of multiplicity, and heterogeneity.

Ultimately, I intend to showcase the local "recipients" of modern digital technologies in a different academic light. MELISSA has explored a variety of research agendas related to digital technologies in development environments: self-efficacy, social representation, self-determination, discourse analysis, and contextual factors that impede or contribute to ICT adoption (see Van Zyl & Rega, 2011; Fanni et al., 2010; Chigona, Bladergroen, Bytheway, Cox, Dumas, & Van Zyl, 2011). Yet I believe the phenomena related to meaningful, evocative engagements to be both salient and subtle. Reflections of the MELISSA research journey – both conceptual and practical – help to underline those communicable dynamics that indicate a deeper, non-utilitarian interaction with digital technologies. This approach lays the foundation for future socio-technical studies that consider such encounters as both the antecedents and results of development interventions.

It has to be noted, finally, that the purpose of this analysis is not built around pedagogical issues in the application of ICT. Rather, 'education settings' provide the systematic context in which ICT is encountered. This bespeaks the developmental role of technology in facilitating the educational experience – that is, in acting as a conduit through which pedagogy is appropriated. I reflect primarily on the meanings that emerge through this experience, and on the implications of these for ICT4D research. This analysis, thus, does not reflect issues of instructional design, interactive materials, formal and informal learning, or any of the didactic elements in the practice of primary scholarship.

Rationale

"How might indigenous communities and persons survive in the rapidly changing circumstances of life...and how might their environments, both "natural" and patently human, most effectively be sustained?" (Brenneis, 2003:219)

Dr. Akhtar Badshah, Senior Director of Global Community Affairs at Microsoft, considers information technology as a "cultural bridge" that exalts unlimited potential in inspiring success and sustaining cultural heritage (Badshah, 2010). This also cements the idea that digital technology can facilitate social and economic empowerment. Subsequently, when meeting certain conditions – focus on community development, local ownership, viable impact, local leadership, and the like – technological tools can serve basic human needs such as food, water, shelter, and healthcare (ibid.). These tools represent a partial answer, then, to Brenneis' weighty question around the sustainability of indigenous communities. The other side of the coin, however, does not bode well for recipient communities' social lifeways.

Reverting to Ginsburg (2008) and Sassen (2013), the circumstances of inequality that characterise access (or lack of access) to resources, technological and otherwise, are often entrenched in neo-developmentalist approaches. These assume that less privileged cultural enclaves with little or no access to digital resources are simply waiting, endlessly, to catch up to the privileged West (ibid.). It would seem that ICTs too have the power to marginalise, and to disregard indigenous practices. Key to this is the assertion that ICTs have the potential to disrupt the communities that undergird our identities (Thompson, 2011). At the behest of these factors, and striving for the objectives thus far mentioned, I ground the rationale for conducting this analysis. It is even more appropriate, given my South African heritage, that I attempt to uncover those local encounters otherwise neglected in the journey to Western idealism.

Moreover, my fieldwork experiences in South Africa led to the realisation that digital technology is far from a tangible reality in many local environments. This is generally the case in the availability of resource infrastructure, access to information and educational opportunities, and holistic understanding of the enabling values of technology. However, at the prerogative of the provincial government in especially the Western Cape, regional discussions and development activities ensue at the hand of ICTs. The focus on educators in disadvantaged communities is of particular academic interest because of the *promise* that ICT holds for such environments (Bytheway et al., 2010; Bladergroen et al., 2012). But it is precisely in those environments where stakeholders have the most difficulty in *assimilating* technologies (ibid.). In going beyond the 'promised' utility that ICTs pose, an exploration of meaningful engagement may suggest a fresh direction in the debate.

Contribution

The proposed research activities will contribute to the knowledge basis of three interrelated domains: theory, practice, and methodology. I have briefly clarified my theoretical vantage point above. In light of the positive roles and transformative capacities attributed to digital technologies, this analysis will reflect on the symbolic narrative of technology. This bespeaks the engagement of technology beyond its utility or pragmatism. This will be achieved, particularly, considering key development priorities in under-resourced communities. In terms of the ICT4D domain, I will locate, conceptually, the significance of meaningful interactions. This ambitious project then accentuates the value of symbolic narrative, meaning-making, and lived experience in the integration and adoption of ICT.

Practically, again building toward Krauss' (2012) emancipated ICT4D, the outcome of this research will help define and delimit those local encounters with digital technologies. Despite the many opportunities that ICTs create for knowledge sharing and uptake, it may also reinforce existing power hierarchies and exclusionary practices (Grimshaw & Gudza, 2010). For practitioners active in the field, local knowledge frameworks are essential in tailoring culturally sensitive programmes (Ranganathan, 2005). Grimshaw and Gudza (2010) discuss the proposition of deploying technologies through local voices, producing local content. The authors maintain that the emphasis on contextual dynamics and personal curatorship can support knowledge sharing and minimise impact on power relations in the community (ibid.). This study will follow suit, stressing local choices and interactions.

This analysis will finally offer a methodological contribution. In the dissertation I present a meta exploration of MELISSA as a research case. This self-referential study has materialised, practically, as the amalgamation of 'rapid ethnography' (Madden, 2010), participant observation (Bernard, 1998), thick description (Denzin, 1989), and interpretive understanding (Schutz, 1967). Lincoln & Guba (1985) termed this as a process of 'emergent design', driven by axial, interpretative, and inductive inquiry. This research is ultimately the outcome of an organic and intuitive methodological pursuit in uncovering the myriad dynamics of ICT4D. I offer as methodological contribution, then, a blended, multi-layered, and spontaneous undertaking that has helped unearth the respective research questions.

Chapter II – Transformative technology

Chapter II provides conceptual order to the arguments set out in the previous chapter: it contextualises the general ambitions of the author, both theoretically and pragmatically.

The first section here is devoted to explaining the 'technological world order', by reflecting on the existing and emerging digital landscape, globally and in South Africa. The analysis extends to a depiction of a 'hyperconnected world', which discusses a global state of networked readiness.

This is meant as a recollection of significant movements in the domain of digital technologies, acknowledging that expert readers will already grasp the scale of hyperconnectedness. However, the discussion moves to position the transformative capacities of digital technologies, noting the utilitarian advantages in addressing the great 'divides'. The author is rhetorically sceptical of the aforementioned 'frames' of argument, and maintains balance in structuring noteworthy academic debates.

In keeping with the transformative capacities of digital technology, the author proceeds to discuss ICT for Development (ICT4D). This is presented as both the discipline and practice of appropriating digital technologies for development priorities. This is followed by a depiction of South Africa's role in adopting ICT4D programmes for regional priorities – a useful and necessary classification in sustaining the analysis.

The chapter is concluded by offering a synopsis of respective ICT4D literature in terms of the South African development context. This is a brief overview of the theoretical insights obtained from the domestication of ICT in education settings.

The aforementioned elements have been presented and discussed in the following papers (co)authored by Izak van Zyl:

- Bladergroen, M.C., Chigona, W. Bytheway, A., Cox, S., Dumas, C., & Van Zyl, I. 2012. Educator discourses on ICT in education: A critical analysis. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 8(2): 107 – 119.
- Fanni, F., Rega, I., Van Zyl, I.J., Cantoni, L., & Tardini S. 2010. Investigating Perception Changes in Teachers Attending ICT Curricula through Self-Efficacy. *Proceedings of the 2010 International Conference*

on Information and Communication Technologies and Development (ICTD '10), 13 – 16 December 2010, London, United Kingdom.

- Fanni, F., Van Zyl, I.J., & Rega, I. 2011. The value of measurement in research practice: Evaluating ICT training in education. *Community Informatics Research Network (CIRN) 2011, "To Measure or Not to Measure? That is the Question"*, 9-11 November 2011, Monash Prato Centre, Prato, Italy.
- Van Zyl, I.J. 2011. Mutual Isolation and the Fight for Care: An Ethnography of South African Home-based Healthcare Contexts. *Journal of Health Informatics in Developing Countries*, 5(1): 15-37.
- Van Zyl, I.J., & De la Harpe, R. 2012. AT-HOME 2.0 – A collaboration model for informal learning in home-based healthcare. Journal of Universal Computer Science, Rethinking Education in the Knowledge Society Special Issue, 18(3): 429 – 453.
- Van Zyl, I.J., & Delen, A. 2011. The intersection of ethnography, design, and development: technological innovation in home-based healthcare. *Design, Development and Research (DDR) Conference*, 23 – 27 September, 2011, Cape Town, South Africa

Reflections on the technological landscape: a hyperconnected world

In 2005, in an important critique on globalisation, Thomas Friedman argued for an increasingly "flat world". It may seem a trivial observation in a contemporary era, but the flat earth premise remains a key consideration in our research quest. This premise describes the possibility for real time collaboration and competition in the face of a global techno society. Through electronic mail, teleconferencing, and internet networks, people from across the planet could engage, on an equal footing, with their counterparts (Friedman, 2005). The flattening of the world also means that all individual knowledge centres are merged into a single, global network. The perpetual digitisation sparked by this world has itself created new opportunities for engagement, notably in the domain of development.

Friedman's principle, along with McLuhan's visionary Global Village and Appudurai's techno landscape, shapes our initial contextual foundations. In light of these perspectives, and at the risk of reiteration, it is no secret that information and communication technologies have become increasingly ubiquitous. This is especially the case in the developed world, where ICTs are pervading most aspects of professional and personal contexts, formally and in-/non-formally. In the following sections, I will briefly reflect on the status and function of the present-day technological landscape, both globally and locally.

The internet as an open-experimental system, originally envisaged as a scientific endeavour (Duque et al., 2007; Leiner et al., 2009), has rapidly evolved into a globally dominant communication phenomenon. And with the advent of digital technologies – in combination with the internet as a now public network – the world has become increasingly *hyperconnected*. This marks an environment where the internet and its associated services are accessible and immediate, where individuals and businesses can communicate instantly, and where machines are equally interconnected (Bilbao-Osorio et al., 2013). The process of hyperconnectivity has been supported by the considerable growth of mobile devices and –connectivity, big data, and social networking, especially beyond the conventional 'First World'.

The World Economic Forum – arguably the leading global body in assessing ICT developments worldwide – maps a hyperconnected world via a Networked Readiness Index (NRI) framework:

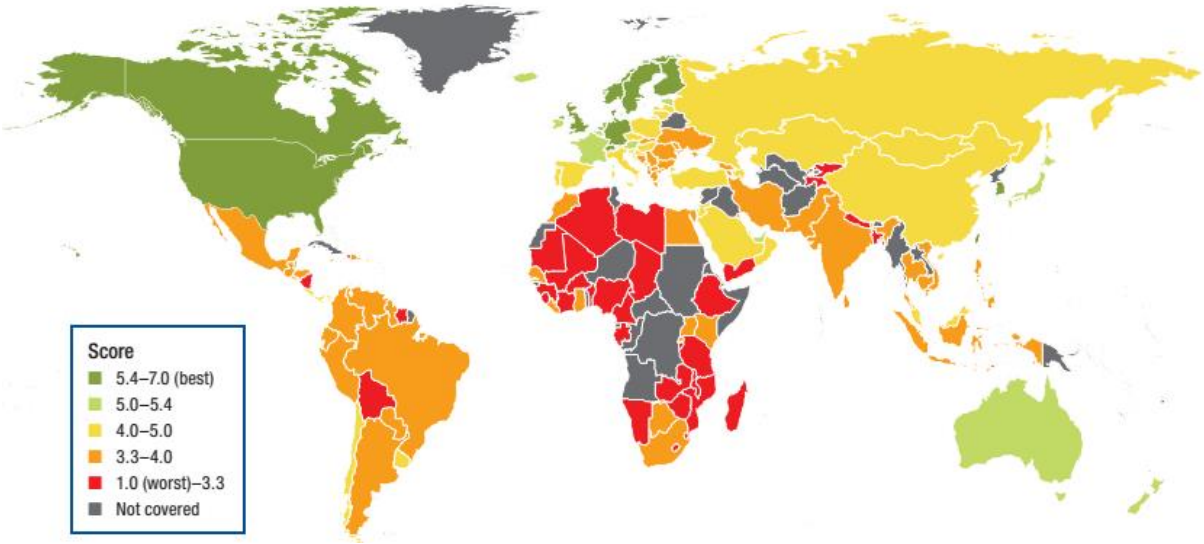


Figure 1: The 2013 Networked Readiness Index Map (Bilbao-Osorio et al., 2013:16)

These movements in mind, the digital universe is now expected to double every two years (Dutta et al., 2012). The increase in data traffic and the multitude of connected devices – both mobile and fixed – has led to a considerable rise in online social network exchanges. Facebook reports 1.11 billion monthly active users as of March 2013 – by far the biggest (and richest) social platform on earth, and the third biggest country by population on the planet (after India and China). Other factors that contribute to the world's hyperconnected state include high-speed broadband penetration, the expansion of digital screen surface area and resolution, the growth in

networked-enabled devices, big data expansion, and the increase in the power and speed of computer devices (ibid.).

The emerging global state of hyperconnectivity, not least in the developed world, has effected a number of deep-seated transformations in society. A foreseeable state of super connectivity, fundamentally driven by the internet, is reshaping the relationships between individuals, communities, consumers and enterprises, and citizens and the state (Bilbao-Osorio et al., 2013; Cantoni & Tardini, 2006). And, as will become evident, these relations evidence a diversity of formations – values, experiences, meanings, behaviours – within and between individuals and their localities (Whiteman & Wesch, 2012; Sassen 2013). A hyperconnected world is also exposed to many of the challenges inherent to the open, complex structure of the internet. These include, inter alia, cybercrime, data security, privacy, and copyright issues, individual rights, access to information and infrastructure, industry convergence, regulatory issues, and environmental management concerns (see Stallman, 2010; Cantoni & Tardini, 2006; Bilbao-Osorio et al., 2013).

Despite these challenges, the state of hyperconnectivity is rapidly evolving, with the many manifestations of ICT evident in previously uncharted domains. Such has been the overpowering role of mobile broadband. With more than 6 billion connections worldwide and US$1.3 trillion in annual revenue, mobile telephony has become the largest and most prevalent information and communication technology in history, at least economically (Bold & Davidson, 2012). And whilst the global scale of mobile telephony and its economic impacts are predominantly well documented (and understood), its "ultra-personal" and omnipresent social networking ability is expected to have a far greater impact (ibid.). In the socio-cultural domain, however, such impact is challenging to qualify, notably in the long term. And yet the very predominance of mobile devices and networks spell an intriguing global-cultural shift.

In its 2012 and 2013 Reports on Global Information Technology, the World Economic Forum lists two fundamental shifts, or tipping points, that describe mobile telephony's power in redefining how the internet is accessed and modified. The first of these depicts mobile broadband as the primary method of internet access for people around the world (Bold & Davidson, 2012; Bilbao-Osorio et al., 2013). In emerging regions, this indicates that mobile is the first, or even the only, way that individuals or communities can gain internet access. Broadly, in both developed and under-developed regions, it offers the notion that the internet itself shifts from a desktop ("fixed") experience to a mobile ("on-the-go") experience (ibid.). This tipping point is further evidenced in the WEF reports by recent global trends, namely that: mobile technologies

increasingly deliver broadband rates; data traffic is surpassing voice over mobile networks; broadband internet access in emerging regions is driven by mobile technology; and that mobile broadband delivers direct economic impact.

These dynamics lead up to a second tipping point in the information technology landscape, which describes mobile as the primary computing platform. The emergence of mobile computing is largely due to the rapid uptake of smartphone devices worldwide, now comprising the largest segment of mobile broadband shipments. The installation base of smartphones exceeded that of personal computers in 2012 and is growing more than three times faster than PCs (Bilbao-Osorio et al., 2013). Smartphones, with high penetration in the developing world, provide increasingly rich multimedia experiences. They often boast high definition web browsing, image and video capabilities, social networking applications, 3D gaming, and proximity technologies (including global positioning and location sharing). Tablet computers are a sleek accompaniment to smartphone technology, comprising a lightweight ultraportable alternative to conventional notebooks (or netbooks).

Transformative capacities of technology

"As the globally evolving Internet provides ever new access points to virtual discourse forums, it also promotes new civic relations and associations within which communicative power may flow and accumulate. Thus, traditionally … national-embedded peripheries get entangled into greater, international peripheries, with stronger combined powers." (Berdal, 2004)

The phenomenon of global hyperconnectivity, in both its economic diffusion and social integration, offers a number of key transformative benefits. The 'core functions' of a hyperconnected landscape can be structured according to the following attributes (adapted from Fredette, Marom, Steinert, & Witters, 2012:113):

- **Always on:** the distribution of high-speed broadband allows for a state of perpetual connectivity within and between organisations, families, friends, and contacts. This can be extended to online communities, in which personal avocations are internetworked among individuals and groups (see Sloep, 2012).
- **Readily accessible:** "always on" connectivity can be facilitated via a universe of readily accessible devices, through desktop, mobile, and hybrid units. Accessibility becomes independent of location, and distance.

- **Information rich:** the global landscape of connected devices all link to sources of information and content (websites, news channels, social media, search engines) – presented in different varieties, from the strategic to the banal. Information richness is generally beyond the individual capacity to consume, prompting Toffler's (1970) notion of "information overload".
- **Interactive:** hyperconnectivity ensures multi-directional information engagement and user-generated content, supporting the development of the next generation internet (Web 2.0 and 3.0).
- **Beyond people:** a state of hyperconnectedness moves beyond superficial person-person engagement, and includes person-machine or machine-machine communication. These ideas are also encapsulated by an ultra- or post-modern techno landscape, characterised by a semantic web (Web 3.0), technological singularity, and the Internet of things (see Whitehead & Wesch, 2012).
- **Always recording:** on- and offline activities and communications are continually documented in a semi-permanent record. This is enabled through virtually unlimited content storage capacities, cameras, global positioning systems, sensors, cloud architecture, and the like.

The attributes of hyperconnectivity cumulatively build towards a transcendence of time, space, distance, and social interaction. Such a phenomenon does present its share of benefits and challenges. It primarily enables a virtual domain for collaboration that can drive global alignment, efficiency, and material development (Fredette et al., 2012). Conversely, it has also produced a number of deep-seated transformations worldwide, and across the development landscape. In this vein, the rapid emergence of a hyperconnected world, not least in high-income countries, transmutes conventional norms of communication, workplace productivity, and information production.

This is by no means an attempt to overstate its omnipresence (or omnipotence!), but a state of multi-levelled connectedness fuels the global 'expectation to change'. Such expectancy manifests predominantly across professional and social institutions. It is only pertinent, then, that we evaluate the transformative capacities of digital technologies in terms of these domains. This can be achieved by outlining those gains (promises) and risks (perils) associated with an increased shift in the adoption and dissemination of digital technology.

The promise of hyperconnectivity

For social institutions and professional organisations worldwide – corporations, industries, academic institutes, education facilities, communities, and the like – the use and integration of ICT offers a number of potentialities. However, this does not imply an actual or practical realisation of these. Hence the oft radical disconnect between the ideals of a hyperconnected world and its tangible benefits, especially in the developing world (more on this 'divide' later). If realised, however, these ideals can drive major shifts, both favourable and detrimental, in terms of impact on work styles, functions, missions, networking, and production (Fredette et al., 2012). Across a variety of realms, hyperconnectivity almost inescapably transforms the practical and foundational components to knowledge exchange. These are briefly depicted below, in the spheres of urban development, government, business, education, health, the workforce, and sustainability.

Neo-urbanisation: The concept of modern urbanisation involves the transformation of post-industrial spaces into neo-urban developments (sometimes referred to as mixed-use spaces) in which to inhabit or work. The benefits of hyperconnectivity here include the increased access to technology in remote (or previously underserved) areas in the domains of healthcare, education, industry, and even entertainment.

***Government*:** A hyperconnected landscape reshapes the relationship(s) between government and the governed (Fredette et al., 2012). A 'networked' government has the benefit of easier access for its constituents, regardless of location. Citizens, both locally and nationally, are the potential beneficiaries of readily available (online) services.

Education: A hyperconnected, socially networked landscape has given rise to notable developments in the role of communication technology in learning (Keegan, 2002). This implies the development of new ways of organising learning delivery that go beyond course- and programme-centric models, envisioning a learner-centred framework of distributed learning (Koper et al., 2005).

Healthcare: The integration and assimilation of electronic health (or e-health) facilities into the everyday contexts of patients and healthcare workers is becoming a hyperconnected reality globally (Ruxwana, Herselman, & Conradie, 2010). E-services ideally contribute to the improvement of access and the provision of a wider range of health provisions to enhance the wellbeing of under-served individuals (not least in the developed world) (ibid).

Business: Hyperconnectivity also offers a capacity increase for the economic business domain. Interconnectedness between sellers and buyers are transcending the spatial confines of logistics. This represents a transformation in regional supply chains that connects customers, suppliers, manufacturers, and retailers in more efficient processes (Fredette et al., 2012).

Workforces: A hyperconnected landscape presents a number of transformative possibilities for the modern workforce. The promise of an ultraconnected labour force is defined by new business model opportunities and ways of working. The proliferation of smart phone technology, increasing broadband speeds, and the growth of the interactive web all contribute to the erosion of traditional work paradigms, ranging from work location requirements, to work hours (Fredette et al., 2012).

Fredette et al. (2012:116-17) list the key forces that will define the working world within the next decade. As we shall come to understand, many of these intersect with the socio-symbolic drivers present in the MELISSA case:

- **Demographics:** the characteristics of the work population are shifting. By 2020, there will be five human generations working side by side.
- **The knowledge economy:** being conversant and skilled in the knowledge economy will become more essential in obtaining and retaining work. A growing number of jobs will require complex sets of interdisciplinary skills.
- **Globalisation:** Globalisation has enabled workforces across the world to tap into markets beyond national borders, propelling economic integration, interaction and interdependence (Evoh, 2007).
- **The digital workplace:** workers as both the producers and consumers of inter-workplace information are gradually exposed to digitised work environments. Organisational knowledge management is transacted via digital communication platforms such as cloud storage, instant messaging, and telecommunication (see Flanagin & Bator, 2010).
- **Mobile technology:** the ubiquity of mobile devices opens the possibility of workforce and corporate training via smart devices and other applicable technologies. Such types of workplace training are sometimes facilitated through mobile virtual learning environments (MVLEs) (Saccol, Barbosa, Schlemmer, & Reinhard, 2011).

- **Culture of connectivity:** as hyperconnectivity emerges within the workforce, it advances a culture of (perpetual) connectivity. This reminds of Castells' 'internet galaxy' (2002), which depicts the new economy embedded in virtual networks (both technological and social) and information flows.

- **Participation:** the hyperconnected workplace, characterised by the movement of digital communication, also invites the participation of workers (users). Partaking in the workforce at this level sustains broader knowledge sharing and user engagement.

- **Social learning:** "Learning 3.0" or social learning can incorporate social media, gaming, real-time feedback, and simulations.

- **Corporate social responsibility:** ideally, hyperconnected workforces lead to increased engagement between business and society. This, in turn can foster greater inter-cultural relations, mutual appreciation, and social responsibility.

- **The 'millennial generation':** an ultra-connected workforce will also contain millennial generation individuals – sometimes known as 'digital natives'. Whilst recognising the immediate debates surrounding this cohort, of being "born digital" (Palfrey & Gasser, 2012) and labelled as such, the millennial generation holds vast ramifications for the workplace (see Chou, 2012; Rapetti & Cantoni, 2012).

Sustainability: the many instrumental promises of hyperconnectivity conclude in the form of increased social and environmental sustainability. For one, M2M2H communications involve less physical intervention, which may ease the deployment of resources. Robust virtual environments can therefore drive reductions in carbon emissions (Fredette et al., 2012). Moreover, communication technologies can play an important role in establishing ecologically viable consumption patterns for consumers.

The perils of hyperconnectivity

In the preceding passages, I have demonstrated some of the more utilitarian – practical, functional, material – advantages generally associated with the emergence of hyperconnectivity. As indicated, it is useful to view these as 'potentialities' or promises. Indeed, such ideals are yet to materialise, in full or in part, in many regions across the world. In South Africa no less, the promises of an ultraconnected landscape are not wholly leveraged (an ICT profile of South Africa is presented later in this chapter). There are a number of reasons for (and implications of!) this,

spanning from economic policy, to social and cultural resistance. These will be detailed as we explore the symbolic interactionist phenomena that undergird many of our respondents' engagements with digital technologies (Chapters V and VI).

For now, emerging hyperconnectivity does present an uncertain future. A closer examination of its global movements reveals a debate around the interactions between digital technologies and societal institutions. Whilst contributing to major shifts in how information is organised, processed, and consumed, a state of hyperconnectivity drives the 'expectation to change' (as alluded to earlier). Certain polar (or, opposite) considerations underline this expectation, in organisations, communities, civil society, and individuals. In 1995, a bustling period in the development of information technology, Philip Agre fittingly termed these deliberations:

> At one extreme is an unsophisticated optimism for which the unpredictability of future events encourages us to err on the side of progress. At another extreme is an unsophisticated pessimism for which the possibilities for authoritarian misuse of information technology encourage us to regulate it out of existence. (Agre, 1995:129)

Much of the confidence and cynicism that underlies the proliferation of ICT accords with what Wellman terms as internet utopia and dystopia (2004). The former considers the internet as a technological marvel, capable of driving global transformation. In the latter case, the internet is seen to disregard traditional values and diminish the quality of human interaction. What I have largely depicted thus far subscribes to the doctrine of utopia: the internet is a revolutionary communication medium; a hyperconnected landscape is embedded in everyday life as a functional and interactive force; the power of this landscape is evident in its rapid distribution and uptake. Moreover, this landscape is characterised by its *transformative capacity*, promoting readily accessible and distributable information that serves to redefine traditional social institutions.

Conversely, dystopian accounts historically depicted the internet as a destroyer of identity, and community (Wellman, 2004). The major concern here was the supposed inauthenticity of internet (or networked) interactions. It was posited that sustained online engagement might erode the foundations of true (or pure) community, and that the internet alienates individuals from their societies (ibid.). These doubts have persisted over time, in light of a rapidly growing hyperconnected context. Much of the contemporary information age dystopia – or, scepticism – can be differentiated as the resistance to technology (fear of adoption, aversion, avoidance, and the like), and/or the negative implications that follows adoption (see Van Offenbeek, Boonstra, & Seo, 2012; LeBeau, 2011).

Individual, organisational, or communal 'resistance' is a crucial factor in promoting or examining digital technology adoption. This may translate into a general aversion to such technologies, and of an anxiety – or deep-seated fear – for their 'consequences'. Thierer (2012) attributes this to a number of socio-psychological dynamics, including generational differences, hyper-nostalgia, pessimistic bias, and soft ludditism. These explanations generally convey a 'fear of progress', which may obstruct that very progress (see Palfrey & Gasser, 2012). The simple recognition, then, of the vast differences across social landscapes, fractures the (perceived) ubiquity of hyperconnectivity. Ultimately, one of the associated 'perils' – threats, risks, liabilities – of such a landscape pertains to its inability to contain micro and macro resistance.

The perils of hyperconnectivity also extend to its negative social implications post-adoption. Critics have decried ultraconnected lifestyles as impersonal, and lacking the quality of face-to-face socialisation (LeBeau, 2011). One of the most vocal criticisms of the internet, exacerbated by 'distant' online worlds, has always been that it contributes to loneliness among its users (Amichai-Hamburger & Hayat, 2011). This, in turn, can have a damaging effect on self-esteem, particularly among adolescents (see Gonzales & Hancock, 2011). Other social or individual implications have included internet and technology addiction, educational distraction and diminished literacy, weakened emotional capacity, antipathy, cyberbullying, privacy concerns (especially for adolescent users), and desensitisation (see LeBeau, 2011; Livingstone, Haddon, Görzig, & Ólafsson, 2011).

And yet, in keeping with the central arguments of Whitehead and Wesch (2009; 2012), the criteria by which to define socio-emotive constructs in a virtual age need to be re-examined. Concepts of loneliness, self-esteem, emotional intelligence, and socialisation assume varying manifestations (expressions) in the online world. In light of this, the adoption of virtual ways of life (digital lifestyles), spurred by an ultraconnected landscape, is complex and elusive to depict. The very perils of hyperconnectivity that penetrate micro level human environments are reconfigured as the boundaries between social and online worlds disintegrate.

In terms of broader, macro level environments, emerging hyperconnectivity has also instilled dystopian imagery. For one, fears of cyber-crime and –warfare have plagued network-dependent governments and citizens, with the well-known Stuxnet case being a recent example (Fidler, 2011). The Electronic Frontier Foundation (EFF, 2012) and scholars including Castells (2007), Stallman (2010), and Chomsky (2013), have confronted concerns of political censorship, disparate power relations, and media authoritarianism in the network society. Finally,

hyperconnectivity necessitates large-scale infrastructure and resource deployment, which may lead to adverse ecological impact (increased e-waste and energy consumption):

> With the rise of "Internet-scale" systems and "cloud computing" services, there is an increasing trend toward massive, geographically distributed systems. The largest of these are made up of hundreds of thousands of servers and several data centers. A large data center may require many megawatts of electricity, enough to power thousands of homes. (Qureshi, Weber, Balakrishnan, Guttag, & Maggs, 2011:1).

And whilst acknowledging some environmental benefits, the rapid growth in global network infrastructure and resource-hungry web technologies compels large-scale energy consumption. The emergence of a hyperconnected landscape, in terms of both uptake and capacity increase, is beyond the global means to supply, requiring new strategies of efficiency management (Hinton et al., 2011). Moving beyond these environmental pressures, I have also alluded to another peril associated with the development of hyperconnectivity in Chapter I. This pertains to the exclusionist, hegemonic character of the digital age. This overarching theoretical consideration – with its associated social implications – is introduced in the segment on *ICT for Development: Discipline and Practice*. For now, the discussion on the transformative capacities of technology is concluded in describing the functional evolution of hyperconnectivity.

The functional evolution of hyperconnectivity

As the proliferation of digital technology continues, the question of post-access is inevitable: the benefits linked to the usage and applications of ICT outweigh its mere accessibility. Digitisation represents the next step in the functional evolution of hyperconnectivity. This pertains to the rapid adoption of new technologies (smart personal devices not least) across social, economic, and political spheres. This evolutionary trend offers incremental growth: countries at the most advanced stage of digitisation derive 20 percent more in economic benefits than those at the initial stage (Sabbagh et al., 2012). Advanced digitisation levels have been demonstrated to reduce unemployment, boost the use of public services, and allow for greater government transparency (ibid.).

Increasing digitisation – not least in the most advanced global economies – offers an arduous task for policymakers. For one, the expected (and perhaps impossible!) question of measurement arises: how does one determine the full extent to which ICT is being assimilated in societies, and what are the indicators to measure the effective utilisation of technologies? At closer inspection, this is a question of both access *and* use, which also speaks to those institutions beyond the

traditional economy. I alluded to this ambition earlier, encompassed by the likes of the ITU benchmarks and indexes and the 2012/3 WEF reports on global information technology impact. For policymakers and key decision takers, the explosive growth of ICT products and services presents a fundamental obligation: how are we to plan for and deliver on its prospective impacts?

Second, given an affordance and availability of assessment tools, the challenge for global policymakers is to accelerate digitisation and reap its accompanying benefits (Sabbagh et al., 2012). The aim here would be to encourage and boost the adoption and use of new digital applications, locally, regionally, and (inter)nationally and across all social levels. This pertains specifically to a post-access environment, beyond the mere provision of infrastructure, and diffusion of technological artefacts. In this vein, (the impact of) digitisation may be measured across six key attributes (adapted from Sabbagh et al., 2012:122):

- Ubiquity – the extent to which enterprises, consumers, communities, and individuals have access to ICTs and respective digital resources;
- Affordability – the extent to which digital technologies are priced in a range that make them as affordable and accessible to as many people as possible;
- Reliability – the quality and consistency of digital services;
- Speed – the rapidity through which users can have real-time access to information;
- Usability – the ease of use of digital services, and their potential for steadily increasing the rate of adoption;
- Skill – the ability of users to incorporate new digital services into their organisations, communities, and personal lifestyles.

The acceleration of digitisation – as the proverbial cherry on the cake of hyperconnectivity – still requires key policy imperatives for many governing bodies across the world. These concern all stages of functional digitisation, and include (Sabbagh et al., 2012:129):

- The elevation of digitisation to a national (policy) level, marking the intent of senior government in promoting the transition to a more connected landscape;
- The adoption of ecosystem philosophies, addressing the convergence of telecommunications, traditional media, and information and communication technology. This also pertains to the holistic management of broad technology networks, as such considering their implications for local livelihoods;
- The enablement of sustainable competition, where viable ICT models are developed to stimulate innovation and sector-wide adoption;

- The stimulation of 'demand' across and between organisations, communities, and individuals. This would require high levels of human capital and ICT literacy.

Reflections on the technological landscape have thus far underlined its 'transformative capacities' and their potential for transforming our societal institutions. The advent of digitisation marks a new phase in the rapid growth of hyperconnectivity. And whilst its purported benefits are relatively easy to assert, the long-term implications of digital technological advancement betray a sense of uncertainty. The repercussions generally associated with imminent technological change can enforce a somewhat tentative future. Imperatives to adapt to increasingly technical environments may veil social complexities that are beyond the scope of technocrats, or pro-hyperconnectivity policymakers. Recognising, then, the countless intricacies associated with the digital age, there is a need to scrutinise its proliferation and adoption carefully and rigorously. A practical and theoretical manifestation of this is seen in the discipline of information and communication technology for development, or, ICT4D.

ICT for Development (ICT4D): Discipline and practice

"ICT for development (ICT4D) has a large role in supporting the future of rural development with the integration of available technologies and the existing knowledge landscape." (Nor & Muhlberger, 2011:137)

This statement, adapted from Professor Tim Unwin, UNESCO Chair in ICT4D, accords with much of the philosophy of the technology for development domain. As previously described, the ICT4D movement can be classified as an academic discipline, and a pragmatic effort in applying new technologies for societal gain. I therefore regard it as a 'pracademic' endeavour, suggesting its implications for practitioners and scholars alike. A pracademic is a "person who spans both the somewhat ethereal world of academia as a scholar and the pragmatic world of practice" (Walker, 2010:1). Borrowing from Walker's thinking, I extend the label to the ICT4D discipline itself, defining it hence as the process of combining reflective practice with scholarship.

It is unclear whether this sentiment is shared in the general ICT4D domain. I would maintain, nonetheless, that the margins between ICT scholarship (theory) and its active engagement (practice) are indistinct. Walker elaborates on the theory-practice connection by citing two key facets that underlie pracademic efforts: practical experience and research training. The former represents a solid grounding in the field to appreciate nuances, to broker (or bridge) information networks, and to create new channels of communication. The latter refers to rigorous academic

and reflective analysis skills. These enable the practitioner to make sense of situations encountered, to probe deeply into causal issues, and to understand implications for practice (Walker, 2010:2).

Whilst in the context of public administration, Posner (2009:12) holds that the synergy between theory and practice is a much sought after, but sometimes elusive, touchstone. And although the integration of academic scholarship and active practice is not always feasible, a healthy relationship is vital to the success of practitioners and academics alike (ibid.). I would be inclined to extend this idea to the ICT4D philosophy in general. As Unwin (2009:33) argues, "ICT4D is about what should be done and how we should do it". He further maintains that the discipline concerns itself with applying technologies to "enable the empowerment of poor and marginalised communities" (ibid.). Each of these thoughts, importantly, can be construed both theoretically and practically.

Leading scholar in the field, Richard Heeks, elaborates on this view, citing the underlying rationales for prioritising ICT application in developing countries. Heeks maintains that the drive to apply digital technologies for international development is entrenched in a moral argument, spurred by enlightened self-interest, and sustained by personal self-interest (2008). These views encapsulate the idea that ICT4D as a discipline is characterised by subjective, moral imperatives. I would envisage regarding these as pragmatic 'obligations', stimulated by inflated global poverty as a 'development priority'. These obligations do not go conceptually unnoticed, and must be the subject of careful scrutiny, and critical insight.

The pracademic attributes that I reference here speak to the oft-neglected and invisible 'I' in ICT4D: in Walker's terms, a "somewhat rare breed of individual" (2010:2). They are "boundary spanners who live in the thinking world of observing, reflection, questioning, criticism and seeking clarity while also living in the action world of pragmatic practice, doing, experiencing, and coping" (ibid.). It must be stated that Walker describes an archetype; one that can often be found wanting in the general application of ICT4D. In this vein, a retreat from either end – theory or practice – may indicate a loss of vital linkages in the technology-for-development approach. As we shall come to understand, the failure of sustained engagement between these poles can inspire overt technocentric practitioners, and deeply critical development theorists.

Key phases and new priorities

I have thus far briefly attended to the key 'actant' behind ICT4D application; that is, the reflective practitioner meets scholar archetype. Yet, as is the inclination of any self-inspecting discipline, the use of digital technologies in development settings begs other fundamental questions. Essentially, ICT4D is concerned with facilitating an inclusive modern society, where information and communication technologies are catalysts for social and economic 'empowerment' and/or 'freedom' (see Badshah, 2010; Heeks, 2008; Sen, 1997; Sahay, 2013). Communication is seen to be central to this process, enabling the access, production, and transfer of information – as such, strengthening the processes of sustainable development and socio-economic progress (UNDP, 2010). The multi-levelled relationships between information and communication are facilitated in a hyperconnected landscape. Ultimately, the proliferation of the internet and associated digital technologies enables certain transformative capacities (formerly discussed), put in force by the ICT4D practitioner.

The hyperconnected landscape is not limited to the mere deployment of physical artefacts (mobile devices, personal computers, digital media), or virtual operations (software, databases, social networks). Rather, it concerns the myriad culminations and usages of these in our human societies. In ICT4D, hyperconnectivity is leveraged in environments that are – perhaps critically? – starved of its presence. For Heeks (2008), ICT4D can address the problem of digital exclusion, working to integrate isolate communities into the digital era. For Unwin (2009), it can support the future of rural development. And for many others yet, the implementation of ICT in (for) development settings can bring about positive social, cultural, and economic change (see Badshah, 2010; Harris & Harris, 2011; Sahay, 2013).

At closer inspection, these views are provocative, and very often the subject of long-standing academic disputes (Parmar, 2009; Heeks, 2008; Kleine & Unwin, 2009). In this vein, any account of ICT4D must explore understandings and interpretations of each of the term's root components – 'ICT' and '4D': *which types of technologies* are to be employed for development, *who* are being developed *for*, what type of *development* is envisaged, and *whose* notion of 'development' is being advanced? In light of these critical inquiries, the discipline of ICT4D itself has undergone a steady evolution. This is with respect to both its development agenda and its intended technology applications.

According to Heeks (2008), the initial phase of ICT4D grew out of global ambitions to redress poverty, whilst seizing the priorities of health, education, and gender equality. The late 1990s and early 2000s saw key policies emerge from the World Bank, the G8 Digital Opportunities Task Force, and the World Summits on Information Society 2003 and 2005. These highlighted the roles that information and communication technology could fulfil in tackling international development challenges. Global development priorities were concretised earlier by the September 2000 Millennium Declaration in the form of Millennium Development Goals (MDGs) (ibid.). International development agencies and non-government organisations quickly heeded these calls, and so arose ICT4D 1.0. This was initially a practitioner-based approach to applying ICTs at the proverbial 'bottom of the pyramid'.

The archetypical 'technology' popularised in this period of ICT4D was the telecentre. This is a type of public or communal facility where individuals can access information through communication technologies (see Rega, 2010). These were seen as 'off-the-shelf' solutions that could be replicated in a great variety of developing countries (Heeks, 2008). And although the telecentre was not the sole technology project during this period, it helped define global efforts in promoting access to ICT-based services (Rega, 2010). These optimisms were not shared by everyone in the development community, and telecentres soon were synonymous with ICT4D failure (ibid). Each failed outcome stimulated fresh concerns in the technology-for-development domain, and practitioners quickly emphasised sustainability, scalability, and impact evaluation (Heeks, 2008).

In 2008, Heeks attempted to sketch the component parts of the yet unknown future of ICT4D 2.0. For much of the late 1990s and early 2000s, priorities centred on the need to promote information access, to bridge the digital divide, and to facilitate inclusion. But rapid technological developments drove significant hardware changes, from landline to wireless, and from fixed computers to mobile devices. The path to mobile telephony was being paved, and broadband was slowly recognised as the definitive marker of progress. Heeks also foresaw the myriad 'new applications' of ICTs in creating relevant local content (e.g. community radio), facilitating interactive social networking (e.g. blogging), and stimulating innovative services (e.g. m-banking) and products (e.g. low-cost terminals) (2008).

Various innovation models characterised the ICT and development continuum at the threshold of phase 2.0. These mostly constitute pro-poor, para-poor, and per-poor efforts. Pro-poor efforts are those development activities that occur outside of resource-limited communities, and are rather concerned with interventions on their behalf (Heeks, 2008). The telecentre was an initial example

of pro-poor efforts, but it often represented the mismatch between abstract design assumptions and observed realities (ibid.). Para-poor efforts describe development activities that occur alongside communities, comprising a participative, user-centred (or at least –engaged) process. These efforts represented a key shift in the practice of ICT4D, and prompted a number of creative collaborations in the domain. User-centred design (UCD) and participatory design (PD) have since become central ideologies in the efforts of social innovation and sustainable development (Van Zyl & Delen, 2011).

Para-poor efforts raise several theoretical and practical concerns. The appropriation of ICTs for development agendas are again at the forefront of debates around 'joint interventions'. Participation has long been a conceptually ambiguous construct, or in Cleaver's terms (1999), a critical paradox. As such, calls for community participation often veil deeper social and cultural subjectivities that mediate the local development narrative. For ICT4D, participatory complexities contribute to "multiple divides between designers and users that must be bridged" (Heeks, 2008:30). Participatory endeavours have come to define the ICT4D 2.0 innovation model, but are partly superseded by per-poor efforts. These represent pure 'bottom-up' development, intended for communities, and driven from within communities. For Heeks, much per-poor activity goes unnoticed, partly due to the absence of development practitioners. He envisaged, though, that ICT4D 2.0 would be compelled to seek more systematic means to harvest per-poor innovations (ibid.).

These considerations in mind, the contemporary discipline of ICT4D is evolving, in both its research considerations and the practical integration of technologies. In a study uncovering important trends in ICTD/ICT4D, Gomez, Baron, and Fiore-Silfvast (2012) found unprecedented growth in the quantity and diversity of research publications and contributions to knowledge in the field. According to the authors, the published ICT4D literature exhibits a dynamic tension between a focus on business and economic development, and a focus on empowerment and community development. These remain the two most salient domains of work in the field (ibid.). Moreover, surveyed ICT4D literature indicates a decreasing interest in information systems (IS), a sustained interest in telecentres and public access venues, and a growing interest in the use of mobile phones for development (which has since spawned the sub-discipline known as M4D) (Gomez et al., 2013; Gallivan & Tao, 2013).

Gomez et al. (2012) conclude by indicating what they regard as a changing, maturing field of ICT and development. This dynamic is twofold: firstly, most of the recent surveyed literature is focused on particular countries or organisations. This represents a gradual departure from field-based descriptions, as more research emphasises scalability, best practices, and national policymaking. These "watchwords" are regarded by Heeks (2008) as important signifiers in the transition from ICT4D 1.0 to 2.0. Secondly, recent trends suggest that ICT4D is shedding its a-theoretical past by laying more solid theoretical foundations and conceptual frameworks for its work (Gomez et al., 2012; Gallivan & Tao, 2013). This may again be a reflection of a maturing field, which recognises both its conceptual basis (theory) and its active engagement (practice).

The Great Divides

Throughout the discussion, I have reflected on the hyperconnected technological landscape and its (supposed!) transformative capacities. A culmination of these elements is represented in the pracademic endeavour of ICT4D. I have paid mind to key phases and new priorities within this "discipline" (for lack of a better term). However, I have not sufficiently acknowledged the second of its root components: '4D'. To reiterate, this would indicate the use and advancement of information and communication technologies *for* accomplishing the goal of societal *development*. Which reverts to our fundamental inquiry: what type of development is envisaged, what/who is it intended for, and whose notion of development is being achieved? This is, borrowing from Unwin (2009), by no means a trivial undertaking. Without delving too deeply into the abyss that is development theory, I will briefly recap on two of the great divides that typify the 4D narrative.

The first and perhaps predominant divide that I refer to here is that of the *digital*. The 'digital divide' is a label that describes the disproportionate access and use of ICT resources (Gudmundsdottir, 2010a). The term especially underpins the great disparities in opportunity to access the internet as a major global resource. The discourse further holds that 'divided' individuals and communities are deprived of the educational and economic prospects tied to this access (Ginsburg, 2008). Traditional conceptions of the digital divide refer to social class distinctions, and technological inequalities between urban and rural areas. These individual and regional differences were historically polarised as the 'information haves' and 'information have-nots' (Wresch, 1996).

The *global* digital divide, however, speaks to a geographical division between technologically resourced nations and those that are much less advanced. Developed nations would typically be able to invest in and develop ICT infrastructure, whilst reaping the fruits of hyperconnectivity. Conversely, developing and emerging nations generally trail along "at a much slower pace" (Ginsburg, 2008:29). Disparate technological progress inevitably shapes geographic blocs along a North-South divide, representing wealthier "Northern" entities and poorer "Southern" nations (Ginsburg, 2008). From earlier reflections on the global technological landscape (networked ready countries), this view is evidenced (see Figure 2).

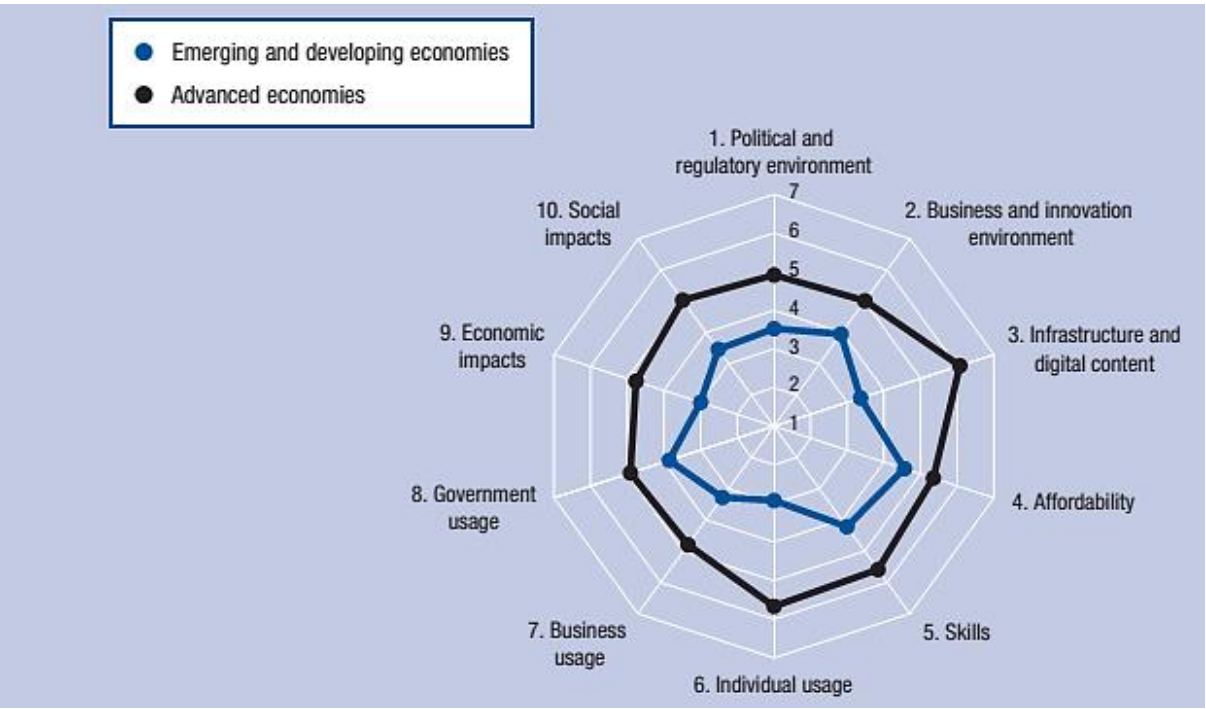


Figure 2: Charting the digital divide along regional blocs (Bilbao-Osorio et al., 2013:17)

The level of ICT uptake in Sub-Saharan Africa, Latin America, and the Caribbean ("emerging and developing economies") is generally lower than that of Northern counterparts ("advanced economies"), dominated by the United States, Europe, and the Asian Tigers. The few Southern exceptions here include Mauritius, New Zealand, and Australia. In the European North, there are poorer exceptions as well; examples include Ukraine, Georgia, and Armenia (see Dutta, Bilbao-Osorio, & Geiger, 2012). Exceptions aside, a global digital 'segregation' manifests along the accessibility and use of information and communication resources. Many nations and their governing bodies are left excluded from the potential social and economic benefits of ICTs:

> The global digital divide arguably is one of the strongest non-tariff barriers to the world trade with potentially adverse social, economic and other consequences influencing a developing country's ability to take advantage of opportunities provided by modern ICTs (Kshetri & Dholakia, 2009:1664).

Initial global advancements in digital technology, then, quickly instilled exclusionist notions of 'information and communication poverty', both within and between countries. These notions, in turn, informed a prevailing political view, broadly settled on combating a perceived dichotomist divide between 'connected' and 'disconnected' citizens (Selwyn, 2004). It followed that disconnected individuals were stranded on the margins of modern or postmodern society. As reiterated by Kshetri and Dholakia (2009) above, those at the wrong end of information divisions miss a variety of socio-economic opportunities. Duque et al. (2007) expand on this view, arguing that the internet itself favoured techno-scientific communities, and that it was not attuned to the inclusion of diverse social groups.

The aforementioned views describe some of the conventional discourses that underpin the (global) digital divide narrative. This appears to be a largely simple premise, in Selwyn's (2004) terms, and has served to reinforce dichotomous portrayals of 'haves' and 'have-nots'. A host of official statistics and academic studies have affirmed the same, buttressing clear-cut resource divisions along North-South localities (Selwyn, 2004; Warschauer, 2003; Ginsburg, 2008). Adherents to the philosophy of information and communication poverty have made it their life's work to reduce global deficits in digital resources. This is largely evident in the work of ICT4D 1.0, but not atypical to the now maturing phase of 2.0 (see Heeks, 2008). Indeed, many contemporary development approaches – notwithstanding national policy agendas – have sought to rectify or 'bridge' digital inequalities through the creative application of ICT (Gomez et al., 2012; Cáceres et al., 2012).

Opposing perspectives, however, hold that the oft cited divide in technological resources is only narrowly (or dichotomously) concerned with the question of access and use. Selwyn (2004) has long since argued for a reconsideration of popular divide conceptualisations. He holds that simplified divide models offer short-term practical and political allure, which is often evident in national ICT directives. Yet in the longer term, as he continues to outline, a polemic set of technologically 'rich' and 'poor' individuals or countries is too rudimentary and limited an analysis (ibid.). Concepts such as 'universal access' and the digital divide, grounded as they are in primarily economic judgements, are 'simplistic, formalistic and thus idealistic' (Selwyn, 2004:345).

> [T]o distinguish between the 'information rich' and 'information poor' both avoids precise delineation of who these are and fails to consider the range of different positions . . . In short the model lacks sufficient sociological sophistication. (Selwyn, 2004:345)

Essentially, the reconfiguration of a long-entrenched digital divide narrative must work to transcend simple access definitions, and incorporate social, cultural, and political perspectives (Gudmundsdottir, 2010a). Likewise, this process involves the reconsideration of ICT competencies and experiences in an increasingly hyperconnected age. These are not of necessity distributed or employed on equal terms, and may build towards varying patterns of information capital. And furthermore, a re-evaluation of the "*use*" factor is integral to understanding glo*c*al information flows. For the presumption that increased ICT access equals increased and sustained use is a deterministic belief at the heart of conventional notions of the digital divide (Selwyn, 2004; Unwin, 2009). Developers have identified the root of several ICT4D failures as stemming from such techno-centric approaches, dominated by an informatics view of the world (Heeks, 2008:30).

The other great divide, that often underlies the notion of information poverty, is that of development. Much of the work in ICT4D has been devoted to understanding the construct of development (or the "*D*") in appropriating digital technologies for social and economic gain. In its crudest form, the development divide informs or drives the core of the global digital divide. As indicated by early work in the field, this so-called – but not yet critically contested – digital divide formed an integral part of a broader and more intractable global development shift (De Alcántara, 2001). People in low-income countries were limited in the access to modern means of communication, naturally enforced by a complex network of constraints. Local to global development complexities ranged from rates of extreme poverty, to high disease burdens, and widespread social and economic insecurity (ibid.).

Notably, these challenges are higher in states that are significantly weaker both economically and socially: those countries with a lower gross domestic product (GDP), per capita income, and general living standards. These dynamics are for example evidenced by Human Development Index indicators and economic impact metrics (see UNDP, 2013). The global development agenda then, acknowledging regional imbalances in socio-economic conditions, is geared towards a reversal of 'detrimental divides'. This is perhaps most evident in the United Nations Millennium Project and the aforementioned intent of the Millennium Development Goals. These policy imperatives address extreme poverty in its many dimensions – income poverty, hunger, disease, lack of adequate shelter, and exclusion – while promoting education, gender equality,

and environmental sustainability, with quantitative targets set for the year 2015 (Sachs & McArthur, 2005:347).

Development in this vein, then, concerns those activities whereby perceived socio-economic and environmental imbalances are restored to accord with 'acceptable' living standards. At its core, the idea of development is understood to involve concepts of 'progress' and of 'growth' (Unwin, 2009:7). These conceptions are rooted in the 18th century cultural movement of Enlightenment, in which rationality, science, and knowledge were regarded as the foundations of societal advancement (Unwin, 2009; Chon, 2006). Enlightenment philosophies have since penetrated public discourse, and a variety of transitions emanated from the practice and diversity of enlightened thought:

> Enlightenment was a desire for human affairs to be guided by rationality rather than by faith, superstition, or revelation; a belief in the power of human reason to change society and liberate the individual from the restraints of custom or arbitrary authority; all backed up by a world view increasingly validated by science rather than by religion or tradition. (Outram, 1995:3)

There are many current schools of development, each with sets of assumptions rooted in classic enlightenment theory. Classic examples include Kant's well-known "courage of one's own understanding", to the emergence of Habermas' egalitarian public sphere, to widely conceived notions of progress and growth. Chon (2006) maintains, though, that contemporary development – construed as modernisation and national economic growth – is essentially a post-World War II phenomenon. A key tenet characterised the immediate post-war period: the need to rebuild societies, both materially and socially. The concept of development was incarnated during this time – as much by accident as by inspiration – in US president Harry Truman's 1949 inauguration speech (Rist, 2002). In it, he called for a "bold new program" whereby industrial progress and scientific advances are made available for the improvement and growth of "underdeveloped areas" (Chon, 2006:2852).

Further to the promotion of social and economic security in the post-War period came the establishment of the United Nations, based on principles of peacekeeping and humanitarian assistance. This period also saw the rise of international monetary orders that promoted growth through trade. Examples include the Bretton Woods System, the International Monetary Fund, and the World Bank (Chon 2006; Rist, 2002). Through the founding of these institutions, it was imagined that every country would be able to share in the promise of abundance. Modern industrial economies were seen as vital agents in helping to solve the acute poverty of the increasingly decolonised South (Rist, 2002). And with the proclamation of the New International

Economic Order (NIEO) in the 1970s, it was thought that a way had at last been found to reduce the inequalities between nations. The satisfaction of 'basic needs' would put an end to the plight of those living in countries with the least resources (ibid.).

Since the incarnation of a 20th century development doctrine, a divide rapidly manifested between swathes of newly decolonised nations (typically in the South) and their industrial Northern counterparts. The emergence of new, sovereign nation states soon contributed to critical development bureaucracy that continued to expand in contemporary international relations (Escobar, 1992; Chon, 2006). To its severest critics, "development unleashed a juggernaut of imperialistic, colonising, impoverishing, and violent programs against most of the world's poor in the name of human progress and humanitarianism" (Chon, 2006:2852). And even to those who support its global transformation agenda, development has imposed hefty costs on vulnerable populations, and severe dislocations and disruptions among social and cultural lifeways (ibid.).

A tangible and psychological divide thus ensued between the developer ("First World") and the developed ("Third World"). Development was not only an instrument of control over the physical and social reality of much of Asia, Africa, and Latin America (Escobar, 1992). It also shares basic features with other colonising discourses such as Said's Orientalism as a Western style for dominating, restructuring, and having authority over the marginalised, powerless 'Orient' (Said, 1978). The problem – or 'crisis' – of development is hence driven by its very inclination to instil hegemonic divides, clearly anchored in systems of production, power and signification:

> Development has been the primary mechanism through which these parts of the world have been produced and have produced themselves, thus marginalizing or precluding other ways of seeing and doing. The problem is complicated by the fact that the post-World War II discourse of development is firmly entrenched in Western modernity and economy. (Escobar, 1992:22)

Without digressing beyond scope, I surmise the development divide as the complex depiction of haves and have-nots within and between nation states, communities, and even individuals. Much like its digital equivalent, the development divide manifests along the ability of the 'under-resourced' in obtaining, retaining, and using economic and environmental resources. With the deployment of forms of power and intervention, segregated societies are mapped and produced (Escobar, 1992:23). In other words, development is what constructs the Third World, silently, without our noticing it. By means of this discourse, individuals, governments and communities are seen as "underdeveloped" (or placed under conditions in which they tend to see themselves as such), and are treated accordingly (ibid.). And this discourse fundamentally defines the inability of the underdeveloped to attain economic security.

In conclusion, I have attempted to contextualise much of the contemporary ICT4D framework by highlighting its foundational divides. It would appear that these are inseparable: divisions in technology access and use are spurred by macroeconomic segregations in resources, infrastructure, and opportunities. These forces culminate in yet another great division, in what well-known economist Jeffrey Sachs terms as the 'global innovation divide'. This, essentially, is the division in innovation and technological advance (Sachs, 2003). And the physical narrowing of this divide is at the heart of much of the international ICT*4D* endeavour. However, the very notion of development here is often conflated with sheer economic or technological growth as well as the neoliberal emphasis on free markets (Chon, 2006). Broadly, it should also concern the conditions of production and the social implications of economic activity and technology-driven society (ibid.). Yet as we shall come to understand, the quest for narrowing global imbalances through the endeavour of ICT4D, often subjugates the very social frameworks it seeks to protect.

Information hegemony and the modernity bias

The fundamental premise of ICT4D pracademia has historically concerned the use of rationality and technological skills in ending absolute poverty (Unwin, 2009). But as contemporary ICT4D approaches proceed into phase 2.0 (and beyond), it will perpetually encounter each of the great divides: digital, development, and innovation. Early pro-poor efforts, well intentioned as they were, inscribed divisions between 'developing actants' and 'developed others'. ICT for development implementations demonstrated the predominant view that information and the internet can be facilitated top-down. Such efforts of 'techno-enthusiasm' hyperbolised the empowering abilities of information access (Selwyn, 2004). This was upheld by the status quo in techno-development studies (Ranganathan, 2005).

As globalised and hyperconnected phenomena rapidly encroach, renewed calls for universal access to information emerge. These again emphasise the transformative capacities of hyperconnectivity, and the necessity to evolve into a modern, technologically advanced era (Fredette et al., 2012). 'Smart' approaches to development priorities are envisaged and a knowledge- and information-based society will inevitably characterise the global landscape. And essentially, this landscape is hoped to become more inclusive, thus bridging the great differences in innovation, development, and digital access (Bold & Davidson, 2012). However, there is a danger that even 'enlightened' applications of ICT may reinforce classic divides. This speaks to a fundamental modernity bias in the transition to globalisation across the world, marking the birth of information hegemony.

Two key debates emerge from this perspective, namely the possibility for either homogenisation or heterogenisation (differentiation) (Embong, 2011). The more critical of these debates centres on the idea that globalisation – and hyperconnectivity as an extension thereof – disrupts local authenticity, autonomy, and plurality (see Escobar, 1992). This school of thought argues that globalised forces effectively homogenise cultural principles to accord with dominant systems and beliefs. This reminds, albeit simplistically, of critiques against hegemonic ideologies in the face of the information age (see Castells, 2006; Ginsburg, 2008; Sassen, 2013). At its extremes, the increased homogenisation of local institutions subscribes to new forms of cultural imperialism and information dominance.

Neubauer (2011) marks this process as the ascent of 'informational neoliberalism'. This dominant ideology undermines traditional notions of culture and citizenship in favour of market discipline and neoliberal hegemony. Reconsidering key arguments in this light, the levels of inequality that define access to technological resources are entrenched in powerful ideological approaches. These sometimes assume that 'backward' cultural groups need to integrate digital resources for material progress (Ginsburg, 2008). Such approaches heed to modernist philosophies of technological capital, or as Pieterse (2005) would have it, digital capitalism. Resultantly, they also serve to re-inscribe historical divisions between information haves and have-nots. 'Underdeveloped' or 'information poor' groups are, in keeping with Escobar's (1992) early assertions, effectively re-produced, mapped, and segregated.

Does the continuous advent of a hyperconnected world then have the potential to marginalise local narratives and symbolic negotiations in favour of dominant modernity? Embong (2011) does point to the alternate perspective, that of differentiation. This school argues for the opposite extreme, and positions globalisation – again, with hyperconnectivity as recent extension thereof – as a heterogeneous force. In this vein, global information advancements do not stunt plurality, but rather promote it in the greater differentiation of cultural groups and social institutions. From this viewpoint, localism, individual autonomy, indigeneity, and grand diversity are supposedly attainable constructs within a globalised domain.

It would seem however, that each of these views polarise the variety of social experiences in an ultra-connected information landscape. A third position has emerged in the debate, that argues for a kind of cultural hybridisation in the global information age (Embong, 2011). This entails a diffuse set of cultural frameworks that are both dominant and dominated. Under hybrid conditions, localism and heterogeneity are attainable constructs within a techno-information landscape. But so too are the dangers of homogenising forces, that serve to reconstruct great

divides along North/South or developed/developing blocs. Notably, a hybridised environment can lead to the coincident expression of Wellman's (2004) utopia and dystopia. Each of these 'domains', as alluded to earlier, entrench the basic tenets of the information age: generally positive, mutually beneficial promises, and generally negative, mutually resisted perils.

Significantly, accounts of information diversity *and* information hegemony can potentially subscribe to technological determinism: "the sheer introduction of a technology would inevitably change social relations and thoroughly remake societies" (Wellman, 2004:27). Early debates, from both the 'homogenous' and 'differentiation' schools, offered a *presentist* character of globalised technologies ("the world started anew with the internet"). They were *parochial*, furthermore, assuming that only those activities that concerned the use of digital technologies were relevant to understanding the technological landscape (less so in the heterogeneity debate). For example, they did not recognise that long-distance communities had flourished well before the internet. Or that a multitude of social, cultural, economic, and psychological phenomena were relevant for understanding who used these technologies, why, and for what purpose (ibid.).

Contemporary depictions of the technological landscape, of the 'glocal village', and of the 'information age' can transcend its historic polar extremes. Hybridity is perhaps an attainable counter-force in the recognition of both the promises and perils of an ultra-connected world. ICTs can facilitate – but not necessarily force – rapid communication, and instant information access. Conversely, it can permeate previously marginalised boundaries and proliferate across development domains, as it negotiates new territory through increasing connectivity and digitisation. In this vein, it is possible for differentiate conceptions of how communication technologies are perceived and employed. Equally, the 'modernity biases' of information hegemony, techno-enthusiasm, and digital capitalism will continue to impress deterministic ideologies. Let us subsequently evaluate the extent to which these debates occur in a South African context. We can thus attempt to add much-needed empirical colour to our hitherto colourless contextual overview.

South Africa in the ICT(4D) Landscape

Figure 3: Map of South Africa (UNDP, 2013)

From the time when the first computer was installed at Rhodes University in 1965, to increasing broadband penetration in 2013, South Africa has become an established citizen of the global information community. Facing the legacy of a politically repressive system, South Africa has continued to encourage technological innovation and regulatory transformation. Since 1994, when apartheid was officially abolished, the underlying objective of government policy has been to address nationwide inequities. This is apparent in a range of efforts spanning from infrastructure development for schools in underserved areas, to broad-based black economic empowerment initiatives (Pather & Gomez, 2010). Another key response to inequities, both in policy and practice, has been the promulgation of information and communication technologies across the national landscape.

In this regard, I briefly describe South Africa's position in the information and communication society. It is not entirely possible to depict this position without due consideration of those unremitting factors – disproportionate resources and socio-economic forces – that continue to plague the nation's development progress. The state of these inequities, both current and historical, has framed the advancement of South Africa's "connectedness". Alluding to earlier discussions, I thus take a hybrid approach in describing the differential positioning of ICTs in the country. ICTs here have come of age through key historical movements, litigious policy-making, and a range of development interventions. The country today boasts a multitude of digital technology undertakings that have contributed to a vibrant innovation sector. Let us examine these facets accordingly.

The 'development divide': socio-economic landscape

The World Bank classifies South Africa as an upper middle-income country. With GDP at parity per capita of $9 333 (approximately R76 120) per year per person, it is the largest economy on the African continent (Oyedemi, 2009; United Nations Development Programme, 2011a). The national government continues to source extensive foreign investment, which sustains its profile as a rapidly emerging economy. As mentioned above, since the abolishment of apartheid,

expansive activities in infrastructure provision, job creation, and service delivery were undertaken. However, the benefits of a growing economy have not wholly reduced the endemic social inequalities within the country. Despite the wealth derived from abundant mineral resources, more than half of the population lives in poverty, and income disparities are among the worst in the world (Oyedemi, 2009).

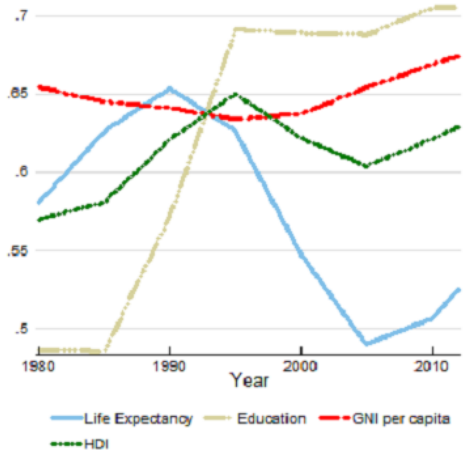


Figure 5: Trends in South Africa's HDI 1980 – 2012 (UNDP, 2013:2)

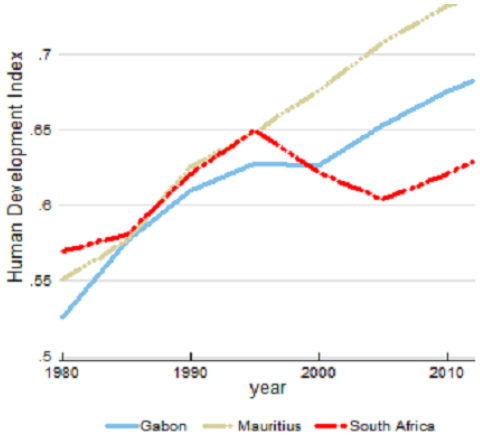


Figure 4: Trends in South Africa's HDI 1980 – 2012 relative to other countries in Africa (UNDP, 2013:3)

According to the 2013 Human Development Index (HDI) report, South Africa ranks at 121 out of 186 countries and territories, with an HDI value of 0.629. This positions it in the medium human development category, an increase of 10 per cent since 1980 (UNDP, 2013). The graphs below – Figures 4 and 5 – depict South Africa's progress in each of the primary HDI indicators over the last three decades. Long-term progress can be usefully assessed relative to other countries – both in terms of geographical location and HDI value (ibid). Between 1980 and 2012, South Africa's mean life expectancy at birth decreased by 3.5 years (to 52.8), mean years of schooling increased by 3.7, and GNI per capita increased by roughly 14 per cent.

Other indices in the 2013 UNDP report further describe a complex socio-economic landscape in South Africa. The Gender Inequality Index (GII) reflects gender-based disparities in three dimensions: reproductive health (maternal mortality, adolescent fertility), empowerment (parliamentary seats held by each sex, attainment at secondary/higher education), and economic activity (labour market participation for each sex). South Africa has a GII value of 0.462, placing it 90th out of 148 countries. This indicates a loss in human development as a result of inequalities between males and females across all three dimensions (ibid.). South Africa's human development is also measured in the Multidimensional Poverty Index (MPI), which identifies multiple deprivations among national households in health, education, and living standard. 13.4

per cent of the population suffer multiple deprivations with a further 22.2 per cent vulnerable to poverty.

The Human Development Index is evidently a quantitative (or numerically measurable) depiction of the primary social and economic constraints that inhibit the country's development. The HDI does encompass a broader definition of wellbeing through a composite measure of the three basic dimensions of human development: health, education, and income (UNDP, 2013). This is effectively extended to the key development components of gender inequality and multidimensional poverty (as well as environmental sustainability and national demography). That said, it could not feasibly incorporate the many social and cultural determinants of both health (wellbeing) and education. Local realities, experiences, and complexities convey a diverse development terrain, in the development priorities of these dimensions.

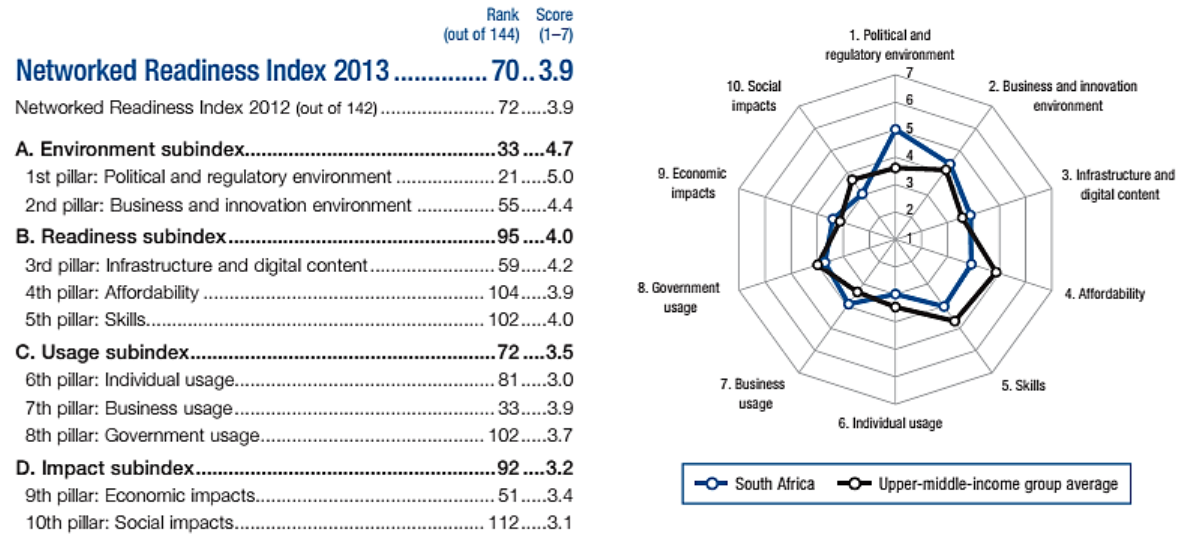
The 'digital divide': technological landscape

The rhetoric around the global digital divide also implicates South Africa, despite its relatively strong economy. As the leader of the African continent economically, the nation has not fully leveraged the potentials of ICT, especially in alleviating social challenges. Compared to stronger counterparts in the North (or similarly, the "West"), the general level of digital technology uptake in the country is low. It is in this vein, when mapping the rates of physical accessibility in the region, that initial notions of a 'digital divide' are prompted. From the earlier discussion on this (theoretically elusive!) divide, it can be safely inferred that post-access considerations are necessary in broadening its original conception. Hence, dichotomous portrayals of those South Africans *with* technology access, and those *without*, essentially veil broader implications of information exclusionism (as have been Selwyn and Warschauer's long-considered arguments).

Within the South African context itself, Gudmundsdottir (2010a) and Chigona, Mbhele, and Kabanda (2008) argue for a post-access, socially refined framework. This then calls for the inclusion of contextual issues such as literacy, language, and education. A digital divide, thus, also refers to the lack of access to social and human resources in using digital technologies meaningfully (ibid.). I would add, however, that the idea of 'meaningful use' could itself be lent to conceptual scrutiny, especially within the practical application of ICT4D. It is not always entirely clear what this concept should mean for individuals, communities, and organisations, particularly when tackling the development priority of education.

Many attempts have been made, in state policy and in academic literature, to reach conceptual order around meaningful and capable ICT use. Amartya Sen's (1997) capability approach has been widely received as the leading paradigm for policy debate in human development. It has been extensively applied within the ICT4D (and related) disciplines, especially in assessing the digital divide (see Gudmundsdottir, 2010a,b; Wresch, 2009; Zheng, 2009). Questions of what constitutes meaningful use in the digital age will be discussed in more depth following our individual case study pursuit. For the time being, the challenge of use as a post-access phenomenon warrants theoretical consideration in the South African digital divide narrative.

At the time, such a comprehensive view of the South African ICT divide did much to frame the country's policies on the local technological landscape. It was evident that the government, or in this case the DoE, had visions of a digitally equitable society through the facilitation of electronic technologies. Presently, these visions have not materialised as South Africa struggles to leverage the full scale of ICT and associated benefits, both within its economy and civil society. The WEF Networked Readiness Index for 2013 affirms the same, as it outlines South Africa's precarious position within a hyperconnected world. On the various sub-indexes of the NRI, the country ranks consistently low, and does not compare favourably to its upper middle-income counterparts. With the exception of its strong political and regulatory environment, as well as higher business usage, South Africa is a long way from being networked ready (see Figure 6 below).



	Rank (out of 144)	Score (1–7)
Networked Readiness Index 2013	**70**	**3.9**
Networked Readiness Index 2012 (out of 142)	72	3.9
A. Environment subindex	**33**	**4.7**
1st pillar: Political and regulatory environment	21	5.0
2nd pillar: Business and innovation environment	55	4.4
B. Readiness subindex	**95**	**4.0**
3rd pillar: Infrastructure and digital content	59	4.2
4th pillar: Affordability	104	3.9
5th pillar: Skills	102	4.0
C. Usage subindex	**72**	**3.5**
6th pillar: Individual usage	81	3.0
7th pillar: Business usage	33	3.9
8th pillar: Government usage	102	3.7
D. Impact subindex	**92**	**3.2**
9th pillar: Economic impacts	51	3.4
10th pillar: Social impacts	112	3.1

Figure 6: An overview of South Africa's ranking on the WEF Networked Readiness Index 2013 (Bilbao-Osorio et al., 2013:261)

As of yet, the economic impacts accruing from ICT are patchy (51st) and related social impacts disappointing (112th) (Bilbao-Osorio et al., 2013). The report continues to emphasise the need for upgrading overall ICT skills at all layers of society, and for increasing efforts to build affordable infrastructure (ibid.). The NRI report notwithstanding, South Africa continues to evidence strong prospects in the national transition to a knowledge economy. For one, possibly along with the rest of the African continent, mobile penetration in the country has surged. Some regard mobile phones as the ubiquitous computing platform across the continent, and as a rapid and accessible enabler of communication (see Jensen & Marsden, 2012; Bold & Davidson, 2012). In South Africa, this is further spurred by the increase of low-end smart devices, the diffusion of mobile broadband, and decreasing infrastructural costs.

Apart from what some term the "mobile miracle" (ITU, 2011) – and not neglecting the critical shortcomings of this view – there are many examples of technology-for-development initiatives in the country. These typically investigate how modern technological advances can lower technical and knowledge thresholds in access and use, across urban and rural contexts (Jensen & Marsden, 2012; Pather & Gomez, 2010). These have heeded national policy directives and have aimed, practically, to narrow both digital and development divides through technology innovation. Some of the foremost South African ICT4D and related initiatives will be discussed in due course. For now, the fledgling status of networked readiness in the country has not gone unnoticed. Myriad practices, activities and dynamics, both historical and present, contribute to a changing technological landscape in South Africa, and will be subsequently evaluated.

The roots of history

The mentioned challenges – in the priorities of development and technology access – are rooted in a historically unequal society, which drove early separations between race and class (Van Zyl & De la Harpe, 2012). These separations manifested as the authoritarian control of value-producing resources that effectively excluded 'infringing' communities from the prosperities of the state. Beyond immediate racial divides – i.e. poor Africans and affluent Whites – the oppressive jurisdiction of resources in South Africa also enforced broader social and economic disparities. Generally, resource control was established across a variety of domains (adapted from Oyedemi, 2009):

- Coercive means, including weapons, jails, and organised specialists in violence;
- Labour, especially skilled or effectively coordinated labour;
- Animals, particularly domesticated food and/or work-producing animals;

- Land, including natural resources located in and upon it;
- Commitment-maintaining institutions such as religious groups, kinship systems, and trade diasporas;
- Machines, especially those that convert raw materials, produce goods or services, and transport persons, goods, services, or information;
- Financial capital – transferable and fungible means of acquiring property and business rights;
- Information, particularly information that facilitates profitable, safe, or coordinated action;
- Media that disseminate such information;
- Science-technical knowledge, especially knowledge that facilitates intervention – for good or evil – in human welfare.

These types of resources, when subject to external control and void of fierce regulation, lend themselves to exploitation and misappropriation (Oyedemi, 2009). This, in turn, inflates a situation of imbalance that was formerly enforced in terms of ethnic membership. But the disproportionate appropriation of resources for most of its authoritarian history has only partly contributed to the present context of inequality in South Africa. Current forces of inequity can also be located in the distribution and ownership of primary resources: financial capital, science (engineering, computing, medicine, telecommunications, and the like), information (including the expansion of electronic and wireless/mobile communication), and media (for the storage and transmission of capital, information, and scientific-technical knowledge) (Oyedemi, 2009:154).

Unequal or imbalanced resource appropriation continues as the national government heeds the transition into a knowledge economy, often in affirmative attempts to reverse historical race relations. The South African telecommunications and ICT sectors are not excluded from these disparities. In fact, as we shall come to understand, these concerns inform the basis of information and communication policy in the country today. The recognition of ICT as a driver of widespread transformation has also ensued across much of the South African political landscape. That said, mere technological intervention is not the ‘golden bullet’ for solving the endemic inequalities in the country. As has been the argument throughout, and will be to come, both the digital and development divides can be reinforced, rather paradoxically, through the misapplication of information resources. Bridging regional disparities, then, transcends the question of both access and use (see Castells, 2002; Warschauer, 2003; Oyedemi, 2009).

A key step in the direction of narrowing said development and technology gaps is perhaps effected within the national government's policy framework. Oyedemi (2009) expands on this view by emphasising the nationwide imperative for policy intervention. National directives, facilitated by leading stakeholders in the state and civil society, can endorse communication technology in addressing poverty, and inequality. As a way forward, however, these directives cannot prioritise physical access nor entrench dominant agendas. For the state, the immediate policy agenda requires a consideration for the old catchphrase of local sustainability, rather than a one-size-fits-all access strategy (ibid.). Let us now briefly evaluate how the South African government has mapped its policies in addressing development priorities through digital technology.

Education: a development priority

As stipulated by the constitutional Bill of Rights, education (like wellbeing) is a fundamental right, "Everyone has the right to a basic education, including adult basic education; and to further education, which the state, through reasonable measures, must make progressively available and accessible" (1996). Yet, given widespread inequities, many educational facilities lack sufficient resources and are deprived of even basic infrastructure (textbooks, electricity, furniture, and stationery) (see Mlitwa, 2010). This is especially the case in more underserved provincial regions that include the Eastern Cape, Limpopo, and KwaZulu-Natal. In 2010, the Human Sciences Research Council found the standard of education in South Africa to be "dismal", even in comparison to poorer countries (Fanni et al., 2010). And although the state education departments vowed to abolish the vestiges of apartheid, new challenges have arisen since the advent of democratic leadership in 1994 (ibid.).

The recent 'textbook saga' that unfolded in Limpopo was a prime example of state mismanagement, and of inherent policy flaws. The adoption of outcomes-based education (OBE), in which textbooks were not considered a requirement for effective teaching and learning, initially sparked the debacle. Teachers were required to develop their own learning material from resources available on the internet and their immediate environments (Visser, 2012). Since the official demise of OBE in 2010, both textbooks and workbooks have since been reintroduced under new Curriculum Assessment Policy Statements (CAPS). But the state did not allow sufficient time for the development of new books, eventually failing to deliver to 5 000 schools in Limpopo (ibid.). The debacle ended up in the High Court, where Basic Education Minister Angie

Motshekga somewhat farcically argued against the guaranteed constitutional right of children to obtain basic education (John, 2012).

The textbook crisis in Limpopo confirmed what sceptics have argued for some time now, namely that the senior management of the department lacks the experience, competence, ability, or capacity to manage a massive system (Visser, 2012). This refers to a bloated national education department, 9 provincial departments, 81 district offices, 26 000 schools and 530 000 teachers providing learning to 12 million pupils, while it expends 20% of the total national budget (ibid.). Despite, or *because of*, the increasing pressures on the South African system, government has made education its apex priority. Following the abolishment of OBE, the state has placed educational skills development at the centre of its administrative mandate (Department of Basic Education, 2010).

Education as development priority is coordinated by two state Ministries – that of Basic Education (or the DBE, referenced in the prior example) and the Ministry of Higher Education and Training. The former focuses primarily on schools in obtaining quality initial education (primary and secondary). The latter promotes higher education as diverse learning institution for youth and adults (Department of Basic Education, 2010). In terms of its legal mandates, both these departments have explored means of attracting and retaining learners and educators alike. This includes the introduction of modern curricula, coupled with the adoption of information and communication technologies (ICTs) (Fanni et al., 2010). Ultimately, educational development in South Africa has had much impetus as a strategic development priority, despite clear challenges in delivery. Hence the state's continual emphasis on the importance of infrastructure, curriculum development, school safety, health promotion, gender equity, and sustainable partnerships (ibid.).

Mapping policies

South African science and technology related policies historically aimed to drive the country's transformation to a knowledge-based economy. These strategic policy instruments are founded on the concept that knowledge and innovation are essential components for economic growth and social development, as well as for South Africa's global competitiveness (Blankley & Booyens, 2010). In the period post 1994, the National Department of Communications (DoC) developed well-researched and thorough policies for ICTs, comprehensively dealing with telecommunications, skills development, universal service, and e-commerce (Pule, 2012). Additionally, the DoC has committed itself to ensure the development of secure, robust, reliable,

and affordable ICT infrastructure. This would ideally enable the uptake and usage of ICT solutions and services to meet the needs of the country and its people (ibid.).

The ICT ideals thus far exhibited by the Department of Communications are further espoused by the Presidential National Commission (PNC) on Information Society and Development (ISAD). The PNC on ISAD advises on the use of ICTs to optimise the pace and extent of addressing the country's development challenges. It supports efforts at making South Africa an integrated, equal member of the global information society (PNC on ISAD, 2012a). The Commission coordinated an ISAD Strategic Plan 2010-2013, citing a clear Information Society vision: "to establish South Africa as an advanced information-based society in which information and ICT tools are key drivers of economic and societal development" (GeSCI, 2011:10). This plan further outlines strategies for capacity development and application, including policy and regulation, infrastructure, and content directives.

National policy has reinforced a global directive that ICT can help address national development priorities, including that of economic growth, job creation, health, rural development, agriculture, market diversification, and education (PNC on ISAD, 2012b). The area of education, a development priority that is central in this analysis, has also enjoyed policy support. It is against the backdrop of the national innovation plan that the systemic and rapid utilisation of technology within teaching and learning begun to emerge (Jansen, 2003; Brown, 2010). Both the then National Department of Education and the PNC have outlined ICTs as integral to modern education, specifically in terms of computer-assisted teaching and learning (Fanni, Van Zyl, & Rega, 2011).

The impetus for technology-enhanced education gained momentum in national policy documents such as the White Paper on e-Education (DoE, 2004). The promise of educational technology has further contributed to a renewed interest in distance education and technological learning in the national B.Ed. degree programme, stipulated as part of The National Policy Framework for Teacher Education and Development (Fanni, Van Zyl, & Rega, 2011). According to this framework, the use of ICTs will invariably add value to education, improve teaching and learning, encourage innovation, and contribute to transformation. The purported positive impact of technology on education is particularly noted in developing countries where most schools are tackling issues such as lack of resources and under-qualified teachers (Chigona et al., 2011).

Given South Africa's emerging status, it became pertinent for the DoE to introduce technological infrastructures within under-resourced provincial schools. The motivations for this were cited as a reduction in teacher-student dependency, the alleviation of overcrowding, the increase of learning effectiveness, and the overall improvement of education services (Fanni, Van Zyl, & Rega 2011). Locally, the DoE's intentions were manifest in a Western Cape provincial intervention, named Khanya (detailed in the forthcoming MELISSA study). The Khanya initiative has seen variable success, at least in the provision of basic infrastructure. It remains one of the flagship ICT-for-education interventions countrywide. It was, however, restricted to primary schools.

According to Brown (2010), secondary and higher education has faced additional pressure in the use of ICTs given its role in developing a national information society. Castells locates higher education as the "engine of development" in the new knowledge economy (Brown, 2010:3). This position has been echoed in perspectives of African development by former UN Secretary-General Kofi Annan and in South Africa's National Plan for Higher Education. The National Plan specifically emphasised that the higher education sector has "a critical and central role to play in contributing to the development of an information society in South Africa both in terms of skills development and research" (Brown, 2010:3).

At all levels of education, then, the national government has promulgated the potential that ICTs have for improving the quality of education and training. As in other spheres of socio-economic development, the government concretised the "opportunity presented by the practical benefits of ICTs to support teaching and learning in the twenty-first century" (Department of Education, 2004:8). In recent years, this has seen the introduction of web 2.0 and mobile technologies within the teaching and learning domain, across primary, secondary, and higher applications (Isaacs, 2007; Brown, 2010). The introduction of modern digital technologies within formal education contexts represents a key step in the build-up to a networked ready pedagogy. But it has also been the subject of much contention, as practical implementations often misalign with their policy directives.

Local ICT4D initiatives

In South Africa, there are a number of initiatives within the general research framework and practical context of ICT for development. These have generally attempted to both understand and redress each of the aforementioned divides. It is not immediately clear, however, whether local ICT4D initiatives share universal conceptions of development or digital priorities. Some projects, it would seem, are context-specific reactants to local challenges (examples include the Siyakhula

Living Lab). Whereas others appear to be one-size-fits-all remedies for widespread access and use problems (examples include the Teacher Laptop Initiative, 2012). Many others still, feature at neither extreme, and float along in the intermediate vicinity. Various notions and methodologies of development are advanced. Although it would seem that there is consensus around the common purposes of digital technology: address poverty and inequality gaps, instil the capacity to communicate (especially within remote areas), and promote information sharing.

At the risk of oversimplifying the multitude of ICT4E applications and activities in South Africa, I briefly depict those projects that have received some public reflection. This has either been in academic literature and/or in local media, that has typically seen some form of social impact. Importantly, ICT4D endeavours in the country can be championed by a range of players. These typically constitute civil society organisations such as non-profit institutes, NGOs, and community-based movements (sometimes in the form of activist groups) (see Van Zyl & De la Harpe, 2012; Isaacs, 2007). But in the case of the policy frameworks referenced earlier, the South African government is itself active in bridging supposed divides ('supposed' precisely because of the conceptual and practical fuzziness of this term).

Technology access programmes in education

Basic education programmes that have recognised material access to digital technology as a foremost challenge in South Africa's transition to a knowledge society are featured here. The initial technology access model has been that of the 'computer lab', reminiscent of ICT4D 1.0 pro-poor telecentre efforts (see Isaacs, 2007). The underlying philosophy of this type of programme seems to be that educators and students, particularly in under-served areas, lack those resources necessary for information access (see Cantrell & Visser, 2011). ICTs appear not to have penetrated school and household contexts sufficiently, renewing the policy focus for computer accessibility (ibid.). Therefore, local educational authorities – in frequent cooperation with government – have spearheaded initiatives to correct access disparities. Examples here include the e-Schools' Network (2012), Gauteng Online (Rasool, 2011), the Teacher Laptop Initiative (2012), the Meraka Institute (2007), and the NEPAD e-Schools Initiative (2012).

Digital content development in education

There are a number of digital content curriculum advancement initiatives throughout South Africa. When ICT for education was still in its infancy, content programmes were typically imported from external and proprietary curricula. These were then localised and adapted for a South African context (Isaacs, 2007). Examples of such programmes have included LearnThings and Intel's Skool.com. Locally produced digital curricula gradually flourished, with the growing

emphasis on technology-enhanced learning. Examples of such initiatives include Mindset (2008), Thutong (2012), and OLSET (Isaacs, 2007). A few programmes also opted for Creative Commons licensing and the promotion of open education resources (Isaacs, 2007).

Informal/field trial education projects

In South Africa, there are also many examples of ICT4D projects in informal, peri-urban, and low-income settings. These are located beyond the formal pedagogical domain, outside of primary, secondary, future education and training (FET) and higher education institutions. Non-formal locales can include communities in rural regions, informal settlements, tribal settlements, and sparsely populated areas. Characteristically, these are excluded from mainstream state or civil organisation interventions (Housing Development Agency, 2012). Although the majority of such initiatives also cater to individuals and schools in informal areas, field projects are generally accessible to out-of-school youth and adult groups. Examples here include the Digital Doorway and BingBee (Wentworth, 2010).

User-driven projects in education

Other examples of ICT4D projects within the domain of education are integrated at multiple levels within local community activities and initiatives. These are holistic attempts at redressing the problem of education through the active involvement of grassroots institutions and stakeholders. A notable model in user-driven educational development has been that of the Living Lab. Living Labs are systemic initiatives, which focus on creating multi-stakeholder collaboration in different stages of the research, development, and innovation (RDI) process. The Living Lab concept refers to a research and development methodology where services, products, and application enhancements are created and validated in collaborative, multi-contextual empirical real-world settings (LLiSA, 2012). Two well-known South African Living Labs include Siyakhula (Pade-Khene, 2012) and RLabs (2012).

Synopsis: ICT in South African education

As per the discussion thus far, information and communication technologies has seen a range of applications, uses, and interpretations within the South African context. Against the backdrop of an emerging economy, ICTs were early on identified as potential enablers of local and regional development. This philosophy was supported by definitive policies in education, earmarking certain priorities for technological support. In academic research, particularly in the literature of ICT4D, these dynamics have not gone unnoticed. And as I have described, ICT4D has itself

become a pracademic endeavour, in both the implementation and analysis digital technologies in social spheres.

What has been depicted thus far is a reflection on the technological landscape in South Africa, with reference to some of the foremost applications of social informatics. I would like to extend this prologue by providing a brief but necessary overview of those theoretical considerations in a local context. Stated differently, what is the research consensus regarding the introduction, use, and eventual acceptance (or non-acceptance) of ICTs within South African education? What are those theoretical and practical issues neglected in the understanding of digital technologies in local contexts? And finally, how can the synthesis of research efforts contribute to future academic explorations? These are not wholly separate research questions, but merely serve to contextualise the research problem of this analysis.

The Domestication of ICT in Disadvantaged Schools

At the risk of reiteration, the universal promise of digital technologies in education depicts a utopian school context. Here, education and learning is advanced through the creative application of technology, for and by teachers, learners, and administrative staff. It would seem, plainly, that ICT has the power to *improve* the processes of both teaching and learning (see Bladergroen et al., 2012). From an educational viewpoint, ICT would appear to support a type of constructivist pedagogy, wherein students use technology to reach an understanding of concepts (Cantrell & Visser, 2011).

Teachers, in turn, also capitalise on the efficiency offered by digital technologies in the classroom, supporting post-traditional teaching models of creative problem-solving and self-directed learning (ibid.). In addition, the use of digital technologies has also offered administrative efficiency, and centralised processing of tasks. In disadvantaged settings especially, electronic systems could present educators with otherwise inaccessible class resources and teaching material. These perceptions have resulted in a growing investment in government and other initiatives implementing ICT in schools, often with the support and involvement of donor agencies (Bladergroen et al., 2012). Khanya is one such initiative that will be described in more detail at a later stage.

The “domestication theory” defines domestication as processes whereby people encounter various technologies and deal with them. This is either through a process of rejection or acceptance, leading to gradual adoption (Cantrell & Visser, 2011). This perspective provides an appropriate lens for analysing the integration of technology into South African schools. It is

particularly significant as a framework for investigating how disadvantaged student and teacher populations meet and experience technology for integration/adoption or rejection (ibid.). That said, the social and technical adoption of digital technologies in schools (and HEIs) has not often demonstrated the purported positive impact that was expected.

Since the first implementations – and subsequent social science investigations! – of computer laboratories in local schools, a number of internal and external factors emerged. These were determined to influence the capabilities of both teachers and learners in adopting ICTs. Years of observation of computer sessions in disadvantaged schools clearly indicate that ICT use and skill levels tend to vary, significantly (Gudmundsdottir, 2010b). Teacher competence was identified as an impactful factor, and was naturally expected to affect the abilities of learners to use technology (see Mlitwa, 2010; Fanni et al., 2010). Extensive research by Gudmundsdottir (2010b) has indicated a great number of teachers struggling with the integration of ICT into the primary school classroom. This is especially in schools where computer and internet access is limited. Furthermore, many educators are not adequately prepared to deliver technology-supported lesson plans. They often have minimal interactions with their learners or minimal ICT interventions, as a result (ibid.).

These factors convey the importance that was eventually bestowed on teacher training by regional initiatives such as Khanya, SCOPE, and the Meraka Institute (among others). The higher education sector itself recognised the need for ICT integration initiatives for pre-service teachers. Several teacher-training campuses across the country have incorporated ICT literacy components in pre- and in-service training curricula. Institutes such as the Cape Peninsula University of Technology, the Durban University of Technology, and Nelson Mandela Metropolitan University have integrated email, end-user computer programming, internet use, and word processing into respective training programmes (Koranteng, 2012). The Durban institute extends the traditional offering, incorporating additional keyboard skills and typing-speed training, computer application technologies, and database skills development for its teacher trainees (ibid.).

Whilst acknowledging the need for ICT competency in the pre-/in- service environment, the majority of programmes are literacy based. Simply put, the emphasis on developing technical abilities could detract from the pedagogical aspects of ICT integration (see Koranteng, 2012; Gudmundsdottir, 2010b). In the case of the government-backed Khanya programme, training was often felt to be inadequate or non-existent, further limiting the opportunities for competency development (see Bladergroen et al., 2012). And even though Khanya's training programme encompasses the use of educational software in the classroom, there is much evidence of

mismanagement and ineffective delivery (Bladergroen et al., 2012; Davids, 2009; Koranteng, 2012).

Recent work suggests that the emphasis on technical skills development only partly expounds the problem, especially in primary schools. Rather, the (ill) adoption of ICT can be attributed to a combination of ICT skill levels, content management proficiency, and an understanding of pedagogy (Bladergroen et al., 2012; Mlitwa, 2010). Furthermore, the uptake of ICT in schools is also hampered by ineffective school management policies. These often constrain the initial enthusiasm associated with computer labs for pedagogical purposes. Teachers are not incentivised or encouraged to make frequent use thereof (Bladergroen et al., 2012). Lab timetables are not properly administered, with computer rooms often being locked and inaccessible (see Davids, 2009). These factors are further inflated by the misappropriation of ICT infrastructure, and the lack of general resources earmarked for ICT expansion (ibid.).

Computer anxiety for teachers and learners

Ostensibly, both teacher and learner attitudes have come to play a significant role in the adoption and integration of digital technologies in primary schools. Early research determined that successful integration not only depended on students' attitudes and aptitudes, but also on those of their instructors (Cantrell & Visser, 2011). Attitudes were recognised as precursors to both behavioural intent and eventual behaviour. Therefore, a positive disposition toward computer use is a prerequisite to acquiring higher levels of computer literacy and successful pedagogical adoption (ibid.). The surveyed literature identified a number of 'inhibiting factors' that constrain positive ICT use, integration, and adoption. These include a lack of job satisfaction, lack of computer expertise, and general computer anxiety. The issue of anxiety relates to an innate suspicion towards innovation and change, often hindering technological adoption (Cantrell & Visser, 2011; Davids, 2009).

The amalgamation of these personal factors have instilled high rates of absenteeism, as well as general disinterest – or even fear – in terms of using classroom technologies. Social cognitive theory has been taken as a theoretical lens into explicating some of the personal factors underlying technology use in schools. This perspective is based on the premise that people learn by observing the actions of others, within the context of interactions and experiences. These observations tend to influence behaviour and adaptability (Cantrell & Visser, 2011). Albert Bandura's later work on gender disparities explored the propensity of difference among males and females. This was soon extrapolated to computer literacy, with the assumption that males are more adaptable to innovation than females (ibid.).

The learner is considered a crucial piece in the ICT adoption puzzle. The introduction and eventual integration of ICT in primary schools is often challenged by the low skill levels of learners. This is inflated by poorly maintained facilities in resource-limited settings, hindering learner access to computer rooms. Although lower skill levels are an expected part of the classroom environment, learners in disadvantaged communities tend not to have computer access at home. They are thus deterred from practicing key concepts as obtained in class (Bladergroen et al., 2012). Consequently, educators expend considerable time in helping learners use the technology, instead of teaching the subject content. In these circumstances, teachers would rather avoid the technology entirely (ibid.).

Possible research agendas

Overall, the reviewed literature suggests a challenging and complex environment for the deployment of digital technologies in South African schools. It would seem that effective integration and adoption necessitates 'buy-in' from three key actors/levels: management bodies, educators, and learners. It is from within this context that differing and even counterproductive perspectives emerge, that may instil or deter ICT acceptance and eventual adoption. It has become pertinent, then, to study the myriad perceptions and (meaningful) engagements of technology in teaching and learning. Infrastructural and policy challenges aside, the many social meanings and representations that are attached to ICTs significantly alter the adoption process. It may be critical, therefore, to find a more comprehensive means in solving the challenge of technological integration in schools (Fanni, Van Zyl, & Rega, 2011). This may hold key prospects for the theoretical narratives attached to ICT integration in the domain of ICT4D.

To conclude this contextual framework, it is worth noting the many intellectual puzzles and research problems that still exist in the application of ICTs for development actions. The sheer number of ICT initiatives, in policy and in practice, evidences a widespread recognition of digital technology's transformative capacities. Yet, can we categorically determine that these have had a positive impact on the social and economic wellbeing of local recipients? Moving back to early research considerations in Chapter I, is digital technology inherently good or desired? How are technologies encountered? How do they shape meaning, if at all? What is next in the pracademic inquiry of the ICT4D domain?

Chapter III – Symbolic interaction and the role of meaning

The author has thus far presented key research considerations, objectives and contributions. These were framed within broader discussions of the technological landscape, hyperconnectivity, and ICT4D, both globally and in South Africa. Building, then, on the contextual basis set forth in the preceding sections, Chapter III will clarify and reinforce the theoretical foundations of the study.

Those terms and concepts that undergird the forthcoming analysis will be offered within the conceptual domain of interpretative social science. This includes a brief contextualisation of 'culture' – a notional keystone that underpins this thesis.

Chapter III continues with a description of the foremost theoretical considerations to be grounded and engaged within the proceeding analysis. These position the overarching scholarly perspectives that may be adopted throughout, notably in the paradigms of symbolic interactionism and meaning creation (framing).

The core discussion will centre on a brief history, overview, definition, and methodology of symbolic interactionism as the predominant theoretical lens applied to and questioned through this study. This grounds the subsequent research design, which will be discussed at length in Chapter IV.

The aforementioned elements are not presented or discussed in any papers (co)authored by Izak van Zyl

A theoretical perspective: symbolic interactionism

'Symbolic interactionism' has come into use as a label for a relatively distinctive approach to the study of human group life and human conduct (Blumer, 1969:1). The term was coined in 1937 by Herbert Blumer, an American sociologist and proponent of George Herbert Mead, an influential pragmatic philosopher. Symbolic interactionism was a term Blumer himself regarded as a somewhat "barbaric neologism" (1969:1). It has since been in general use, notably in sociology and social psychology. The school of symbolic interactionism explores the peculiar character of interaction as it takes place between human beings within social environments. Human actions are mutually defined and interpreted – a process whereby meaning is ascribed to behaviour. Social interaction is essentially mediated by the use of symbols, by interpretation, or by ascertaining the meaning of one another's actions (Blumer, 1969:79).

The nature of symbolic interactionism is, as with any theoretical framework, challenging to position. The perspective rests on three key premises: meaning, social interaction, and interpretative processes. In the course of interrogating respective literature, and through an ethnographic exploration, I locate 'culture' at the foundation of these tenets. Much of the ensuing symbolic interactionism that is presented, therefore, observes culture as a reciprocal process of meaningful interaction: it produces meaning, and is produced by meaning. Additionally, it is perhaps necessary to remark that much of what is presented as the conceptual foundation of this study has developed organically. Symbolic interactionism, thus, was both a 'hypothetical disposition' and the discovery of theory through the analysis of data. Let us henceforth examine these considerations.

Locating culture as meaning(ful)

The basis for much of this inquiry rests on a 'localising problem': how do individual teachers experience digital technologies, and what does this entail for the practice of ICT4D? Considering a diversity of understandings, this analysis explores those meanings constructed through and associated with technology encounters. As mentioned in Chapter I, said research questions are rooted in intersecting academic discourses, chiefly adopting perspectives from the social anthropology of technology. At the heart of this intersection lies the exploration of cultural values in a digital age. This considers ICT as a symbolic and normative agent in sustaining participation in the (potentially) hyperconnected community.

Recognising culture, firstly, as foundational component to understanding the dynamics of technological encounters, the need arises to locate it conceptually. This need accords with the local/narrow objective of this analysis: to uncover meaningful narratives as they are negotiated in terms of digital technology for educational development. Culture, as we shall come to understand, can be approached semiotically, in the production of meaning, via flows of signification and communication (Geertz, 1973). Hence its underlying significance as transformative symbolic agent. This understanding of culture also builds toward the broader objective of this analysis: to locate the theoretical implications of a symbolic narrative in ICT4D as pracademic discipline. As a symbolic/semiotic system (or process!), culture is expressed as narrative, meaning, normative behaviour, and collective belief.

Given the many experiential accounts that (can) surface within the ICT4D arena, then, it becomes necessary to uncover the applications and implications of culture. While the term generally denotes the normative patterns that characterise social life, the exact meaning of culture has been the object of much variation and academic debate (see Hays, 1994; Gjerde, 2004). Although social analysts recognise the concept as slippery and contested, 'culture' (along with 'social structure') continues to be used in ways that are often ambiguous and misleading (ibid.). Such imprecise usage, in turn, may inappropriately condition the way in which theorists study and make sense of the social world (Hays, 1994:57). For the ICT practitioner, false impressions of culture may condition the unfitting implementation of technology initiatives.

It is around the theoretical underpinning of culture that anthropology (and the social sciences) has mobilised and has increasingly been devoted to specifying, focusing, and containing. It is a term, as this analysis will eventually show, that also warrants scrutiny in the communication sciences. It has seen innumerable classifications in the theoretical evolution of several disciplines, ranging over major intellectual milieus. Since the mid-1980s, anthropologists (primarily the American variety) were beset by culture worry: the uneasiness, apprehension, or defensiveness felt by many at what they perceived as threats to their core concept (Silverman, 2002:xv). Such threats came from criticisms of the concept from within the discipline as well as from its appropriation and, too often, misuse in other academic fields, in public discourse, and in political contexts (ibid.):

> [Culture] seems to connote a certain coherence, uniformity and timelessness in the meaning systems of a given group, and to operate rather like the earlier concept of 'race' in identifying fundamentally different, essentialised, and homogenous social units (as when we speak about 'a culture'). Because of these associations… [it] falsely fixes the boundaries between groups in an absolute and artificial way. (Gjerde, 2004:138)

Recent discourse, strengthened by classic insights (Hays, 1994; Geertz, 1975; Said, 1978), presents culture as unfixed, flowing, and pluralistic. In opposition to the silent and exoticised 'other', theorists such as Barth (2002) advocate for the range of social narratives, actions, lifeways, and representations that warrant consideration in the sciences. In this vein, culture is conceived not as ahistorical, predetermined or static, but as dynamic and situational (ibid.). As a tentative conceptualisation, therefore, culture is a malleable process that shapes and orders the subjective experience of individuals. Hays (1994) cautions, however, that such reductionist thinking risks a culture of insignificant, internal, and free-floating ideas. Rather, she argues for a culture understood as a social, durable, layered pattern of cognitive and normative systems.

Hays presents cultural systems that are at once material and symbolic, objective and subjective, embodied in artefacts and embedded in behaviour. These systems are furthermore passed about in interaction, internalised in personalities, and externalised in institutions (Berger & Luckrnann, 1966; Durkheim, 1966; Hays, 1994; Embong, 2011). Hays' perspective represents a disentangled conception of culture, as both the product of human interaction and the producer of certain forms of human action (1994:65). This position, oversimplified as I have presented it, is perhaps an amalgamation of the many theoretical trends in anthropology and the social or communication sciences – functionalism, cultural materialism, structuralism, semiotics, practice theory, and postmodernism.

At this point, it is not feasible to present the aforementioned trends and their visions of culture in part or in full. I do no favours to the vast range of intellectual paradigms in this regard; doing so requires an extensive reading of core movements in the 'making of' culture: Tylor's cultural evolution, Boas' culture in context, Durkheim's organic society, Sapir's culture and language, Malinowski's functions of culture, Harris' cultural materialism, Lévi-Strauss' structuralism, Foucault's stratification and power, and Wolf's culture, history and power (see Moore, 2012). We can maintain, all the same, that the concept of culture has both progressed and regressed, organically and sporadically. Its complex nature and conceptual difficulty attracts us to formulations that are both constraining and enabling. In conceiving of culture in this way, we can surmise a social process consisting of two central, interconnected elements: systems of social relations and systems of meaning (Hays, 1994).

Systems of social relations consist of patterns of roles, relationships, associations, and forms of power according to which persons are interconnected. These patterns are exhibited via myriad social categories, ranging from class, gender, race, education, and religion, to sexual preference and position in the family (Hays, 1994). Systems of meaning include conventional presentations

or conceptions of culture, which represent the beliefs and values of social groups. Additionally, these extend to language, forms of (indigenous) knowledge, and common sense, as well as the material artefacts, international practices, rituals, and lifeways established by these (Hays, 1994:65). Culture as the complex incorporation of social relations and meaning then presents a hybridised expression of interaction, beliefs, normative behaviour, and interpretative practice.

Hybridised notions of social life partly underpin a *semiotic* view of culture, characterised by the search for meaning. This perspective is strongly associated with the work of Clifford Geertz, leading American theorist recognised for his work on symbolic anthropology. Geertz advocated culture as "an historically transmitted pattern of meanings embodied in symbols; a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate, and develop their knowledge about and attitudes toward life" (1973:89). Geertz believes, with Max Weber, that man is an animal suspended in webs of significance he himself has spun, and takes culture to be those webs (1973:5). The analysis of culture, furthermore, is not an experimental science in search of law, but an interpretive one in search of meaning (ibid.). Social expressions are thus seen to be enigmatical to the social scientist, and necessitate an interpretive process of symbolic inquiry.

I have severely reduced the concept of culture in the interest of transparent research. Yet by no means is culture an abstraction of its constituent parts, or a simple representation of the 'true nature' of reality. Furthermore, culture is embedded within local, regional, and global ideologies. These strengthen or constrain it, in the interests of individuals, communities, or institutions. In this sense, culture becomes enmeshed in global movements of capitalism, modernity, consumerism, hyperconnectivity, development approaches, and geopolitics, inter alia. Indeed, culture in both its classic and modern senses has been introduced into many new and previously unfamiliar domains (see Wright, 1998). Any claim to its universality, therefore, is diminished in light of its variable understandings, positions, and manifestations.

In light of its evolution, both in lay and academic terms, I recognise culture as both a *process* of social interaction, of behaviour, and of interpretation, as well as a *product* thereof. I read particular value into Geertz' 'pattern of meanings', and on the processes of conceiving and communicating these. Geertz cites Langer, who holds that the "concept of meaning", in all its varieties, is the dominant philosophical concept of our time, and that "sign, symbol, denotation, and signification" are our intellectual stock in trade (1973:89). Closer to my own analysis, our case examples will show that an emphasis on meaning is essential in sustaining and synthesising pracademic perspectives of social life.

The postmodern turn in communication studies is associated with this development. The omnipresence of media (verbal, visual, textual), popular culture, and digital technology can be seen as further extensions and catalysts of the concept of meaning. In a hyperconnected era especially, in light of content mechanisms such as television, smart devices, and personal computers, identities mobilise in the context of mass mediation and rapidly fragmented information (see Taylor, 2004). Cultural 'dialogues', as then embodied in technology, are significant in breaching boundaries, intensifying and multiplying encounters among lives, sensibilities, and ideas (Abu-Lughod, 1999; Taylor, 2004). This process reaffirms a symbolic narrative in which meaningful phenomena are perceived and produced, aligning to an interpretive, semiotic presentation of culture.

The nature of symbolic interactionism

The variability of culture as fluid entity should not deter the social scientist from studying its common implications. In short, culture as a source of meaning can be particularly helpful in locating systematic relationships among diverse phenomena (Geertz, 1973). Symbolic interactionism can be taken as an organised approach for achieving this. This perspective has grown out of the preceding literature and conceptual analysis. I continue to construct and employ it as a theoretical lens that may help frame my empirical objectives. Through this process, I hope to have contributed to the theory's own notional structure, by applying it within the hitherto unapplied domain of ICT for development. Symbolic interactionism, like its cultural component, is therefore both a producer of this analysis, and a product of it.

At this point, symbolic interactionism is taken as a conceptual framework for this study, and thus offers a frame of methodological reference. In his influential book on the subject, Blumer (1969) reaffirms symbolic interactionism as both a perspective, a way of looking at the social world and a method, a way of gathering data about the social world (Manning & Smith, 2010). I proceed to argue for its epistemological position in Chapter IV. In what is regarded as a seminal statement about symbolic interactionism, Blumer introduces George Herbert Mead as a theorist of the self. Blumer poses the same question that troubled Mead: how does an individual become an object to him- or herself? Blumer answers this by drawing on Mead's theories of child development, which emphasise that all children must pass through both a 'play stage' and a 'game stage'. During these stages, they learn to master increasingly complicated role taking and rule following behaviour (Manning & Smith, 2010:38).

In his later (and much better known) discussion, Blumer suggested that the symbolic interactionist perspective is based on three straightforward principles ('premises') and six 'root images'. Taken individually, each of these nine claims is surprisingly uncontroversial. Taken together, however, they add up to a highly distinctive approach to the social world (Manning & Smith, 2010:38). The first premise denotes that individuals act toward things based on the meanings that the things have for them. "Things" refer to everything that the human being perceives or experiences in his or her environment (adapted from Blumer, 1969:2):

- Material objects or artefacts – chairs, trees, computers
- Other human beings – store clerk, father, husband
- Categories of human beings – friends, enemies, colleagues
- Institutions – school, church, government
- Guiding ideals – honesty, independence, ambition
- Activities of others – requests, behaviours, manners

The first premise here concerns any situation that the individual encounters in their surrounding environments or "worlds". Incidentally, it may be useful to explore the overlap between Karl Popper's three worlds of knowledge and those individual encounters spanning across different 'experiential worlds' as per Blumer's theorem (see Popper, 1979:143). The second key premise to symbolic interactionism holds that the meaning of such things is derived from, or arises out of, the social interaction that one has with one's fellows (Blumer, 1969:2). Stated differently, our mutual social interactions inform or construct the meanings that we attribute to other individuals and elements/things in our environment. The third premise denotes that these meanings are handled in, and modified through, an interpretive process used by the person in dealing with the things he or she encounters (Blumer, 1969:2). Processes of interpretation become a matter of organising and altering meanings in light of the situation in which the actor is placed.

Each of these premises requires some elaboration. It is also worth noting that such notions were contained in Blumer's classical works, and have since undergone a process of interpretation and critical scrutiny in academia. Much of the empirical work that I present in Chapter V and VI both reinforces and reconfigures these premises. Concerning the novel formation of the symbolic interactionist perspective, Blumer himself thought that the concept of *meaning* was underplayed in the social sciences at the time. He felt that the sciences – particularly sociology and psychology – were overly concerned with human behaviour and the factors regarded as producing it. Stimuli, attitudes, motives, perception, social roles, norms, values, and group affiliation: these were the

various features of personal and social organisation to account for given forms or instances of human conduct (Blumer, 1969).

The idea and role of meaning became absorbed in the initiating and causative factors of behaviour, becoming a mere transmission link to be ignored or neglected. Blumer viewed this as a critical neglect of the role of meaning in the actual formation of behaviour. The foundation for his first premise, thus, gradually arose. However, the position that human beings act toward things on the basis that things have for human beings was too straightforward to differentiate symbolic interactionism. This was rather achieved by the second premise, referring to the source of meaning. For Blumer, there were two well-known and traditional ways (and many since) of accounting for the origin of meaning.

The first of these views reflects the traditional position of realism in philosophy. Meaning is here regarded as being intrinsic to the thing that has it, as being a natural part of the objective makeup of the thing (Blumer, 1969). The other view is rooted in the domain of (social) psychology. Meaning is here a psychical accretion that is attached to the thing by an individual. Meaning, then, becomes an expression of constituent elements of the person's psyche, mind, or psychological organisation – sensations, feelings, ideas, memories, and attitudes (ibid.).

Symbolic interactionism, conversely, views meaning as arising in the processes of interaction between individuals and groups. Meanings are constructed and attributed in the flow of social interactions, as social products, and creations. This point of view gave symbolic interactionism a very distinctive position, further differentiated by its third premise. The use of meaning(s) by a person in his action is not a mere application of the meaning derived from the context of social interactions. Rather, meaning is used and applied through an interpretive process, involving two key steps. Firstly, a person engages in an internalised process of self-communication, indicating the things toward which he is acting. Second, by virtue of this process, interpretation becomes a matter of handled meanings (Blumer, 1969).

The actor selects, checks, suspends, regroups, and transforms the meanings in light of the situation in which he is placed and the direction of his action (ibid.). This is a formative process, importantly, in which meanings are used and revised as instruments for the guidance and formation of action. The intuitive combination of these elements represents the core tenets of symbolic interactionism: *meaning manifests as symbolism through a process of interaction and interpretation*. Blumer proceeded to ground these on six basic ideas, which he referred to as 'root images' (adapted from Manning & Smith, 2010:38):

- **Social life exists in action**. Symbolic interactionism is anchored in the empirical world and must study action/behaviour as occurring in specific, concrete groups.
- **Group members interact with one another**. Human conduct is formed in interaction, and must be studied as such.
- **The social world is composed of three types of 'object**: The physical (e.g. a cabinet), the social (e.g. a friend), and the abstract (e.g. a judgement that a person is manipulative). It falls to the symbolic interactionist to understand the meanings that are first given to and later modified for each of these object types.
- **The person is the possessor of a self, or an identity**. Humans can be the objects of their own reflection and can interact with themselves. They are seen as active agents.
- **The person is an interpreter of a 'flow of situations'**. Meanings are produced as a continuing and contingent realisation. In this way, the social world is made and remade continuously.
- **Human actions are fitted together as joint productions**. Many of these emerge as stable, routinised activities that produce expectable behaviours. Blumer gives the example of the church service where both clergy and congregation become very familiar with the conduct and responses that are expected of them.

The strength of symbolic interactionism as it was originally conceived lay in its clarity, and near uncomplicated explanation of meaning (Manning & Smith, 2010). Yet, the perspective in Blumer's hands over-relies on the study of meaning, at the expense of other significant dynamics of the social world. As a distinct position based almost exclusively on the inquiry of meaning, symbolic interactionism was also considered to be an unremarkable ideology. This is largely related to its narrow application, by concentrating on Blumer's orienting conceptions.

The broader interactionist approach is more methodologically eclectic and only loosely linked to the original ideas of Blumer (Manning & Smith, 2010:41). Understood broadly, any sociological research that considers the meanings that objects, people, and activities have for group members, and the processes whereby these meanings are sustained or transformed, is a version of symbolic interactionism (ibid.). David Maines (2001) draws from pragmatist and symbolic interactionist assumptions to formulate a consistent view of the field of sociology. He suggests that the distinction between narrow and broad interactionist approaches is the 'fault-line' running through contemporary sociology (Manning & Smith, 2010; Maines, 2001). This is because the narrow definition of symbolic interactionism has become, in Maines' view, a marginalised sociological

speciality. At the same time, the broad definition has become sociological orthodoxy. The result being that no one and everyone is a symbolic interactionist (ibid.).

The boundaries of symbolic interactionism, hence, are challenging to police. The approach fragmented in light of new perspectives that reinvigorated the study of identity and meaning. These emerged in the second half of the 20th century, and reopened discussion about the foundational questions concerning what symbolic interactionism really was and what it could be (Manning & Smith, 2010). Traditional interactionists retained ties to Blumer, but explored intersecting ideas drawn from ethnomethodology, semiotics, post-modernism and post-structuralism (ibid.). These have repurposed Blumer's original ideas, resulting in a diverse range of theoretical and methodological approaches that go beyond the confines of the solitary study of meaning.

Frame analysis: alternate interactionism

It is not conceivable to discuss the theoretical development of symbolic interactionism in its entirety. Much emphasis can be devoted to the pre-disciplinary ideas of George Herbert Mead, a Renaissance figure, primarily associated with the school of pragmatism. Mead was engaged in a number of intellectual pursuits, and studied the dynamic interplays between the self and the social group. These ideas were readily absorbed by Blumer, resulting in the gradual emergence of the interactionist perspective. Mead's anthology is important to recognise as the founding principles of symbolic interactionism. I do briefly want to point to another influential figure that furthered the interactionist approach, Erving Goffman.

In a series of writings from the 1950s to the 1980s, Goffman focused on the organisation of observable, everyday behaviour in a range of work, domestic, institutional, and informal settings in contemporary society (Manning & Smith, 2010). Like Blumer, Goffman was interested in the micro-dynamics of selfhood, and in the many carriers – or 'sign-vehicles' – for expressing meanings (see Goffman, 1959). Goffman was tentative in classifying his work as being symbolic interactionist. He did pay tribute to the work of Blumer, but was generally resistant to the oversimplifications brought about by the label of interactionism. Even so, Goffman's overarching subject matter concerns the identification and classification of the different themes of face-to-face interactions (Manning & Smith, 2010). He referred to this as the 'interaction order' – a conceptual map to the innumerable occasions of social communication (see Goffman, 1959).

In what he intended as a magnum opus, *Frame Analysis* (1974), Goffman delivered an extended perspective on his previous works. In this project, Goffman studied the spontaneous or involuntary behaviours and interactions in social life. In essence, he argued that the ways in which human beings interpreted their actions would affect the performance of the action itself (Manning & Smith, 2010; Goffman, 1974). The notion of a frame, then, is a means to organise experiences, and to negotiate and validate identities in face-to-face encounters (Miller, 1995). In this vein, frames are mental orientations that organise perception and interpretation. From a socio-cognitive perspective, frames are problem-solving schemata, stored in memory, for the interpretative task of making sense of presenting situations (Johnson, 1995).

Frame analysis as an overarching perspective, is the study of the organisation and interpretation of experience. Early forays into frame analysis emphasised the social and cultural processes by which frames were generated. Yet they also preserved the essential definition of a frame as a mental structure that organised perception and interpretation (Johnson, 1995). Goffman's seminal work on the topic explored a number of 'primary frameworks' in how individuals perceived and expressed their experiences in the process of social interaction. These reveal to the individual what is "really" (or, objectively) happening. The meaning of primary frameworks can be altered in various ways, via 'keying' or 'fabrications' (Manning & Smith, 2010). When a primary framework is keyed, its meaning is transformed into something patterned on but independent of the initial frame (ibid.). For example, when we watch a theatre performance or a film, we can distinguish its performances from reality. Fabrications, in turn, are designed to mislead others, to the benefit of either the audience or the fabricator.

The sheer number of possibilities that arise in the process of framing is manifold. For my own analysis, this is considered an important theoretical perspective in describing those meanings and symbols that individuals attribute to their interactions with digital technologies. Much of Goffman's interest is in his analysis of the depth and richness of everyday interaction (Miller, 1995). I wish to extend this interest in describing those encounters with technologies in the ICT-for-development arena. Indeed – the problem of establishing and maintaining an acceptable "self" in a hyperconnected world remains, and there is a range of expressive resources available for this end (see Miller, 1995). Well before the internet's global dominance, Chayko (1993) argued for the 'retraining' of frame analysis in determining technological transformation. This, she maintained, would help us understand the ways in which social worlds involving highly sophisticated technologies are created and endowed with meaning by actors, as well as the subtle, long-term effects of such technologies (ibid.).

Methodological applications

Symbolic interactionism as it was originally conceived did not contain a definitive set of guidelines for its methodological practice. Blumer himself remained ambivalent on the topic, but suggested to study interactionism through a process of naturalistic inquiry. This bodes well for the anthropologist/communication scientist, seasoned in the probing, exploratory means of such an inquiry. I will describe my own naturalistic ontology, with its emphasis on meaning and social life, in the following chapter. For conducting interactionist research, yet, Blumer did offer two methodological possibilities (see Blumer, 1969): exploration and inspection. The former of these is a descriptive task, providing basic familiarity with a social phenomenon (Babbie & Mouton, 2001).

For Blumer, this would constitute no easy task, and would involve a dedicated, constant interface to the research field. The ever-trusty method of interviewing would be an immediate choice in generating rich data, but not to the extent of satisfying the research questions. For this, further phenomenological inquiry would be necessary, perhaps invoking participant observation and self-reflection. Since, as Giddens argued, respondents themselves may only possess 'practical' and not 'discursive' knowledge (Manning & Smith, 2010). In this vein, they grasp their own social behaviours and activities, but cannot necessarily convey or explain these to others in a meaningful way.

The latter possibility, inspection, involves a process of deep analysis. This would entail a procedure of codifying and explicating the collected data, in an effort to uncover layered meanings. It is vital that this process be grounded in the empirical world, so to derive concrete representations of meaning-laden interaction in the social domain. This in itself presents an inherent challenge to the eager interactionist. The combination of the perspective's three fundamental premises underpins the need to study meaning as an interpretive process. This, firstly, necessitates a lot of time to be spent in the field, allowing for a deeper engagement with individuals. Second, the interactionist must somehow elicit the methods of interpretation from his or her study group. Of course, these methods are processed cognitively, but manifest socially – it thus obliges the interactionist to transcend the realms of social psychology.

Symbolic interactionism as a pragmatic discipline was itself speculative in studying the (Freudian) unconscious mind. To reconcile these apparently distant areas would require a less rigid adherence to interactionism's fundamental premises, and a more interpretive, flexible appropriation thereof. This is largely evident in later developments, as the theory itself

fragmented in light of what Manning & Smith (2010) deem, an "intellectual cross-fertilisation". That said, my own analysis presents an interesting (perhaps insoluble) dilemma because of multi-disciplinary interests: the role and dimensions of both physical and mental artefacts within the social environment. Within the unbounded practice of ICT4D, we may be obliged to study not only how meaning is attributed to technology (and the content of these meanings). We may also consider how technology itself creates meaning, thus drawing closer to concepts of material agency. Let us firstly and finally examine the selected research design, which is intended to address these concerns.

Chapter IV – Ethnographic pursuit of 'meaning' in a hyperconnected world

This chapter provides an overview of the selected research design relevant to this analysis. The author positions his ontological and epistemological stances. These represent the paradigms of naturalistic inquiry and phenomenology, respectively. It is within these interdependent paradigms that the research is conducted, located, and explored.

The author then describes the selected methodology as appropriate to the overarching research questions. This methodological pursuit is contextualised as a multi-sited fieldwork approach. This framework proposes the data collection methods of depth interviewing, and participant observation. These are complemented (augmented) by a critical process of self-reflection, which is described accordingly.

Furthermore, the selected data analysis techniques are described. These constitute key elements of thematic analysis, empirical exploration, and phenomenological inquiry. The chapter concludes with a discussion of ethical implications, which warrant due consideration.

The aforementioned elements are not presented or discussed in any papers (co)authored by Izak van Zyl

Ontological reflections

At the very onset of this inquiry and its accompanying research design, I as the 'chief architect' (however terrifying this role can be) had to take a critical decision. This necessitated a choice of the intellectual paradigm(s) that needed to both situate and clarify the forthcoming study. This use of the term "paradigm", which derives from the work of the historian of science Thomas Kuhn, refers to a set of very general philosophical assumptions about the nature of the world (ontology) and how we can understand it (epistemology) (Maxwell, 2005). Ontological and epistemological assumptions tend to be shared by researchers working in a specific field or tradition, typically informing specific methodological strategies (ibid.). Generally, and abstractly, Maxwell considers paradigms as philosophical positions that may embody very different ideas about (the construction of) reality, and how we are to study it.

Despite Maxwell's intentions of concretising the role of a research paradigm, I find it less of a critical decision, and more of an embedded reflection. I am not adept at practising different ontologies for different varieties of research. I do recognise the Kuhnian view of gradually evolving practices that shape scientific disciplines at certain points in time (see Kuhn, 1996). In their pioneering work on naturalistic inquiry, Lincoln and Guba (1985:15) suggest that paradigms represent a distillation of what we *think* about the world, but cannot prove. Our actions in the world, including those we take as inquirers, cannot occur without reference to those paradigms: "as we think, so do we act" (ibid). They maintain, thus, that while paradigms are enabling, they are also constraining:

> A paradigm is a world view, a general perspective, a way of breaking down the complexity of the real world. As such, paradigms are deeply embedded in the socialization of adherents and practitioners: paradigms tell them what is important, legitimate, and reasonable. Paradigms are also normative, telling the practitioner what to do without the necessity of long existential or epistemological consideration. But it is this aspect of paradigms that constitutes both their strength and their weakness – their strength in that it makes action possible, their weakness in that the very reason for action is hidden in the unquestioned assumptions of the paradigm (Lincoln & Guba, 1985:15).

I see this analysis, in terms of what has been presented and of what is to follow, as a phenomenological perspective that may balance opposing philosophies and paradigms. The tradition of phenomenology can more correctly be described as a metatheory of social science. The term "metatheory" is normally used interchangeably with such terms as "philosophy of science", "metascience" and "epistemology of science" (Babbie & Mouton, 2001:20). All of

these terms refer to critical reflection on the nature of scientific inquiry, often with a variety of methodological implications (ibid.).

The phenomenological tradition is based on a predominantly 'mental' metaphor – the centrality of human consciousness (Babbie & Mouton, 2001). Within this paradigm, the aim of the human sciences is defined as understanding (not explaining) people. People are conceived, not primarily as biological organisms, but as conscious, self-directing, symbolic human beings (ibid.). The phenomenologist emphasises that all human beings are engaged in the process of making sense of their (life) worlds. Individuals continuously "interpret, create, and give meaning to, define, justify and rationalise [their] actions" (Babbie & Mouton, 2001:28). This epistemological position links closely with a naturalistic ontology, underpinning the experiential construction of knowledge, and the significance of meaning.

The leading thinker and architect behind the phenomenological tradition is Alfred Schutz – Austrian social scientist and philosopher. Schutz's social phenomenology (1967) is a descriptive and interpretive theory of social action that explores subjective experience within the taken-for-granted, "commonsense" world of the daily life of individuals (Fereday & Muir-Cochrane, 2006:81). Schutz's theory emphasises the spatial and temporal aspects of experience and social relationships. Social phenomenology takes the view that people living in the world of daily life are able to ascribe meaning to a situation and then make judgments (ibid.). With its emphasis on the socially constructed nature of the social world, Schutz' phenomenology offers an epistemological 'resolution' to a naturalistic ontology. According to this position, the fact that people continuously construct, develop, and transform the everyday interpretations of their worlds, should become critical to social science research (Babbie & Mouton, 2001).

Although not strictly part of this tradition, I consider symbolic interactionism as a metatheory with sufficient similarities to phenomenology. The generally accepted principle of interactionism holds that meaning frameworks and interpretive processes influence social behaviour. This principle accords with Schutz' emphasis on the subjective point of view. It follows from this, that there are an infinite number of orders of social realities, each with its own special and separate style of existence (Babbie & Mouton, 2001). For Herbert Blumer, these realities were forged in the experiential worlds of meaning-making and –sharing. For Schutz, these orders converge in the world of "daily life" as an intersubjective domain which all humans share. In both views, the socially constructed nature of the social world is emphasised, and this position, essentially, informs my epistemological foundation.

Methodology

In light of the above, I assume a naturalistic ontological stance, which denotes my overarching research paradigm. This paradigm holds that there are multiple realities, internally and interpretively constructed by the social actor. From an epistemological perspective, knowledge is constructed collectively and experientially, and this underpins the role, value, and content of 'meaning'. These positions offer a number of methodological implications, which distinguish it from a more rationalistic paradigm (see Kinash, 2010). In terms of a naturalistic framework, ultimately, I have pursued a methodology that has relied on a process of fluid emergence (see Lincoln & Guba, 1985). This has been achieved by exploring an empirical case within the discipline of ICT4D.

At this point, it is worth noting that the selected research case is not a mere example from the field, utilised to solidify my research objectives. Rather, it is an actual academic project that I have taken part in as researcher, field worker, data analyst, trainer, and practitioner. In terms of my experiences as researcher and project manager on this case, a research argument gradually evolved. This was the result of axial and inductive inquiry, sometimes pursued instinctively (as opposed to intentionally). This research, though informed by the scientific process, grew organically and sporadically as a methodological pursuit.

For the purposes of clarity, furthermore, it is necessary to differentiate between the employed methodologies at *project level (MELISSA)* and those at *meta level (dissertation)*. At a project level, MELISSA studied disadvantaged educational contexts through mixed-method research, incorporating both quantitative and qualitative approaches. I am not making direct use of these methodologies or approaches. For the purposes of a doctoral qualification, presented through this dissertation as a meta-analysis of MELISSA, I pursued an emergent, multi-sited fieldwork approach. As indicated in Chapter I, this materialised as the combination of rapid (or 'snapshot') ethnography, participant observation, thick description, and subjective interpretation (reinforced by self-reflection).

Multi-sited ethnographic fieldwork, then, would constitute the predominant methodological framework employed throughout this analysis. Whilst not literally residing in any of the field sites, I stayed in Cape Town for the duration of the fieldwork. I thus remained in close proximity to the case settings. For MELISSA, this required that I regularly travel from Switzerland to South Africa, and again from Cape Town central to surrounding 'sites'. I spent significant time at each of these sites, to allow for the sufficient exploration of the many dynamics at hand.

Discussion, observation and reflection

For a meta-level exploration of MELISSA, I do rely on much 'data' that was collected at project level during my participation as project team member. I joined the MELISSA group in March 2010 – by this time, the project had already run for one year. The project was officially completed in October 2011, and I travelled to Cape Town for a final dissemination event. Between March 2010 and March 2012, I spent a total of six months doing fieldwork in six primary schools and one non-affiliated school (for augmentation purposes; see the Appendix). At the time of writing, I am still involved in developing the MELISSA extension phase, which concerns higher education and technology integration. This is hoped to continue beyond 2013. Augmentative information was obtained from follow-up discussions with project team members, community stakeholders, and affiliates of the broader MELISSA network.

This study relies on those ethnographic experiences that manifested as in-depth discussions, (participant) observations, and reflections (see the Data Collection Framework and Protocol in the Appendix). These are the principal methods in anthropological research (Bernard, 1998; Babbie & Mouton, 2001) and allow for the study of social dynamics in a technological landscape. Research participants – interlocutors, respondents, informants – were selected based on their involvement in various institutions, and of their association with the primary school communities concerned. Local primary schools were already accessible to the project team; the respective research participants were selected purposely from this point, following a process of non-probability sampling (see Babbie & Mouton, 2001).

I met with participants through local contact points (school, university, office, laboratory) – non-neutral environments that provided the respondent with a sense of comfort and safety. Participants were generally well informed and amiable, and were able to suggest other individuals for me to approach. This created a snowball effect of interviewee selection: study participants were met, continually, through daily encounters, leading to even more encounters. This process might appear disorganised. In fact, I can barely recall the number of people I spoke with! It is considerably valuable, however, in meeting a diverse range of characters, with differing backgrounds, experiences, stories, and viewpoints (see Van Zyl, 2010). The process of selecting interviewees coincides with the criteria presented by Spradley (1979) for selecting respondents:

- Enculturation – those individuals that are familiar with the local context, and accustomed in the norms and behaviours of the surrounding environment;

- Current involvement – respondents that are active or knowledgeable in issues concerning the study;
- Time – sufficiently allocated time for conducting the interview or for having a general discussion.

The majority of respondents met the aforementioned criteria and were not approached or pursued otherwise. I attempted to remain as minimally invasive as possible, despite the fact that I was a conspicuous stranger in otherwise acquainted settings. It was not easy, therefore, to hide my enthusiasm or willingness in speaking to as many people as my own time and resources availed. That said, discussions were generally informal, and did not always abide by clear, pre-determined structures. Questions were governed via the flows of conversation and the interpersonal dynamics between the respondent and myself. In this manner, I followed the approach of basic individual interviewing (open, flexible, iterative) as well as depth individual interviews, focusing more on the context of the interview (see Babbie & Mouton, 2001:291; Van Zyl, 2010). Essentially, the interview process depended on local dynamics, contexts, and interactions. In this sense, the research methodology was dictated through the research field (ibid.).

Primary data was supported by archival and desktop research, where I examined a variety of on- and offline media: journal publications, books, news articles, blogs, and formal reports. Finally, and as is evident throughout the preceding chapters, the data collection process was reinforced by the practice of self-reflection. The reflexive turn in anthropology emerged in the 1970s, problematising the production of ethnographic texts. As Bob Scholte aptly observed:

> Anthropological activity is never only scientific. In addition, it is expressive or symptomatic of a presupposed cultural world of which it is itself an integral part…Epistemological reflection (the assessment of "ethno-logical" assumptions entailed in the possibility and constitution of any anthropological knowledge whatsoever) must complement, if not precede, scientific activity proper. (Scholte, 1972:431)

In this vein, I attempted to reflect on my own position in terms of the research context. In MELISSA, I helped curriculate a training programme to be implemented in South African primary schools. I was also the local facilitator of this programme, and had trained educators on the use of technology for pedagogical purposes. My role as project coordinator intended to explore development priorities. Together with the project team, I helped create methodological inquiries for 'solving' these. It has become part of my professional, contracted duty to explore the possibilities for technological integration in marginalised communities. Through a process of self-reflection, I gradually unearthed some of the assumptions in ICT4D practice that I did not

challenge in the past. This activity itself reveals much of the practitioner, of the recipient community, and of the surrounding and supposedly 'underdeveloped' environment.

In light of these roles, it is important to locate my personal influences, experiences, and relationships in terms of the research environment. Scholte argued for anthropology's emancipatory and normative interests. He called for anthropologists to reflect on those power relations created through the practice of ethnography (1972). I pay heed to these calls, and will attempt to express my own identity in line with the evocative encounters I intend to uncover. In this case, I am obliged to abandon ordinary self-understanding, and immerse myself within the process of understanding others. The understanding of others not only contributes to our emancipatory interest, but also presupposes, in turn, at least a partial self-emancipation (Scholte, 1972:447).

The table below summarises the data collection process, and indicates the respective project- and meta-level data concerned.

	MELISSA	**Technology encounters**
Method	**Project level (Western Cape research initiative)**	**Dissertation (meta) level (multi-sited fieldwork)**
Depth discussions (semi-formal and informal interviews)	Principals, teachers, computer lab managers, other (school administrators, community members)	Project stakeholders (teachers, principals, general community members), advisors, visiting researchers/academics
Surveys (quantitative)	Teacher and computer self-efficacy questionnaires	Quantitative data was not gathered for this analysis, but was assimilated to contextualise leading findings
Participant observation	Not in the research design but may have been conducted inadvertently or naturally	Conducted during the investigator's time as project coordinator, and especially in curriculum development and training
User-centred / participatory design	Not employed for this project	The principles of participatory design are incorporated in this analysis
Self-reflection	Conducted informally; disseminated in a small number of publications	Strong epistemological reflection
Augmentative data	Academic literature, online media (articles, blogs, reports), books and ad hoc material	

Table 1: Data collection framework.

Subjective interpretation and thematic analysis

As a fledgling social anthropologist, I am interested in the behavioural (ir)regularities in everyday situations: language use, artefacts, rituals, relationships (Miles & Huberman, 1994:8). This, particularly, is embodied as the study of "empirically collective forms of understanding, whose properties have been solidified, as it were, and are revealed…in countless concrete representational systems" (Levi-Strauss, 1969:11). As a budding communication scientist, furthermore, I am interested in the categorisation of the world encoded in representational systems of communication. These embody processes of meaning: experiential interpretations and classifications of the universe (see Wierzbicka, 1984).

Social beings express meaning as patterns, norms, or rules – these are meant to provide the inferential keys to the culture or society under study (Miles & Huberman, 1994). The prime analytic task, then, is to uncover and explicate the ways in which people in particular settings come to understand, account for, take action, and manage their daily situations (ibid.). This is the critical undertaking of the social anthropologist, the communication scientist, and soon, the ICT4D practitioner. And the outcome of this undertaking, expectantly, may lead to the genesis or refinement of a theory (ibid.). This may begin with a position of theoretical inference, conceptualised as hypothetical framework, but later subject to inductive discovery. This process of cyclical inference, or iterative and emergent analysis, has outlined the data exploration strategy for this study.

Schutz' phenomenology (1967) offers an analytical framework for studying the subjective meanings in the sphere of human action. Central to this is the "postulate of subjective interpretation". This requires that social scientific accounts have to regard its subjects of study as social actors capable of ascribing meaning to their actions and environments. Methodologically though, there is a risk of substituting or replacing the world of social reality by a fictional, non-existent world constructed by the researcher. This in mind, Schutz formulated a method for studying social action involving two senses of 'verstehen' (interpretive understanding) (Fereday & Muir-Cochrane, 2006). The first order is the process by which people make sense of or interpret the phenomena of the everyday world. The second order of understanding involves generating "ideal types" through which to interpret and describe the phenomenon under investigation (ibid.).

First order constructs signify a concept's "denotation" (denotata); second order constructs signify a concept's "connotation" (categories) (Wierzbicka, 1984). Through exploring these levels of interpretive understanding, I have identified and codified all recorded data. This has manifested practically as a process of thematic analysis: a search for themes that emerge as being important to the description of a phenomenon (Fereday & Muir-Cochrane, 2006). Themes have been identified through careful reading and re-reading of the data – a form of pattern recognition where emerging themes become the categories for analysis (ibid.). As patterns or themes emerge, they become recognised as 'significant moments' and encoded prior to a process of interpretation. It is essential for these codes to convey the richness of the qualitative detail as presented by the data source.

The selected data analysis process is not an attempt at ethnology, nor is it a linguistic inquiry. Rather, it strives to identify and organise rich but disjointed information into a systematic presentation of narrative experience. For maintaining rigour, this process is based on the phenomenological postulates of logical consistency and adequacy. The former mandates the researcher to establish the highest degree of clarity for the conceptual framework and method applied, following the principles of formal logic (Fereday & Muir-Cochrane, 2006). This involves in-depth planning, careful attention to the phenomenon under study, and productive, useful results (ibid.) – all of which I have devoted much consideration toward.

The latter postulate of adequacy calls for a consistency between the researcher's constructs and those found in common-sense experience. Stated plainly, the research outcomes must be understood and recognisable by the social actors within everyday life (Fereday & Muir-Cochrane, 2006). This is an equally challenging task, which requires a process of member validation and checking. I have gone to some lengths in developing an open, transparent research design, subject to the inputs of study respondents. As for the findings – these will be discussed at a number of public conventions, academic and otherwise. Dissemination will become an important component in the completion of this study, which will allow for input from the stakeholder audience.

The thematic analysis approach accords with a naturalistic ontology, and with the tenets of phenomenology, emphasising meaning and subjective interpretation. Within the theoretical perspective of symbolic interactionism, furthermore, thematic analysis can allow for the systematic exploration of micro social interactions. It is not a 'precise science', however, exactly due to the fluctuating role of interpretation and to the abundance of multiple perspectives. Despite this, I strive to maintain interpretive rigor through logical consistency, adequacy, and transparency.

Delineation and transferability

This study is delimited to the MELISSA enterprise and its stakeholders: educators, principals, learners, and policymakers. The research team is included in this study as its 'actioning force'; I do reflect on the team's ambitions and activities in the implementation of MELISSA. I also frame this study within a South African context, with particular reference to Cape Town, in the Western Cape Province. I conducted my fieldwork in the Metro Central Education District and its vicinity (see Chapter V). Although the empirical findings emanate from the study of education communities in this region, they may hold broader relevance. In particular, I present this study within the ambit of ICT4D and I proceed to challenge some of the discipline's theoretical foundations. The insights from this undertaking may be significant for future analyses of technology encounters in developing contexts.

The validity of MELISSA findings, yet, is unclear beyond the limited context of this inquiry. All observations are defined by the specific contexts in which they occur (Babbie & Mouton, 2001). In the absence of cross-contextual verification, we do not fully understand the applicability of such findings, or the knowledge it may foster in other environments (see Winschiers-Theophilus et al., 2013). The responsibility for transferable results, however, lies in the hands of those future analysts who wish to explore the dynamics of symbolic narratives. Whilst having generated promising results, the process of transferability requires in-depth contextual engagement and validation (ibid.). Lincoln and Guba (1985) present two strategies for enhancing transferability:

- *Thick description*. Throughout this thesis, I present an academic narrative nuanced with rich, context-based descriptions. If I have reported these in sufficient and precise detail, the reader (future researcher) may judge the applicability of such data in other contexts. He or she can determine, subsequently, whether the produced data, guidelines, models, and theories may be reproduced or reapplied in different contexts.

- *Purposive sampling*. Qualitative research requires a diverse pool of respondents to avoid a parochial analysis. A purposive sample, representing groups and individuals from multiple settings, aids in transferability of the research design. A non-probable sample group allows for a plurality of insights, purposefully different from one another. Given its blended design, MELISSA initially selected a random sample – a strategy that later proved challenging. I adopted a purposive selection strategy as described in this chapter.

In the effort to create a transferable research design, I endeavour to describe all results thickly (although incompletely!), and within the context of its occurrence. A purposive sampling design should augment this cause. I yet encourage a spontaneous cross-context validation of intermediate findings. This requires literature comparisons and validity checks (see Winschiers-Theophilus et al., 2013). To enhance the transferability of our results, we may also look to the principles of triangulation, credibility, and confirmability. These approaches ensure findings that are the product of the focus of the inquiry, and not of the biases of the researcher (Babbie & Mouton, 2001). However, this study is also strongly self-reflective, and thus involves introspective analysis. For this reason, the produced results are also contingent on subjective interpretation.

Ethical considerations

This study does lend itself to a number of ethical implications. These primarily concern the described methodological framework of multi-sited fieldwork. At a meta level, most of those study respondents already participating in MELISSA were considered for this research. This process can be regarded as obtrusive, as respondents had to devote extra time and energy in the fieldwork activities. All respondents were availed the option to partake in the research, however, and could freely decide on the level of their involvement. These decisions were also informed through a discussion in which I explained my research objectives. To the best of my abilities, I tried to convey the purpose of my research in terms that were comprehensible to the respondent group. This accords with Schutz' postulate of adequacy for maintaining rigor in the methodological process (1967). No person was observed or interviewed without his or her formal consent and knowledge.

No emotional, physical, or mental harm was inflicted during the course of this study. It was my intention to avoid a discussion of sensitive topics during interviews, and this was naturally the case. However, it was reasonably expected that such topics could arise during the data collection process. These instances were minor, and I employed tact and reason to defuse potentially damaging situations. Furthermore, the anonymity and confidentiality of all study respondents will be respected; names and identities will be protected unless otherwise specified. All interview and observational data is stored on a password-protected computer hard disk, which is periodically backed up to a secure online server. No unauthorised (non-project) persons have access to such data. Finally, this study abides by the ethical guidelines of local institutional authorities – formal, written permission was obtained in all cases of data collection.

Chapter V – The MELISSA experience: reflections in action

In this chapter, the author presents the first part of what he calls 'the MELISSA experience'. This experience is a reflection on those opportunities and challenges that led to the MELISSA design. The author revisits the key considerations that helped conceptualise the main research action, and discusses the respective research plan and methodology (sample selection, curriculum design, methods, and timeline). A description of the expected results is subsequently provided.

The author proceeds to describe the leading project findings in the two primary research domains: self-efficacy, and critical discourse analysis. These reflect the practical and theoretical contributions of the project thus far.

In light of the project intentions, the author reflects on the MELISSA ideology and considers the means through which it has been appropriated. Beyond this, the author reflects on the theoretical contributions of the project, and offers a convergent exploration – one that deepens the research agenda.

The aforementioned elements have been presented and discussed in the following papers (co)authored by Izak van Zyl:

- Chigona, W., Bladergroen, M., Bytheway, A., Cox, S., Dumas, C., Van Zyl, I.J. 2011. Educator discourses on ICT in Education. *ReSNES'2011: E-Skilling for Equitable Prosperity and Global Competiveness*. East London, South Africa.
- Fanni, F., Rega, I., Van Zyl, I.J., Cantoni, L., & Tardini S. 2010. Investigating Perception Changes in Teachers Attending ICT Curricula through Self-Efficacy. *Proceedings of the 2010 International Conference on Information and Communication Technologies and Development (ICTD '10)*, 13 – 16 December 2010, London, United Kingdom.
- Fanni, F., Van Zyl, I.J., & Rega, I. 2011. The value of measurement in research practice: Evaluating ICT training in education. *CIRN Community Informatics Conference: "To measure or not to measure: that is the question"*. 9-11 November 2011, Monash Centre Prato, Italy.
- Van Zyl, I.J., & Rega, I. 2011. Critical approaches and varied impacts: Understanding the role of educational technology in disadvantaged schools. In: International Development Informatics Association (IDIA), 26-28 October. Lima: School of IT, Monash University.

Opportunities and challenges: access and integration

The MELISSA project – Measuring E-Learning Impact in primary Schools in South African disadvantaged areas – commenced as an international research initiative between three universities: Cape Peninsula University of Technology and the University of Cape Town (UCT) in South Africa, and Università della Svizzera italiana (USI) in Lugano, Switzerland. It was jointly funded by the Swiss Secretariat for Education and Research (SER) and the South African National Research Foundation (NRF) for a 36-month period from November 2008. As can be inferred from the project title, MELISSA had the objective to determine the impact of digital technologies in terms of pedagogy in primary schools. The use of 'disadvantaged' alludes to the fact that these schools are located in areas that are socio-economically deprived, and may face resource difficulties. In which case it was anticipated that the access to and integration of technologies within these schools would be constrained.

BET-K12 – Salvador de Bahia, Brazil

The conceptual development of MELISSA grew out of two preceding initiatives. The first of these, Brazilian eLearning Teacher Training in K-12 (or BET-K12), was implemented in Salvador de Bahia, Brazil between 2005 and 2008. This project was based on prior collaboration between the New Media in Education Laboratory at USI and a Brazilian nongovernment organisation, CEAP – Centro de Estudo e Assesoria Pedagogica (Fanni et al., 2010). BET-K12 was created to help primary teachers in disadvantaged community schools to obtain university degrees by training them in the use of ICTs. The goal here was for teachers to become more equipped in living and working in the knowledge society (ibid.). The project, then, had a clear social directive, which regarded the access to information as an endemic challenge to regional development (see Cantoni et al., 2009).

BET-K12 offered a technology-based curriculum on digital literacy, ICTs in pedagogy, and communication theory for local primary school teachers. The project team intended to measure the role of technologies in influencing self-efficacy: the belief that one is capable of performing an activity or achieving a goal. The results were inconclusive and required deeper analysis. Subsequently, the team at USI determined that self-efficacy warranted further investigation as a construct to explain changes in teachers' attitudes toward technologies (Fanni et al., 2010).

The Khanya Project – Western Cape, South Africa

In the South African context meanwhile, a regional ICT-in-education initiative was being spearheaded by the Western Cape Education Department (WCED). A few years prior, the national government recognised the future prominence of information and communication technologies. The potential for ICTs was specifically acknowledged in the domain of education (as described in Chapter II): digital technologies could strengthen the processes of teaching and learning in local schools (Bladergroen et al., 2012). In 2001, the Khanya project was officially launched by the WCED, in collaboration with corporate and smaller donor agencies. In line with local and national ambitions toward a knowledge society, Khanya was established to promote learning and maximise educator capacity. This was achieved (or envisioned) by integrating the use of appropriate, available and affordable computer technology into the curriculum development process (Western Cape Government, 2011).

The Khanya business model revolved around four central tenets (Khanya, 2011):

- **A critical shortage of teacher capacity**

  This is inflated by a lack of new entrants into the teaching profession, and a continuous decrease in qualified teaching staff. The Khanya model, then, would address these shortages through the provision of technology. This was not intended to replace educators, but rather to help them conduct their professional duties more effectively.

- **The need for coordination efforts**

  The WCED recognised that there was a lack in unitary, consolidatory efforts in the regional education sphere. Industry, local government, and civil society organisations are (or should be) compelled to band together in tackling the problem of education in the province.

- **Bridging the digital divide**

  As discussed in Chapter II, much of the ICT4D efforts the world over have been directed at narrowing the 'digital divide'. In the education sphere, this could be achieved by creating environments where technology is accessible to educators, learners, parents and administrators alike.

- **Preparing the Western Cape for the knowledge economy**
  In view of a global vision of 'participating in' the information society, the WCED has underpinned technology as a foremost driver of progress in the Western Cape. This would (hopefully) enable and equip individuals to apply knowledge effectively in hyperconnected world.

Based on these business drivers, the Khanya project set the very ambitious objective of equipping every primary school in the Western Cape with technology facilities by the start of 2012. These were typically in the form of computer laboratories, with learner units (internet-connected desktop PCs), teaching aides (interactive whiteboards, personal computers), and administrative tools (printers, network capabilities, and the like). The project intended to go beyond mere computer access, however. Rather, Khanya aimed to facilitate and strengthen the process of digital literacy and curriculum delivery. This is within the context of a constrained pedagogical environment, in which educators and learners are equally deprived of technology access (Khanya, 2011).

By the end of 2011, Khanya had installed computer laboratories in 1402 schools, with another 89 schools in the completion stage. More than 50 000 computers had been in use by this time, with more than 30 000 educators and nearly 1 000 000 learners granted access to technology facilities (Khanya, 2011). By sheer numbers alone, the project was deemed an immense success (see Marnewick, 2011). On Wednesday, 28 September 2011, the responsibility for technology in education was formally transferred from Khanya to the Western Cape Education Department. Henceforth, the WCED would assume responsibility for technology innovation in the classroom through its own internal structures (Marnewick, 2011). The handover was preceded by the resignation of Kobus van Wyk, chief project manager, two months earlier. These activities signalled a new 'era for technology in schools in the Western Cape' (ibid.).

The apparent successes of the Khanya programme notwithstanding, the process of extensive technology installations in local schools proved challenging, and uncertain. A standard Khanya computer laboratory only contained between 25 and 40 computers. This resulted in high learner to computer ratios in most schools with populations of over 500 learners (Davids, 2009). Computer laboratories also required regular physical maintenance. For lower income schools, this would not always be feasible, and in-house resources were thinly stretched. In some of the schools I visited, there were several instances of poorly maintained facilities: broken PCs, missing/stolen equipment, no network infrastructure, and faulty air conditioners (which, in some

cases, leaked onto computers below). These schools also received limited technical support from Khanya, which in most cases was not timely (Chigona et al., 2011).

In addition to these challenges, the low level of ICT skills in local schools was a major concern. Educators did not possess the technical, content management, or pedagogical skills to integrate ICT effectively in their work (Chigona et al., 2011). This was inflated by inadequate training provision from Khanya and unsupportive school management policies (see Davids, 2009). In some cases, computer labs were inaccessible for most of the day, with educators only permitted access in scheduled timeslots. Ineffective scheduling meant that most educators were excluded from accessing the lab during normal work hours. Schools offered little incentive for lab use, moreover, which further impeded the process of ICT adoption in provincial education.

The Khanya programme was hampered by the very problem it set out to address: low technology uptake (among both teachers and learners). The skill level among learners was severely low, especially in less resourced settings. Learners did not generally have access to computer facilities at home, and could not practice what they learnt in school. Even at school, technology contact hours were at a minimum, with some learners only granted an hour per week in the lab. Related to this is the feeling amongst educators that the current curriculum does not require them to use ICT for curriculum delivery. By implication, the integration of ICT is not perceived as important by the WCED (Chigona et al., 2011). These dynamics have not instilled the massive technology uptake that the Khanya project aimed to produce. Whilst vastly successful in terms of introducing computer facilities, Khanya fell short in the adoption and integration process.

Research considerations

It is in this context that the impetus for MELISSA grew. The opportunities and challenges created by Khanya left many unanswered questions and ill-conceived ambitions. This was supported by findings in BET-K12, where the role of technology was questioned in terms of pedagogical effectiveness. To the MELISSA project team, it was not immediately clear how technology was perceived by educators in the South African context. It was not salient, additionally, how digital technologies could contribute (if at all) in the process of curriculum delivery, and in the practice of shaping better educators. In this vein, the team set out to measure the impact of exposure to ICT in teaching and learning. The aspiration was to try to understand and analyse changes in teachers' attitudes to and uses of digital technologies (Fanni et al., 2010).

With these ambitions in mind, the MELISSA project objectives were formulated. Officially, the project aimed to:

- Enable primary school teachers working in disadvantaged South African primary schools to become mediators of digital literacy skills. This process would support learners in becoming active, employable members of the knowledge society.
- Develop an integrated set of measures to determine and assess the impact of ICTs in teacher training and curriculum delivery.

To accomplish its directive, the MELISSA team created a mixed-method methodological framework, appropriating quantitative and qualitative 'measurements' among a *control* and an *experimental* group. This would be enacted in two successive research phases. The first phase was envisioned as a long-term teacher training curriculum, involving six primary schools in the Cape metropole. Practically, this entailed that 120 primary school teachers would attend a three-module training course on a weekly basis. This course would be designed and facilitated by the MELISSA team itself, and presented once or twice a week to each of the six participating schools.

The actual curriculum was themed around three core areas, based on the course structure of MELISSA's predecessor, BET-K12. Incidentally, the Brazilian context may have presented similar conditions to that of South Africa. Both countries feature among the most unequal regions in the world, and both have emerging and growth-leading economies (see BRICS). Comparisons aside, the three MELISSA modules were themed around digital literacy, ICT in the educational context, and teaching and learning in the knowledge society. ICTs were hence introduced into teaching practice as a subject of study, an educational strategy, and an educational tool to be integrated (Fanni et al., 2010).

Understandably, the teacher training component would require a massive 'localisation effort', as was recognised in the original MELISSA proposal. This would entail a sustainable and effective curriculum that corresponds to the local environment both socially and technologically. The project team needed to devote much effort to understanding the complexities of school settings in the Western Cape. To compensate for the lack of practical familiarity with local conditions, the Deputy Director of e-Learning at the Provincial Government was invited as part of the research group. This would provide much needed acquaintance with the level of ICT uptake in primary schools and with the resource-restricted environments in which schools operated.

The second core phase of the MELISSA project was dedicated to investigate the impact of the exposure to ICTs on the teachers attending the aforementioned learning experiences. Impact would be explored across three interrelated dimensions:

> **1. Computer and teacher self-efficacy:** How teachers' own perceptions change as they grow more or less confident in using ICTs
>
> **2. Social meaning:** How a web of meaning grows and changes along with the acquisition of digital literacy skills
>
> **3. Locus of control:** How the possibility to master ICTs enables teachers to acquire more self-esteem, and to become active social agents in their professional contexts

In terms of the first dimension, Albert Bandura's self-efficacy theory (1977) was employed as conceptual lens. The impact, then, of technology was investigated in terms of perception change: do educators view themselves as more capable, as they use ICTs? In Bandura's terms, this would reflect a study of the relationship between computer and teacher self-efficacy (CSE and TSE) (Fanni, Van Zyl, & Rega 2011). By employing Bandura's perspectives as initial conceptual basis, the MELISSA team proposed a quasi-experimental research venture. This entailed the delivery of three interrelated modules over two rounds, followed by an 'e-learning impact measurement'. This was only briefly described in the preceding passages – I will elaborate on this methodology in the following sections.

For the second dimension, the concept of social meaning was proposed as augmentative conceptual lens. This notion was developed by sociologist and philosopher Pierre Bourdieu (1977). Bourdieu held that those meanings individuals attribute to objects are influenced by the network of relations in which s/he is involved. Meaning as given to 'an object' is not individually ascribed, but constructed, shaped and shared by the members of that particular community. Within the context of a community of educators, the concept of a 'shared social meaning' may affect the way that technology is introduced, received, and utilised. For the MELISSA team, this was a noteworthy construct that could reveal much about the impact of e-learning and ICTs. The third dimension, locus of control, was later dropped by the team, citing its methodological unfeasibility.

At this point, it may be useful to clarify the reasons behind the selection of teachers as the key research focus. The motivation for this is twofold: teachers are regarded as the mediators between ICTs and learners. In terms of delivering a technology-rich curriculum, teachers fulfil the primary role in the learning process. Secondly, teacher training is a crucial driver of advancement in the sphere of education. MELISSA drew much of its purpose from those educational challenges in developing countries: the lack of (qualified, technically skilled) educators, insufficient quality in curriculum delivery, and the general lack of resources, financial and otherwise (see Rega, 2004). These factors considered, the MELISSA framework was created to assess and explore teacher experiences in an emerging technology context.

Research plan and methodology

To reiterate, the two research objectives for MELISSA can be framed very simply: to train teachers of disadvantaged schools in mastering ICTs, and to assess the impact of these learning experiences. To achieve this, a deductive-experimental approach was proposed. Central to this undertaking were three interlinked hypotheses (Fanni et al., 2010):

- The increase in technological skills – offered by the attendance of an ICT curriculum – would lead to an increase in computer self-efficacy (CSE)
- An increase in computer self-efficacy would lead to an increase in teacher self-efficacy (TSE)
- The increase in technological skills through the attendance of an ICT curriculum, would lead to a change in the social meaning of technology. This would evolve into a more complex and articulated model, including a wider awareness of knowledge society dynamics.

The first of these hypotheses suggests that, through attending a practical course on digital technology, teachers will not only become more technically skilled, they will also become better educators. I wonder, in retrospect, whether the inverse is also postulated to be true. The less technically skilled a teacher is, the greater the possibility of that teacher perceiving his or her ineffectiveness as an educator? Technicalities aside, the final premise is one that piques my individual interest. It is a suggestion that would certainly hold water in terms of the literature I surveyed. Any significant change in social meaning would surely excite the likes of Herbert Blumer, Erving Goffman, and Pierre Bourdieu. Importantly, however, quantitative descriptors cannot paint a complete picture of such a change, if any. Any complex articulations that characterise a social meaning framework would require an equally complex analysis.

With these considerations in mind, the MELISSA team proposed a mixed-method investigative strategy. The measurement of self-efficacy constructs would be obtained through a quantitative instrument: survey research. Whereas the construct of social meaning would be studied according to a qualitative instrument: depth interviews. This allowed for a blended inquiry, integrating seemingly complimentary quantitative and qualitative measurements. Although quantitative testing is powerful in itself, qualitative analysis could assist with the interpretation of data, and suggest new perspectives with which to deepen quantitative components. This helps develop a diversity of inquiry for single constructs. These instruments would be empirically grounded in disadvantaged educational settings, laden with social, cultural and economic complexities. It was therefore essential for the blended methodology to be adaptable to local conditions and respondents.

Selection of teachers and schools

As much of the MELISSA methodology rests on the back of the Khanya programme, its research sample was to be drawn from participating Khanya schools. In partnership with a local NGO, Edunova, the project partners selected a 'convenient' sample group of schools and teachers. Edunova has had much experience with ICT training for educators. It had also been a long-standing Khanya partner. Participating schools and teachers would have to match a set of eligibility criteria:

- Schools are members of the Edunova and Khanya project network. Hence, they would be equipped with training facilities (on-site computer laboratories).
- Teachers can access network facilities, to be able to take part in the online part of the curriculum.
- Schools were motivated and enthusiastic for their staff to become digitally literate.
- Teachers lacked computer skills.

Following these criteria, the project identified a group of 120 teachers representing six primary schools in the Metro Central Education District of Cape Town (see figure 7 on the following page). This number was later reduced due to the inability of some respondents to participate. As the curriculum was to be delivered in two distinct phases, teachers were randomly assigned to experimental and control groups – 60 members per group. Two schools, Rosmead and Zimasa, were part of the original experimental group. These schools would receive the training in the first round, and thus be exposed to the intervention. The control group, conversely, was made up of four schools: Vukukhanye, Thembani, Moshesh, and Blossom Street. These schools would not

receive training during the first round. Rather, they would only attend the curriculum during the second round of delivery, effectively becoming the next experimental group. Their experiences would later be compared to those of the original (first round) experimental group. For the qualitative round of interviews, groups were later renamed to Groups A and B for simplified classification. I will use these labels interchangeably.

Figure 7: The Metro Central Education District of Cape Town, located in the South-West of the Western Cape Province (WCED, 2008).

Both groups were balanced according to certain social and environmental characteristics: sex, age, and ethnicity; teaching experience and career; location (urban, rural); and language (English, Afrikaans and Xhosa). This was to ensure uniformity across the sample, thus reducing potential bias (at least on the surface). Only two schools, however, formed part of the experimental group (Group A) as opposed to four schools in the control group (Group B). This dilemma came to fruition much later, especially during the process of quantitative analysis. In terms of the qualitative component, strict generalisability and transferability were not primary concerns at the time.

For purposes of clarity, a brief description of the sample group is provided (adapted from Fanni, Van Zyl & Rega, 2011; Fanni et al., 2010). Individually, I helped train many of the teachers and administrators in both groups. For this research undertaking, I also interviewed and observed a number of these same persons (see Chapter IV). Initially, the experimental group was reduced to 42 teachers working in two disadvantaged primary schools, Rosmead and Zimasa. The majority (85%) of this population were female. The majority of teachers were then between 31 and 40 years old, with a college diploma as highest educational level.

Teachers in the **experimental group** have been teaching for 18 years on average – a very experienced pool of educators. In terms of technology usage, teachers use a personal computer daily (46%), from school (98%), in particular for writing/editing purposes. 56% own a computer at home, but the majority (76%) of this group are without an internet connection. Teachers access the internet two or three times per week from school, mainly to look for information (72%) and for sending email (52%). A recent snapshot of Rosmead and Zimasa is provided in Table 2 below (adapted from Fanni, Van Zyl & Rega, 2011). These figures do not necessarily reflect the current situation at each school (at the time of writing, June 2013). They were recent at the time of conducting the fieldwork, however.

ROSMEAD	
Area	Wynberg
Language	English
Type:	Primary
Number of (official) PCs	158
Educators	26
Learners	736
Learner:PC ratio	5:1

ZIMASA	
Area	Langa
Language	Xhosa/English
Type:	Intermediate
Number of (official) PCs	69
Educators	42
Learners	1435
Learner:PC ratio	21:1

Table 2: Khanya school snapshots – Experimental group (Group A), Rosmead and Zimasa

The **control group** was composed of 68 teachers from the remaining four primary schools. This group is somewhat older, on average, than Group A, the majority being between 41 and 50 years of age. The majority (72%) of members are also female, as with the experimental group. The control group averages 16 years in teaching experience, with a college diploma as highest educational level attained. Members use personal computers daily, from school. As with the other group, computers are used mostly for writing and basic administration. The majority of members do not own personal computers, and access the internet mostly from school (87%). Here, the internet is generally used for retrieving information. Less than a quarter of the group (21%)

accesses the internet infrequently (less than once a month). Recent snapshots of the four control group schools are provided in Table 3 (adapted from Fanni, Van Zyl & Rega, 2011):

VUKUKHANYE

Area	Cape Town
Language	Xhosa
Type:	Primary
Number of (official) PCs	32
Educators	16
Learners	605
Learner:PC ratio	19:1

BLOSSOM STREET

Area	Athlone
Language	Afrikaans
Type:	Primary
Number of (official) PCs	29
Educators	15
Learners	587
Learner:PC ratio	20:1

THEMBANI

Area	Goodwood
Language	Xhosa/English
Type:	Primary
Number of (official) PCs	54
Educators	28
Learners	950
Learner:PC ratio	18:1

MOSHESH

Area	Goodwood
Language	Xhosa
Type:	Intermediate
Number of (official) PCs	35
Educators	18
Learners	549
Learner:PC ratio	16:1

Table 3: Khanya school snapshots – Control group (Group B), Vukukhanye, Blossom Street Primary, Thembani and Moshesh

Curriculum design and implementation

Once teachers and schools had been identified, the MELISSA team set up a number of roundtable meetings to discuss the terms of participation. All invited parties agreed, and were excited at the opportunity for them to receive computer training. The team also invited participating principals, teachers and administrators to a MELISSA kick-off event, which introduced the aims and ambitions of the programme. The curriculum design process soon followed, with the BET-K12 model as basis. As discussed, this was composed of three core segments: digital literacy, technologies in educational contexts, and communication theories. Three corresponding course modules were designed and stored on Moodle as the selected Learning Management System (LMS). The idea was for teachers to have a direct experience with this platform as a potential educational tool in administering course content.

The course modules included digital literacy, ICT in educational contexts (to familiarise teachers with current practices), and teaching and learning in the knowledge society (instructional design using technology). As mentioned, it was important to localise curriculum design efforts in terms of the actual educational contexts of MELISSA participants. In essence, the curriculum had to both respond and adapt to particular local conditions. However, school environments were obstructive, for the most part, and hampered the successful delivery of the programme. This aspect will be discussed in due course. The curriculum itself was developed and implemented as a short-term modular framework, to be delivered in 1-2 hour weekly sessions. Each school would receive a total of 64 hours of training over the implementation phase. The curriculum was delivered in two rounds to enable a measurement of experimental versus control groups. The curriculum was fine-tuned after the first round, to better match teacher expectations.

The first round of delivery commenced from July 2009 to May 2010, followed by the second round from July 2010 to June 2011. During the first period of implementation, only schools in the experimental group received the training. The same curriculum, refined according to the feedback gained during the first round, was delivered to the control group in the second round (Fanni et al., 2010). For all practical purposes, Group A fell away in the second round; the control group effectively becoming the second (new) experimental group. The double round delivery would enable the team to evaluate any (perceived) changes in training impact over a period of about 30 months. It would also allow them to measure the differences in experience between the two groups. In this way, the team could explore whether the exposure to computer training (i.e. for Group A) would instil any difference in perceived ability (TSE and CSE) and social meaning, as opposed to a non-exposed group (i.e. Group B).

Method design

The methods for data collection were to correspond to the three hypotheses originally proposed by the MELISSA team. The first two hypotheses – on teacher- and computer self-efficacy – would require quantitative measurement. A structured questionnaire was thus foreseen, and would be conducted with both experimental and control groups before, during and after each round of course delivery (see Table 4). The questionnaire design was adapted from existing scales as developed by researchers in the field of self-efficacy – Bandura, Compeau, Higgins, Tschannen-Moran and Hoy (1995). Teachers were then asked to rate their ability in accomplishing certain tasks and goals. This was achieved by means of a standard Likert scale.

For CSE, questions mostly related to using technologies in educational contexts. All digital technologies that teachers would be exposed to during the training – word processing software, internet browsers, and the like – were included as themes in the survey. For TSE, themes were grouped according to three categories: student engagement, instructional strategies, and classroom management. Corresponding questions would establish the ability of a teacher in each of these groupings. The main purpose of studying these constructs is to determine a correlation, if any, between technologies and (self-perceived) abilities. Explicating this potential relationship would shed much light on the usefulness and value of digital technologies in the disadvantaged educational context.

For the third and final hypothesis, semi-structured interviews were selected as the appropriate method for collecting data about individual 'webs of meaning'. The interview protocol was designed to explore actions, behaviours, and beliefs attached to ICTs and the knowledge society. Interview questions needed to elicit key data that would help determine the level of *change* in those personal meanings associated with technologies. To this end, interview questions were designed to ascertain demographic details of the interviewee; free associations and spontaneous meanings attributed to ICTs; and an understanding regarding those behaviours and beliefs associated with ICTs and the knowledge society. Each semi-structured interview was designed to run for 45 minutes to an hour. A guideline / manual was compiled which contained the basic interview protocol.

Fifty percent of teachers involved in the training intervention would be selected as respondents in the social meaning analysis. In theory, this required 30 teachers from the control and 30 from the experimental group. As per the project proposal, 60 teachers would represent a consistent sub-sample in terms of the larger population (actual interview numbers were lower). Interviews would be conducted with both groups during three intersecting periods (see Table 4): before the first round (i.e. before teachers have attended the training course), at the end of the first round, and again midway through the second round (months after completing the first round). These periods would allow the project team to determine the degree of change (if any) in social meaning frameworks. Due to time limitations, second round participants would not be interviewed again at the end of the course.

	Group A	Group B
Surveys conducted	Beginning of course (July 2009)	Control group (no course) (July 2009)
	Middle of course (January 2010)	Control group (no course) (January 2010)
	End of course (May 2010)	Middle of course (January 2011)
	Follow-up (July 2011)	End of course (July 2011)
Interviews conducted	Beginning of course (July 2009)	As control group (June-August 2010)
	End of course February-April 2010	End of course (July 2011)

Table 4: Synopsis of measurement periods (adapted from Rega & Fanni, 2012)

Data analysis

For the quantitative assessment, gathered data was analysed and compared in terms of the level of change in TSE and CSE constructs. This was done by means of statistical t-tests and regression analysis. Results of groups A and B were then compared to determine any correlation between variables. The initial results of these findings will be discussed below. However, in light of the preceding arguments, I shall also motivate why these measurements do not depict the technology-in-education environment in socially explicated terms. Essentially, the quantitative data analysis strategy was created to determine the impact of computer technologies on the *perceived* professional abilities of teachers. It was important, therefore, that these measurements be both implemented and interpreted rigorously.

Qualitative data, gathered through interviews, was transcribed and coded by means of analysis software, ATLAS.ti and NVIVO. In addition, a code manual was developed between the Swiss and South African team members. This helped to establish those common practices that would underline the coding process, thus reducing possible ambiguities. Qualitative content analysis was employed as the primary data analysis strategy. This approach highlighted the primary and secondary (first order and second order) meanings associated with the use of technology. This was later supplemented by critical discourse analysis, though not originally anticipated. All gathered, coded content would be further analysed in terms of mental model techniques. The aim was to develop a constructed shared mental model for each of the two groups, thus inferring comparisons (see Johnson et al., 2006).

Expected outcomes

The data analysis process would ultimately shed light on the question of *impact.* Through the combination of quantitative and qualitative measurements, data would be assimilated to obtain a detailed understanding of technology's influence in educational contexts. Change would be assessed on the levels of professional ability, technical skills development, and social meaning. The information gained through these assessments would help build a more comprehensive knowledge base on which to introduce technologies in teacher environments. From a research point of view, this practice was essential in determining *if* ICTs had any influence on abilities, behaviours and perceptions. And if so, MELISSA would help to illuminate these influences, informing future policies and helping to sustain development priorities in education.

In light of this, several results were envisioned at the completion of the project. These would help protract the broader ICT4D mandate of MELISSA, and seek to clarify the many dynamics underlying the uses and meanings of digital technology. If all three hypotheses – barring locus of control – are tested positively, the team foresaw the following key findings (see Fanni, Rega, & Cantoni, 2013:102):

1. An increase in the technological competencies of teachers (CSE);
2. The increase of CSE influences an increase in TSE; and
3. A change in teachers' perceptions of technologies.

At the time the project was conceived, it was not immediately salient what kind of technological or professional capabilities would arise from attending the MELISSA curriculum. Nor was it evident how teachers would end up perceiving technologies during or after the course. The keyword here was *impact* – any observable change in ability or meaning, positive or negative, would indicate a level of influence. In light of this endeavour, the foremost results attained through the project would include:

- A digital literacy curriculum localised to the South African context. Again, the development of a locally favoured course was recognised by the project team from the outset.
- More than a hundred teachers trained in the use of ICTs. This would extend beyond mere technical skills, and to the integration of technologies for teaching and learning activity.

- Six thousand pupils would reap the benefits of more experienced and knowledgeable teachers. The team imagined this to be a snowball effect, capable of reaching well beyond the sample group.
- The NGO partner, Edunova, will have improved its capacity in developing and delivering ICT content.
- All curriculum material will be made available as open educational resources (OERs) and guidelines.
- An integrated set of impact measures will be obtained through the completion of the project. This will lead to an improved understanding of the effects of ICTs within the educational environment.

All project findings would be disseminated via international peer-reviewed conferences and journal submissions, as well as related project events. For the purposes of this dissertation, leading project findings are presented below. An extended description of findings is available as Annexure 4.

Leading project findings: self-efficacy

Quantitative findings did not convey any salient correlation between the two 'domains' of self-efficacy. Although teachers improved their perceptions of mastering technologies, this did not affect their beliefs as being better (or worse) educators. Both efficacy constructs reflected high values preceding the actual training intervention, however. Educators, then, were already self-confident in their abilities. At best, these findings are partial and decontextualised. The respective qualitative results augment our understanding here. In terms of performance accomplishments, both groups referenced a number of pre-intervention technological encounters. Educators had already employed digital technologies for various purposes in their professional environments. These experiences were positive, for the most part. This may help explain the high 'starting values' for CSE at the beginning of the course for both groups (see Fanni, Rega & Cantoni, 2013).

A singular analysis of quantitative results may have bred the assumption that teachers have had little to no experience with technologies. Qualitative analysis, in contrast, indicated that this was far from the case. ICT-supported teaching and learning practices were present at most of the surveyed schools. This supports further explanations underlying the apparent lack of correlation between TSE and CSE variables. Hence, it is not a matter of whether technological adoption occurs, but rather whether this is a 'conscious occurrence' especially in terms of teacher self-efficacy (Fanni, Rega, & Cantoni, 2013). ICTs were long introduced to teacher contexts – notably via the Khanya programme – but this did not translate into conscious professional development. What, then, was the impact of ICT on self-efficacy, if any?

The research team inferred two possible conclusions from these findings. The first of these denote that a training intervention did not instil an explicit, conscious understanding of technologies as related to educational practice. In this vein, technology was only loosely associated with the educational domain, and could not be integrated within it. Despite a well-intentioned curriculum, aiming to propose the integrative possibilities of technology in the classroom, teachers were not professionally compelled. Certain self-reflections can affirm this point, on which I shall elaborate in the coming sections. Second, teachers did not deem technology to be a distinct tenet of professional practice. In this way, ICTs are tools, methods, or artefacts that do not affect the capability of the educator (Fanni, Rega, & Cantoni, 2013). This leads to the presumption that the introduction of ICT does not inherently (by default) improve teaching practice (ibid.).

At this point, the intellectual puzzle as to the impact of ICT on self-efficacy has been left partly unsolved. Self-efficacy would seem a noteworthy construct in exploring the adoption of ICT at micro educational level. Accordingly, this calls for an integrated methodological approach in teasing out the many constitutive foundations of technology encounters. However, the team recognised that the theory of self-efficacy alone could not recount the myriad practices, understandings, meanings, and motivations underlying the 'ICT experience'. For these reasons, gathered data would be explored via an alternative avenue: discourse analysis. Seemingly, this would explicate some of the hitherto 'unknowns' with reference to the question of ICT impact.

Leading project findings: social meaning

In terms of the social meaning dimension, the MELISSA team pursued a framework of Critical Discourse Analysis (CDA) in determining technological impact. CDA was to be employed as a narrative strategy, and could potentially unearth some of the factors that underpin the technology experience. The results of our intermediate CDA study were structured along three core themes:

dominant discourses (at micro level), contextual factors, and national discourses (at macro level). From these narrative analyses, it was determined that MELISSA-affiliated educators act based on societal belonging. These persons are not 'detached' actors, functioning independently from broader socio-political domains. Rather, they are connected and embedded within larger social contexts, movements and spheres. Within these environments, educators are also 'active agents', with individual experiences, interests, beliefs and political commitments. In this way, macro- and micro-level interplays tend to manifest, which in turn dominate teacher discourses.

Ultimately, the CDA study revealed a number of dynamics that characterise the 'technology in education' context. The research team noted that educators in under-resourced settings valued the (potential) role of ICTs in the primary school environment. Educators publicly and confidently expressed the willingness to adopt and integrate technology into their teaching approach (Bladergroen et al., 2012). However, this apparent confidence was quickly overshadowed by a range of negative experiences, and indifferent attitudes. Given challenging social surroundings, a culture of disrespect, and unsupportive governance, teachers felt disempowered and underappreciated. Despite evidences of determinism and knowledge society ideology, teachers were not afforded the capabilities to integrate technologies in their practice.

Introspection (and the way forward)

Have we finally enabled primary school teachers to become the mediators of digital literacy skills? Did we develop a set of measures to determine and assess the impacts of ICTs in teacher training and curriculum delivery? Moreover, what are these respective "impacts" of ICTs, and do they consider individuals' meaningful engagements with digital technology? We are not yet able to answer such questions definitively. We can, nonetheless, look to our existing analyses within the MELISSA context to evaluate whether we have accurately captured or depicted the ICT experience. We may revisit, briefly, those analytical foundations that have characterised the study of the six participating primary schools.

An ideological impasse

At the outset, the identified schools were sampled from the Metro Central Education District, from a list of existing Khanya schools. This particular district was selected due to its relative proximity to the research teams at both UCT and CPUT. It was believed, furthermore, that schools in this district shared policy, strategy and management processes (see WCED, 2008). There was thus a perceived uniformity across the group of six schools. For consistency, schools

were grouped based on social and environmental characteristics (as I have mentioned earlier in this chapter). The MELISSA methodology, however, was both quantitative and qualitative. Within the quantitative (nomothetic) tradition, it is the obligation of the researcher to ensure that findings can be generalised to its target population (Babbie & Mouton, 2001:277). Representative, unbiased, and generalisable sampling then becomes a critical consideration. In terms of the latter, these elements were not explicitly listed as concerns given the idiographic nature of qualitative research.

These concerns, albeit methodological, introduce a theoretical difficulty: an ideological impasse between the paradigms of rationalism and naturalism. Firstly, the two designated groups for intervention purposes – control (A) and experimental (B) – did not seem to correspond either numerically or socially. Tables 2 and 3 help to explain these complexities. In terms of the control group, Rosmead and Zimasa seem markedly dissimilar. Based on the listed figures, Rosmead has less learners, a better learner:teacher ratio, more computers, and a stable learner:computer ratio. Zimasa, conversely, is a community-driven school and battles with high learner numbers. Equipment at Zimasa is also limited to community donations, and to untimely Khanya contributions.

From experiences at both of these schools, I recognise that these are comparisons on the surface, based on numeric descriptors. Although Rosmead is located in an upmarket region of Cape Town, it serves traditionally marginalised township communities. It is also a landmark in a historically separatist area. Many coloured communities were forcibly evicted from here in the 1970s. In this vein, Zimasa carries much the same history. Located in the oldest Capetonian township, Langa, the school serves a severely impoverished community. The school relies on regular contributions from its community of parents in order to sustain itself financially. These characteristics drove much of the early Khanya philosophy. Schools were under-equipped and starved of resources, financial and educational – ideal recipients for modern technology. Both schools then qualified as future beneficiaries of Khanya laboratories.

The experimental group consisted out of four schools from three different regions in and around Cape Town: Vukukhanye (Gugulethu), Blossom Street (Athlone), Thembani (Langa), and Moshesh (Langa). Several key differences and comparisons can be identified across these regions. Gugulethu, like Langa, is a predominantly Xhosa township, and among the many historically black-designated areas in the Western Cape. Athlone is a suburb in the historic Cape Flats, another designated area for Coloureds and Black Africans during apartheid. Today it is a largely Coloured area, with a population of around 50 000 (see Standing, 2003; Bergman, 2013).

These communities, then, have a communal past. As historical "dumping grounds" for non-whites during the previous regime, such regions are similarly plagued with socio-economic strife; violence, poverty, and ill health persist (ibid.).

For these observable reasons, the four schools in the experimental group are generally under-resourced and -equipped. As Tables 2 and 3 indicate, all four schools are understaffed, with little access to technology resources. Learner:PC ratios are relatively high (between 16 and 20:1) – a natural criterion for participation in the Khanya programme. Overall, as with the control group, schools from the experimental group met the 'disadvantaged' standard as per Khanya needs analyses (Van Wyk, 2002). As for MELISSA, schools located in economically poor regions, and whose catchment areas include communities in these regions, are classified as disadvantaged. These elements collectively define the subject group for the project: six disadvantaged institutions compared in terms of resource access, poor catchment areas, and overburdened education structures.

On the surface, then, it would appear that schools from both groups are comparable. However, this veils the true heterogeneity of each of the six 'education communities'. The population of Cape Town is deeply polarised along race, class, and language distinctions (Standing, 2003). Communities yet present diverse histories, experiences, and socio-cultural norms and values (see Gjerde, 2004). In this way, schools are heterogeneous but not isolate entities, embedded in larger political and educational structures. As the Khanya interviewee stated earlier, "each school is an individual project" – the state must respond accordingly. For these reasons, the generalisability and representativeness of the MELISSA sample group is weakened, giving way to an unconscious sampling bias.

The variability of the sample group accords with the intentions of naturalistic research, rather, with its emphasis on narrative exploration, unpredictable behaviours and processes, and subjective engagement (Kinash, 2010). Non-probability sampling is more suited to such research, and was the overarching strategy adopted in MELISSA. Specifically, purposive or judgemental sampling was applied based on the predefined criteria: access to computer facilities, a lack of e-skills, membership of the Khanya network, and the motivation to take part in the training experience. The participating schools met each of these criteria, although to varying degrees. Ultimately, this process was always determined *purposively*; therefore, the sample was selected based on relevance to the research aims.

The sampling disparity as I have thus far described occurred purely due to reasons of purposive judgement. Methodologically, the balance between quantitative and qualitative approaches is challenging to sustain. This has practical and theoretical implications for both domains. Rationalistically, the experiment/intervention is ill controlled and marred by variable factors and conditions. This affects the ability of the researcher to draw accurate, representative conclusions from the subject pool. Naturalistically, the experiment/intervention is embodied in subjective processes, contexts, and relationships. These are mutually negotiated and inferred from the researcher's own experience (Kinash, 2010). This then represents a critical, ideological impasse between two opposing paradigms.

This impasse reminds of the "key controversies" in mixed methods research explored by John Creswell (2011). Creswell presents two controversies that are of particular interest: the paradigm debate, and the many (confusing!) design possibilities. In the case of the former, scholars have long debated the possibility of 'mixing' paradigms. Sceptics challenge the notion that naturally opposing worldviews (ontologies, realities) can be mixed. The logic being that methods are derived from paradigms – through mixing methods, paradigms are also obfuscated (as I demonstrated above). This view has been described as the purist stance, and is called the "incompatibility thesis":

> Can we really have one part of the research which takes a certain view about reality nested alongside another which takes a contradictory view? How would we reconcile, or even work with, competing discourses within a single project? (Creswell, 2011)

Adherents of the incompatibility thesis hold that the intellectual boundaries between paradigms are fixed and impermeable. An alternate perspective gradually emerged, delinking the relationship between paradigms and methods. This view conveyed that a paradigm justification did not dictate specific data collection and analysis methods (Creswell, 2011). Proponents of this view supported the notion of multiple paradigms, arguing for the healthy tensions and new insights that this would produce (ibid.). Creswell himself supported such views, but suggested that multiple paradigms be related to different phases of the research design. In this way, the researcher 'shifts' from paradigms as the research proceeds. Not all scholars took favour with such an approach and advocated instead for a single, overarching paradigm that corresponds to mixed methods (ibid.).

These debates have been central in the quest for philosophical clarity. Mixed-approach examples such as MELISSA indicate the practical and intellectual challenges that can arise out of imprecise theory-method alignment. The very selection of the sample group has already been to the detriment of the intervention, given the lack of control, representativeness, and generalisability. Such controversy presented by mixed-method research, believes Creswell, is further indicative of discipline fragmentation (2011). From the purist stance, such fragmentation reinforces the philosophical differences among scholars and perspectives. From a non-purist or multi-disciplinary view, these differences enrich the research experience, and provide multiple lenses of insight.

In light of these differences, the mixed method paradigm debate continues. Critics often allege that these methods favour post-positivist thinking over more interpretive approaches (Creswell, 2011). In the case of MELISSA, rather, the interpretive paradigm was dominant, at least implicitly. Another controversy, however, refers to the multiple design possibilities that mixed methods elicit. The "baffling and complex array of research designs", in Creswell's terms, for conducting mixed research can obfuscate the investigative process (2011:278). To simplify the conceptualisation phase, Creswell and colleague Plano Clark suggested a parsimonious set of designs. These consisted of triangulation or convergent designs, explanatory and exploratory designs, and embedded designs.

Creswell's classification system did not mirror the complexities of actual practice, but was thought to be sufficient for the novice mixed-method researcher. This also contributed to a typology approach in mixed design, entailing interactive dimensions: the purpose, the conceptual framework, the questions, the methods, and the issue of validity (Creswell, 2011). Such dimensions are thought to enable a more expansive conceptualisation of mixed method design. Hall and Howard (2008) offer an alternative – the synergistic approach. Instead of weighing the influence of quantitative and qualitative design, their value and representations are equally significant. Similarly, the ideologies of objectivity and subjectivity are balanced. The synergistic perspective corresponds to the 'critical approach' later propagated by MELISSA researchers (Fanni et al., 2010).

Ultimately, the practical enactment of mixed method research is not without controversy. Guiding paradigms are often fragmentary, representing a misalignment between theory and method. This hampers the ensuing research design, which is confused in light of the numerous and complex methodological possibilities. The MELISSA project had become entangled in the first of these controversies, being unable to discern an overarching, guiding paradigm. An interpretivist or

naturalistic stance seemed to guide the conceptualisation phase, despite clear rationalistic ambitions. This has bred an ideological impasse, which has characterised the primary project findings, both unwittingly and undesirably.

However, the research team later regarded blended methodologies as necessary and mutual counterparts (Fanni et al., 2010). These are naturally counterbalanced in understanding the dynamics of technology in education, and in illuminating "previously unknown" or "dark" elements of data (ibid.). Mixed methods, then, represent a critical approach to measuring e-learning impact in disadvantaged contexts (Fanni, Van Zyl, & Rega, 2011). That said, the theoretical discrepancies that thus far exist challenge our fullest understanding of the ICT4D experience. Reflecting on those theoretical and intellectual ambitions that have guided MELISSA, we begin to recognise the many challenges that underpin such inquiry. I hesitate to label these challenges as critical shortcomings – rather, the introspection of ideology enables us to explore the deep nuances of our research action. This hopefully builds toward an *emancipated* context of inquiry, in which the study of people and technologies is enhanced. In concluding this chapter, let us now reflect on some of the 'analytical constructs' used to discern the impact of e-learning.

Attitude, discourse and the journey to a symbolic narrative

Two foremost theoretical vantage points guided the MELISSA enterprise: the role and influence of self-efficacy, and the narrative exploration of discourse. The former was hypothesised to manifest in the form of teacher (or professional) self-efficacy, and in computer (or technical) self-efficacy. The latter would reveal prevailing discourses – everyday conversations, talk, speech – reflecting the micro social order. Jointly, these perspectives would produce an understanding of individuals' perception of and dealings with technology. This knowledge would lead to an expansive model of social meaning, depicting the engagement with the information society (optimistically!). In light of these ambitions, I believe the constructs of 'self-efficacy' and 'discourse' to be limited in the full appreciation of social meaning.

At closer inspection, the construct and theory of self-efficacy contains, like any theoretical pursuit, a number of discrepancies (see Marzillier & Eastman, 1984). In terms of the broader MELISSA endeavour, this pursuit did not yet reveal a definitive answer to the question of *impact*. We do not yet know, consequently, the precise (psychological, behavioural, social) extent to which ICTs have permeated the teaching and learning environment. Early findings revealed an unsteady progression of efficacy, without any statistical significance and marred by problematic

sampling. An analysis of primary efficacy sources did reveal the occurrence of ICT-supported teaching and learning practices. These seemed to manifest unconsciously or at least outside the domain of discernible efficacy impact, however.

Moreover, the attempt to depict the technology-in-education experience via critical discourse also lacked nuanced theoretical application. At its core, CDA conceives discourse as a social phenomenon and seeks, consequently, to improve the socio-theoretical foundations for situating discourse in society (Blommaert & Bulcaen, 2000). These goals were not implicitly formulated in our MELISSA study, although this may have been the explicit case: "A critical approach adds to our practical and theoretical understanding of educators' roles in ICT interventions. Findings from this study contribute to the development of evidence-based policies in ICT intervention" (Bladergroen et al., 2012:108). Although the study revealed findings of academic interest, these were not analysed in view of those "complex social systems" (Brown, 2010) and dimensional intersections (Fairclough, 1995; 1999) that encapsulate discourse.

Such constraints are indicative both of the ideological impasse we referred to earlier (rationalism versus naturalism; inductive versus deductive) and of the inherent shortcomings of CDA. Although there have been, and continue to be, a great number of critics of CDA, essentially they are all concerned with asking, from their several perspectives, the same fundamental question: 'Does CDA produce valid knowledge?' (Haig, 2004). This is based on the varied claims that the critical analysis of discourse itself obfuscates key concepts and models: what is precisely meant by discourse, text, structure, practice, and mode. These and other "philosophical foundations" (ibid.) are taken for granted, as if they were unproblematic. This general fuzziness is not helped by the rhetorical use of concepts from social theory (Blommaert & Bulcaen, 2000).

In the effort to synthesise these analytic avenues, we may build towards a convergent perspective – one that depicts the 'impact of ICT' in deeply nuanced terms. I label this the 'journey toward a symbolic narrative'. Within this narrative, we seek to understand and portray a series of technology experiences as encountered by primary school teachers. Such encounters, as we shall come to understand, are not mere utilitarian representations or loose associations. Rather, they are meaningfully embedded in a broader narrative of symbolism – one that eventually defines and localises digital technology in teacher practice. Ultimately, such a narrative does not depart from the constructs of attitude and discourse: it serves to expand the underpinnings of our existing study. Let us now consider these arguments.

Chapter VI – The MELISSA experience: journey towards a symbolic narrative

This chapter, as an extension of Chapter V, presents the second core part of the MELISSA experience. This is a deeper, more nuanced analysis of some of the project's key findings and thematic areas.

The author builds toward an integrated conceptual framework in the tradition of social meaning. Such a framework considers and negotiates the principles of symbolic interactionism in discussing foremost 'technology encounters'. To accomplish this, the author firstly reflects on those systems of social relations that characterise teachers' lifeways.

Second, the author positions the 'meaningful encounter' as both an applied and a theoretical construct, with much significance for the ICT4D domain. He positions this within the global, meso, and micro systems of meaning, and discusses the symbolisms that accrue throughout these domains. These operations converge in a symbolic narrative: one that locates and deepens the technology encounter. The author then reflects on the value and relevance of these insights in relation to the initial intellectual puzzle (research problem) of this analysis.

The diversity of contributions of this treatise is finally discussed. The author relates these within key reflections that espouse the overall intellectual pursuit. A critique against interactionism is also discussed.

The aforementioned elements have been presented and discussed in the following papers (co)authored by Izak van Zyl:

- Bladergroen, M.C., Chigona, W. Bytheway, A., Cox, S., Dumas, C., & Van Zyl, I. 2012. Educator discourses on ICT in education: A critical analysis. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 8(2): 107 – 119.

- Van Zyl, I.J., & Rega, I. 2011. Critical approaches and varied impacts: Understanding the role of educational technology in disadvantaged schools. *Proceedings of International Development Informatics Association (IDIA)*, 26-28 October. Lima, Peru: School of IT, Monash University.

Systems of social relations: positioning the teacher realm

"Systems of social relations consist of patterns of roles, relationships, and forms of domination according to which one might place any given person at a point on a complex grid that specifies a set of categories running from class, gender, race, education, and religion, all the way to age, sexual preference, and position in the family." (Hays, 1994:65)

I have devoted considerable time in discussing and reflecting on the MELISSA experience. But this is a parochial reflection, only to frame imminent issues that require further consideration. Up to this point, I have explored the original ambitions of the project, its foreseen research plan, and its expected results. I proceeded to describe its leading findings, both in the quantitative (self-efficacy) and qualitative (discourse analysis) domains. As both an investigator and course facilitator throughout much of the process, I recognised that these elements do not depict the ICT-for-education experience satisfactorily. Apart from a tentative discourse analysis, furthermore, the concept of 'meaning' has not assumed a central role in the MELISSA enterprise.

The journey toward a more extensive inquiry is thus underway. Essentially, this entails a transition in methodology from intervention-based action research to a naturalistic approach, re-emphasising the role and extent of meaning (in its many manifestations). Furthermore, this also creates a transition in theory, from loosely arranged psychological and semantic analyses, to an integrated, symbolic narrative. Furthermore, in light of some of the local understandings of ICT, I am guilty (victim?) of two subtle misdeeds.

Firstly, I presented teacher responses (in Chapter V) beyond the context of critical interpretive inquiry. This has resulted in an abstract depiction of 'discourse', void of the nuances of social interactions and meaningful encounters. This implies, furthermore, a certain static, or absolute, representation of teacher narratives – definitive and final views, incapable of change. Second, I offered a rather exotic portrayal of teacher narratives. In keeping with the tradition of Said's Orientalism (1978, see Chapter III), the attempt to 'know others' through academic inquiry is often confounded by essentialism. Because of the static, contextually removed representation of teacher narratives, we risk fixing boundaries between the researcher ('onlooker') and the subject ('exotic other').

Ultimately, the portrayal of research participants, of their plural realities and subjectivities, warrants critical consideration. The many accounts, experiences, and attitudes thus far expressed, require social context, and theoretical depth. For example, those instances of technological determinism, of globalised views, of disempowerment, and of productivity, do not (should not!) exist as singular exoticisms. Information technology is global, functional – this is surely a common and implicit belief? Do we attach special meaning and purpose to otherwise redundant expressions/discourses of techno-enthusiasm (see Bates, 2000)? Are expressions of the many utopias and dystopias of information technology equally surprising (see Wellman, 2004)? Or do we perceive, in these expressions, a modernity bias, in which information becomes hegemonic and deterministic?

I return to these matters in due course. For now, the very social manifestations of ICT – and their characteristics – are embedded in larger cultural, political, and ideological structures. The (*re)presentation*, then, of such elements needs to depict these structures, as presented in the social worlds and plural realities of study participants. For this reason, and in the effort to advance a fuller understanding of the 'digital technology experience', I intend to journey deeper. This warrants a discussion around the systems of *social relations* and of *meanings* that underpin the lifeways of our teacher community. These systems help define and position the social order to which individual agents enrol and which, in turn, helps shape their social experiences (Hays, 1994). An emphasis on these foundations will also shed light on the meaning framing/creation process of individual agents.

Knowledge facilitators, social workers, engagers

The concepts and theories employed by scholars and analysts are only useful to the extent that they clarify the everyday activities in which individuals are engaged (Manning & Smith, 2010). For this reason, the many local 'understandings' of digital technology do not exist as absolute representations of reality. Rather, they are anchored in the empirical world, and are defined by those individual and group behaviours that typify daily life. It is not conceivable, however, to describe the many actions, behaviours, or in Blumer's terms, "multitudinous activities" of those participants in this study (1969:6). Yet, I did observe a particular 'teacher realm' that seemed to emerge within the primary school community.

Generally, teachers, managers, and learners engage in the ebb and flow of everyday primary school life. This life is guided or shaped by an overarching educational directive, as denoted by the national vision for education (see the 'Action Plan to 2014', Department of Basic Education). Broad-based policy, however, does not necessarily encapsulate the many roles and activities that characterise school life at the grassroots. When queried on his daily activities, one senior educator at Rosmead described his routine functions:

- Educate;
- Inform students about the technicalities of growing up;
- Up skilling the students to help them to be productive;
- Social work counselling [for] both parents and students;
- Moulding the students and help them see opportunities;
- Help them deal with the results of the social circumstances and [the] political climate, and [help them] rise above all that.

  (Deputy Principal at Rosmead)

These functions reveal the diversity of the teacher realm at primary school level. Teachers are not reducible to '*teachers'*, bound to stale classrooms and chalkboards (admittedly, a horridly essentialised notion!). Rather, their duties range from being knowledge facilitators, social workers, and engagers. The same individual at Rosmead elaborated on his responsibility to learners:

> At Grade R, they come in as 'clean slates' that have different languages, cultures, beliefs and have only been exposed to their families. So we then help them not [to] operate from ignorance and fear about each other, and help them transition to accommodating each other.

Much has been written about the role of educators in modern pedagogy – I do not intend to labour the point. These expressions from a MELISSA respondent, however, convey the miscellany of social actions in the school environment. Teachers very much fulfil secondary parent functions, and guide students in dealing with their surroundings. They harness and mould those crucial skills learners would require in becoming productive members of the (knowledge) society. Educators also act as counsellors, helping students transition from positions of "ignorance and fear" to positions of accommodating and integrating diversity. Essentially, this diversity of acts / activities / behaviours epitomises the social lifeways and educational functions of teachers:

> I try by all means to give whatever I've got to put it through to the learners as much as I can. (Teacher at Zimasa)

> Most of the students have been traumatised. I majored in Psychology and linguistics, so I am comfortable counselling students. I also talk to them because I want to see them achieve their goals. (Teacher at Thembani)

Teachers – or more sensibly, educators – regard themselves with obvious holism: beings that are central to the pedagogical process, and to the socialisation of youth. They are required, quite naturally, to possess skills and capabilities that far exceed their training. Within the interactionist perspective, these systems of social relations – of realms – define much of group life. Such relations are embodied empirically as facets of the social environment (Manning & Smith, 2010). It would then seem, rather evidently, that the introduction and use of technology would always be contained within the idiosyncrasies of everyday relations. In this vein, does a computer laboratory, or a digital device, or the internet, advantage teachers as trauma counsellors, as knowledge facilitators, as social enablers? Can the application of ICT4D somehow be conducted within these realms?

Interactive domains

An innate component to the teacher's system of social relations is interactive domains (Blumer, 1969; Hays, 1994; Sassen, 2013). This refers to the rather apparent notion that group members socially interact with one another. Human conduct is formed in interaction:

> Group life necessarily presupposes interaction between the group members; or, put otherwise, a society consists of individuals interacting with one another. (Blumer, 1969:7)

Interaction is not simply the medium in which social forces or psychological properties are expressed (ibid.) – rather, it is an embodied function in its own right. Any productive discussion about teaching and learning practices, therefore, must be grounded in concrete analyses of the diverse interactions that go on in classrooms and other educational settings (Säljö, 2012). This emphasis on interaction in the educational space reminds of the influential premise by philosopher John Dewey: "education is a process of living and not a preparation for future living" (1897:78). If we follow this Deweyan principle, the social-scientific pursuit should take us into the daily lives of teachers, students and others as they engage (interact) in joint activities (Säljö, 2012). This exploration opens up a more differentiated view of the pedagogic process, as a social, interactive, and personified environment (ibid.):

> Yes, yes. And we help each other, I've got other teachers that are more knowledgeable than me or I've forgotten something, you know? I can just ask and they will come and assist me, so we assist each other when we're in a lab and doing something. We're very excited about it and we like to work, sit and work in the lab and doing IT. Working together. (Teacher at Blossom)

> I am getting learners to be involved in a lesson so they can learn the meaning from the lesson. They get active involvement in a lesson. (Teacher at Rosmead)

> I am no longer enslaved to the use of the textbooks, I tend to be more into using things like the Internet as I get more current and up to date examples of the concepts I might be teaching which helps the students appreciate the relevance of the topic in their everyday life. (Teacher at Rosmead)

> The principal activities that are I am involved in are social work. Like, I spend a lot of time counselling students who come from broken homes, have been victims of rape, violence. (Teacher at Thembani)

Social interaction, however self-evident, is both a definitive and diverse function in the daily lives of educators. The above examples are minor representations of those interactions that characterise the teacher's daily experience. Barring the many frustrations of teaching politics and technology resources, teachers interact as mediators of information skills, as peer-to-peer supporters, as social counsellors, and as self-guided learners. This latter engagement refers to human-computer interaction – a seemingly extended characteristic of the Deweyan educational life process. Collectively, these interactions are inseparable from those teacher functions, behaviours and activities thus far explored.

Successful social interaction contributes to a greater sense of community, increased learner motivation and enthusiasm (Newman, Olle, & Bradley, 2012). Among both learners and educators, peer-to-peer interactions contribute to strengthened critical thinking and problem solving skills as outcomes. Peer collaborations facilitate the co-construction of new knowledge, which is the primary goal in education (ibid.). In light of these engagements, the primary school manifests as both an active and *inter*active education society. It follows logically that both the meanings attached to and the dealings with digital technology stem from the everyday interactional practices that embody this society, inter alia (this will be discussed with reference to Sassen, 2013 in following sections).

Blumer offers additional insight in social interactional practice, and presents two forms or levels of interaction in human society. He refers to these in Mead's earlier work, respectively as the "conversation of gestures" and the "use of significant symbols". Blumer terms these as "non-symbolic" and "symbolic" interactions (1969:8). The former takes place when one responds to an

action (bodily movements, expressions, tones of voice) immediately or unreflectively without interpreting that action. Symbolic interaction is a process of reflective identification or interpretation of an action. Stated differently, this is the characteristic and implicit process of seeking to understand the meaning of each other's action.

Ultimately, the association between people, groups, and objects exists in the form of social interactional practices. This is predominantly manifest on the symbolic level. As individuals, collectives, or objects are encountered, social beings take account of the presented action, and so formulate their own action. Both individual and joint conduct is formed in and through this on-going process – they are not mere expressions or products of thought. By virtue of symbolic interaction, human group life is necessarily a formative process and not a mere arena for the communication of pre-existing factors (Blumer, 1969:10). I examine this process more closely in the section titled *Systems of meaning.*

The nature of 'objects'

Any system of social relations also contains a series of object types (see Hays, 1994; Blumer, 1969). MELISSA respondents encounter these in various capacities:

> Mostly I use computers here at school to research the lesson I will be presenting. (Teacher at Zimasa)
>
> Yes, we do use communication channels especially email. We don't encourage SMSs because especially when you are a language teacher, learners they use those SMS language. So you make sure when you are busy with email you try to be [as] formal as possible. (Teacher at Zimasa)
>
> They use cell phones. They use cell phones quite a lot, but I'm not sure about the scanner and other things. But you know what, one time I said to them last year: "What can you do if you don't have access to the internet?" They said, "We do have cell phones. We can search for the information." Then I said to myself, "these kids are very clever because really, instead of going to Mxit, the can use it." (Teacher at Rosmead)
>
> I go for Facebook, for research. Like my daughter is doing Matric, looking for dresses, looking for hairstyles. I don't go for music. I go for educational purposes like if I need any information I just go there. And meeting different people from everywhere. (Teacher at Moshesh)

> No but things like Mxit, because one of my colleagues told me that her child messed up her mind because she was so Mxit-focussed. Even if the child is washing the dishes, she would have the phone on the other side up. One day that phone fell in the sink then the parents said "yes thank you God, now my child will concentrate". So that is thus a bad thing. So I have this bad conception about Mxit and whatever. Although my daughter is Mxiting her friend. (Principal at Vukukhanye)

Digital technologies consist of both physical (hardware) and non-material (software) objects. Social objects are also perceived: learners/students, children, teachers, friends, and colleagues. Abstract objects are encountered as conceptual or notional phenomena: research, communication, encouragement, relief, the judgement that "kids are very clever", the belief that Mxit is a "bad thing", and the like. In these observations, I could not explicitly differentiate between abstract objects and their associated meanings. An abstract object such as 'functionality' (using computers for administration or research), then, also indicates the implicit meaning of such an object (in this case, its functional value).

The nature of objects is determined by the meaning it has for the person for whom it is an object (Blumer, 1969). Such meanings are attributed or shaped through social interactions. Thus, the associated meaning of objects arises fundamentally out of the way they are defined to a person by others with whom he/she interacts. This meaning sets out the way in which an individual perceives, acts toward, and communicates about an object. Objects, therefore, become frames of reference for behaviour, for action, and interaction. The same object – in its physical or notional form – may represent different symbolic associations for different individuals. This is an obvious but understated point. Consequently, a physical object like a personal computer may simultaneously imply feelings of 'function', of 'fear', and of 'power' (as in our prior MELISSA examples).

Social interaction is a salient feature in the process of meaning-making. Out of a process of mutual indications (gestures, expressions, acts), common objects emerge. These are objects that have the same meaning for a given set of people, and are seen in the same manner by them (Blumer, 1969). This commonality may explain some of the universal meanings associated with digital technologies: functionality, ease of information access, efficiency of communication, empowering, globalised, and the like. Some of the foremost local understandings of ICT share a common framework of meaning (for example, the many positive associations with technology as a teaching and learning enabler). However, the very social and interactionist basis of such meanings can invoke an array of perspectives, thoughts, and symbolisms.

Introspective realms

Considering our MELISSA exploration, we observe the emergence of a dramaturgical self (Goffman, 1959) across interrelated levels:

> It enlightens me, there are so many things that I have learnt that I thought I knew. Most of the time with the computers, we did the ICT with Khanya there are things that we have learnt but they [are] still haunting me. But now with the MELISSA project, I used to browse on my own most of the time, now that I am doing this thing with MELISSA I have learnt more now, things that I thought I knew only to find out I don't know them. (Teacher at Zimasa)

> You must deal with the learners in the mainstream, and you must also deal with those learners who are a little bit gifted, you know? So you must be a jack-of-all-trades, you must help each and every one, and that is a huge challenge especially in this time. Where I am teaching now, I sit with a class of forty-eight learners and that is not an easy task. (Teacher at Rosmead)

> But parents nowadays [do] not care. But if I think about myself, I was also a working parent, teacher or not, I was also a working parent because you know afternoon when I came home from school I had to see to my kids, I had to see that they have to do their homework, their school work. I had my own work to do. (Teacher at Blossom)

These statements warrant further consideration because of their reference to the 'acting self'. In the first instance, the particular respondent assumes the role of a discrete individual on what Goffman terms the 'play stage'. The person recognises her lack of skills and knowledge in terms of using computers. She recognises too her inability to understand the many concepts acquired during Khanya training. And she attributes the MELISSA programme as being informative, to the extent that she is 'enlightened'. The respondent at Rosmead, conversely, refers to her broader capacity with reference to a discrete, organised group: the teacher. She speaks of the (ideal?) educator as being a "jack of all trades", and of her own challenges as a teacher in a resource-limited environment.

The respondent at Blossom refers to 'parents' as an abstract or external community. She indicates that this community "does not care", and laments their lack of involvement. She positions herself within this community as well, referencing her past responsibilities as a working parent. On this level, the 'generalised other' (Goffman, 1959) is reconciled with the individual self. Ultimately, these examples are minor indications of the layered self as a dramaturgical organism. An important matter that stems from this fact is that the individual is enabled to interact with him/herself. Blumer regards such interaction as being inherently *social* – a form of communication or indication that gives meaning to objects and directs action (1969:13).

The self as acting organism (and inward object) departs from the view, common in the social sciences, that the person is wholly driven by psychological properties or social structural factors (Manning & Smith, 2010). From earlier observations, we may perceive of the individual teacher as a profoundly social being, in the sense of an organism capable of deeply interacting with itself. In this way, we depart from pure structural functionalist and psychoanalytic views. I do not dismiss biological psychology and its emphases on impulses and unconscious processes, however. The cross-fertilisation of such dimensions (see Chapter III) extends our interactionist orientations and allows for the emergence of 'introspective realms':

> I would like to learn more. I found that I am now able to do things which I could not do on the computer, so I am always looking forward to the sessions to learn more. I do take my time – I am slowly learning. You know I have a computer at home so when I learn something I go home and practice. I am getting better and better. (Teacher at Rosmead)

> What I can say is that teaching as a profession for me was [a] good idea, in as much as that all my interests were based in teaching as I am so talkative, I'm not shy. I can be able to explain everything to the learners. I want learners to be confident so as to become critical thinkers and future independent. (Teacher at Moshesh)

Ultimately, the teacher is – as hopefully everyone else! – the possessor of a self or an identity. Very simply, this means that s/he can be objects of their own reflection (Manning & Smith, 2010:39). Within the interactionist tradition, individuals do not only react to the actions of others, but also respond to these via symbolic indications (expressions, gestures, speech). These function as interpretive interactions, in which meaning is assimilated by the 'self'. The self is not an esoteric distinction; rather, it denotes that a human being can be a purpose of his/her own action (Manning & Smith, 2010). The individual may for example recognise him or herself as a student, or in a teaching profession, young in age, from a particular family, with certain goals and ambitions in mind. The human self is an object to himself, and acts toward others on the basis of the meaning ascribed to this object.

Action: interpreted relationships

The nature of human action is essentially characterised by interpretive inquiry. Through this process, meanings are ascertained and individual action is constructed. The narrow symbolic interactionist stance departs here from the view that human actions are (solely) determined by motives, attitudes, need-dispositions, and situational demands (Manning & Smith, 2010). These initiating agents do not necessarily account for the enabling function of the social being: self-interaction and processes of interpretation. As per Chapter III, experiential meanings are modified through an interpretive process used by persons in dealing with the things they encounter. The person interprets a flow of contingent situations, and remakes his social world continuously.

In his seminal work, Blumer did not intend to analyse such processes of interpretation or self-interaction – perhaps due to its methodological unfeasibility (see Snow, 2001). Rather, he intended to call attention to its presence and operation in the formation of human action: "one has to get inside of the defining process of the actor in order to understand his action" (Blumer, 1969:16). With reference to MELISSA, I embrace this view, particularly, and agree with Blumer as to the significance of interpretive action. It remains central in our study of those social and cultural dynamics that undergird the technology-for-education experience. This is relevant too when considering joint or collective action: individuals fit their lines of action to one another (ibid.). In our MELISSA example, the interpretive function was evident in the Bandura-related constructs of mastery and vicarious experience:

> And then it makes the teaching to be effective because learners will know that you're just teaching a story. But as I'm teaching natural science, which is part of biology, and when you're talking to students like about molecules and atoms sometimes they don't understand what-what. Once you bring them into the lab they see this is how it works and it's clear they come back and they can imagine everything themselves. (Teacher at Moshesh)

> For learners they are very excited when it comes to [the] computer. They are on top of the moon, they enjoy it, there are no lazy learners. They also help each other. I do also enjoy it and I don't have a problem. (Teacher at Thembani)

> Digital technology? Microwave, camera, DVD – I don't know whether television forms part of that. Even the watch. For the information: from the television I got information. When I put a DVD [in]...I can type the DVD and then I have the information. (Grade R Teacher at Vukukhanye)

At the risk of over-reduction, the examples above depict some of the foremost interpretations in terms of digital technology encounters. The respondent at Moshesh interprets the "lab" to be a positive learning enabler; one that releases the imaginative capacity in learners. He refers to its interactive benefits when instructing natural science. The respondent at Thembani shares this opinion, and relates her learners' excitement to the use of the "computer". With reference to both these respondents, there exists an *interpreted relationship* between digital technology and interactive, excitable instruction. I quote two positive correlations in this case, but negative instances are plentiful (Chapter V).

The respondent at Vukukhanye mentions a somewhat different understanding of digital technology. She wonders whether objects like the microwave, the television, or the watch can form part of its classification. She does however associate the process of obtaining information to the DVD media form. This again exhibits an interpreted relationship between a digital technology and its beneficial outcomes (in this case, seeking information). Ultimately, the root image of interpretive human action is one that resonates with our MELISSA example. Its significance to social interaction should not be understated – this is a definitive characteristic of the theory. Broadly, however, this precept does not distinguish symbolic interactionism from other intersecting perspectives (Manning & Smith, 2010).

Interlinkage of action

As a definitive dynamic within systems of social relations, actions are fitted together as shared or common productions. This links with the tradition of Emile Durkheim, and his associated notion of 'joint action': the group and its norms are seen as "continuously reconstructed products of human interaction" (Remender, 1990:343). Fundamental, for Durkheim, is the perception of the *symbol* as key emergent within the domain of joint action (ibid.). I will discuss this notion at a later stage, with specific reference to its role in distinguishing man as an inherently cultural, human creature. For now, the interlinkage of action denotes the established, routinised and predictable organisation of social acts.

I wrote earlier of Blumer's church service example: the clergy and congregation become very familiar with the behaviour that is expected of them. Such behaviour is normative and institutionalised as the joint action of a collectivity. The collectivity, in turn, is an interlinkage of the separate acts of the participants (Blumer, 1969:17). Thinking of our MELISSA case, the salient collectivity can be imagined as the educational institution – the primary school. This nature of this organisation is not determined by the loose arrangement of actors and acts. Rather,

as I have stated prior, the primary school is the institutionalisation of an educational (pedagogic) directive. As such, it is guided by the national vision for education, as per the Action Plan to 2014 (Department of Basic Education, 2012).

Participants in the primary school collectivity become aware of the conduct and responses that are expected of them. They engage in joint action that is repetitive and stable; they share common and pre-established meanings of what is expected in their actions (see Bladergroen et al., 2012). They are able to guide their own behaviour by such meanings. Conversely, meanings are not created or interpreted universally. It is thus foreseeable that many participants (teachers) may understand and approach their environments differently. The common purpose of such an environment, however, remains universally positioned. Through interactional practice, and the interlinkage of action, this purpose is gradually reinforced.

A key observation in the recognition of interlinked action is the extended connection of actions that make up much of human group life (Blumer, 1969). This pertains to large(r), complex networks characterised by an interdependency of diverse actions and diverse actors. Examples of such networks include the national and international division of labour, the processes of government, the economy, and industry. These networks are manifest as routinised and regularised operation: a large "complex of diversified activities" (Blumer, 1969:19). They also allude to the notion that human group life resembles that of a 'system', or a collection of interrelated processes. In the case of MELISSA, I have begun to think of this collection as a complex ecology; one that contains a diversity of technology encounters. More on this in the section – *Systems of meaning.*

The 'ideal' system of relations

Before we study the individual production of meaning, I need to summarise the nature of the social world as it relates to our MELISSA respondent group. In this case, it is worth discussing the state-endorsed vision of a post-apartheid schooling system. This is an external directive (expectation) which positions the 'ideal social order' of teachers, learners, and their counterparts in the year 2025. Those current understandings and implications of this world, as I have briefly discussed, are not of necessity aligned to the vision of an emancipated school community. The feasibility of this vision is beyond the scope of this research. Its accumulative achievement, however, along with those interactional practices and interpretive actions that are required to fulfil it, is worthy of brief consideration.

The Department of Basic Education structures its vision for 2025 along the various stakeholder dimensions in the education community: learners, teachers, principals, parents, learning/teaching materials, and school facilities. Let us describe these dimensions in brief (adopted from the vision document, 2012:46-47).

Learners who attend school every day are on time, and want to come to school. There are consequences to missing school. Learners understand the importance of doing their schoolwork. The school is accessible to them, and the school will do everything possible to get them to learn what they should. Much learning happens through the use of computers. From Grade 3 onwards, all learners are computer literate. Learners want to come to school knowing they will meet their friends in a secure environment, where everyone is respected; they will get a good meal; they know they can depend on their teachers for advice and guidance; and they are able to participate in sporting and cultural activities organised at the school.

Teachers continuously improve their capabilities, and are confident in their profession. Teachers recognise the importance of their profession in the development of the nation. They do their utmost to give their learners a good educational start in life. Teachers are satisfied with their jobs, and know that their employer is sensitive to their needs, both personal and professional. Remuneration and working conditions are decent, and similar to what one would find in other professionals.

School principals ensure that teaching takes place as it should, according to the national curriculum. He/she understands their role as leader whose responsibility is to promote harmony, creativity, and a sound work ethic within the school community and beyond.

Parents are well informed about what happens in the school, and are keen to be involved in school affairs. Parents receive regular reports about how well their children perform against clear standards that are shared by all schools. Parents know that the principal or someone in the department will listen to them and take steps to deal with any problems.

Learning and teaching materials are in abundance and of high quality. The national Minimum Schoolbag policy, which is widely understood, describes the minimum quantity and quality of materials that every learner must be able to access. Computers in the schools are an important medium through which learners and teachers access information.

School buildings and facilities are spacious, functional, well maintained, and safe. Learners, teachers, and the school community look after their buildings and facilities because they take pride in their school environment.

Vision 2025 presents an educational milieu in which the core stakeholders (teachers, learners, parents, and the like) act and cooperate in a state of harmony. Significantly, this environment represents the well-balanced interaction of social and material elements. Schooling 2025, then, extends beyond improving the quality of teaching and learning. The fundamentals of basic education will encompass early childhood development, and the integration of computer-assisted learning. The general school environment – buildings and facilities – will need to cater for the ambitious, organised, and committed learner. At this point, the feasibility of such a vision is debatable. Nevertheless, this type of plan reveals an ideal state of educational affairs in the not too distant future.

Synopsis: A social logic of relations

From the above, we may depict a social logic of relations. This offers a synthesis of the interconnected 'teacher realm'. As our exploration revealed, teachers are predominantly knowledge facilitators, engagers (or enablers), and social workers. These position them as holistic educators. Furthermore, they are individuals in their own right, evidenced by introspective realms. Teachers are possessors of 'self', and of 'identity'. A number of object types are also present here, ranging from conceptual (students as 'enthused'); social ('parents'), and physical ('computer'). Other types may or may not be present, depending on the context of inquiry. Finally, these dynamics are negotiated through an interactive domain, in which teachers, other individuals, objects, roles, and activities are embedded within a broader system. I refer to this as a normative system of social relations, as both the product of interaction, and as the producer of it.

Significantly, this system is neither fixed nor bounded by its environment. It is, seemingly, transient. Roles, activities, objects, identities – these are all fluid, dynamic, and transitory. Many teachers in fact speak of 'change' and of how it shapes their environment (for better or worse):

> [My approach to teaching] has changed also because sometimes when you've got access to the Internet you don't have to go and look for books or all the information. You can get in front of the computer without stressing too much because it takes longer in terms of which book or which topics you need. (Teacher at Moshesh)

> My feelings are mixed up: the change of curriculum, everything, workload… The way the curriculum changes makes you to be unstable and sometimes you are doubting yourself. (Teacher at Thembani)

> I like teaching very much, but now there are complications and frequent changes that we were not trained on. Sometimes a person is given an area in which she/he was not trained on and then it becomes difficult, especially when you have limited time to master that new area. (Teacher at Zimasa)

Revisiting our earlier discussion, a hyperconnected landscape instils a number of systemic changes throughout the modern workforce. Despite these schools being socio-economically disadvantaged, they too encounter the dynamism of global educational practice. The local profession is subject to this global transition. Thus, new, diverse, and altogether different systems of social relations will be generated. This may be illustrated by depicting a 'grid-like' logic (see Hays, 1994): one that is multi-dimensional and divergent. Within this dimensional system, teachers also produce (and are produced by) systems of meaning. Tangibly, these manifest as 'encounters'. Let us now concretise some of these observations.

Systems of meaning: culture as the embodiment of shared symbols

As I have thus far determined, the world of the teacher represents a complex interplay between systems of social relations – interactional practices, object types, human actants, and interlinked actions. It is not clear, therefore, to which extent an ideal vision – propagated by the national government – will incorporate the social complexity of its educational community. For teachers, the idyllic nature of education in 2025 may seem unfathomable, given those interpreted and actual encounters they experience daily. In light of a greater pedagogic vision – the idealistic positioning of different stakeholders – it becomes necessary to concretise the interpreted reality of MELISSA respondents.

Central to the interactionist principle is the notion that human life is community life; that human life is thoroughly intersubjective in its essence (Prus, 1996). Individual behaviour, for Prus, cannot be separated or understood in absence of the community context in which people live. In Chapter III, I made explicit reference to this point: humans derive their social essences from the communities in which they are located (ibid.). Human communities, furthermore, are contingent on the development of shared symbols, meanings, and activities ('joint action'). The embodiment of shared symbols develops as culture (see Geertz, 1973), or as cultural frameworks. Culture, in this way, becomes both a process of social interaction and a product thereof (Hays, 1994). The manifestation of culture as an intersubjective recognition of symbols – collective experience – means that there can be no self without the (communal) other:

> At the heart of the sociological enterprise is the idea that human behaviour is the product of community life; that people's behaviours cannot be reduced to individual properties. (Prus, 1996:2)

I take particular cognisance of the role of culture in creating and sustaining the 'community life' or the 'social order'. One's position and role within this order is contingent on the acquisition of a community-based language (see Prus, 1996; Geertz, 1973). It is in the process of acquiring this language, and interacting with others, that humans begin to attain stocks of knowledge, or develop minds (abilities to learn, think, and create) (ibid.). In Chapter III, I wrote of Geertz' pattern of meanings (1973), and of the many signs, symbols, and denotations that characterise the 'meaningful encounter'. I wrote of Goffman's frame analysis (1974) and of the organisation of experience, as the validation of identity in social interaction. The recognition of interpretation, and of meaning, becomes central in the lived, human experience.

Within the MELISSA context, the dynamism of culture may also manifest through organisational modalities. Since the early 1990s, information technologies have elicited considerable interest within organisation scholarship (Prasad, 1993). And within the context of technological change, organisational cultures reveal a diversity of symbolic processes. I distinguish between these across static and dynamic levels. At a macro static level, the national government invokes a culture in which technology is considered an empowering tool (see Cantrell & Visser, 2011). At a micro and dynamic organisational level, this can be appropriated across diverse modalities: school management, infrastructure, pedagogy, and studentship. Seemingly, primary schools as organisations possess cultures of norms, behaviours, and expectations. These are likely to affect the meaningful encounters with technology.

In keeping with the aim of this discussion, however, I do not locate culture at an organisational level across the six primary schools. In this regard, I did not possess the necessary analytic framework to interpret encounters within organisation-specific modalities. This can be perceived as a limitation of the research, as organisational culture may ostensibly affect the symbolic experience of technologies. In this sense, I do make explicit the many organisational dynamics, histories and politics that do affect 'systems of meaning'. Yet these are not assimilated within a concrete organisational narrative. Let us now discuss the manifestation of meaningful encounters across three dimensions of context.

Systems of meaning: positioning the meaningful encounter

"Systems of meaning are what is often known as culture, including not only the beliefs and values of social groups, but also their language, forms of knowledge, and common sense, as well as the material products, interactional practices, rituals, and ways of life established by these." (Hays, 1994:65)

In keeping with Hays' discussion, our ethnographic journey of MELISSA teachers also yielded a number of meaning-ful discoveries. These manifest along technology encounters within and through global, regional, and micro localities. Up to this point, I have not clarified the 'encounter' as a theoretical construct. This term positions much of the meaningful interaction that underpins the 'technology experience'. Encounter cannot be defined in its lay sense alone, which pertains to a casual interaction, engagement, or experience. Rather, I advance the particular notion of 'encounter' as a symbolising and interpretive (inter)action. Our ethnographic explorations help to concretise this definition, specifically referring to actual, meaningful (or, evocative) encounters. For now, the encounter is the spontaneous and generally unconscious engagement both within and between social beings. This includes interactions with material and immaterial objects (see Michalski, 2013).

In the following passages, I will elucidate these dynamics in light of those practical and interpreted interactions of teachers in disadvantaged local schools. First, I reiterate the macro and meso manifestation of encounters. These are perhaps intangible at a personal level, but represent the abstract understandings and experiences with technology. Such interaction shapes the micro encounter, and informs the local – or grassroots – digital technology experience. Ultimately, reflections from the MELISSA case reveal that the social production of meaning is contextualised within a broader symbolic narrative. This represents a complex ecology, in which we observe the co-emergence of symbolism and mediating practices

A global, hyperconnected community: macro encounters

Encounters at macro and meso levels are mostly discernible as abstract interactions or discourses, and act as contextual bases for micro experiences. I have done much to position the macro level discourse of information technologies and their transformative functions in ICT4D. To avoid unnecessary reiteration, I summarise the key narratives of this discourse:

- The rapid advance of a global state of hyperconnectivity, which drives (supports, propels, promotes) the development of infrastructure and techno-capabilities;

- The (resulting) transformative capacities of digital technology, with its 'promises' of functionality and efficiency, inclusion, and social learning;
- The associated perils of hyperconnectivity instil the 'expectation the change' and can breed a state of internet dystopia. This is associated with impersonal, ultraconnected lifestyles, and (fears of) cybercrime and –warfare;
- The transformative capacities of technology embodied in a pracademic enterprise (ICT4D): tackling the great divides (digital and development) through the diffusion and adoption of technology.

These elements are manifest on a global or macro scale, but may have diverse implications on both meso (national, regional) and micro (local, personal) levels. In the preceding chapters, I have broadly discussed some of the meso implications, with reference to the ICT4D landscape in South Africa. Following the abolishment of apartheid, the South African government pursued a digitally enabled landscape that would contribute to national development priorities. The primary narratives within this landscape are summarised below.

Towards a national information community: meso encounters

Some of the foremost regional encounters with digital technology are manifest within the domains of national policy development and strategic implementation. This also pertains, eventually, to technology interventions at provincial level. I list some of the primary meso-level encounters below:

- The local materialisation of the 'digital divide' as a state of technological inequality between the many South African groups, ethnicities, and communities. Individual and regional differences are polarised along social class, geography (urban and rural), and access to opportunity (information haves and have-nots);
- The perpetual development challenge, marked by the high incidence of poverty, ill health, violent crime, and unemployment;
- The roots of an oppressive past, which contributed the unequal distribution of resources in the country;
- Resulting policies to address the digital and development imbalance nationwide. Strategic frameworks include the ISAD Strategic Plan, the ten-year national innovation plan, and the White Paper on e-Education;
- The implementation of ICT4D initiatives countrywide. In the domain of education, these include technology access programmes, digital content development initiatives, field

trials, and user-driven projects. In the Western Cape, the Khanya Project has likely shaped a range of both meso and micro encounters (discussed on the following page).

On both macro and meso levels, the ICT experience is marked by a sense of techno-enthusiasm. This denotes a type of modernity bias: local individuals, communities, and institutions purposefully advance a digital/ised environment. This is perceived as a *necessary* evolution, in order to reach the peaks of modernity – a hyperconnected and technologically advanced milieu. In Chapter II, I discussed the possibility of such discourse to disrupt local autonomy (Escobar, 1992) and to homogenise local (otherwise indigenous) communities (Embong, 2011; Ginsburg, 2008). An alternate perspective, conversely, advocates for the enhanced diversity and cultural richness in light of hyperconnectivity. For Embong (2011), however, both techno-enthusiasm and –cynicism are binary opposites, and polarise the diversity of social encounters in a hyperconnected community.

We may consider the third – and perhaps conciliatory – position in the debate, which argues for a state of cultural hybridisation. As Embong (2011) describes, this perspective does not favour either condition: both localism (many hyperconnected encounters) and universality (one hyperconnected encounter) can exist, and are attainable realities. Considering some of the many social experiences that have defined the teacher environment in MELISSA, we might lean toward this hybridised perspective. As further mentioned in Chapter II, this is the coincident expression of internet utopia and dystopia (Wellman, 2004). We can recognise multiple performance accomplishments and social encounters with digital technology. These are diverse (heterogeneous) but located within a homogenising 'divide discourse'.

Revised notes on the 'teacher experience': micro encounters

Before examining some of the micro understandings of digital technologies, it is imperative to revisit the social environments of teachers. As I have thus far argued, it is unfeasible to separate such environments from the actual and interpreted encounters with ICT. Indeed, human life is community life; the communal interaction shapes the personal engagement (and conversely). As per our MELISSA case, teachers are located within two interrelated contexts: professional and personal. Within the professional context, they act according to a broader educational directive. This informs their daily professional responsibility to help students acquire knowledge. Both within and beyond this environment/community, teachers are also individuals in their own right.

Much of the constructed social world of the teacher has been clarified up to this point (*Systems of social relations*). This pertains to some of the primary activities and interactional practices that define the professional context of the teacher. But what are the expressed experiences in and of this world? Are teachers enabled to fulfil their educational duties? What are the major optimisms and frustrations? I discuss some of the responses and observations in this regard, which denote the professional teaching experience (below). Some of these were clarified in the contextual analyses of earlier findings (critical discourse analysis, Chapter V).

> So you become exhausted because they [the learners] can't cope because of the apartheid system. Even the teachers are not trained because of Bantu education. So we lack skills as teachers and I am part of that. (Teacher at Zimasa)

> I don't like teaching as a career, but my current problem that I have at school…its becoming boring for me to be here, because what I'm here to do as a teacher I'm not doing it very well because my headmaster is expecting me to do the technical work. (Teacher at Rosmead)

> I don't like teaching at the moment, I used to like it but not anymore. There are lot of changes and more paper work. (Teacher at Thembani)

> To me, I am tired. If it was not for my children, I would sit and look for another job. What frustrates me is the number of learners that we have in our classrooms – it's too much. So by that way, learning it is not conducive and this chop and change of work schedules and work programmes. Whilst you're starting to adjust to this one, there's a sudden change, so that frustrates me. So there are times I feel truly that I can just resign, that's it. That's my feeling. (Teacher at Rosmead)

> Ah, the way things are, the department is chop and changing things every now and again, they introduce this kind of system before you even get used to it they introduce something else (that really put someone down). (Teacher at Zimasa)

> I don't enjoy teaching. I started teaching in 1991, I used to be involved in extra mural activities, and kids were so obedient. Yes, there were those, but after some bills from the system, things have changed. There's no respect from kids and they are not interested in studying at all. [Which makes your job very hard?] Very hard, in so much when you try to organise the extra mural or give them assignments they don't bring the assignment back or you find out that half the class didn't bring the assignments. Then you feel disappointed because it is difficult to punish them, because you are not 100% sure aware of what kind of punishment is suitable these days and then you let it go. (Teacher at Moshesh)

These excerpts indicate a sense of frustration among the MELISSA respondents. This is evident at all of the surveyed schools. Some experience a widening skills gap due to past injustices. Others find the teaching profession challenging and do not enjoy the additional pressures of greater learner numbers, more paperwork, and changing work schedules. These frustrations are not surprising, given the socio-economic position of each school. With the exception of Rosmead, the remaining five schools are all located within informal settlements, plagued by unemployment, crime, and poverty. Rosmead itself serves a disadvantaged bloc of learners, and is not well resourced compared to other public schools. Generally, these contexts are not conducive for the practice of teaching and learning.

The professional teaching context is further constrained by a lack of ICT resources, e-skills, and pedagogic engagement. These were discussed at length in Chapter V – I briefly return to some of those elements in the following section. A number of other frustrations are evident, to varying degrees, at each of the six MELISSA schools. These include institutional and policy constraints (micro-management, increased administration), departmental politics, workplace compensation, a lack of learner discipline, instructional language difficulties, and ICT-related technical/logistical issues. I do not elaborate on these elements, purely because they are natural and expected occurents within a constrained environment. We need to take cognisance of their *perceived reality*, however, in order to help contextualise the engagement with digital technology.

Despite visible frustration, many MELISSA respondents were optimistic as to the teaching profession, especially with relation to technology:

> I am happy. The students – even though we do not beat them – listen to us and follow instructions very well. (Teacher at Thembani)
>
> I will say when I see a child I took from scratch, and I can see that he/she has grasped what I was teaching…seeing that improvement makes me happy. This motivates me a lot. This motivates me because I would know that I have achieved something. (Teacher at Zimasa)
>
> So you understand, teaching is my life, it's in my blood. (Teacher at Moshesh)
>
> My feelings about teaching at the moment is that I love my job, I love working with the children they really make my day (Teacher at Rosmead)
>
> I love it. It's a noble profession. I want to leave a legacy, like seeing us moulding a person. It has changed but the core business remains the same: imparting knowledge. (Teacher at Rosmead)

These excerpts are only minor examples of the passionate and enthusiastic attitudes among some of the respondents. The teaching profession is not universally constrained; no solitary encounter equally resonates with the entire group of respondents. No surveyed teacher, however, seems to be disillusioned by the South African state of educational affairs. Whilst the minority of respondents are generally content, they remain aware of the endemic challenges to the national system of education. The majority, likewise, are less enthused and similarly more verbal around the hardships of the teaching profession.

In terms of the other domain – that of the 'personal' – teachers experience similar difficulties both in their households and in their broader communities. At the time, my interview questions did not probe these environments in more depth. I was too narrowly concerned with the social meanings around technology use. Most of the transcribed responses, however, relate to the socio-economic circumstances of learners:

> The thing is, if you look, this is a feeling of many of us who teach in the townships: learners have more than anything else social problems and it's not easy to break through them. (Teacher at Zimasa)
>
> The socio economic status of the students also has to be dealt with. These affect the way they behave when they are in class and [it] affects the way they do everything in class. (Teacher at Thembani)
>
> Social economic problem[s], child delinquency – the parents don't know that the kid was not at school. I just inform the parent about that. Parents are so tired because of the kids. (Teacher at Zimasa)

The teacher as a social agent cannot be excluded from the "socio economic problem[s]" of the townships. Many of our MELISSA respondents emanate from communities near their schools. Generally, they are exposed to similar conditions as their learners. Again, due to logistic limitations, I was not able to accompany educators in their activities beyond the school environment. I was thus not able to participate in and observe the personal circumstances that otherwise shaped teachers' lifeways. That said, the sociality (and external reality, beyond the primary school) of the teacher should not be understated. This remains a central dynamic in the engagement with digital technology.

In light of the above, there is a risk of portraying the teacher experience dichotomously – as polar encounters of positive (optimistic, enthusiastic) versus negative (cynical, pessimistic). I believe both the 'personal' and the 'professional' experience to be plural and heterogeneous. This limits the possibility of a uniform, generic discourse around the social order of the teaching professional. Rather, our MELISSA exploration yields a discourse of multiple experiences, cultural frameworks, and collective interactions. This represents a microcosm of the broader educational context, which is characterised by a diversity of realities.

The 'technology experience': micro encounters

"For me, ICT is how you link with the global world in terms of sharing knowledge, information, and resources with people that are not here with you. For me, it also ties up with skills; sharing skills. It has to do with skills development. It also makes you aware of the changes that are out there by using ICT. And it opens up your eyes and it gives news. It brings the other world here. It makes things easier for me." (Head of Department at Zimasa, 2011)

The passage above, expressed by a female teacher at Zimasa Primary, represents one of the many local understandings of information and communication technology. When asked to reflect on "what you understand by ICT", this teacher alludes to the hyperconnectedness of digital technology; of the possibility it offers to share information, knowledge and resources. Interestingly, the respondent references skills sharing and development as a particular advantage of ICT. Perhaps most significantly, she describes the ability of ICT to 'bring the other world here'. She later adds, "For me if I talk about ICT, I think about computers, television, everything, digital, everything. This is excellent equipment that I don't think I can even live without".

At the risk of oversimplification (or –exaggeration!), these statements reveal much about the social representations of ICT in under-resourced school settings. The teacher at Zimasa assumes a characteristic 'universal' view, suggestive of Brown's globalisation discourse (2010). ICT makes her life easier, furthermore, which reminds of Brown's productivity discourse: technology is a useful, productive mechanism (ibid). I am intrigued, yet, by the reference to the 'other world'; where/what is it, and what does it contain? For her, information technology is everywhere, and embodied in everything – she cannot live without such "excellent equipment". What then, is this other world; does it stand in opposition to the existing social world she inhabits? Can it help explain and define local technology encounters?

This passage is one of many instances of globalisation and productivity themes to have emerged from MELISSA transcripts. Among those respondents interviewed at Zimasa, however, there was little explicit acknowledgement of the global prevalence of technology. The productivity theme, rather, is prominent:

> It helps us a lot, the ICT. Before I didn't know about email, and now I know a lot. And as a result, now I am going to Langa. So now I'm using the computer. It is very, very useful (Foundation Phase Teacher at Zimasa).
>
> It makes our life easy. It is easy to get. We don't struggle like before. Like setting papers, using that old typewriter. Now it is just 'click, click' and everything we got. It is very very easy (Teacher at Zimasa).

> It is easy now to get a lot of information, especially when there is the internet here. So, most of the time we just go there and we will get the information. At least everything is easier to find. If it is easier to get, of course we have access to it (Teacher at Zimasa).

The immediate benefits of ICTs seemed clear at this school: the digitisation of older media (for example typewriters, books) and the availability of the internet, simplified the work of the teacher. The available computer equipment is purposeful, functional: "it makes our life easy". This sentiment is common across all of the respondent schools as observed in prior MELISSA findings (see Chapter V). The functional value of technology is also closely linked to its educational benefits:

> Especially our learners who don't really experience outdoor life, outdoor activities, they don't venture out there, they don't see things. Some of them have never been close to Table Mountain although they see it from our school. They need to be shown these things. You don't want to accuse them of ignorance but their lack of experience, it's alarming. They don't experience your lifestyle. Showing them opens their eyes up to what is around them (Teacher at Rosmead).

> Their experiences revolve around what happens in the townships, because that is where they live. You try to broaden their horizons to show them. For them this is the best thing, and that is why they enjoy these computers. They don't usually have access to it and showing them clips about Cape Town looks like. You think, wow, here you are driving around Cape Town every day, and they've got to see it. So that's part of the value – the exposure (Teacher at Rosmead).

> Because we've got learners who, when they come to the computer room, they are so excited they can't wait. I think this has a lot of impact because when I take my kids they are so excited... Because there's a lot of information that they are getting from the computers (Teacher at Thembani)

> To me computers are like a supporting material. I like to use computers because the learners find it much more interesting to learn with computers. And they get some of the programs there, like Talking Stories. So to me, it is very good use [useful] (Learning Support Teacher at Thembani).

Teacher-respondents are pertinently aware of the educational benefits of digital technologies. For some, it offers interactive engagement with the unknown or external world. Learners can be exposed to previously unfamiliar lifestyles, activities, events, and natural elements. Their horizons are broadened as the access to information is increased. For teachers, ICT is particularly useful as "supporting material" in the classroom: learners are engaged, excitedly, in the education process. These benefits have bred a sense of optimism among the majority of respondents, which can be observed in the number of positive performance accomplishments (see Annexure 4). According to this graph, student engagement ranks particularly high: "It feels good when you know that you've managed to teach and make children understand" (Teacher at Zimasa, 2011).

The associated benefits of ICTs link closely to the South African policies of information access and the purported learning opportunities offered by technology (see Chapter II). It must be added, yet, that the implications of digital technology in MELISSA schools extend beyond its purported functional and educational value. I make particular reference to the 'transformative capacities' of technology: the intellectual promise of hyperconnectivity, its narrative of empowerment, and its lure of self-improvement and competency development.

> It sharpens their minds and become critical thinkers because they are viewing the information. (Head of Department at Zimasa)
>
> ICT enlightens. (Foundation Phase Teacher at Zimasa)
>
> So the teacher feels that they imparting far more than just the basic lessons. So the technology opens up so many more avenues, so many more horizons for them. They can see so many more things, do so many more things. So it is a very empowering tool. Only for those who want them. (Advisor at Khanya)
>
> The whole community and South Africa [will benefit], because we are exposing our learners at primary school already. There will [be] computer literacy at primary level so the nation will benefit from them [it]. One day they will be parents and coach their children. So the whole world will benefit from this ICT. (Teacher at Rosmead)

The transformative benefits of technology are evident in its ability to 'expose', to 'enlighten', and to 'empower'. These features are globally beneficial – the "whole world will benefit" from information and communication technology. Beyond its immediate functional and educational properties, then, ICT becomes a crucial knowledge trait; an indispensable component of the information society. The respondent from Khanya affirms, however, that this benefit is offered only to those who 'want' it. This reminds, albeit subtly, of a particular hegemonic view: the benefits of digital technology are undeniable; those who do not share this understanding will lag behind (see Wellman, 2004; Brown, 2010).

Expressions of functionality, productivity, globalisation, and empowerment associated with ICTs in primary education are manifold. ICT is recognised as invaluable in the practice of learning and teaching. A number of conflicting opinions have surfaced as well, somewhat negating the techno-enthusiasm of the majority. Not all teachers are confident in using digital technology for education (or other) purposes:

> I know that there are some educators that are too shy for information technology. And they don't know the IT, so they stay far [away] in using IT, and they are so shy to ask questions about IT. They are not

> comfortable to use it, because they don't have that knowledge. I think with this project, [they] are going to benefit and they will learn to use it more effectively. (Teacher at Rosmead)
>
> There are challenges because I am not an expert. Sometimes if I have a problem, I just ask other teachers that are better than me and help me. (Teacher at Thembani)
>
> I don't access the internet at all; I'm still scared to use it. (Teacher at Zimasa)
>
> I don't know what is internet. I don't know anything…that [is] challenging [to] me. There is a teacher that helps us when we need help. (Teacher at Thembani)

These passages present a differing technology experience. Respondents claim to lack confidence in using information technology, and stay far away from it as a result. Teachers are "shy" and "scared" and rely on the support of others to help them. Rather frighteningly, one teacher does not seem to know what the internet is or how to use it. She depends on a helpful colleague instead. Although these feelings (computer anxieties) are thought to be familiar in the ICT-for-education domain (Mlitwa, 2010; Cantrell & Visser, 2011; Gudmundsdottir, 2010b), they are easily overshadowed by techno optimisms and modernity biases. Seemingly, those who lack confidence in technology are in the majority; those who *oppose* it are far less visible.

Computer anxiety is but one of the negative associations or consequences related to technology use. Other concerns amount, and indicate frustration, inexperience, limited resources, and technical and logistical challenges. These were explored in the self-efficacy and critical discourse analyses. They remain useful in juxtaposing the optimistic ICT in education experience that has thus far dominated the MELISSA narrative:

> The biggest challenge is, sometimes, the system is maybe too slow, and then you find out that sometimes there is no internet for one or two, three, five days and then we need to come back. Also very few computers. And maybe like more than two labs, because once one class is in the lab, that means there is no other class that can have access to computer. (Teacher at Moshesh).
>
> I do not know how to use the Internet, which tends to limit me (Teacher at Thembani).
>
> Well from my experience of using the computers, sometimes you get stuck and you don't know what to do and this is really frustrating (Teacher at Rosmead).
>
> But they've got a negative attitude. They said – you want to take part of our time now for this training, but we don't want that nonsense. We can teach without computers. We can manage. When I was talking to the IT, the teacher who is teaching IT, Mr **, he said to me – I'm glad that you are here, you will really see the attitude of the teachers. They don't want to learn, to sit down and learn. They want

> their kids to sit down, but they do not want to. And they do not want to develop themselves. Negative. (Teacher at Rosmead)
>
> There is not enough time, even if you come here for training, we don't have computer at home…you forget what you have learnt. Even you are here at school, you teach, and after school, you are tired. Then you go home without practising. There are not enough computers (Teacher at Zimasa).

These excerpts are not all-encompassing but reveal a number of challenges and frustrations related to ICT. Because of the nature of the participating schools, the limited access to information resources may initially seem unsurprising. Yet, all six schools were Khanya members at the time, and received working computer laboratories and internet connections. Computer systems and networks were not maintained, however, due to lack of funds and proper control. The inflation of student numbers furthermore contributed to higher learner:computer ratios, thus limiting the allotted time for each computer session. The lack of information resources is confounded by technical illiteracy, time constraints, and negative attitudes. This latter experience (negative attitudes) was unanticipated, but became evident as the training progressed.

Intersecting dominant understandings of digital technology

At the risk of offering a dichotomous explanation for some of the more frustrating technology experiences, MELISSA participants allude to a 'digital native' discourse. This refers to the commonly accepted trope within ICT-for-education: young people have grown up with computers and the internet, and are naturally proficient with new digital technologies and spaces (Rapetti & Cantoni, 2012). Older people, conversely, will always be a step behind/apart in their dealings with the digital (Bayne & Ross, 2007). Taking this position, it is assumed or expected that 'older people' are less digitally literate than their youthful counterparts are. They have grown up beyond the information age, and struggle to adapt within it. This too affects their professional experience with digital technology:

> I don't want to lie, when Khanya was here they were steady and helping those who were not computer literate. Like I don't know computers, I don't know anything about computers. Somebody must remind me where to switch off/on. If I want to type something, what must I do? Whereas other people are computer literate. (Teacher at Rosmead)
>
> We got [have] the problem because us as teachers, we are not coming from this generation so we are not equipped enough for this. Because we only started to be computer literate only now while we [are] already teachers. (Teacher at Zimasa)

> I can be very honest with you, when I started, came back into teaching, I was very afraid of the computer. It was like a monster to me, you know. I was afraid even to touch my children's computer because I didn't know the computer. I did not know how to switch it on; I did not know how to switch it off. And I was very afraid to handle or go and sit in front of a computer. My children, I can be honest with you, they never had the time to really teach me at home because they said – Mommy, you're at home, what could you [teach us on the] computer; whatever. But when the Khanya training stared here, I was just as afraid. (Teacher at Blossom)
>
> Yes because, like I said, I had never had any experience with computers, I could only switch it on and off. (Teacher at Rosmead)
>
> But we are old with this! (Teacher at Thembani)

These experiences reaffirm feelings of computer anxiety, as I have earlier described. A great number of teachers are not proficient in using 'computers' or the 'internet' and do not have confidence in their abilities. Generally, teachers had minimal exposure to digital technologies. They mentioned the old cliché of 'not knowing where to switch it on or off' (although in some cases, this was true!). Some make explicit reference to the supposed generation gap between older and younger persons. Such feelings of inexperience and digital immigration may seem perfectly reasonable in justifying negative ICT experiences. They instil, however, a series of dangerous, binary oppositions (Bayne & Ross, 2007).

Bayne and Ross (2007:2) draw on the terminologies evident in the popular and academic literature on the native-immigrant opposition. They tabulate the following (opposing) characteristics:

Native	**Immigrant**
Student	Teacher
Fast	Slow
Young	Old
Future	Past, or 'legacy'
Multi-tasking	Logical, serial thinking
Image	Text
Playful	Serious
Looking forward	Looking backward
Digital	Analogue
Action	Knowledge
Constant connection	Isolation

These attributes instil a dual technology experience: natives are proficient and practised; immigrants are inept and untrained. Immigrants are depicted as older, slower, backward looking, and dependent on analogue (print) technologies. In this way, the immigrant assumes a subordinate or a diminished role in relation to the commanding position of the native. Any knowledge possessed or created by the immigrant is at risk of becoming obsolete. This is especially considering the constant and multi-levelled information production of the native. Additionally, aspects of rapid hyperconnectivity and technology evolution hinder the technical capabilities of immigrants in keeping pace with natives (Williams, 2012; Rapetti & Cantoni, 2012). This results in a (perceived) knowledge and skills gap between two generations of users. Such a gap may further instil a social and symbolic disconnect between age groups.

Popular and academic literature does posit a one-way determining relationship between the technology and the role of the teacher or institution (Bayne & Ross, 2007). I have already considered the 'promise' of ICT in education – this has been well documented (Cantrell & Visser, 2011). In the socialisation of teacher roles, however, the technological imperative seems to resurface as an institutional directive: technological change forces schools to deal with new populations of learners. If digital immigrant educators want to teach digital natives (all of their students), *they* will have to change. Those who do not are 'just dumb (and lazy)' (Bayne & Ross, 2007).

Educators are essentially encouraged to take cues from students' 21st century innovations and behaviours, abandoning in many cases their own pre-digital instincts and comfort zones (Williams, 2012). This does however place the educator in a precarious and impossible position. He/she is subordinate to the skills of the native, but forced to change in order to remain a competent, employable professional. Ultimately, the immigrant generation is attributed a particular substandard skill-set with relation to technology. It is simultaneously expected of this generation to change with the times; to alter long-socialised behaviours and methods to reach native students. An impossible barrier is constructed between teacher and students, which both cannot be, and must be, breached by the teacher through the responsibility (imperative) to change (Bayne & Ross, 2007).

In Chapter II, I wrote about the 'expectation to change' in terms of the global technoscape. This too is evident among teachers in MELISSA schools. Teachers, whilst often perceiving themselves as digital natives, acknowledge the need for change, and for the development of 21st century skills:

> We have a lady that comes in and makes it very basic for them because, you know, at first it was something scary, especially for the older generation. They're buying into it. And they're using it. They're all positive about it. (Teacher at Blossom)
>
> We got a teacher who is heading this computer project and stuff like that. She encourages us to use those computers every time and whenever you get stuck she is always willing to help you. That makes it easy not to be scared to go to computers and thinking about "what if I get stuck?". There is someone who is willing to help you at any time and she encouraged us to be there at all times. (Teacher at Zimasa)
>
> There is no way we can teach without ICT, we must use it to make things easier for us and learners. (Teacher at Rosmead)

These expressions affirm that the profession of education is inevitably linked with ICT (given its functional and productive benefits), and that the development of technical skills is encouraged. Fundamentally, for Bayne and Ross, this represents the paradox of the immigrant discourse. An essentialised selfhood determined by generational positioning – the immigrant can never fully *become* the native – is promoted alongside an imperative to change. The latter prospect is the social encouragement or demand of a new worker identity; of a professional necessity to adapt or to die. The imperative to change – to "buy in", to be "positive", or to "teach with ICT" – bespeaks a professional development agenda, driven by the needs of globalisation and the marketisation of education (Bayne & Ross, 2007).

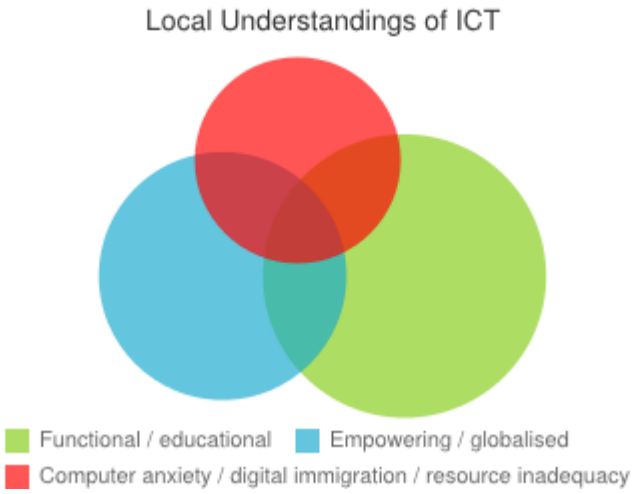


Figure 8: A Venn diagram, indicating the intersecting dominant understandings of digital technology.

For an overly familiar visual emphasis, I have roughly charted some of the foremost local understandings of ICT among MELISSA respondents. The positive, beneficial, and empowering features of technology are offered as the dominant discourses relating to ICT interactions. Negative, frustrating, and digital immigration experiences are less prominent, but equally significant. These discourses do not depict the technology experience holistically, but do render some of its primary meanings or representations. Moreover, such understandings do not manifest discretely. Rather, they are intertwined and embodied in the interactive domains of human-group life. Ultimately, these representations are both complimented and negated by other less salient meanings, particularly in terms of individual autonomy, meaningful action, and communal symbolism. Let us explore some of these dynamics in more depth.

Visual cues: protective action

A number of theoretical inquiries remain with specific relation to the symbolic manifestation of technology in development settings. At the very outset of the Khanya programme, its architects envisioned a connected educational community. This entailed the open and equitable access to computer facilities, strengthening the processes of teaching and learning. These ambitions were embedded visually, to represent the continuous progression towards a knowledge society. The Khanya emblem (below) is the first of such visual indicators – the triangles on the left symbolise "darkness being overtaken by light" (Van Wyk, 2011).

Figure 9: The Khanya emblem: darkness being overtaken by light.

For Van Wyk, the former director of Khanya, 'darkness' alludes to the digital divide, and of a lack of information access in Western Cape schools. The 'overtaking of light' hints at the sustainable provision of technology resources. This metaphor resonates beyond the provincial context, however, and ties in with a national ICT directive (much of which was discussed in Chapter II). Van Wyk (2012) points to a page on the website of the Department of Basic Education, containing three statements on the importance of technology in education. The first of such statements is embedded as a visual motif: "every child is a national asset" (Figure 10). Viewing every child as a national asset implies that one should invest in the education of every

child (Van Wyk, 2012). An investment in a child's education "cannot be complete if it does not include digital literacy" (ibid.).

Figure 10: The emblem of the Department of Basic Education: every child is a national asset.

The second technology statement reads, *"The aim of the DBE is to develop, maintain and support a South African school education system for the 21st century."* (Van Wyk, 2012). Evidently, the 21st century is an information- and communication-based environment. This requires the full-fledged presence and incorporation of digital technology. And finally, in its mission statement, the DBE advocates the importance of technology in education, *"Our mission is to provide leadership with respect to provinces, districts and schools in the establishment of a South African education system for the 21st century"* (ibid.). This statement again refers to a modern – 21st century – education system, and indicates the need for appropriate leadership. A combination of these statements instils a broad vision in which learners – and by extension, their teachers – are developed and supported in a modern, information-based educational community.

A national ICT4E vision, as adopted by the DBE and Khanya, is also manifest as a symbolic indicator in low-resourced primary schools. All six of the MELISSA schools were donated fully equipped computer laboratories. These were regarded as *essential apparatus* to the educational enterprise at each school:

> The technology I think is the future because everybody should be computer literate. Because not only in the classroom, but in the world (globally). We need to be computer literate. Everything you use: it's technology. (Teacher at Zimasa)

The sentiments expressed here by the teacher at Zimasa resonate at all of the MELISSA schools. Furthermore, school management bodies went to great lengths to 'protect' their Khanya labs. Computer rooms were often locked for most of the day, and secured by steel gates and burglar bars. Generally, only a designated authority – for example, the IT administrator – would have access to such rooms. Furthermore, computers were in some cases covered with physical casings, preventing damage and/or theft. At Zimasa, theft is a particular concern; all desktop computers are protected by irremovable plastic casings (Figure 11).

Figure 11: The Khanya laboratory at Zimasa: protective blue casings are installed for every computer (see Van Zyl, 2010).

During my first encounter at the Zimasa laboratory, I was bemused by these blue casings. They somehow reduced the computer to a rigid, static block. In my own view, they did not invite interactive encounters with a digital medium. Rather, they displayed a big blue warning: *do not touch!* As the training at Zimasa progressed, however, these casings did not seem to deter any of the teachers or learners (as is evident in the picture). This in itself is perhaps indicative of the normative socio-economic circumstances at such schools. Theft crimes are a regular, unsurprising occurrence in these communities – learners and teachers are socially desensitised to 'protective actions'.

In the Rosmead laboratory (Figure 12), we did not notice explicit rule stipulations or blue casings (fortunately). The posters near the ceiling do warn against computer theft and even offer preventative guidelines. Such measures have become standard practice at many Khanya affiliated schools.

Figure 12: The Rosmead lab - warnings against theft near the ceiling.

In addition to physical computer security, laboratory administrators also implemented protective measures against learners. Most of the visited labs were strictly regulated: learners and teachers were prohibited from any activity that would impair the computer facilities. This included drinking, eating, downloading, and printing. Whilst such rules are expected within a communal facility, they may restrict the full embrace of digital technology (among both learners and teachers). I include a few responses from the schools in our experimental group, Rosmead and Zimasa, below:

> Those learners, if the teacher is not here, so they [are] disadvantage[d]. They won't come to the lab because no learner is supposed to be in the computer lab without the teacher. (Teacher at Rosmead)

> Nobody's allowed to go on the internet, you know? Nobody is allowed to go on the internet without the teacher's permission and obviously supervision for that. Nobody's allowed to eat or drink in the lab, swear or talk loud. There should all be silence and concentration. Nobody is allowed to bang or whatever on the keyboard or move or put their fingers on the screen or anything. (Teacher at Blossom)

You know learners, now they can even type their project[s]. But you must just be there to monitor them. They do especially search for information for investigation purposes, but sometimes if you are not monitoring them…well you will find out that they go [to] music sites and download the music of which it is illegal to do that. It's just that the kids sometimes you are busy monitoring the other side, and others [are] busy listen[ing] to music. (Teacher at Zimasa)

The disadvantages: they use to research negative information like pornography. (Head of Department at Zimasa)

No written policy but there are mechanism[s] in place regarding the usage of ICT. For example, we have software that monitors websites visited and bars access to those we consider inappropriate and we also manage the amount of time spent on the internet. (Deputy Principal at Rosmead)

Figure 13: The computer laboratory at Thembani Primary. Colour-coded rule stipulations are above each desktop PC.

As our teacher respondents affirm, there are many rules in place that mandate behaviour in the computer laboratories. This can reduce the entertainment value of educational technologies for learners, and thus curb effective learning (see Bladergroen et al., 2012; Cantrell & Visser, 2011). These rules generally apply to teachers as well – e.g. to not exceed bandwidth capacity; to limit printing – which may further contain technology use. In addition, both teachers and learners are constrained by a diversity of technical issues as previously discussed. Ultimately, the combination of restrictive policies and faulty equipment does not bode well for the use and eventual adoption of ICT:

You can imagine if you take technology into a school that's never ever used computers before…and that was the case eight years ago where teachers have never seen a computer. They didn't know what the mouse was; they didn't know any components of the technology. If you take technology into a school and that technology breaks down, nobody will have the expertise to fix it and nobody is going to say, "Well let me try, let's give it a bash". They're going to lock it up, put it back into a cupboard and never use it again. That has been the case. So what do we do about technical sustainability? (Advisor at Khanya)

If a classroom is locked and the computer lab is not being used every single period, it's not the technology's fault, it's not the department's fault. It's that principal who needs to make sure that that is happening. (Advisor at Khanya)

Figure 14: Rule stipulations at Thembani Primary. Do these inhibit the embrace of digital technologies?

The respondent at Khanya raises two key considerations. Firstly, teachers are typically unfamiliar with digital technology, and are not equipped to maintain computer laboratories. Second, the school principal is ultimately responsible for the proper use and maintenance of the respective laboratories. Essentially, these comments encapsulate the teacher experience: a lack of skills breeds a lack of engagement – technical, educational, and otherwise. This falls to the school management body (e.g. the principal) to rectify. Consequently, much value is placed on the physical computer equipment – they are to be respected, protected, and treasured. However, instead of doing so openly, and freely, computer laboratories are confined to external spaces, locked away from intrusive persons and activities.

The emergence of a symbolic narrative

These practices of techno-shelter may form part of a broader idolatry of technology; or stated differently, 'gizmo idolatry' (Leff & Finucane, 2008). This is the general implicit conviction that a technological approach is intrinsically better than one that is less technological (ibid.). Not all interviewed teachers hold this belief, as can be observed from some of the described responses. Despite this, the computer laboratories at all six schools are heavily protected, and generally cherished as an indispensable element to the educational process. Even so, as affirmed by earlier statements of 'computer anxiety', teachers are often fearful of these computer machines: *"The time Khanya introduced the computer here at school, they told us that the computer does not break. [But] we used to be scared to touch even [the] mouse"* (Teacher at Thembani).

Computer anxiety, ignorance, respect, and shelter, then, are constituent seductions of digital technology. The nebulous allure of new technology drives individuals from usual rational assessments of cost and benefits: they believe it confers on them a sense that they are truly on the "cutting edge" of their profession (Nickel, 2010:1). Nickel uses the metaphor of 'robot seduction' to describe the dehumanisation of professional (and specifically, medical) practice:

> The robot has really seduced us. Like many affairs, we may wake up some morning and realize that the cost of our infatuation may not have been ultimately worth it. Although I now understand our fascination and idolatry with the machine and fully realize the dangers to myself and my profession, I, too, am enamoured of and even bewitched by the robot. If the mechanical lady comes calling, I fear I could be seduced as well. (Nickel, 2010:2)

Concerning educational practice, and particularly in economically disadvantaged contexts, the "fascination with the machine" is likely to be exacerbated. I have already described the information hegemony of hyperconnectivity, the subtle determinism of national education policy, and the modernity bias in local technology access programmes. These techno-enthused dynamics have penetrated the ICT4D discourse in education. Indeed, much of the Khanya programme was driven by the need to bridge the digital divide. In addition, it was founded to prepare the Western Cape Province for the ever advancing 'knowledge economy' (Khanya, 2011). These ambitions are in line with a broader functional view of digital technology: ICTs are catalysts for social and economic empowerment, and for educational development (Badshah, 2010).

In light of the above, the 'digital technology' assumes a purposeful role in educational practice. Yet, returning to a question I posed formerly: is this an unexpected finding? Do we (I) attach special meaning to the otherwise redundant belief that ICTs are functional and beneficial apparatus in the educational domain? Surely, this is a commonly accepted notion that does not warrant in-depth, critical inquiry. We return then to the 'technological imperative'; a concept some believe to be confined to the dustier corners of academe. One former proponent of this idea, Tony Bates (2000) today holds that the tech imperative is an "old-fashioned" idea. For him, "technology is everywhere" – the issue is how best to use it, and when (P. Brunello, pers. comm., June 2012).

At its core, the technological imperative is inherent of a broader determinism – or technocentrism – in which the presence and uptake of technology would inevitably change the course of our future (see Wellman, 2004; Ginsburg, 2008). Seemingly, however, Bates is a converted enthusiast: the technological imperative is no longer relevant, and has become superfluous in light of the global advance of technology. Moreover, in his personal correspondence with a colleague, Bates argues that technology use in developing countries has become "much more sophisticated" (P. Brunello, pers. comm., June 2012). The African continent, specifically, is home to some of the most innovative uses of mobile technology in education. Bates also mentions the natural resistance to "neo-colonialist attempts to force new technologies into the classroom" (ibid.). He cautions against neo-Luddite ideals, however, and challenges Africans and donor organisations to heed lessons from the past.

Generally, I do not diverge from Bates' contemporary arguments. Much of this inquiry has rested on those dynamics and encounters far beyond the 'imperative polemic'. A grand technological determinism, with its advances of utopia and dystopia, is too reductionist in its assessment of technology encounters. The diversity of technological interactions, rather, indicates a multiplicity

of experience – one that cannot be singularly contained within a modernity bias, or determinism rhetoric (see Ginsburg, 2008). The 'technological encounter', then, goes beyond the mere techno-centric and -optimistic attempts to harness ICT. Despite this, however, the technological imperative does not cease to exist. Rather, it has become institutionalised as an *instrumental symbol* of modernity.

In a historical article, with much relevance for the ICT4D discourse today, Prasad examined the symbolic processes involved in the computerisation of work in an organisation (1993). The theoretical recognition of the symbolic nature of information technology has gained strength during this time. With Turkle (1984, cited in Prasad, 1993), she examines the 'computer' as an extraordinarily evocative technology, holding different meanings for different people. Prasad alludes to the "magical symbolism" of the computer in the workplace, and identifies those "ritualistic assurances" inherent to an automated organisation (ibid.). Again citing Turkle, she comments on studies that exclusively focused on the 'instrumental computer', while ignoring what was called the 'subjective computer'. Much of this discussion rests on the micro interpretations of digital artefacts – a much-needed reflection in the time of gizmo idolatry and technological directives.

Ultimately, information and communication technology is functional, useful, and global – this is a widely held, common belief. Similarly, digital technologies create problematic situations and instil different, contested perceptions in a hyperconnected landscape. The 'technological imperative' thus becomes an archaic, redundant concept in light of the digital technoscape and of emerging hyperconnectivity. Rather, it is enacted within a *symbolic narrative*. Stated differently, the educational institution – in this case, primary schools – drives the global ideologies of pragmatism and of instrumentality. To achieve this, the institution needs to create a favourable climate for computerisation in which technology becomes *desirable*, and associated with the virtues of professionalism (Prasad, 1993).

These realities are further enacted by excluding serious opposition – e.g. late adopters, digital immigrants, cynics. Such individuals will likely be unwilling to raise their concerns with school management, in the fear of being seen as "unprofessional" or "backward" (Prasad, 1993; Bates, 2000; Brown, 2010): *"I know that there are some educators that are too shy for information technology and they don't know the IT so they stay far [away] in using IT and they are so shy to ask question[s] about IT."* (Teacher at Rosmead). In practice however, MELISSA educators were sometimes visibly frustrated, dismissive, and indifferent in their technology interactions. This

was observed by all module facilitators as the training progressed (Van Zyl & Rega, 2011; Bladergroen et al., 2012).

As discussed in Chapter V, the association of ICT with professionalism in the school may explain the high incidence of public approval and positive mastery experience. Teachers are openly in favour of digital technology, because this is instrumentally enacted at organisational level. It then becomes untenable for the teacher to oppose the 'envisioned professionalism' of the school body (see Brown, 2010). Within this context, furthermore, the long-term commitment to computerisation is also enacted. By linking computers with professionalism, considerable status is awarded to those who work with them (Prasad, 1993): *"My teaching has improved a lot. I now see myself as a reflective practitioner. I am so proud of my achievements"* (Teacher at Thembani). This, in turn, ensures the teacher's continued commitment to the system, despite technical and logistical constraints (ibid.).

Despite these enactments, the long-term adoption or innovative use of digital technology has not materialised in the MELISSA case. This may precisely be due to the assortment of symbolic realities that have underpinned technological encounters. These are manifest as 'multiple symbolisms', encounters, or experiences (discussed on the following page). Despite existing imperatives, or deterministic practices, the 'subjective computer' is located within the realm of human meaning and related meaningful action (Prasad, 1993). Symbolic interaction rests on the assumption that every organisational situation – primary schools inter alia – is likely to be filled with multiple and frequently conflicted interpretations and meanings (ibid.). Therefore, the perspective underpins the need for a diversity of perspectives and meanings.

The emphasis remains on local meanings: those held in multiple everyday contexts, such as particular areas, functions, and enclaves within an organisation (Prasad, 1993). Within these domains, individuals symbolically engage with notional objects. These can then be observed as multiple symbolisms. It is understood that such symbolisms vary within and between different organisational levels, individuals, and communities. They should not be exoticised or reduced, furthermore, to single, isolated communities (see Said, 1978). I discuss the primary symbolisms that have been ascertained from the MELISSA experience on the following pages (also see Prasad's individual classification, 1993). Excerpts from discussions are added to illustrate each property.

Pragmatism. This has emerged as a more dominant encounter in our exploration. Within this perspective, ICT is practical and functional. It is generally useful and necessary for administrative purposes and classroom management. In some cases, this may extend to actual pedagogical interaction – i.e. it becomes valuable as an educational technology.

> It takes a lot of weight off you because certain things that you do on the board you can easily go to the computer lab and just do it. (Teacher at Zimasa)

Organisational necessity. This has emerged as another dominant encounter in our study. Digital technologies are critical to the progress of the school, and to the advancement of the teaching profession. This symbol is promulgated at a national level, in which the need for ICT gains momentum in policy, regional programmes, and public discourse. In this vein, the embrace of digital technologies is embedded within an educational directive – i.e. it is pertinent in developing the capacities of the teacher. This symbol is tied with the 'expectation to change' directive as earlier explored. And as with other symbols, organisational necessity is often implicit or inherent – that is, technology becomes unquestionably necessary (e.g. Teacher at Zimasa).

> There is no way we can teach without ICT, we must use it to make things easier for us and [our] learners. (Teacher at Rosmead)

> We are using it because there is nothing we can do without computers, because our work has to be computerized whether we like it or not, there is no other way. (Teacher at Moshesh)

> It is very important. I will encourage the teachers to use it. Yes, the school must own the ICT because it makes life easier. (Teacher at Zimasa)

Optimism, enthusiasm. Not surprisingly, experiences of optimism and a general eagerness are plentiful. This relates largely to the potential transformative capacities of ICT and to the 'promise' it brings in effecting change. This can be coupled with a sense of gizmo idolatry, in which the very properties of 'new technology' stimulate teacher interest. Significantly, teachers also tend to extend this to the learner community.

> It makes them confident and enthusiastic to learn more. (Head of Department at Zimasa)

> For learners, they are very excited when it comes to computer. They are on top of the moon, they enjoy it, there are no lazy learners. They also help each other. I do also enjoy it and I don't have a problem. (Teacher at Thembani)

> It is advantageous because the learners learn more and I learn more even from them. It makes teaching easier and exciting. (Teacher at Zimasa)

Pessimism, cynicism. As with the previous symbol, a healthy number of educators are pessimistic or cynical in terms of using technology (for various purposes). Within this perspective, respondents doubt the transformative benefits of ICTs, or are sceptical of its purported value to the classroom context. This was evident throughout the MELISSA training programme. Although such expressions are plentiful, they are often subjugated or marginalised by dominant enthusiasm or instrumentalism. I discussed the reason for this as the fear of being ostracised – of being labelled as backward, or incompetent.

> But they've got a negative attitude. They said – you want to take part of our time now for this training, but we don't want that nonsense. We can teach without computers. We can manage. They don't want to learn, to sit down and learn. They want their kids to sit down, but they do not want to. And they do not want to develop themselves. Negative. (Teacher at Rosmead)

Challenging, frustration, skill deficiency. This symbol reflects actual negative encounters with the use of technology, which build up to a disheartening experience. Frustrations are tied to a series of negatives: lack of bandwidth or electricity, mismanaged timetables, lack of knowhow, overpopulated classrooms, time pressures, and the like. Such encounters are also frequent, but are often suppressed in the ascendancy of positive or enthused interactions.

> The biggest challenge is sometimes the system is maybe too slow and then you find out that sometimes there is no internet for one or two three, [or] five days and then we need to come back. (Teacher at Moshesh)

Fear, digital immigration. The engagement with digital technology is frequently associated with fear, anxiety, and concern. Fear emotions were sometimes the outcome of frustrating or negative encounters. This also manifested in perceptions around digital immigration. Older respondents tended to resort to such perceptions, and were seemingly afraid of technological interaction. This effected their confidence and overall willingness to engage with ICT (to the point of complete avoidance).

> No I do not use those things. Even [the] internet, I don't know it. (Teacher at Thembani)

> Some of them are quite afraid. It's not a fear of what must be done, but fear of not knowing. That's what I picked up when you guys presented the workshops. When I asked you these questions I was thinking: You know you shouldn't need to explain. All you need to do as a colleague is to follow the instructions. It's not that they didn't understand what you want them to do, but they were afraid to get it wrong. They don't really get into one thing to experience it. I mean that's how I learned it - you learn by mistakes. You see this is not how you do it; this is how you do it. So it is a fear of computers or even. Dare I say it, DVD players. (Teacher at Rosmead)

Romanticism, anthropomorphism, idolatry. This symbol contains instances where respondents romanticised about the use of technologies. It also pertains to cases in which teachers idolised technology, for example, the overt security measures for computer labs, the protective blue casings, and the visual warnings. This symbol also alludes to instances in which digital technologies were attributed with or even hoped to contain human and animal characteristics. In such cases, digital objects were thought of as lifelike, with attributes that remind of humans or creatures (e.g. the 'monster' that a teacher at Blossom describes with indifference). This theme was ill explored in our analysis, however, and could be the subject of future explorations.

> It opens up your mind, you know, exposure. It helps you to help others, because sometimes when you are sitting here, or in the staff room, you start saying to colleagues – "no go to..." You start becoming a useful tool for other colleagues, you know. (Teacher at Rosmead)

> And I look at that dead thing there [refers to the non-functional PC in the room]. And I think to myself: if I can have one like that, even if it's an old one that I can just bring him here and liven that one up. I normally used to put a picture on the screen just to give the children an idea. (Teacher at Blossom)

Utopianism, enlightenment, globalism. This symbol alludes to a (global) state of technology utopia, in which ICTs instil a sense of enlightenment and inclusion. Teachers here perceive ICTs as inherently good or desired, and stress their transformative capacities (in education and professional practice).

> When we started the programme in rural areas, where people took to the technologies, you had a sharing between teachers within a school because everybody was willing to help the next one, but you also had a sharing of knowledge between other schools and other clusters of schools. (Advisor at Khanya)

> The school has gone..., you know it's like we've come out of the dark ages. They've gone leaps and bounds. Once the lab came in here, everybody was into it. (Head of Department at Blossom)

Entertainment, enjoyment, interactivity. The engagement with digital technology is recurrently associated with expression of enjoyment – fun, excitement, interest. This relates especially to the learner community, who tended to be uncontrollably eager to visit computer laboratories each week. Teachers were equally enthusiastic, particularly in terms of the interactive features offered by technology in the classroom.

> The only thing that I am doing that I am enjoying is teaching computer, especially the skills just to give the learners a base and to assist them. (Teacher at Moshesh)

> …but now it is really nice to have something new and to get the learners to be interested in something new and to show them how technology can utilised. (Teacher at Rosmead)

These symbolisms can generally converge within a meaningful narrative. Specifically, I term this a 'symbolic narrative' – one that recognises the multiple, interpreted realities that arise in the engagement with technology. This narrative broadens the conceptual basis of those micro encounters we earlier explored. At the very outset of this exploration, several utilitarian themes – including pragmatism, optimism, and organisational necessity – were visible as the foremost discourses. Other significant narratives later emerged, including that of idolatry, fear, and utopianism. The theme of anthropomorphism piques my interest especially, given its allusion to human qualities. This links closely to the socialisation and cerebrality of technology, in which computers are strongly associated with the human presence, modelled on the principles of behaviour and intelligence (see Prasad, 1993; Haraway, 1991; Case, 2007).

This notion of 'human-like' technology was not fully explored within our interview protocol. Rather, I observed it as a casual occurrence in the context of everyday use, especially during formal training sessions at each of the schools. I generally perceived anthropomorphist symbols such as loyalty, unreliability, interactivity (or sociability), temperamentality, and indifference (unresponsiveness, "death"). In these instances, the computer system and associated technologies seem to acquire human characteristics (Prasad, 1993). In some cases, teachers appeared to be demonstrative toward computer machines and laboratories. This resulted in the exaggerated safekeeping of labs, rendering them inaccessible for long periods. Such sentiments are broadly associated with technology idolatry, as earlier discussed (see Nickel, 2010).

Ultimately, the symbolic narrative that characterises the technology-in-education experience is, paradoxically, both perceptible and elusive. Many of the foremost symbols emerged ambiguously or obscurely; teachers, for instance, desired to use technology, but also insulated themselves against it. In public (e.g. interviews), they were passionate and optimistic about educational technologies. In practice, they were passive and indifferent to acquiring digital literacy skills (see Van Zyl & Rega, 2011; Bladergroen et al., 2012). Many of them, moreover, have not encountered ICTs as a real educational tool; there existed no magical benchmark by which to gauge successful adoption (ibid.).

The diversity of themes described above could be interpreted in different ways at various interactional levels. In light of our MELISSA case, digital technologies may simultaneously represent chaos and turmoil, as well as professionalism and educational enlightenment. The images and meanings of these objects do not transpire homogenously, and need to be understood in terms of their contextual manifestations (Prasad, 1993). It is therefore not sufficient to claim that, for all MELISSA respondents, digital technology symbolises pragmatism or organisational efficiency. A focus on local meaning is necessitated (Prasad, 1993). Certainly, the contexts of local interactions and interpretations enact respective symbolic narratives (ibid.).

A complex ecology: liberating the analytic border zone

Throughout this treatise, I have attempted to bring forth a diversity of encounters and perspectives. However, it is impractical to canvass the numerous local manifestations of the differing symbols of digital technologies. Rather, it is the systematic and pracademic *recognition of* individual and collective sensemaking that remains of critical concern. The very nature of such meaning creation, then, forms the analytical basis of our inquiry. Within this conceptual framing, the nature of human action is inherently social. The human being is an acting organism; its social action defines much of community/group life. I do not exclude cognitive processes from this action. The social encounter, rather, represents the complex interplay of emotive, cognitive, cultural, and behavioural factors.

Assuming this multitudinous position, encounters can manifest through a range of 'mediating practices'. This refers to a "series of operations (social, subjective, cultural and technical) that mediate between the user and the technology" (Rantanen, 2006:156). For Saskia Sassen (2006; 2013; Rantanen, 2006), this bundle of operations is often reduced to such variables as the 'interface', technical competence, and related notions. This indicates the naturalisation of a particular mediating practice, but does not encompass other diverse operations. Our MELISSA exploration has observed the emergence of different types of encounters, manifest across symbolisms, meanings, and representations. These are also highly dependent on culture, on communal localities, on technical competencies, and on social interaction.

The multiplicity of technology encounters help to underpin the notion of mediating practices, in which we observe the interplay between many different kinds of experiences. For Sassen (2006; 2013; Rantanen, 2006), the study of these infinite experiences will problematise the study of technology and people. It will also liberate what she terms the 'analytic border zone' between the user and the technology. Here, there is a "tendency to collapse the matter into a dividing line"

between users and electronic objects (Rantanen, 2006:156). The study of mediating practices allows for a more critical understanding of the user (ibid.), and builds toward a nuanced ICT4D undertaking (in which the user is always considered within the context of his/her mediating operations).

Ultimately, in the study of systems of social relations, and of meaning, we observe the emergence of a complex ecology. This is shaped both by technology and by diverse 'cultures of use' (Rantanen, 2006). This ecology is not reducible to binary human-computer interactions, but rather determined through intersecting practices (identities, culture, objects, actions, meanings). A complex ecology is then a fluid convergence of two intersecting systems: social relations, in which we detect interactive domains, individual 'selves', and interlinked actions; and social meanings, in which we detect culture, and evocative encounters. These are arranged along macro, meso, and micro contexts.

Returning to the forefathers of 'social meaning'

In view of the encounters and mediating practices that concern digital technology, symbolic and otherwise, a final and brief consideration remains. The very foundation of the qualitative MELISSA enterprise rests on the analytical framework of social meaning. Our research team wanted to explore a 'web of meaning' as it transpired along with the acquisition of technical skills. In actuality, this web did not emerge in any framework of critical and in-depth inquiry. I return briefly to three ancestors in the study of meaning, only to ground this inquiry within a broader theoretical domain.

For Pierre Bourdieu, individual meaning came to fruition in a network of social relations: meaning is constructed and influenced by the collective. And within the collective context, 'shared' meanings emerge, and ultimately affect the engagement with digital technology. In his seminal work, Bourdieu develops a theory of practice that is a critique of the methods and postures of social science (1977). Citing his fieldwork experiences in Algeria, he provides an account of how human action should be understood (ibid.). He pioneered, furthermore, a theory of symbolic capital, which has stood as the analytic foundation in the study of domination and power.

I do little justice to Bourdieu's theoretical texts, and by no means attempt to emulate his work. This exploration, rather, as the emergence of a symbolic narrative, builds toward a rigorous and integrated Bourdieu-n inquiry. I have thus endeavoured to shed more light on concepts of meaning, and of mediating practices, in explaining the many technological encounters in educational development settings. This remains a central deficiency in the pracademia of ICT-for-development.

We may also think back to Goffman (1974), and his seminal frame analysis, to understand the organisation of the human experience. The frame as a mental orientation links closely to our understanding of the evocative encounter, despite Blumer's wariness of cognitive processes (1969). At least, as I have gradually discovered, the symbolic experience of teachers in developing contexts is never a solitary, delinked social phenomenon. Rather, it is an integrated and dynamic process, parallel to other notional frameworks and mediating practices (as for example instilled through culture and community). The evocative encounter manifests through these dimensions of the human condition. This occurs in the form of a symbolising (or interpretive) capacity, which both constructs and responds to behaviour and action (Stajkovic & Luthans, 1998).

In terms of an individual or collective meaning, we are reminded of the social representation approach, popularised by Serge Moscovici in the early 1960s. This approach, according to Wagner (1996:96), is a paradigmatic way of making scientific sense of an array of social phenomena. These range from the role of science in society, social and cultural processes, and to common sense in general (ibid.). This approach also departs from social cognition, and is closely connected to social constructionism (ibid.). In its classic sense, social representation is a way of 'world making', and of reality construction. This again links to symbolic interactionism, but not in the more contemporary framework of it in this thesis. I have explored this perspective in a more integrated sense, rather, especially in relation to other socio-cultural factors.

The social representation construct extends to the interpretive capacity of individuals, and to the social construction of technology encounters. A diversity of representations may shape the multi-levelled interactions with ICTs. This may also influence the rate and strength of technology adoption. For Wagner (1996) however, the notion of representation is problematic. He cites the conceptual 'divide' between social cognitions and social representations. The former acknowledges the existence of objects with specific attributes, independent from the subject. The latter, however, does not (ibid.). Social cognition upholds the veridicality – or, the degree to which reality is accurately represented – of cognitions; this is not upheld by representation (ibid.).

It is in this divide that our own exploratory account has varied from social representation in the traditional sense. The encounter is enacted as a symbolic force, capable of (re)directing behaviour. But this is not determined by symbolism alone; sociality, emotionality, culture, and cognitions – mediating practices! – have some stake. It is in this interplay that we locate – or *localise* – the symbolic narrative. I do not therefore consider under-resourced primary schools – or, 'development communities' – to be abstract symbolic societies. This excludes a variety of other mediating operations. The experience of ICTs, then, is only a *partial narrative* of a complex relationship between human and digital society. The future development of ICT4D will depend on the integration of this with other leading perspectives in localising the technology experience.

The anti position: a fear of knowledge

Before concluding this analysis, I pay duty to what I deem a critical weakness in the symbolic interactionist framework: its social constructionism. The constructionist approach of this type of inquiry may brand it non-objective, relativistic, and antirealist – let us briefly evaluate these critiques.

As stated in Chapter III, any social scientific research that studies the meanings of objects and activities is a version of symbolic interactionism (Manning & Smith, 2010:41). This includes the processes whereby such meanings are created, modified, and sustained. It is broadly held that "meaning" – in the sense that it somehow represents a distillation of "knowledge" – is socially constructed. It is both dependent on and constitutive of the *contingent* needs and interests of the individual / constructor (Boghossian, 2006). This represents both the strength and weakness of social constructionism. Knowledge, facts, and beliefs are contextual, localised, and relatively positioned. Simultaneously, for the pure constructionist, both universality and objectivity are contested (or denied) (ibid.).

The methodological position of symbolic interactionism – with its constructionist basis – conceives of the world empirically, and studies man (collectively) as the creator of his institutions (Remender, 1990). One historical difficulty with this position has been that it provides rich information on practices, symbolisms, and beliefs in local settings. Such studies tend to be small-scaled, and focus on local level dynamics, often disregarding the contexts of macro social inquiry (see Swartz, 1998). This generates 'knowledge' that is fragmented and difficult to systematise (ibid.). Focusing too narrowly on the context of symbolism – or on the local enactment of a symbolic narrative – may be a possible drawback of an interactionist perspective. This exacerbates those empirical difficulties associated with the methodology:

> [M]eanings are interpreted and modified during the process of social interaction. This simple statement presents three interwoven challenges to us as symbolic interactionists: we must spend enough time 'in the field' to enable us to grasp the changing meanings given to objects, we must learn the methods of interpretation used by group members and, finally, we must be present during the scenes of social interaction so that we can observe the interpretive process as it plays itself out. (Manning & Smith, 2010:40)

The methodological practice of interactionism is challenging to accomplish as empirical research. A lot is expected of the interactionist, whilst symbolisms are ambiguous and elusive. Although a deeply interactionist account might be relevant to the discipline of ICT4D, it may not necessarily suggest concrete ways for practitioners to integrate newly acquired 'symbolic knowledge'. Moreover, many interactionists – or communication scientists – may not be intent on changing hegemonic ICT4D discourse. This itself is not a criticism of the perspective; some pracademics will simply lack patience and insight with regard to deeply localised and constructionist analyses (see Posner, 2009). Consequently, it cannot be expected that all symbolic research be effortlessly integrated within the ICT4D enterprise.

Returning to the ontological challenge of constructionism – and of its antirealist counterparts – Boghossian (2006:16) maintains that it is too narrowly focused on the contingency of facts. The 'extreme' or pure constructionist may hold that constructed knowledge refers to phenomena that were *built*, as opposed to simply being discovered (ibid.). That is, such knowledge is brought into being by an individual's intentional activity at a given point of time. To claim that it was *socially* constructed is to add that it was built by a society; by a group of people organised in a particular way, with particular values, interests, and needs (ibid.). For Boghossian and others (e.g. Brown, 2007; Van Inwagen, 2009), this account of constructionism contests the foundations of rational belief. It transcends, furthermore, the realist constructs of universality, objectivity, and mind-independence.

The position of social constructionism, then, indicates a "fear of knowledge". The rational basis of knowledge seeks epistemic justifications for propositions. These are located within an objective reality, capable of being studied independently from the constructions of the social mind. Rationality, furthermore, indicates a fallibility of belief, which is also defeasible: knowledge is capable of being refuted (Boghossian, 2006). Consequently, both Boghossian and realist counterpart Van Inwagen (2009) lay the foundation for rationality, in which belief can be justified as truth, and hence sustained as 'knowledge'. This is a Platonic ideal of knowledge, in which universal fact resides independently of the human mind.

These critiques mar the validity of the interactionist stance: how are we to study the emergence of symbolic encounters without a subjective or relative basis? In their classic text, Kim and Berry (1993) propose a means of dealing with the ambiguity of relativism – a key tenet of constructionist thinking. They suggest an *emic* approach – centring on the individual experiences of persons – and believe it possible to conduct a series of these, identifying cross-cultural commonalities between them. As a result, a universal understanding will likely arise across different symbolic manifestations – a notion referred to as a 'derived etic'. A derived etic necessarily differs from an imposed etic, in which a dominant ideology is bestowed on marginalised groups (see Said, 1978). In the case of a derived etic, universals will emerge amid social groups, and not be assumed beforehand (Kim & Berry, 1993; Swartz, 1998).

It is in the spirit of Kim and Berry that we aim to position our symbolic interactionist pursuit. Because essentially, the perspective lends itself toward increasingly relativist and subjectivist thinking. Social meaning is modified through an interpretive process, and positioned through human group interactions. The phenomena of interpretation and reinterpretation represent the critical subject matter of the symbolic interactionist (Remender, 1990). Man is jointly implicated in the historical process of making and reconstructing social institutions (ibid.). Does this negate objective reality? Is there an absolute, rational truth, as opposed to multiple symbolic realities (see Brown, 2007)?

Significantly, from the original Blumerian account, we may understand that the notion of both objective reality and rational belief is not purposely undermined. Firstly, for Blumer, objects – or "things" – seem to exist in their own right. As stated in Chapter III, "things" refer to everything that the human being perceives or experiences in his or her environment (Blumer, 1969:2): material objects or artefacts; other human beings; institutions; guiding ideals; and the activities of others. These appear to reside in an objective reality, independent from the human mind (e.g. a Platonian ideal). Critically, however, these objects are symbolically mediated (Sassen, 2006; 2013; Michalski, 2013). This inevitably shapes the actions and reactions toward such objects (as per the first Blumerian premise). The interpretive process through which objects are negotiated then shapes/constructs/enacts a symbolic reality.

Second, the symbolic interactionist seeks to explain human behaviour at its own level of analysis (Remender, 1990). The emergence of the symbol is seen as the justification of the perspective's anti-reductionist stance (ibid.). In this way, symbolic interactionism departs from more classic behaviourist analyses – it is positioned, rather, as social behaviourism. As Remender claims, therefore, "distinctly human behaviour is symbolic behaviour" (1990:349). Those social actions

that characterise the human experience form the basic units of observation for symbolic interactionism. This speaks particularly to joint action, through which meaning is both emergent and enacted. Ultimately, the interactionist pursuit is driven by the study of man as a distinctly human creature, engaged in defining situations, and acting in terms of his meanings (ibid.).

In light of these arguments, the symbolic interactionist perspective does not exhibit a "fear of knowledge". Rather, it *desires* knowledge. But this "knowledge" is not singularly determined by abstract, homogenous truths or hegemonic narratives. Knowledge is mediated and directed by plural subjectivities, by a multitude of 'human truths', of symbolisms, and of symbolic narratives. This does not diminish the metaphysical constructs of rational belief, of universality, or of objectivism. The nature in which the absolute world is experienced and interpreted, however, is at the true core of the interactionist pursuit. Ultimately, a 'derived etic' may present the only pragmatic study of the myriad symbolic narratives. This will seek (or derive) a universality from multiple knowledges, rather than a fear of a singular, objective knowledge.

Retrospection: emancipating ICT4D?

Through the in-depth exploration of social relations and meanings, we begin to understand the limitations of ICT intervention strategies. These are to go beyond the provision of physical, imperative access. On top of access considerations, interventions may need to contemplate aspects of attitudes and self-beliefs, discourse, context, and individual meaning – mediating practices. But this is not a novel realisation, in the least. Scholars have long explored the social and cultural nuances that shape the use and adoption of technology, and have indicated its embedded, formative character (Ginsburg, 2008; Bijker, Hughes, & Pinch, 2012; Castells, 2002; 2007; Sassen, 2013).

And yet, it is against this backdrop that the impact and experience of ICT remains an enigmatic, near insoluble phenomenon! Considering some of the foremost experiences and reflections within the MELISSA context, a final consideration remains. This is the emancipation of ICT4D within the perspective of a symbolic narrative. There is here the uncharted possibility of a more extensive study of meaning and experience. An exploration of these avenues broadens the understanding of the 'social technology' discourse, and may even build toward the emancipated practice of ICT4D. But how is a diverse series of constructs – social relations, encounters, meanings, mediating practices – to be incorporated in a research agenda? Having already discussed ontological foundations (Chapter V), and in the light of a symbolic narrative, I shift the

focus briefly to a number of design reflections. These bring us closer to the (hopeful) emancipation of ICT4D.

The MELISSA project team strove to attain two project goals:

- To equip primary school teachers with e-skills, thereby developing their digital literacy, and in so doing helping learners to adapt to the knowledge society; and
- To create a set of measures to assess the role and impact of digital technologies in teacher training and curriculum delivery.

These ambitions grew directly out of prior experiences in Brazil, and out of local failures presented by the Khanya programme. In response, the research team envisioned an experimental methodology. This entailed the sampling of six primary schools, the creation of a three-tiered ICT training module, and a mixed-method data collection strategy. Ultimately, this research design was experimental in nature. Firstly, the design was formulated deductively. The team proposed a set of hypotheses, hoping to test these in an ensuing training experiment. And even though these premises grew out of prior experience, and out of the surveyed literature, they were intervened as opposed to deduced from a 'naked field' (as, for example, associated with grounded theory).

In this vein, MELISSA was created as an intervention-based research project. In principle, this type of inquiry accords with that of participatory action research (PAR), which "seeks to understand and improve the world by changing it" (Baum, MacDougall, & Smith, 2006:854). This is a widely used methodology (ideology?), and is characterised by an extensive notion of participation, both in terms of the researcher and the subject/respondent/interlocutor. Typically, this type of research is conducted at the 'grassroots' and is appropriated for development priorities. PAR is defined through various principles that both correspond to and diverge from the initial MELISSA vision (see Babbie & Mouton, 2001:314). In its project proposal, MELISSA was never explicitly defined as a PAR approach, but there is much cause to support such an argument.

Researcher as change agent

A defining principle of PAR regards the researcher as an active change agent that works with individuals and communities who occupy peripheral positions in society. These groups are often characterised by economic, class, and cultural vulnerabilities. As 'educated activist' (Babbie & Mouton, 2001), the researcher conducts intervention- or design-based research, that aims to address a development concern in the recipient community. Knowledge generated here can then

be applied practically, by addressing the local challenge, as well as theoretically, in terms of closing the gap in our understanding of local dynamics.

In theory, this may instil a politically sensitive relationship between the researcher as external specialist and the participants as internal authority. The motivation of the change agent, then, is risked at the prerogative of local dynamics and stakeholders: these may not be in favour of intrusive forces. In the case of the MELISSA study, such a relationship was inevitably perceived in terms of visiting experts, there to address challenges in skills development:

> I think MELISSA came at the right time and also where Khanya left the void, MELISSA came in. (Principal at Blossom)

> …because I had a start, a kick-start with Khanya and I've got the beginners now – the basic knowledge of computers and I wanted to improve myself, empower myself. (Teacher at Blossom)

> I think it is different. Khanya brought something different. Khanya was more teaching us to be computer literate, where with you guys…who taught us things on the computer that we can use. (Teacher at Rosmead)

> Oh MELISSA training was good and the teachers were so transparent in such a way that they come here without any knowledge from us, from our side, but they managed to teach us. (Teacher at Moshesh)

These comments from local educators affirm that MELISSA helped fill the 'void' left by Khanya. In addition, the visiting experts could instruct and develop skills that would be useful to the beneficiary group – that would help to 'improve' and 'empower' teachers. As researchers, we were then regarded as change agents from the outset, and were tasked to help address widely perceived vulnerabilities and shortcomings. Whether any perceived 'change' was inevitably useful, or beneficial, would require a process of in-depth research. Ultimately, the project was received as an opportunity for positive change.

At this point, even though research team members / course facilitators were recognised as change agents by teachers, I am uncertain how the team regarded itself. Certainly in my own experience, I was explicitly aware of the project goal: to help develop digital literacy, and assess to what extent this influenced teacher practice. As the designer of some of the training modules, I bought into the purpose of the curriculum, but had difficulty conceptualising its instructional design. I worried that infrastructural limitations would hamper the effective delivery of the course. These concerns were not unfounded, as prior experience in these schools did caution me against the many variables that could hinder any progress. Nonetheless, I proceeded naively into each school, flash disk in hand, ready to teach digital literacy, and to observe the process of this.

As I facilitated each training session, I quickly became entangled in the immediate task: to get to the school in time (navigating the unfamiliarity of township life), to set up the computer lab (which was heavily consuming), to wait for the arrival of latecomers (of which there many), and to instruct the lesson plan. These activities conspired to make the research process an extremely challenging endeavour – certainly no menial task! As a result, I lost track of those 'naturalistic motivations' that led me to be here, as I fell prey to the real-world environment. The research did not suffer because of this; on the contrary, it was enriched. The very process of implementing such a social experiment is revealing, and enlightening.

From observing some of my team members during these sessions, I am confident that they too fell victim to the demanding research action. Some of our early facilitators soon felt the implications of working in strenuous environments: teachers were often late or uninterested, computer resources were minimal, internet access was restricted, rooms were hot and stuffy, and the like. These challenges seemed to sway the research action, quickly becoming a weekly 'educational task' as opposed to a long-term 'knowledge vision'. I was involved in preparing newer team members on the mechanisms of the training process, and found myself explaining the many uncertainties and frustrations of my own experience. I later observed as these members became entangled in the technicalities of the curriculum, and of instructing it. I had hoped they understood their subtle role as change agents, and what this could imply for the broader research process.

These personal observations do not necessarily accord with those of individual team members. I am however enthused to explore them in more depth. At this point, the relationship between the pracademic facilitator and the 'recipients of digital literacy' is an important symbolic consideration moving forward. By tapping into such an affiliation, I further hope to reveal the nuances and subtleties of ICT4D encounters. MELISSA team members and course facilitators, ultimately, would be the first and primary point of contact with teachers (and associated role players). It was important, therefore, to create rapport with this research audience. A sense of unity and trust between researcher and participant is characteristic of a democratised research relationship, another PAR fundamental.

Democratising the research relationship

A common practice in PAR is to reduce the social distinctions and the communication distance between the change agent and research participants. In doing so, the subject-object relationship (that characterises traditional quantitative research) is transformed into a subject-subject affiliation (Babbie & Mouton, 2001). This approach has a number of implications that may alter the outcome of the research. Firstly, individuals are not regarded as objects of research. Rather, they are participants, informants, or interlocutors. The roles of the researcher and participants (interlocutors) are flexible and variable. The researcher is not an objective observer, furthermore, but an embedded change agent. Incidentally, the 'democratising principle' of subject-subject relationships accords with a naturalistic ontology as presented by Kinash (2010:5) (see Chapter IV). Here, the very concept of subjective/objective is diminished. Rather, the research is embodied as a social process, and the relationships between participants and change agents are mutually negotiated.

A democratised relationship is also characterised by the presence of non-professional intermediaries or co-actors in the research process (Babbie & Mouton, 2001). These persons later replace the traditional authority of the outsider professional (expert activist). In this way, the generated research knowledge and practices are transferred to the general population. Whether this process occurs gradually or abruptly, needs to be well defined at the commencement of the project. Indeed, much of the project 'success' can be achieved in this phase – it is imperative to create symmetrical, horizontal, and non-exploitative relationships between participants (Fals-Borda & Rahman, 1991). Therefore, the asymmetrical relationship of submission and dependence, implicit in much rationalistic research, is diminished in favour of a subject-subject connection (Babbie & Mouton, 2001; Fals-Borda & Rahman, 1991; Kinash, 2010).

In practice, a democratised relationship is challenging to sustain. This goes to the heart of PAR, however, in which the research team is (or should be!) inevitably aware of power dynamics. Much effort is devoted to ensure reciprocity and symmetry of relations (Babbie & Mouton, 2001). This also holds relevance for the wider community beyond the target group, which may be affected by the development intervention. Thus, all related participants should ideally function on equal footing in the research process – local interactions are key in achieving development aims (ibid.). These principles support an egalitarian vision, and not a technocratic experiment. Whether or not MELISSA was structured along this agenda, is a case of interpretation and reflection. Some respondents had affirmed this position:

> What I loved about MELISSA is the way that the facilitators trained us in their friendly tone. They would train and stand back, they would allow us to struggle and watch and monitor and almost at the point where you realise: listen I want to give up, then they step in. (Principal at Blossom)

> What I like about MELISSA is the elementary and the personal way that they trained us. They train you at your level. They really come down. They come down to your level and they never make you feel as if you know nothing, that you know we're going to start there and we're going to proceed from there. As far as I'm concerned whatever they trained us, stayed with us, because in the way that they trained us. (Principal at Blossom)

> Just to thank MELISSA project for the patience because sometimes we were reluctant to come but at the end of the day, we benefitted something. There are some teachers who really benefitted like me. (Learning support teacher at Thembani)

These are just some examples of the praise bestowed on course facilitators, and speak volumes about the effort to democratise the research relationship with participants. It was important to remain friendly and patient, and not come across as overly intrusive. From my own experiences in the training sessions, this was a tough ask, as teachers were generally 'hot and bothered' after a long day's work. Interestingly, the principal at Blossom suggests that facilitators came "down to" the level of teachers and did not assume a subject-object or expert-novice role. In my own experience again, this was another tough ask, given the variety of tricky situations teachers would end up in! As so-called course experts, we were required to resolve such issues with lack of complaint, striving toward amicable relations between participants.

There were instances of negative training experiences from the perspective of teachers, but not overtly related to interactions with course facilitators. Rather, these extended to the speed of the sessions and the high load of theory content. Such instances did not bespeak a lack of democratic relations, but rather a lack in synergy between the course outcomes and individual teacher expectations. One teacher at Rosmead – a school where training sessions were generally welcomed, and in which teachers performed well – noted a few grievances:

> In the beginning there was that, "oh no not another workshop!" because it impact[ed] on our time, on the school. But I think in the long run, we do moan and we do groan, and find that "I didn't understand this" and "I didn't understand that".

> At the risk of some racism, there was a lady here; I think she came with you once at the beginning and we didn't [feel] that they learnt at that time because she couldn't really bring across what she was supposed to. Until you came and took over and then we could keep up. (Teacher at Rosmead)

The respondent is careful of being perceived as 'racist', remarking on the supposed inability of a female facilitator in instructing course content. The element of race here is observed to be a possibly defining influence on the researcher-participant or instructor-student relationship. In my own experience, racial or gender discrimination was not a determining factor in designing the course, or in building the project team. Team members were aware, certainly, of discrimination being a rampant problem in South Africa. But as this respondent alludes, it could well be an underlying dynamic that manipulates the social interactions between facilitators and course attendees. If so, this may even extend to the process of technology adoption itself! Conversely, this is but a single comment presented in the context of a diverse interaction space. It may therefore require further elaboration.

Beyond this seemingly obtrusive relationship, the respondent at Rosmead experienced a process of steady progress among his colleagues. He later stated that the group had "no reason to complain" and that they eventually enjoyed the course. These positive affirmations again indicate that relations between course attendees and facilitators were amicable and non-exploitative. The respondent attributes some negativity to the "busyness of the school", which was a persistent logistical constraint. This, in his view, hampered the training, but that it was an expected challenge in light of the school's demanding calendar:

> The only thing I heard was that the whole [group was] not computer literate. They struggled because it was moving a bit too fast for them but when they got the hang of it then there was an "Aha!" and then they enjoyed it because they understood it.
>
> But there was nothing, like, negative about the workshops. The only negative thing was it was after school obviously. But we were aware of the fact it was going to be after school. But we had no reason to complain… It is really more the busyness of the school it really is. (Teacher at Rosmead)

The respondent's comments are indicative, conceivably, of an awareness of being interviewed; of being recorded for external analysis. This is minor evidence, perhaps, of the Hawthorne effect, citing a change in some respondents' attitude and behaviour in the presence of the interviewer/researcher. Practical studies in real-world settings may be particularly vulnerable to unintended effects on intervention outcomes (Fernald et al., 2012). Although a natural or expected occurrence, the Hawthorne phenomenon was not explicitly defined as a vulnerability within the MELISSA context. The observational component of the project allowed for a range of subjective experiences, on part of both the observers and observed. This, in turn, would shape particular responses to the presence of course facilitators, interviewers and general team

members. These elements provoke a broader discussion, which I am unable to address. For now, the Hawthorne effect is a potentially eminent factor in the design of MELISSA.

Whose participation is it anyway?

In a 2005 article, Helen May tackles the subject of pupil participation in UK schools, calling for more acknowledgement of pupils as motivators and executors of their own participation. May continues to argue for the assimilation of those perspectives of both the professional and the pupil, thus embracing participatory action within education. Pupil participation is a topic that then gained much salience on the state agenda, also mirrored in the academic community. After all, she asks, whose participation is it anyway (May, 2005)? Although I do not wish to labour the point, I do want to underline the nature and extent of participation throughout the MELISSA endeavour. As with the context of pupil participation in the UK, the role and implication of the 'agent's voice' cannot be neglected in sustaining development initiatives. It is the most distinctive feature of PAR, which informs and influences all the other characteristics of this paradigm (Babbie & Mouton, 2001).

Participation is defined as a cyclical, reflective process. In this manner, it can (should?) occur through all phases of the research enterprise. In its broadest sense, participation means bringing together diverse participants to work together on problems or development priorities (Babbie & Mouton, 2001). This implies, both theoretically and practically, that it is not to be inhibited by singular, isolated activities. Rather, it is to be a holistic, embedded function of the universal research action. These thoughts are easier expressed than achieved. They do yet help us to determine the relationship between participation and the study of technology interactions. In light of this, does the notion of participation help emancipate the practice of ICT4D? Is it, therefore, a concept vital to the success or failure of our research experiment?

In May's work (2005), participation is addressed in political, pedagogical, and research domains. Despite this, interventions were largely professional in nature (policy, educator, researcher), and did not embrace student-centred learning processes or inclusion. In this vein, the very concept of diverse participation was inhibited by adult-centric pursuits. As with May's key domains, participation can occur through all phases of the research programme: problem formulation, design planning, implementation, monitoring, results generation, dissemination, and review and reflection (see Babbie & Mouton, 2001). Already at the outset of the project, participation with the stakeholder group gains impetus, and is foreseen as an integrated, active process of involvement. Let us examine to what extent this occurred in designing MELISSA.

Problem formulation

This is the conceptualisation phase of the programme, during which participants discuss the key focus areas of the inquiry. They may decide why an intervention/action is needed and what the goal of the research may entail. The problem formulation phase is collaborative in nature, and can involve representative members and groups in the subject field. In the case of MELISSA, much of the research objectives grew out of prior experiences in Brazil (BET K-12). As mentioned, the research team wanted to explore/confirm self-efficacy as a worthwhile construct to ICT adoption. Locally, the Western Cape Khanya programme was the first of its kind in delivering technology resources to primary schools. Integration and adoption, however, was seemingly worsening (see Chigona et al., 2011).

These experiences in mind, the MELISSA team formulated a research plan to address skills shortages and study e-learning impact. Yet, aside from infrequent discussions with local principals and other stakeholders, it would appear that the study population was not represented adequately in the conceptualisation phase. The selection of participating schools was done in partnership with a South African NGO, Edunova. As mentioned earlier, Edunova was at the time a long-standing Khanya partner – schools needed to be associate members of either institution to qualify for MELISSA involvement. Colleagues at both Khanya and Edunova did contribute thoughts and experiences as to potential research avenues for MELISSA (and similar initiatives):

> [W]e like to have the entire community involved and with that also I say the governing body is drawn into that process so the school actually is a part of it all. It is not just something given or thrown to them. They are part and parcel of it and part of the consultation and the decision making, because it is only the school that knows what their focus is. (Advisor at Khanya)

> You know it is not about the technology going into the school it is about saying to the school, what is your need? Are you a Maths focus school? Are you an Arts school? Are you going to concentrate on [the] English language? What is your focus? And so the lab has to be prepared with that in mind because…one size does not fit all. Each school is an individual project. And particularly the financial implications, like on the infrastructure we would go to a school and say okay the infrastructure is going to cost R200 000 now this is what needs to be done…can you contribute? (Advisor at Khanya)

> If you're a teacher, [you are] left a bit high and dry [when] a laptop doesn't work or… there is not a clear support process. So on the technical side you do need someone to help respond. Reframe that or redirect that or get support to get your direction. The layer of support; to me that extends across all technical and other more pedagogical kinds of issues. (Partner at Edunova)

These contributions helped to conceptualise the research problem: the school community is not involved in consultation and decision-making processes; technology interventions are not tailored to individual schools; infrastructure limitations hamper the successful integration of computer laboratories; teachers are not supported adequately; and "support" extends beyond technical issues and also concerns pedagogy. Already before commencing the project, the research team had sufficient background knowledge in terms of the subject area. This was supported by related academic studies; inter alia Davids' analysis (2009) on ICT4E success factors, and Chigona, Mbhele and Kabanda's investigation (2008) into the impact of the internet in eliminating social exclusion.

Apart from these valuable contributions, the remainder of the primary school network was not explicitly engaged in the problem formulation phase. School principals and management staff were met occasionally throughout the process, but nearer to the next phase (initial design planning). In this way, much of the problem intervention, as well as its scholarly ambition, were created in absence of those groups earmarked to be its key participants. As far as I can tell, teachers were not interviewed prior to the process, and if so, this was never formally recorded or disseminated. Ironically, the interviewee at Khanya noted the importance of school participation and involvement – much of the educational community was again excluded in key decision areas!

These claims accord with an earlier observation that the MELISSA design was positioned deductively, from a set of existing hypotheses. The problem central to its intervention, subsequently, was already defined prior to confirming any participants. This, of course, is a natural circumstance in any academic enterprise, and not indicative of an exclusionist agenda on part of MELISSA. Furthermore, the project was never disguised as a genuine PAR undertaking. Rather, it was created as an 'action experiment' that would delve into some of the dynamics that shape ICT engagement. One cannot ignore its key development aim, however, of helping teachers become mediators of digital literacy skills, thus easing their integration into the knowledge society. For this aim, stakeholder involvement and participation may have been foreseen as integral to the research action (Raval, Mckenney, and Pieters, 2011).

💻 *Planning the initial design*

During this phase, participants decide on a plan of action / methodology for achieving said aims (Babbie & Mouton, 2001). In particular, they may decide on suitable research and action techniques, and on the timing of the development intervention. In the case of MELISSA, participants were generally involved during this phase. By this time, the context area had been defined and the team had gathered enough background data in order to formulate a research

problem. Using the selection strategy previously discussed, the team compiled a sample from the Metro Central Education District of Cape Town (indicated in figure 7). This region was selected for reasons of convenience and uniformity. Indeed, both CPUT and UCT were within close proximity of all schools. Moreover, schools shared district business planning and strategy processes (WCED, 2008).

Following the selection process, permission was obtained from the Western Cape Education Department to conduct the intended research. In particular, meetings were held with the e-Learning and Research Directorates at the WCED. After an agreement was reached, the MELISSA team hosted an Open Day at the CPUT Campus in Cape Town in June 2009. This event was anticipated as an introduction to the MELISSA project, presenting a brief history of its conception, and exploring potential research design strategies. All 'prospective' participants were invited and the delegation included principals, teachers, government functionaries, and external advisors. Subsequent to the Open Day, the team visited all interested schools to present some of the project particulars. Three schools declined participation, and three new schools were identified.

The initial design phase, thus, was a period of stakeholder consolidation: schools were identified, approached, and confirmed as participants. Other role players were also engaged in the process, including advisors from the provincial government, Khanya, Edunova, and the UCT School of Education. A Chief Education Specialist from the WCED also joined MELISSA as a PhD student. This addition to the team was later helpful in understanding many of the political dimensions that characterised education in the province. Overall, the initial design phase was structured in accordance with the fundamentals of PAR: diverse stakeholders were brought together to tackle the development priority of technology in education. It is for this reason that I continue to regard MELISSA as a participatory action research venture, as opposed to an isolated experiment. However, for reasons stated above, participation was only partial, and did not extent to all phases of the project.

Implementing and monitoring

The implementation phase has long been considered as the primary data gathering or intervention stage (see Oja & Pine, 1987). During this phase, the research team, including participants and interlocutors, undertake fact-finding missions and explorations to generate an understanding of the research field. In the case of PAR, the implementation and subsequent monitoring of a project is typically collaborative. In the MELISSA case, the implementation process was twofold. Firstly, the team designed a three-tiered curriculum, without formal input or content suggestions from the

participant group. Concurrently, the team visited some of the identified schools to introduce the project, and obtain consent. Next, course facilitators set up timeslots and venues for the curriculum delivery. This was the only stage in which teachers and school management staff partook in the project arrangements. The respective parties suggested appropriate schedules, designated or invited teachers to join the sessions, and prepared the laboratories.

At this point, it is important to consider the implicit project *roles* of each participant group. Given that MELISSA was never explicitly intended as a participatory action venture, the research team was appointed as its 'driving force'. In this vein, team members would be responsible for developing the project goals, structuring the course curriculum, and implementing the course. Teachers, likewise, were not ill considered in this process and were perceived as the beneficiaries of an in-depth training curriculum. Excerpts from an early project-participant agreement affirm this, and convey the simple message that "ICTs should make teaching and learning better":

> What if technology made it *easier* to manage large classes? What if technology can save a *significant portion* of teachers' time? What if the curriculum could be *managed* in some way using the internet?
>
> This project sets out to bring the benefits of ICTs to primary schools, by focusing on and working with *teachers*. As a teacher, you are invited to join in, to give you the **ability**, the **confidence** and the **motivation** to use information and communications technologies in your work, in an informed, effective and sustainable way.
>
> - Excerpts from an unpublished agreement between MELISSA and participating teachers (2009-2011). Original emphases.

These passages reveal the MELISSA project's intended contribution toward ensuring the effective use of ICTs for teaching and learning. Furthermore, this agreement reveals, perhaps inadvertently, teachers' implicit roles as 'development recipients'. However, the agreement states very clearly that the potential benefits of ICTs can only be realised through a proper learning experience. This refers to the three-tiered curriculum, presented in the agreement via marketable terms:

> **Stage One: How to use a PC to do more work in less time.**
>
> **Stage Two: How to be a better teacher.**
>
> **Stage Three: How to come to terms with the new world.**

The project implementation phase would seek to facilitate these stages, thus supplying teachers with the necessary skills in becoming active members of the information society. Teachers were accordingly required to 'participate' as course attendees, joining in on the training sessions and completing assigned tasks. These expectations, of course, were ideal and did not always correspond with the actual state of affairs. The three-stage training course was promoted as an exciting opportunity by principals and IT managers alike. Our experiences in the field proved otherwise, as teachers did not always recognise the potential value of the curriculum.

Overall, the implementation phase did not explicitly frame teachers as project design participants, nor did it appear that such a possibility was of any interest to school staff. Rather, teachers were regarded as the primary beneficiaries of the project and as students of new technology. This was reflected in the anticipated outcomes of the project, as presented in an official MELISSA brochure: "confident teachers, capable learners". In this brochure, circulated to interested parties, project intentions were further described: "at least 100 teachers will have the ability, the confidence and the motivation to use information and communications technologies in their work, in an informed, effective and sustainable way". These formal outcomes affirm the roles of project 'participants' as the beneficiaries of educational development.

Reaching conclusions and generating knowledge

The products of participatory research are sometimes referred to as 'local theory' (Elden & Levin, 1991:132). In PAR, local theory is generated collaboratively, utilising the different types of expertise and frames of reference of the participants and change agents as a point of departure (Babbie & Mouton, 2001). Participants interpret their own data in terms of their own experiences, values, and language (ibid.). This process ensures a cyclical flow of stakeholder engagement, from the project commencement to its conclusion. In the case of MELISSA, research team members assumed the primary responsibility for this closing phase. There were instances of fact checking with teachers and principals (I remember emailing the IT manager at Rosmead a few times), but these were minimal.

Course attendees did evaluate the project during the final training sessions, and provided feedback on their experiences. This assessment was later helpful in discerning the 'impact' of MELISSA. As for the actual knowledge generated, and its relevancy to the research outcomes; this was discussed in Chapters V and VI. For now, the hopeful outcome was expressed as the improvement of teacher capabilities. This, in turn, would lead to the improvement of learner outcomes, which was an indirect expectancy. A combination of these elements would produce a

positive impact as earlier alluded: “confident teachers, capable learners”. The interaction of these elements is conceptualised as per the project brochure:

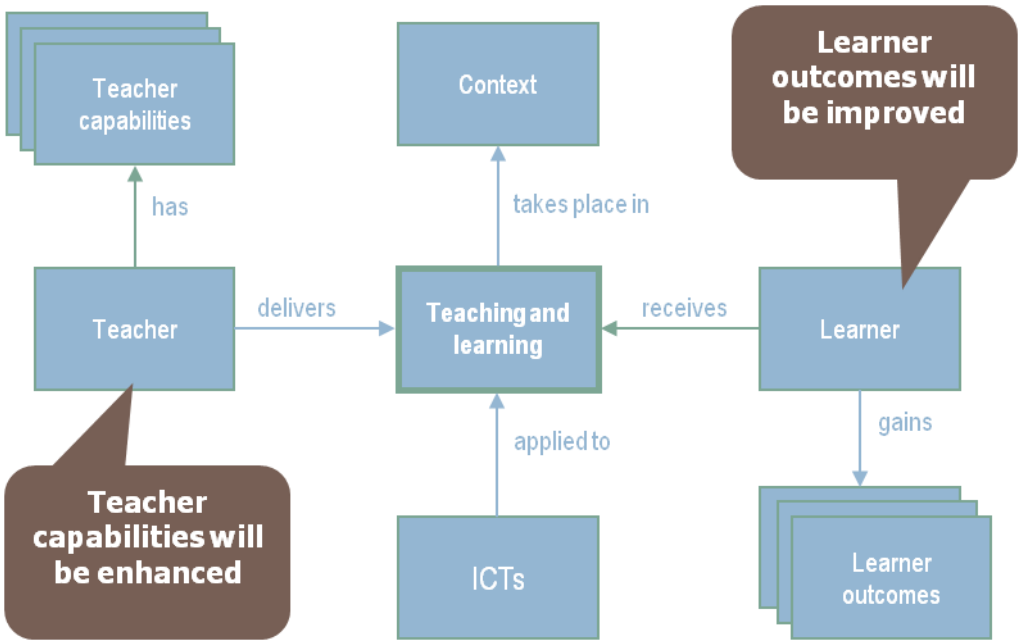


Figure 15: Key MELISSA concepts and outcomes (source: unpublished project brochure, 2009).

Ultimately, the four core research phases yielded a variety of inputs, activities and engagements. The MELISSA team was outlined as the driving, actioning force. This unit was responsible for architecting the primary layout of the project, from the problem conceptualisation phase, to the production of new knowledge. Participating teachers, however, were regarded as the receivers of an educational intervention. This was hoped to stimulate the development of capability, of confidence, and of efficacy. In turn, the universal impacts of education in primary schools would be enhanced, and learner outcomes would be improved (optimistically!). Participation in the sense of project management, input, and direction, was limited mostly to contributions from the project team.

We have now moved closer in understanding some of the key design challenges that characterised the MELISSA experience, especially from the perspective of participatory action. The fact that the project was designed and implemented as an action research venture, and not as a participatory undertaking, may hold immediate implications for the practice of ICT4D. These will be discussed in due course. Up to this point, we have identified only some of the reasons as

to how this particular ICT4D enterprise has incorporated individuals' local knowledges and experiences. A number of methodological challenges remain, before we turn to final reflections.

Other methodological challenges

I have thus far reflected on some of the foremost design considerations in contextualising and assessing the MELISSA project. Other methodological considerations remain, including the social verification and validation of data, the diffusion of results, and the application of problem solutions. The validation of findings, firstly, was a challenging task. In participatory action research, social verification is a joint process, where all stakeholders corroborate the presented findings. In lieu of such collaborative input, however, validation becomes a process of triangulation against paradigms, methodologies, methods, and researchers (Babbie & Mouton, 2001). In this vein, MELISSA attempted to do 'justice to the object of study' (Smaling, 1989) by controlling for reliability in several of its key phases.

Initially, the project was designed from two theoretical vantage points (barring locus of control): self-efficacy and social meaning. This would allow for a central data set to be explored through different notional lenses, therefore avoiding singular perspectives. Next, the project employed both quantitative and qualitative methodologies in collecting and assessing the data set. This would help to overcome some of the biases that stem from single methodologies (Denzin, 1989). Finally, the MELISSA team employed its three member groups in executing the project. The team in Lugano chaired the project proposal and created the course curriculum. This was facilitated by the research groups in Cape Town (UCT and CPUT). All three teams helped to analyse and disseminate (publish) the findings.

Following triangulation, data was validated through a process of peer review. This would extend the triangulation phase, whereby researchers from all three teams evaluate the collected data and the resultant conclusions. As such, peer review functioned as a cross-evaluation of the project, in which team members debate issues, raise concerns, and reach consensus. This took place in the form of teleconferences, annual research visits (to both Cape Town and Lugano), and email exchanges. Despite these activities, communication between universities was often thin and irregular (at least, in my own experience). Subsequently, much of the peer review process was fragmented, negating consensus between the team.

Another methodological difficulty involved the diffusion of results to participants/respondents. The MELISSA team hosted an Open Day to market and introduce the project to potential stakeholders. Much later, following the analysis of results, certain publication avenues were pursued and many of the senior researchers regularly travelled to international conferences. In this way, results were disseminated to the academic community. However, apart from a Project Finalisation meeting in October 2011, new knowledge was not diffused to the educational community (i.e. teachers, learners, principals). This refers not only to knowledge nuggets obtained through training (which were partly disseminated online), but mostly to the practical and theoretical contributions of the project.

Project results, even if incomplete, were not regularly disseminated to stakeholders (both teachers and school management bodies), stalling an effective review and reflection process. In the same vein, tangible problem solutions have not been identified. This includes the development of an action agenda, and the design, generation, and operation of actions that are based upon (and arise out of) the research (Babbie & Mouton, 2001). This would thus be a concrete, practical enactment of research outcomes. Despite the project having been formally completed, the analysed findings – for both self-efficacy and critical discourse analysis – have not translated into ensuing improvement actions. It remains unclear to what extent digital technologies have affected the disadvantaged primary school community, and to what extent this impact could be harnessed.

That said, given the triangulated research design, these types of projects could produce results with potential for near infinite analysis. In light of the endless theoretical avenues, and of the constantly evolving subject field, project results can remain incomplete for prolonged periods. The question of applying research outcomes becomes entangled in the practicalities of obtaining (new) funding, of retaining the research team, and of generating relevant, practical results. These dynamics are perhaps indicative of broader concerns in the ICT4D domain: to what extent is local theory incorporated for action, after project completion? And is the notion of participation necessary to achieve the intended goals of development?

Solving the intellectual puzzle

We have finally arrived at the near conclusion of this thesis. I must return, ultimately, to the various contributions I sought to make originally. We may think back of our intellectual puzzle at the very outset of this analysis. Our research problem firstly involved *the manifestation of meaning:* how do individuals construct their 'technological worlds' – and how do they encounter these? How does the digital technology experience manifest symbolically? Secondly, our puzzle involved the *emancipation of ICT4D:* how do we incorporate local knowledges, symbolisms, and experiences of ICTs? How do we integrate a participatory research process in the ICT4D pursuit? These ambitions have shaped the research process, and I am now able to reflect on their accomplishment. I distinguish, at this point, between the theoretical, methodological, and practical contributions of this treatise.

Theory considerations: key reflections

In the spirit of both classic and contemporary theory (Prasad, 1993; Bijker, Hughes, & Pinch, 2012; Orlikowski, 2010; Ginsburg, 2008; Sassen, 2006), I can align my theoretical contributions to some of the leading propositions in the computerisation of educational practice. This requires, firstly, a recognition of some of the basic tenets to the 'symbolic being' – most of which are not entirely novel in an interpretive or naturalistic social science. Secondly, however, our propositions extend into the realm of ICT4D, necessitating a recognition both of their presence, and of their nature. The collective interplay of these principles imparts an in-depth theoretical contribution. This is specifically pertinent to the analysis of technological encounters (symbolisms, experiences, interpretations, practices) in the advent of technology-for-development.

This study has explored the multiple experiences of digital technology in development settings (low-resourced primary schools). Preceding any of these experiences, at least in theory, is the notion of the constructed social world. This world – as so aptly explored in Emile Durkheim's sociology – is characterised by the interactional nature of human group life. Social action or behaviour shapes and influences much of group life; action both produces and is a product of the social environment. The human being is inherently an acting organism and human conduct is formed in *inter*action. The MELISSA experience is positioned within this social order, to which individual agents enrol, and which defines the many subjectivities and realities of the social community. We may thus derive our first reflection:

> *Individuals, as social beings, are the creators of their institutions. The social world – or experiential reality – of the individual is arranged along a system of social relations: roles, interactive domains, objects, introspective realms, and interlinked actions.*

The constructed social world also sees the emergence of meaningful inquiry. This type of inquiry is embedded within culture as the embodiment of shared symbols. Within this domain – or, system of meaning – the individual possesses a basic interpretive function. We may term this a *symbolising capacity.* This capacity breeds evocative encounters that in turn allow individuals to respond to their environments. Such encounters go beyond mere functional indications or representations. Rather, they produce and espouse *meaning.* The experience with digital technology is framed within this meaning-making process. From these premises, we may derive a second reflection:

> *The human being is an acting, interpreting organism, and produces meaning in the process of interaction. Meaning is not mere representation, but is concretised as evocative (symbolic) encounter.*

The range of meaningful encounters are also located and enacted within micro, meso and macro contexts. At the macro level, the rapid advent of hyperconnectivity has penetrated the global workforce. This resonates both nationally and regionally, in which a directive to embrace technological progress is advanced by leading actors in government, industry, and civil society. Concerning the meso level, the national school administration has deployed technology access and integration programmes throughout the provinces of South Africa. This has permeated the micro level, in which primary schools engage in local ICT4D initiatives (e.g. Khanya, Gauteng Online, and the like). Our third reflection is derived:

> *Symbolic realities are located and enacted within micro, meso, and macro environments. These environments are treated interpretively, in which technology directives (instrumentality, determinism, hyperconnectivity, and the like) are propelled multi-directionally.*

With reference to the MELISSA case, the computerisation – or increased digitisation – of the educational workplace will exhibit meanings and symbolic associations relative in nature, strength, and degree. Technological symbolism is likely to take multiple forms, and may transcend the professional or organisational space. Within the educational community, the myriad of meaningful encounters will determine the (re)actions toward digital technology. Across this landscape, ‘meaning’ may not transpire equally for all workplace members. However, technology

encounters may dissipate in light of hegemonic forces (i.e. management structures, determinism, instrumental directives, and the like). Such processes may have broader significance for the meso and macro contexts in which individuals are located.

On the micro surface, I have identified some of the foremost 'technology encounters' that emerged in the MELISSA case. These include, seemingly, discourses that emphasise the useful or enlightening features of technology. The overwhelming majority of MELISSA respondents were in fact adamant that ICT somehow contributed positively to their professional activities. ICTs were identified as being useful for administrative purposes, classroom management, and student engagement. Ultimately, ICTs were understood to be functional, and educational. Additionally, some were 'enlightened' or 'empowered' by the use of technology, and equated their e-skills with being prominent educators (as per Figure 8).

A number of negative and discouraging encounters also emerged, especially in terms of adoption. Respondents were frustrated at perceived resource inadequacies, and some did not possess the necessary literacy skills. This revealed early discourses of digital immigration and computer anxiety, in which participants felt insecure and fearful in their techno-interactions. Encounters of a negative or indifferent nature were less dominant, and did not appear to transpire in the public school domain. Rather, they were reasonably suppressed, likely due to existing technology imperatives.

We observe, furthermore, the emergence of multiple symbolisms, each in some way related to broader technology encounters. These represent the enactment or the embodiment of local meanings beyond mere utilitarianism. Teachers experience a diversity of symbolic themes, ranging from pragmatism, organisational necessity, fear, romanticism, idolatry, utopianism, and entertainment. These converge within a broader symbolic narrative that encapsulates the overall 'technology-in-education' experience. A fourth reflection is therefore derived:

> *A diversity of symbolism emerges. This pertains to the embodied meanings, associations, and experiences of digital technology. These ultimately converge within a symbolic narrative, and shape both the physical and notional engagement with digital technology in education.*

The symbolic narrative – as the convergence of multiple encounters, symbolisms, cultures of use – functions in a complex ecology. This pertains to the interplay between systems of social relations and systems of meaning. These systems offer a series of mediating practices – social, cultural, technical, cognitive – that affect the engagement with technology. It is within this

complex ecology that the analytic border zone – the reasoned distance between users and technologies – is problematised. Overall, this builds to a critical study of people and their digital interactions.

> *The symbolic narrative is enacted within systems of social relations and systems of meaning. These converge into a complex ecology, and manifest as a series of mediating practices. Collectively, such practices problematise the analytic border zone between users and technologies.*

Although a myriad of meanings and practices may transpire in the developing educational context, this thesis cannot study their innumerable varieties. Rather, it is the systematic and pracademic recognition of their *being*, and of their *power* in shaping the symbolic narrative. The process of individual and collective sensemaking, therefore, is our foremost theoretical concern. Yet, the recognition and integration of these tacit processes may challenge a broader ICT4D pursuit. With counterparts in the academy (Ginsburg, 2008; Kraus, 2010; Case, 2007; Bijker, Hughes, & Pinch, 2012; Sassen, 2013), I am confident the assimilation of a symbolic narrative has not materialised in the broader ICT4D domain. We can derive, thus, our final reflection:

> *The diverse meanings and practices that transpire within the 'technology for development' experience are not assimilated within the ICT4D enterprise. This requires a systematic recognition, ultimately, of the being and power of sensemaking – the emergence of a symbolic narrative.*

The 'assimilation' of symbolic narratives within the pracademia of ICT4D is no simple task. Nor does it offer a quick solution to a prolonged intellectual puzzle. I will discuss these elements in the section on *'Methodology considerations'* below. For now, a meta-critical consideration remains: is a symbolic interactionist perspective sufficient in uncovering and integrating the many nuances that characterise our development narrative? In what follows, I briefly discuss how this treatise has (and should have!) extended this framework. Essentially, symbolic interactionism is present in the fundamental inquiries of interpretivist or naturalistic research. Does it classify thus as a particularly "discernible" approach, through which we can engage local symbolisms and experiences?

Theory considerations: extending symbolic interactionism

Blumer's early formulation of the symbolic interactionist perspective was conceived well before the advent of hyperconnectivity and the resultant ICT4D pursuit. These phenomena have extended the interactional practices between social beings and their perceived objects. It is Blumer's principle of symbolisation that highlights the significance of this relationship. This principle underpins the "processes through which events and conditions, artefacts and edifices, people and aggregations, and other features of the ambient environment, take on particular meanings" (Snow, 2001:371). Such meanings become *objects of orientation*, furthermore, which elicit feelings, actions, and interactions (ibid.). This is recognised as a fundamental premise to the interactionist perspective.

For David Snow (2001), the exclusive focus on the production of meaning, and on the interpretive process, can give rise to two erroneous presumptions. The first of these states that symbolisation is a continuous challenge for social actors. Second, actors are endlessly engaged in the interpretive task of making sense of the world as they encounter it and negotiate it throughout their daily lives (2001:371). According to these presumptions, the principle of symbolisation defines much of interactional life. The authority of this principle, however, veils the extent to which symbols – and the meanings they convey – are embedded in existing cultural and organisational contexts and systems of meaning (ibid.). Stated differently, symbols are routinised and entrenched in the normative structures of daily life (culture, community, organisation, and the like).

At this point, we are reminded of an accompanying perspective – Goffman's frame analysis (1974). His treatment of frames as interpretive schema illustrates the cultural or organisational 'containment' of symbolisation and meaning. Frames are conceptualised as interpretive frameworks that render otherwise meaningless aspects into occurrences that are meaningful (1974:21). Yet, Goffman suggests that frames are not so much constructed or negotiated anew as individuals move from one situation or activity to another. They exist, rather, as "elements of the individual's or group's enveloping culture, and thus contain within them the situation-relevant meanings" (Snow, 2001:371). For Goffman, frames are institutionalised within the broader domains of culture and social life.

Within this perspective, we notice a structuralist element in Goffman's treatise. Frames are generally determined and constrained by culture, which may inhibit their subjective appropriation. For Goffman, however, primary frames are themselves subject to transformation through various "keyings" and "fabrications". These transformations can be fleeting or enduring, thus suggesting that frames are subject to historical change and do not remain "static cultural entities" (Snow, 2001:372). The issue of meaning and interpretation – as embodied in the principle of symbolisation – therefore offers both structuralist and constructionist dimensions. This adds a culturally institutionalised component to the Blumerian conceptualisation of meaning, in which people act toward things on the basis of the (interpreted) meanings they have for them.

Ultimately, Goffman and colleagues (Fine, 1992; Chayko, 1993) argue for the extension of the principle of symbolisation by rearranging its focal question: how do meanings or symbolisations become taken-for-granted and routinised, forming part of Bourdieu's "habitus", Mead's "specious present", or Goffman's "primary frameworks" (Snow, 2001:372). The question is yet broadened: what kinds of social contexts, organisational forms, relational practices, and cultural processes are conducive to or facilitative of the routinisation of meaning (ibid.)? We are reminded of the *sedimentation* of meaning (explored in Prasad, 1993), in which symbols acquire some level of permanence within social institutions. In our MELISSA case, this routinisation of meaning was evident in the gradual advance of the technology imperative – a 'directive of instrumentality' that came to define the contemporary education landscape.

In light of the above, we are now able to transcend narrow conceptualisations of the interactionist framework. Symbolisation occurs within the broader constraints of culture, and is enacted through it. A more nuanced symbolic analysis calls for the study of routinised, sedimented, or entrenched meanings. Conversely, under what conditions and in what ways are sedimented meanings or extant cultural frames *fractured,* contested, or debated (Snow, 2001)? It is assumed that such contestations may render the symbolic basis for action problematic, thus calling for new or revitalised interpretations and framings (ibid.). Our MELISSA case is once more indicative of the multiple fractured meanings within a narrative of development. The many instances of cynicism, pragmatism, organisational necessity, and euphoria are just some of the indications of a contested symbolism.

The newly sedimented principle of symbolisation begs a final consideration. I speak here of the principle of human agency. From the symbolic interactionist perspective, human actors take account of their environments or of interactional "objects" – vis-à-vis symbolisation – and direct the appropriate line of action. However, at a practical or observable level, this veils the deep

routinisation of behaviours, responses, and actions. Indeed, human actors generally function within the constraints of biological, cognitive, structural, and cultural factors – systems of social relations and meaning. This again refers to the structuralist and constructionist dimensions in the interactionist thinking. For Snow (2001), however, the structure/agency debate yields a 'false dichotomy' in that the two constructs presuppose one another.

Ultimately, the classic notions of symbolisation and human agency are extendable in light of structuralist orientations. It is the task of the modern-day interactionist, then, to explore the many sedimented and agentic manifestations of 'structurally constrained' meaning. Fine (1992) refers to this as a "synthetic interactionism"; one in which the elements of structuralism (culture, institution) and agency (symbolic constructions) are maintained. It is not clear to which extent the MELISSA environment caters to both of these dimensions. The aforementioned data, however, did reveal a number of symbolic pursuits, embedded within broader macro and meso constraints – hyperconnectivity, technology directives, determinism, techno-enthusiasm, and the like. These observations reveal symbolic realities as inseparable from cultural realities, which both espouse and inhibit human agency.

Methodology considerations: the virtues of design beyond participation

Throughout this analysis, I have also considered a number of methodological factors. I reflected earlier on some of the research design characteristics in structuring the MELISSA programme. I described some of the principles of a participatory action research venture, in which the researcher acts as a leading change agent. Within such a venture, the research relationship is democratised (ideally), and the identified stakeholders "participate" throughout all phases of the project. As stated, these fundamentals of PAR were not fully accomplished in the MELISSA programme. The methodological design of the project did not compensate for some of the socio-political and logistical difficulties the research team would eventually face. In addition, some of the ontological virtues of participatory action research were not practically feasible.

Although the original MELISSA programme did not start out as a participatory action venture, it may have benefitted from a rigorous implementation of PAR. This analysis and my accompanying fieldwork experiences have helped us recognise the significance of participative inquiry. This is what I take to be a methodological contribution, furthermore, to the broader pracademia of ICT4D. Indeed, some of the questions that accompanied our initial research problem concerned this troublesome area of participation: how does a local ICT4D initiative consider and incorporate local knowledge and experience? To what extent is participation

necessary; what is the nature and degree thereof? How is knowledge generated for purposes of 'action' or 'development'?

To address these concerns, we may firstly reflect on the nature and the degree of participation. Many typologies of participation exist, with Arnstein's (1969) ladder of citizen participation a noteworthy contribution to the social science discourse. True participation was historically labelled as "authentic" and "democratic" (Fals-Borda & Rahman, 1991). On Arnstein's ladder, 'citizen control' was the ultimate and legitimate outcome of true public involvement. At the grassroots, however, the principles of democracy, authenticity, and citizen control are mostly elusive! Rather, as was evident from MELISSA reflections, participation is discernible on a continuum of "degrees" (Babbie & Mouton, 2001).

I depict the continuum of participation in Figure 16. These more or less correspond to Arnstein's ladder across three phasic rungs/steps. At the 'less democratic' extreme of the continuum, participants are *consulted* on the central aspects of the research. Near the more 'democratic middle' of the scale, participation is conceived as a *partnership* between the change agent and the participants (ibid.). The decision-making and responsibilities around the project are shared. Finally, at the more authentic or democratic extreme, participants are in charge of the inquiry. This is a form of co-determination in which all primary responsibilities and project activities are 'owned' by the participant group (ibid.).

The chief responsibility for implementing MELISSA was held by the research teams at CPUT, UCT, and USI. In this way, respondents were largely involved as external consultants. This meant that they – likely the principal or head of the computer laboratory – only provided input sporadically. Input largely concerned the discussion of project particulars: logistical details, administrative arrangements, and the like. Respondents were not involved in the design of the training curriculum, but could comment on its eventual outcomes. Member checks were also carried out with some respondents to confirm data that was collected. This was especially helpful in triangulating the data collection and analysis process (see Babbie & Mouton, 2001).

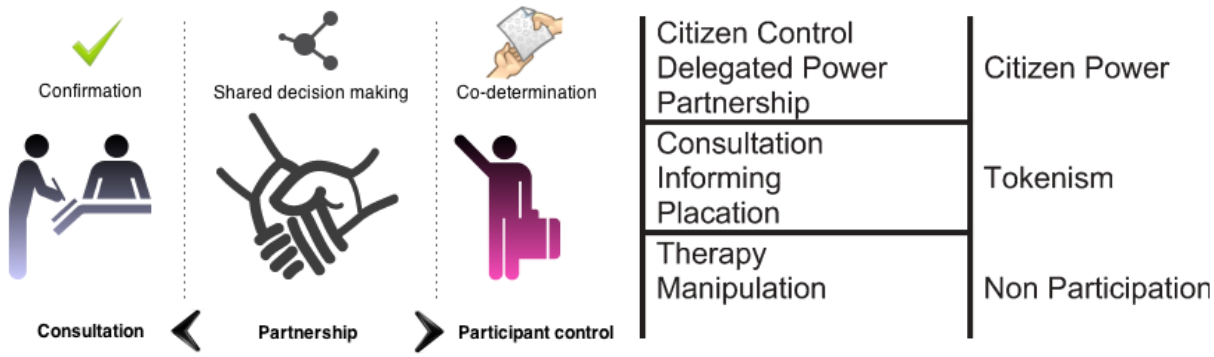


Figure 16: The continuum of participation (left) and Arnstein's ladder (right).

Ultimately, these processes of consultation did not progress to shared decision-making or co-determination. It was not originally anticipated that respondents' input would be required beyond the practical implementation of the project. Yet, the training module could have benefitted from a localised design for 'indigenous circumstances'. Much of the South African research team did partake in the curriculum design. There was a strong sense, however, that the project outcomes did not match the school contexts at the grassroots (Van Zyl & Rega, 2011). From the perspective of the in-field teaching programme, it would appear that conditions – institutional, social, economic, and political – were not fully conducive for successfully completing the training. This was due to several factors, notably under-resourced school environments, institutional restrictions (e.g. the research was not to interfere with any educational duties), and teacher disinterest (ibid.).

In terms of the actual MELISSA research team, it would appear that members were not equally participative, where individual agendas superseded those of the team (Van Zyl & Rega, 2011). Buy-in from all team members was not fully attained, and the project lacked sufficient ownership. This was evidenced in weak communication input, and high 'transaction costs' (ibid.). The overarching methodological approach's weakness was identified as the inability to adapt to strenuous local conditions. Ultimately, the MELISSA experiment perhaps indicated too much of top-down approach, as opposed to more collaborative inquiry, which would have the educators as co-creators of training modules (ibid.). Seemingly, then, the MELISSA initiative may have orientated towards a more co-determinant approach in which "even the research itself may be reinterpreted and reconstituted" (Babbie & Mouton, 2001:317).

One of the vital considerations toward a more participatory – or co-determinant – approach is the role of the researcher as a change agent. Earlier, I discussed the relationship between the ICT4D facilitator and the 'recipients of development' as an important symbolic consideration. We may extend this discussion by arguing for a more nuanced position of the external change agent. From

the MELISSA experience, we acknowledge the research team members and course facilitators as the primary initiators of the development experience. This experience, furthermore, is enhanced by a deeply collaborative relationship that can extend beyond the austerities of a participative continuum.

Firstly, such a relationship needs to be informed by principles of democracy and trust, on mutual grounds. Second, it must build towards a supportive and facilitative forum, through which unilateral control of the research is relinquished (Babbie & Mouton, 2001). The change agent then assumes a "catalytic" role by being an active partaker in, and at times the initiator of, dialogue (ibid.). Third, the change agent must assume intellectual flexibility as a *learner* and thus be open to unexpected change. Although a facilitative learner, the change agent will naturally undertake the role of teacher or instructor in moving the project forward. To maximise the virtues of participatory development, however, the agent should not act imperialistically. The agent will certainly bestow technical knowledge or social theory on the respondent group. Significantly, however, change agents should not try "to convince the 'uneducated' of the merits of their own educated convictions" (McTaggart, 1991:178).

The abovementioned roles are necessary in sustaining a democratic, trustworthy, and mutually inclusive relationship with the participant group. Ultimately, they bring us closer to recognising the virtues or the importance of participation in ICT4D endeavours (with great relevance to a project such as MELISSA) (adapted from Babbie & Mouton, 2001:318-319):

> **Empowerment.** Scholars have long recognised the value of participation in research and knowledge creation as being empowering (or 'enabling') (see Grimshaw & Gudza, 2010). This is the result of participants acquiring new skills, adaptable for immediate development priorities. Authentic empowerment is one of increased self-reliance: participants recognise and adopt the means through which development issues are tackled.
>
> **Decreasing distance.** This virtue is synonymous with the methodological benefits of participant observation. The change agent gains an insider understanding – an 'emic perspective' – of the respondents' social realities. This is achieved by spending a lot of time in the 'field' and by partaking in the daily routines of the group under study. Only by the deeper understanding of local knowledge and experience can the development research accomplish its goals.

Building a basis for a common field of knowledge. The decrease in distance between social actors can also contribute to a 'common consciousness' within the research environment. This is constitutive of collective, prevalent knowledge (in the societal domain) and academic, empirical knowledge (in the scientific domain). This consciousness is preferred over a deterministic or narrow understanding of development priorities.

Producing more socially meaningful research results. The research outcomes are directly beneficial (relevant) to the participant group. Socially relevant results are accessible, and meaningful – not veiled in the ivory confines of academia. The produced results are compatible with the needs, cultural values, and subjective realities of all participating stakeholders. Science, therefore, is democratised to instil a sense of immediacy and personal identification with the research pursuit (Babbie & Mouton, 2001).

The hitherto methodological application in terms of the MELISSA case has not been smooth sailing. This initiative's ambitious research design itself has exposed and presented a number of salient challenges. These necessitate, perhaps, a reconfigured methodological framework that caters to a diversity of settings and builds towards an inclusive (or, participatory) data collection process. To compensate for a diversity of settings in which technology interventions take place, and for its complex symbolic manifestations, the possibility arises of employing a *design-based research (DBR)* framework. This is an adaptable and flexible methodology, capable of meeting the diverse needs of teachers and students in various conditions. DBR is yet an emerging perspective, and has not found its distinct position within the communication and social sciences. It does, however, offer a number of important advantages:

> Design-based research is an emerging paradigm for the study of learning in context through the systematic design and study of instructional strategies and tools…design-based research can help create and extend knowledge about developing, enacting, and sustaining innovative learning environments. (Clarke & Dede, 2009:358)

Clarke and Dede suggest that the value of DBR lies within its iterative process, where interventions are shaped according to the classroom and learning context. This allows for both qualitative and quantitative approaches (from the perspective of the researcher), including observations, interviews, and participant interaction. This process is cyclical, allowing for continual theory refinement and implementation redesign. The potential utility of design research also derives from its focus on developing practical theory and tools that can be used to support

local innovation and to solve practical problems (Penuel, Fishman, Cheng, & Sabelli, 2011:331). Furthermore, the collaborative nature of much design research positions practitioners as co-designers of solutions to problems, which can facilitate the development of usable tools that educators are willing to adopt (ibid.).

DBR gained traction in the 1990s when a number of research and development teams worked collaboratively with practitioners to develop context-specific educational tools and curricula. These were aimed at improving the processes of teaching and learning, and at enabling educators to be better equipped as educational professionals. Such cooperative programmes had four common elements (adapted from Penuel et al., 2011):

- A focus on persistent and common challenges from the perspectives of diverse stakeholder groups;
- A commitment to iterative, joint design;
- An undertaking to develop sound principles of pedagogy, inclusive of technologically-integrated or –supported environments;
- A concern with developing capacity in order to effect and sustain system-wide change.

These components were later adopted by a number of educational interventions. In their study of the professional development of para-teachers working in underserviced communities, Raval, Mckenney and Pieters (2011) noted the benefits of stakeholder involvement. It implies, as a first step, that professional support practices must cease to view change as something that is done to teachers who are passive participants of programs (ibid.). The authors maintain that lasting changes in classroom practice are gained when teacher learning is sustainably supported, and is connected to participation in authentic, real-life tasks. In their study on the effects of teacher perceptions on technology integration, Cviko, McKenney, and Voogt (2011) facilitated a steady 'teacher dialogue' in the implementation of a technology-rich curriculum. Their findings suggest that a high extent of technology integration is related to a developmental approach to teaching and learning and very positive expectations towards the implementation of innovations.

Ultimately, facilitating participation in ICT4D is "not about cultivating a composite of disparate individuals but about contributing to an environment where interactions can influence design" (Winschiers-Theophilus, Bidwell, & Blake, 2012:99). To make appropriate participation possible, the pracademic needs to observe, reflect on, and respond to local values and local voices. Every design situation presents a diversity of identities, viewpoints, agendas, and roles within the

developed or recipient community. Thus, mutual learning informs the design process so that common concepts, such as "participation", are defined within the design context (ibid.). These tenets set the tone for design-based research, which may leverage on participatory dialogue for effective educational interventions.

Considerations for practice: applying design-based research

The design-based research approach supports participative, context-based and partnership-focused environments that enable the development of suitable educational tools. In light of these factors, both its theoretical basis and practical value deem design-based research as a valid methodological possibility within ICT4D and specifically, technology-for-education. It contributes to the understanding of the socio-cultural 'embeddedness' of pedagogy through a focus on systematic and contingent issues. This framework is valuable to researchers and practitioners interested in identifying the systemic influences or links to effective teacher development (Raval, Mckenney, & Pieters, 2011). The use of objective, transparent, and participative data collection methods may help to demystify ground realities for management and enable grassroots staff to enter into open discussions with their peers (ibid.).

Thinking back to the notion of an 'emancipated ICT4D', the outcome of this research broadens the understanding of technology encounters. For active practitioners, this may be significant in the design of localised interventions. For Krauss (2012) and company, context and personal curatorship are key drivers of emancipation. This study on ICT4D has attempted to follow suit, and has explored the need for locality-based design, with the emphasis on choices, interactions, and experiences. Effectively, it becomes possible to offer a design-based framework as a practical, methodological alternative. Within the MELISSA study itself, there would certainly have been scope to incorporate aspects of DBR. This is especially considering that its training curriculum was designed in absence of most of the study participants. Despite this, collaboration between education role-players on an innovative design has the potential to create a sense of ownership and commitment to an innovative effort and a sustained use of an innovative curriculum (Cviko, McKenney, & Voogt, 2011).

In this vein, design-based research elements could be relevant and beneficial to our practical research outcomes. DBR posits synergistic relationships among researching, designing, and engineering (Wang & Hannafin, 2005:5). Design experiments espouse both scientific and educational values through the active involvement of researchers in learning and teaching procedures and through "scientific processes of discovery, exploration, confirmation, and

dissemination" (ibid.). Practically, I propose a design-based strategy that would incorporate the following elements:

- **Socially meaningful problem formulation.** A contextual analysis or baseline understanding of the 'empirical setting'. This necessitates that the researcher partake in a type of snapshot ethnography (see Madden, 2010), in an effort to unearth those circumstantial dynamics that shape the educational environment.
- **Democratised research relationship.** Networking with gatekeepers and stakeholders, in an attempt to gain trust and rapport with the participant group, and to stimulate the respective research agenda.
- **Incorporation of local knowledge.** Arranging focus groups, or roundtable discussions, to delineate core issues, challenges and risks pertaining to the practice of education (in an under-resourced setting). These may not be limited to the immediate teaching/learning environment, but to the daily and personal challenges that underpin the lifeways of educators.
- **Self-directed design.** Stimulating processes of self-directed learning, in which curricula, pedagogical tools, and other respective components are 'imagined and designed'. This is envisioned as iterative cycles of design, enactment, analysis, and redesign (Wang & Hannafin, 2005). It is suggested that these cycles correspond to available literature and design cases from multiple sources.
- **Knowledge for action**. Proposed 'solutions', designs, or knowledges are to be implemented systematically, and purposefully (Wang & Hannafin, 2005). It is expected that when created collaboratively, these interventions will foster the varied dynamics of teaching and learning within diverse contexts (Raval, Mckenney, & Pieters, 2011).

I have listed some of the initial components that will reflect a design-based research strategy for future MELISSA-esque endeavours. MELISSA is in many ways a study that has been designed away from its core stakeholders or interlocutors. As a quasi-experiment, it may have itself benefited from a DBR methodology. But for the future understanding of meaningful encounters in the technology-for-education (or ICT4D) arena, design-based research can play a central role in structuring participative encounters. These move beyond the mere abstraction of symbolic interactions, and toward the practical incentive of shared activity, based on reciprocal cooperation.

Assimilating symbolisms and experiences

From the above, it is apparent that DBR can play an important role in creating participative methodologies with a concern for capacity development. It is not clear, however, to what extent design-based activities translate into impactful, tangible improvement. In my own view, this is an underlying problem evident in the broader application of DBR. Embedded in this approach are the normative practices of participation, collaboration, iteration, flexibility, evaluation, and real-world contexts. These are superficially located as progressive, constructive, or 'appropriate' activities that pay lip service to culturally sensitive, politically correct interventions. In this vein, DBR may strive to correspond to a social constructivist imperative, whereby much design emphasis can be placed around the supposed 'value of local voices'. But are these provided a forum to interrogate and ultimately reject the exaggerated offerings of context-sensitive, collaborative, and participatory interventions?

I would challenge myself and other proponents of DBR, henceforth, to try to address these issues. It is assumed that, by including participants (respondents, users, communities) into the design process, that their needs will be considered and integrated – *assimilated* – within the greater intervention or improvement action. It is taken as an uncontested premise that the quality of learning/teaching will be improved by the action of including local perspectives and role players. These 'default benefits' are not directly akin to sustaining development initiatives as community-curated flagships: to facilitate learning at the uninhibited prerogative of local groups. More precisely, how do local communities become the 'duty-free' facilitators of their own actions, be it improvement or deprovement? How do they become this without intellectual and economic dependency created by externally funded design research?

We are reminded, finally, of May's (2005) quip: "whose participation is it anyway"? Participation is only valid insofar it creates a *democracy of disapproval*, as much as it asks for democratic cooperation. The full assimilation of the variety of symbolisms in the ICT4D domain requires what Bijker, Hughes, and Pinch (2012:159-160) refer to as "interpretive flexibility": the ability for persons to use technology differently than intended by the interventionist. Pure egalitarian participation will embrace this principle, and seek to maximise freedom *only* within the (sometimes hostile) constraints of symbolic interaction, culture, and experience. I term this "assymbolation", a neologism that caters to the fullest incorporation of symbolic engagements. This, ultimately, is the foundation of a more nuanced engagement in ICT4D.

Chapter VII – Towards a nuanced engagement in ICT4D

This chapter presents concluding thoughts on the reflections thus far exhibited. A synopsis is provided of each chapter, summarising the overall research pursuit.

The primary outcome that emanates from the discussion is also discussed. Briefly, this denotes that the 'technology for development' experience in Southern Africa is embodied within a complex symbolic narrative. It would appear that this deep and nuanced narrative is not assimilated within the local ICT4D/E enterprise.

The above sections are followed by a discussion on the limitations of the thesis. These include constraints in the rhetoric of interpretation, and the failure in depicting organisational cultures.

Finally, new directions and future priorities are proposed. These are hoped to further the symbolic interactionist pursuit in ICT4D research.

The aforementioned elements have not been presented and discussed in any papers (co)authored by Izak van Zyl

Synopsis

In this thesis, I have explored an ICT-for-development project that was implemented in the Western Cape of South Africa. The MELISSA programme was envisioned as an experimental research intervention in response to the increased calls for technology-supported teaching. Nationally, the South African government had sanctioned transformative policies in which schools – primary and tertiary – were the catalysts for 21st century skills. This required, at a local level, the increased adoption of digital technology in the differing facets of pedagogy. From a research perspective, however, the increased engagement with digital technology had bred new and diverse experiences. These affect the pedagogical domain, and impart modern directives on the teacher persona. This thesis has attempted to examine such dynamics more closely.

Chapter I frames our research dialogue within the global movements of technology. It depicts, firstly, Appadurai's technoscape: a multi-dimensional and –accessible landscape of ICT appropriation. Global trends suggest a rapid increase in digital technology, from mobile subscriptions to broadband access. This landscape also forms the basis of a social and economic development agenda: to introduce ICT as an enabling tool. This agenda is in line with the Digital Divide narrative, in which increasingly 'backward' groups are excluded from the access and use of technology. And given the rapid advances of the technoscape – i.e. hyperconnectivity – ICT seems an alluring tool for repairing its own consequence: the marginalisation of social groups.

The magnetism of ICT is particularly relevant to the domain of ICT-for-development (or ICT4D). This is the simultaneous pragmatic activity of employing digital technologies for development priorities, and the academic activity of understanding the impacts of technology appropriation. ICT4D is henceforth recognised as a pracademic enterprise; it seeks, consequently, to eradicate – conceptually and practically – the global divides in technology access. The allure of ICT, however, is not beyond critical inquiry. Grand claims of "development", often reliant on quantitative assessments, are diminished in lieu of rigorous and experiential analyses of impact. We then move closer to the core concern of this analysis: how are ICTs to be incorporated on indigenous, localised terms?

An intellectual puzzle then emerges, one that resonates closely with the local ICT4D agenda. This pertains to the fundamental understanding of technologies as socially appropriated objects. Consequently, technological diffusion is not reasonable as an end in itself. Our scientific pursuit needs to understand technology in its many manifestations, not merely as the symbol of progress,

of economic empowerment, and of modernity. The fundamental inquiry for ICT4D is then positioned along the empirical exploration of social dynamics, of cultural production, and of symbolic meanings. This represents the epistemological aim of our treatise: to destabilise the hegemonic order of the Digital Age, and of the technology imperative.

Said research problem concerns two domains of inquiry, 1) the manifestation of meaning, and 2) the emancipation of ICT4D. The first aimed to establish some of the ways in which meaning around technology engagement is created and shared. The second aimed to apply such understanding in liberating the ICT4D pursuit from its modernity bias, thus arguing for a nuanced engagement with digital technology. These domains represent the two foremost objectives in the proposed analysis. Firstly, it aims to explore the manifestation of socio-symbolic perspectives in the engagement(s) with technology. And secondly, it aims to position the theoretical significance of such engagements in the general ICT4D approach. The simple rationale behind these aims is to lift the veils of idealism, determinism, and modernity that have thus far obscured the ICT and development landscape.

Chapter II presents a deeper contextual reflection of the global technological landscape. This landscape offers many transformative capacities – "promises" – that continue to propel the global technology uptake. Hyperconnectivity is also perilous, especially in terms of cybercrime, the fracturing of personal identity, and the fear of adoption. Ultimately, however, hyperconnectivity evolves across functional attributes: ubiquity, affordability, reliability, speed, usability, and skill. These form the basis of the ICT-for-development pursuit, which is built around those pragmatic impacts of new technologies.

We are introduced to ICT4D as a pracademic enterprise; one that tackles issues of development practice, and research inquiry. Key phases and new priorities in the ICT4D realm are discussed, emphasising the great divide narratives – digital and development. I continue to locate South Africa within the ICT4D landscape, noting its socio-economic priorities and its technology (or ICT) environments. I emphasise historical factors in the shaping of South Africa's own divides, and describe the policies created to redress historical imbalances. To help frame the ICT4D dialogue, I briefly describe a number of local initiatives that relate to technology in education. These include technology access programmes, digital content development, field trial projects, and user-driven projects.

Chapter III frames the conceptual foundations of the imminent analysis, and describes the theory of symbolic interactionism. At the core of this perspective, I take 'culture' to be a meaningful and normative process and product of interactional practice, interpretation, and social behaviour. I continue to study the tenets of symbolic interactionism, noting its three key premises: 1) human beings act toward things on the basis of the meanings that the things have for them; 2) the meaning of such things arises out of social interaction; and 3) these meanings are handles in an interpretive process. I discuss the particular relevance of these tenets to this treatise and of their resonance to Goffman's frame analysis. Finally, I describe some of the methodological considerations in employing interactionism as a conceptual lens. I conclude that this lens is not fixed, and has extended in light of my ethnographic pursuit.

Chapter IV presents the research design of this study. I firstly discuss those epistemological and ontological bases that define my scholarly convictions. In particular, I locate this study in a naturalistic paradigm, supported by Schutz' phenomenology in the study of 'meaning'. The specific methodology of the study is then discussed, noting the processes of data collection (interviews, ethnographic observations, meta-reflections), analysis (phenomenology as analytical framework), and ethical considerations (in keeping with Schutz' postulates of adequacy and rigour). No foremost ethical difficulties are encountered, aside from the ambiguous role of the researcher as a 'change agent'.

In **Chapter V,** I describe the first part of what I deem the 'MELISSA experience'. This experience is not simply a reflection of my own encounters, but a deeply nuanced account as per interviewees / interlocutors. MELISSA was inspired by several opportunities and challenges in the ICT-for-education domain. These were later encapsulated by two key research considerations: 1) to enable primary school teachers to become mediators of digital literacy skills; and 2) to develop a set of measures to assess the impact of ICTs in teacher training and curriculum delivery. The MELISSA team derived three hypotheses from these aims, which encompassed the study of computer- and teacher self-efficacy, and social meaning of ICT. The selected method design and data analysis techniques were then presented.

The chapter continues with an account of the leading project findings in terms of both quantitative and qualitative descriptors. The self-efficacy findings yielded two possible conclusions. Firstly, the MELISSA intervention did not impart a conscious understanding of those technologies related to educational practice. Digital technology was, it seemed, only loosely associated with teaching and learning. Second, teachers did not identify ICTs as significant in the improvement of professional educational practice. Technology training, then, offered no

(observable) benefit to the self-efficacy of the teacher. These findings were supported to some extent by critical discourse analysis, which frames perceptions and meaning around technology use in primary schools. Dominant discourses revealed an ambiguous role of ICT: teachers were ill equipped; contextual factors were challenging; and management bodies were under-resourced.

I reflect finally on theory considerations in the MELISSA experience. In particular, I explore the ontological challenges in the original conception of MELISSA, noting its ideological impasse. Furthermore, I describe the limitations of its two analytical constructs: attitude and discourse. These are found wanting in the assessment of technology adoption, meaning construction, and impact. They do help to build toward a symbolic narrative, however, in which the deeper nuances of technology interactions can be explored.

Chapter VI is what I regard to be the focal point of the analysis. Within the ethnographic exploration of MELISSA, I derive several key domains that depict a constructed meaningful social world: a diversity of professional roles, interactive domains, perpetual object encounters, self and identity, and interpreted, interlinked action. These help to locate the system of social relations in which our teachers are embedded. Furthermore, I position the meaningful 'encounter' – an interpretive social capacity that forms the basis of interaction. In particular, I locate a series of encounters along macro, meso, and micro experiences.

At a global level, the macro-level discourse of hyperconnectivity penetrates the ICT4D domain, and defines much of its development priorities. At a meso (regional) level, the hyperconnectivity discourse penetrates national ICT policy and civil directives, which sees a number of ICT4D initiatives countrywide. We move finally toward a micro-level depiction of those experiences that characterise technology encounters (for teachers in primary schools). I chart the foremost understandings of ICT among MELISSA respondents. These include – but are not limited to – functional, educational, and empowering discourses of ICT interactions. These do not exclude negative or frustrating experiences, typically expressed as computer anxiety, digital immigration, and resource inadequacy. Seemingly, in lieu of a deeper exploration, these represent the primary techno experiences.

At the more nuanced micro level, however, we explore the institutionalisation of the 'technology imperative': the use of technology out of the (deterministic) belief that it is good or beneficial. Examined more closely, we notice this imperative – among others – to be enacted as a symbolic reality. This depicts an alluring state of new technology, in which it becomes an instrumental symbol of modernity. Our exploration deepens to discover related symbolisms – symbolic

experiences – produced by collectivities of teachers, and to which they inherently subscribe. Some of the multiple symbolisms of ICTs include pragmatism, organisational necessity, cynicism, digital immigration, fear, romanticism, utopianism and enlightenment.

These are just some of the descriptors that we can assign to resembling encounters. Notably, macro-meso contextual issues, and specifically organisational and work-related dynamics, may affect teachers' attitudes towards technology. It is therefore likely that encounters and meanings that arise in environments where the use of technology is voluntary may be different. The symbolisms thus far described may therefore not be typical of disadvantaged primary schools, or of teachers in general. In this vein, symbolic encounters are highly situational, and may differentiate across different institutional, personal, and cultural modalities.

Overall, the multiple symbolic experiences of individual teachers converge within a fluid symbolic narrative. This constitutes a bundle of operations, experiences, and cultures of use, which we term 'mediating practices'. Such practices mediate between the user and the technology (digital artefact, service, object, system) and ultimately facilitate the technology encounter. The 'user' is this critically understood, and is perceived as a symbolic. Mediating practices, as entangled within a symbolic narrative, help to free the analytic border zone. This is a classic binary portrayal of user and technology. This escape from the analytic border zone broadens our discussion, in which we now derive a complex ecology of socio-techno interactions.

Taking heed of this ecology – which hosts the multiple symbolic experiences of individuals – I continue to argue for the emancipation of ICT4D. I explore the opportunities of MELISSA as a participatory action research approach, with specific reference to the researcher as 'change agent'. This also pertains to a democratised research relationship, and an underpinning of 'participation' as the key propeller of intervention-based development. However, the interactionist stance is marred by critiques from the positivist-leaning sciences: how do we study meaningful encounters beyond the domains of absolute truth and rational belief? In addressing such critiques, we move toward a more 'emic' perspective, based on the relative mediation of knowledge amidst plural realities, truths, and symbolisms. This does not counter the rationalistic, objectivist paradigm. Rather, objective and absolute reality is the realm in which symbolisms emerge; it is the task of the interactionist to study the universal elements among these.

I conclude the final chapter – and the overall thesis – by reconsidering the intellectual puzzle that has positioned our analysis. This undertaking was directed at the central construct of 'meaning' and of its relative significance in the ICT4D domain. I pursued several theoretical, methodological, and practical considerations in 'solving' this puzzle. I have derived a series of reflections as the theoretical contributions to the body of scientific knowledge. This largely concerns the disciplines of social and community informatics, anthropology, and communication sciences. Taken collectively, these reflections all embody a central premise: **the 'technology for development' experience is embodied within a complex symbolic narrative – this is not assimilated within the (South African) ICT4D enterprise.**

In light of this discussion, I also propose several ways for extending a narrow symbolic interactionist account. We look to the aspect of symbolisation, and of its relatedness to culture and broader paradigms of meaning. I argue for a more nuanced interactionist approach; one that considers the enactment of symbols in the sedimented routines of social beings. This also concerns those structural elements that constrain symbols and the meanings they represent. Finally, we look to a synthetic interactionism, incorporating the tenets of structuralism (institutionalised lifeways) and social agency (symbolic lifeways). It is unclear whether this fusion can survive in postmodernist academia; this is to be determined in future analyses.

Concerning my methodological contributions, I reflect on the notion of participation in ICT4D (and related) research. It is clear that this is a contested construct, and not fully attainable in the pragmatic implementation of interventions. Rather, I build towards the foundation of design-based research (DBR), which offers a more integrated approach to action research (of which MELISSA is a relevant example). DBR commits to iterative and joint design, specifically in the domain of pedagogy. It is concerned with capacity development, and helps to identify common challenges with the support from diverse stakeholder groups. DBR calls for more consensus-based design, and seeks to incorporate multiple voices and experiences.

From a practice viewpoint, design-based research can offer a context-based approach for research interventions. Some of its more pracademic dimensions include self-directed design (the appropriation of design principles by the participant group); socially meaningful problem formulation (the ideation of problems with local relevance); incorporated local knowledge (recognising the significance of local voices, and local content); and actioned knowledge (solutions are pertinent to the participant group and are implemented with systematic purpose). These features offer a research design that caters to the locality of the subject group. Therefore, stakeholders become active curators of their own interventions.

Ultimately, we are reminded of the pitfalls of participation. I posit that the mere consideration and integration (or assimilation) of respondent needs does not result in true, egalitarian participation. Only once the user group is given the forum to define its own boundaries, needs, and actions, can it proceed to tackle development priorities. This includes the 'participatory right' to reject or disapprove of external interventions, and the 'interpretive flexibility' to appropriate ICT solutions to their prerogative. The global proponents of ICT4D can strive toward such egalitarian participation via the systematic assymbolation of symbolic engagements, technology encounters, and cultural contexts. This represents the critical emancipation of the ICT-for-development enterprise.

The limitations of this treatise

Throughout this thesis, I attempted to bring to light those implicit and explicit relationships of meaning as presented through an experimental research inquiry. This was motivated by an academic interest, as I endeavoured to explore those "complex social systems" (Brown, 2010) and "dimensional intersections" (Fairclough, 1995) that encapsulate technology interactions. My aim was simple, and in line with that of my team: "A critical approach adds to our practical and theoretical understanding of educators' roles in ICT interventions. Findings from this study contribute to the development of evidence-based policies in ICT intervention" (Bladergroen et al., 2012:108). However, the effort to depict the technology-in-education experience via the 'meaningful encounter' is strenuous!

This study has relied on a 'rhetoric of interpretation', which leads to a question of representation: can I speak on behalf of the average teacher? Also, and perhaps more critically, an interpretative focus presents biases of selectivity, partiality, and prejudice. These are inflated by the tendency to assume a priori relevance of aspects of context. There is thus the risk that I project my own biases and prejudices onto data (Bommaert & Bulcaen, 2000:455-56). A number of theoretical limitations of this type of framework can be advanced, similar to those levelled against critical discourse analysis (adapted from Haig, 2004:140):

- Interpretation is not open inquiry, or analysis in support of theory, but interpretation in support of belief;
- The beliefs of the researcher are ideologically biased, leading to him/her reading meaning into, rather than out of texts;
- This bias is further compounded by the fact that the researcher selects only those texts, narratives, or voices that will confirm his or her beliefs;

- The distinction between the interpretation of the researcher and that of the lay reader is ignored.

These arguments affirm the potential lack of critical engagement in the practice of interpretive research. The risk here is that meanings are constructed (interpreted) into transcripts/texts/discourse, further limited by selectivity and personal bias. In light of these limitations, I cannot help but feel my own biases against ICT in education to have permeated the analysis. Although it is unclear whether this study has been exceedingly interpretive, I did attempt to offer a substantive critical examination. I pursued a process of open and axial induction, allowing for the discovery of multiple meanings. This was negotiated within a theoretical narrative (the manifestation of symbolic interactions), and located along a macro context of inquiry (hyperconnectivity, ICT4D). Insofar possible, then, I have attempted to offer a treatise of interpretation, critical inquiry, and reflection. It is advisable, in future, to include member checking (of observations, experiences, interpretations) as part of a critical, participatory analysis.

Finally, this exploration was unable to offer a synthesis of each of the six schools – i.e. describe each school as a singular entity. I did not have sufficient material to do so, as this was not one of the original objectives of the study. Such a grouping also takes our exploration into a somewhat different direction. It risks a further analytic border zone between institutions and their members, and it risks essentialising the former through the latter. The aim was always to offer a fluidity of perspectives within and across institutional boundaries, with a strong focus on the symbolic realities of individual teachers. The institution in its 'seeming entirety' cannot be neglected here, however. It may be especially possible to study it within the context of sedimented meanings, which is a future priority in this field.

New directions and future priorities

Throughout this dissertation, I localised the role of symbols and meanings in the technology-for-development pursuit. A number of research priorities remain in light of future analyses. At a theoretical level, firstly, it will be worthwhile to pursue the symbolic manifestations of digital technology encounters. This includes the study of those "techno-social sites of engagement" in relation to ICTs, particularly mobile technologies and the internet (see Case, 2007; Whitehead & Wesch, 2009; 2012). More specifically, studies may look to highlight the instrumentality of symbolic interactionism for e-learning research (see Michalski, 2013). This will help explore some of the interactionist framework's conceptual resources as applied to organisational analysis and e-learning design (ibid.). This can extend to the study of cyber communities, in which symbolic interactionism can examine new identities on and through the internet (see Robinson, 2007).

From the perspective of research design and methodology, studies may look to apply the constructs of 'assymbolation' and 'interpretive flexibility'. It is unclear to which extent this may be methodologically feasible. Designs that emerge from the psycho-anthropological sciences may be useful to consider here, so too elements of emotion sociology, cognitive anthropology, and communication studies. We may look to the principles of in-depth ethnography, visual anthropology and photo elicitation, participant observation, thick description, life history, and critical reflexivity to accomplish a nuanced symbolic analysis. These designs are not mutually exclusive; rather, they complement the ethnographic pursuit in exploring the enactment of symbolic narratives.

In ICT4D practice, a deeper or nuanced study of symbolic narratives may transpire as design-based research. Its participatory underpinnings may serve the ICT4D agenda purposefully. In brief, participants in intervention-based development research require a forum in which to voice their interests. The practical recognition of collective voice may enrich the implementation of the research design. Stakeholders are provided the agency to determine their participation in issues of development. This process is enhanced by design-based research, which is based on self-directed problem solving. For the pragmatic inclinations of the ICT4D enterprise, this could prove a viable strategy.

References

Abu-Lughod, L. 1999. The Interpretation of Culture(s) after Television. In: Ortner, S. B. (ed.), *The Fate of "Culture": Geertz and Beyond.* pp. 110 – 135. Berkeley: University of California Press.

Agre, P.E. 1995. Reasoning about the Future: the Technology and Institutions of Intelligent Transportation Systems. *Santa Clara Computer & High Technology Law Journal,* 11(1): 129 – 136.

Albirini, A. 2006. Cultural perceptions: The missing element in the implementation of ICT in developing countries. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 2(1): 49-65.

Amichai-Hamburger, Y., & Hayat, Z. 2011. The impact of the Internet on the social lives of users: A representative sample from 13 countries. *Computers in Human Behavior,* 27(1): 585 – 289.

Appadurai, A. 1996. *Modernity at Large: Cultural Dimensions of Globalization*. Minneapolis: University of Minnesota Press.

Arnstein, S. 1969. A ladder of citizen participation. *AIP Journal*, 216 – 214.

Attwell, G. 2007. Personal Learning Environments - the future of eLearning? *Lifelong Learning*, 2(1): 1 - 8.

Babbie, E., & Mouton, J. 2001. *The Practice of Social Research*. Cape Town: Oxford University Press.

Badshah, A. 2010. Unlimited Potential. A Catalyst for Social and Economic Empowerment. *Information Technologies & International Development (ITID),* 6(1): 72 – 77.

Bandura, A. 1977. Self-Efficacy: Towards a Unifying theory of behavioral change. *Psychological Review*, 84(2): 191-215.

Barth, F. 2002. Toward a Richer Description and Analysis of Cultural Phenomena, in Fox, R.G., & King, B.J. (eds). *Anthropology beyond Culture*. Oxford: Berg: 23 – 36.

Bates, A.W. 2000. *Managing Technological Change: Strategies for College and University Leaders.* San Francisco, Jossey-Bass.

Baum, F., MacDougall, C., & Smith, D. 2006. Participatory action research. *Journal of Epidemiology and Community Health*, 60(10): 854 – 857.

Bayne, S., & Ross, J. 2007. The 'digital native' and 'digital immigrant': a dangerous opposition. *Proceedings of the Annual Conference of the Society for Research into Higher Education (SRHE)*, December 2007. pp. 1 – 6.

Berdal, S.R.B. 2004. *Public Deliberation on the Web: A Habermasian Inquiry into Online Discourse*. Oslo: University of Oslo, Department of Informatics.

Bergman, M. 2013. *Origins of Athlone.* Retrieved 17 January 2013, http://bit.ly/10BI6Xi

Bernard, H.R. 1998. *Handbook of Methods in Cultural Anthropology*. California: Altamira Press.

Biggs, P., Johnson, T., Lozanova, Y., & Sundberg, N. 2012. Emerging Issues for our Hyperconnected World. In Dutta, S., & Bilbao-Osorio, B. (eds.), *The Global Information Technology Report 2012: Living in a Hyperconnected World.* pp. 47 – 56. Geneva: World Economic Forum.

Bijker, W., Hughes, T.P., & Pinch, T. 2012. *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. The MIT Press.

Bilbao-Osorio, B., Dutta, S., Geiger, T., & Lanvin, B. 2013. The Networked Readiness Index 2013: Benchmarking ICT Uptake and Support for Growth and Jobs in a Hyperconnected World. In Bilbao-Osorio, B., Dutta, S., & Lanvin, B. (eds.), *The Global Information Technology Report 2013: Growth and Jobs in a Hyperconnected World.* pp. 3 – 34. Geneva: World Economic Forum.

Bilbao-Osorio, B., Dutta, S., & Lanvin, B. 2013. *The Networked Readiness Index 2013: Benchmarking ICT Uptake and Support for Growth and Jobs in a Hyperconnected World*. Geneva: World Economic Forum.

Bill of Rights of the Constitution of the Republic of South African. 1996. *Government Gazette*, No. 17678.

Bladergroen, M.C., Chigona, W. Bytheway, A., Cox, S., Dumas, C., & Van Zyl, I. 2012. Educator discourses on ICT in education: A critical analysis. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 8(2): 107 – 119.

Blankley W.O, & Booyens I. 2010. Building a knowledge economy in South Africa. *South African Journal of Science*, 106 (11/12): 15 – 20.

Blommaert, J., & Bulcaen, C. 2000. Critical Discourse Analysis. *Annual Review of Anthropology*, 29: 447 – 466.

Blumer, H. 1969. *Symbolic Interactionism; Perspective and Method*. New Jersey: Prentice-Hall.

Boghossian, P. 2006. *Fear of Knowledge: Against Relativism and Constructivism.* Oxford University Press.

Bold, W., & Davidson, W. 2012. Mobile Broadband: Redefining Internet Access and Empowering Individuals. In Dutta, S., & Bilbao-Osorio, B. (eds.), *The Global Information Technology Report 2012: Living in a Hyperconnected World.* pp. 67 – 77. Geneva: World Economic Forum.

Borgmann, A. 2000. *Holding on to Reality: The Nature of Information at the Turn of the Millennium (2nd edition)*. University of Chicago Press.

Bourdieu, P. 1977. *Outline of a Theory of Practice*. Cambridge: Cambridge University.

boyd, d. 2009. Social Media is Here to Stay... Now What? *Microsoft Research Tech Fest*, Redmond, Washington, February 26.

Brenneis, D. 2003. Reflections: Toward New Conceptions of Rights, in C. Zerner (ed). *Culture and the Question of Rights. Forests, Coasts, and Seas in Southeast Asia*, 219 – 234. London: Duke University Press.

Brown, C. 2007. *Metaphysics. Objectivity*. Retrieved 25 March 2013 from http://www.trinity.edu/cbrown/metaphysics/objectivity.html

Brown, C. 2010. *It's (I'm) not good enough: contrasting discourses of ICTs amongst South African university students*. Working "paper" on Discourse groupings presented at CHED writers workshop. Unpublished.

Bytheway, A., Sadeck, O., Dumas, C., Chigona, W., Chigona, A., Mooketsi, B., Rega, I. & Fanni, F. 2010. Integrating ICTs into the classroom: Assisting teachers in disadvantaged primary schools. In: P. Cunningham & M. Cunningham (eds.), *Proc 2010 eSkills Summit, Cape Town*. Cape Town, IIMC International Information Management Corporation.

Cáceres, R., Belding, E., Parikh, T., & Subramanian, L. 2012. Guest Editor's Introduction. Information and Communication Technologies for Development. *Pervasive Computing, IEEE CS.* 12 – 14.

Cantoni, L., Fanni, F., Rega, I., & Tardini, S. 2009. Fostering Digital Literacy of Primary Teachers in Community Schools: The BET K-12 Experience in Salvador de Bahia. In Marshall, S., Kinuthia, W., & Taylor W. (eds.), *Bridging the Knowledge Divide. Educational Technology for Development, Information Age Publishing*, Charlotte (NC), pp. 415 – 433.

Cantoni, L., & Tardini, S. 2006. *Internet.* Routledge.

Cantrell, S. & Visser, L. 2011. Factors Influencing the Integration of Technology to Facilitate Transfer of Learning Processes in South African, Western Cape Province Schools. *Quarterly Review of Distance Education*, 12(4): 275 – 285.

Case, A. 2007. *The Cell Phone and its Technosocial Sites of Engagement*. A thesis submitted in partial fulfillment of a degree in Sociology/Anthropology. Lewis & Clark College, December 17, 2007.

Castells, M. 2002. *Internet Galaxy: Reflections on the Internet, Business, and Society.* New York: Oxford University Press.

Castells, M. 2007. Communication, Power and Counter-power in the Network Society. *International Journal of Communication*, 1: 238 – 266.

Chandler, D. 1995. *Technological or Media Determinism*. Retrieved 2 June 2013, http://bit.ly/14krDCS

Chayko, M. 1993. What is Real in the Age of Virtual Reality? "Retraining" Frame Analysis for a Technological World. *Symbolic Interaction*, 16(2): 171 – 181.

Chigona, W., Bladergroen, M., Bytheway, A., Cox, S., Dumas, C., Van Zyl, I.J. 2011. Educator discourses on ICT in Education. *ReSNES'2011: E-Skilling for Equitable Prosperity and Global Competiveness*. East London, South Africa.

Chigona, W., Mbhele, F., & Kabanda, S. 2008. Investigating the Impact of Internet in Eliminating Social Exclusion: The Case of South Africa. *PICMET 2008 Proceedings*, 27 – 31 July, Cape Town, South Africa.

Chomsky, N. 2013. *Power Systems. Conversations on Global Democratic Uprisings and the New Challenges to U.S. Empire.* Metropolitan Books.

Chon, M. 2006. Intellectual Property and the Development Divide. *Cardozo Law Review*, 27: 2821 – 2912.

Chou, S.Y. 2012. Millennials in the Workplace: A Conceptual Analysis of Millennials' Leadership and Followership Styles. *International Journal of Human Resource Studies*, 2(2): 71 – 83.

Clarke, J., & Dede, C. 2009. Design for Scalability: A Case Study of the River City Curriculum. *J Sci Educ Technol*, 18: 353 – 365.

Cleaver, F., 1999. Paradoxes of Participation: Questioning Participatory Approaches to Development. *Journal of International Development*, 11: 597 – 612.

Compeau, D.R., & Higgins, C.A. 1995. Computer Self-Efficacy: Development of a measure and initial test. *MIS Quarterly*, 19(2): 189 – 211.

Creswell, J. 2011. Controversies in Mixed Methods Research. In Denzin, N.K., & Lincoln, Y.S. (Eds.), *The SAGE Handbook of Qualitative Research (4th edition).* California: Sage.

Cviko, A., McKenney, S., & Voogt, J. 2011. Teachers enacting a technology-rich curriculum for emergent literacy. *Education Tech Research Dev*, 1 – 24.

Davids, Z. 2009. *The Educators' Perspective on the Factors that Influence the Success of ICT School Initiatives within the Western Cape*. Masters Thesis. University of Cape Town.

De Alcántara, C.H. 2001. The Development Divide in a Digital Age. *Technology, Business and Society*, Programme Paper Number 4. United Nations Research Institute for Social Development (UNRISD).

Denzin, N.K. 1989. *Interpretative interactionism.* Newbury Park: Sage.

Denzin, N.K. 1994. The art and politics of interpretation. In Denzin, N.K., & Lincoln, Y.S. (Eds.), *Handbook of qualitative research*, pp. 500-515). California: Sage Publications.

Department of Basic Education. 2010. *Strategic Plan 2010 – 2013.* Retrieved 26 May 2012, http://planipolis.iiep.unesco.org

Department of Basic Education. 2012. *ACTION PLAN TO 2014. Towards the Realisation of Schooling 2025.* Retrieved 25 February 2013, http://bit.ly/XwhZgU

Department of Education (DoE). 2004. White Paper on e-Education. Transforming Learning and Teaching through Information and Communication Technologies (ICTs). Notice 1922 of 2004. *Government Gazette*, No. 26726.

Dewey, J. 1897. My pedagogic creed. *School Journal*, 54: 77 – 80.

Digital Doorway. 2012. *The Digital Doorway – Enriching your mind.* Retrieved 25 August 2012, http://www.digitaldoorway.org.za

Duque, R. B., Collins, M., Abbate, J., Azambuja, C.C., & Snaprud, M. 2007. History of information technology: introduction & conclusion, in Shrum, W., Benson, K., Bijker, W., & Brunnstein, K. (eds.), *Past, Present and Future of Research in the Information Society.* New York: Springer Publishing, pp. 33 & 43 – 44.

Dutta, S., & Bilbao-Osorio, B. 2012. Executive Summary. In Dutta, S., & Bilbao-Osorio, B. (eds.), *The Global Information Technology Report 2012: Living in a Hyperconnected World.* pp. xi – xix.

Dutta, S., Bilbao-Osorio, B., & Geiger, T. 2012. The Networked Readiness Index 2012: Benchmarking ICT Progress and Impacts for the Next Decade. In Dutta, S., & Bilbao-Osorio, B. (eds.), *The Global Information Technology Report 2012: Living in a Hyperconnected World.* pp. 3 – 34. Geneva: World Economic Forum.

Elden, M., & Levin, M. 1991. Cogenerative learning: Bringing participation into action research. In Whyte, W.F. (Ed.), *Participatory action research,* pp. 127 – 142. Newbury Park: Sage.

Electronic Frontier Foundation (EFF). 2012. *Don't Let Congress Use "Cybersecurity" Fears to Trample on Civil Liberties.* Retrieved 17 April 2012, https://action.eff.org/

Embong, A.D. 2011. The Question of Culture, Identity and Globalisation: an Unending Debate. *Kajian Malaysia,* 29(1): 11 – 22.

Escobar, A. 1992. Imagining a Post-Development Era? Critical Thought, Development and Social Movements. *Social Text: Third World and Post-Colonial Issues,* (31/32): 20 – 56.

E-Schools' Network (ESN). 2012. *About the e-Schools' Network.* Retrieved 23 August 2012, http://www.esn.org.za/

Evoh, C.J. 2007. ICTs, Secondary Education, and the Knowledge Economy: Exploring the Roles of the Private Sector in Post-Apartheid South Africa. *Journal of Education for International Development*, 3(1): 1 – 25.

Fals-Borda, O., & Rahman, M.A. 1991. *Action and Knowledge: Breaking the monopoly with participatory action-research*. New York: The Apex Press.

Fairclough, N. 1995. *Critical Discourse Analysis*. London: Longman.

Fairclough, N. 1999. A dialectical-relational approach to Critical Discourse Analysis in Social Research. In Wodak, R., & Meyers, M. (Eds.), *Methods of Discourse Analysis*. London: SAGE.

Fanni, F., Rega, I., & Cantoni, L. 2013. Using Self-Efficacy to measure primary school teachers' perception of ICT: results from two studies. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 9(1): 100 – 111.

Fanni, F., Rega, I., Van Zyl, I.J., Cantoni, L., & Tardini S. 2010. Investigating Perception Changes in Teachers Attending ICT Curricula through Self-Efficacy. *Proceedings of the 2010 International Conference on Information and Communication Technologies and Development (ICTD '10)*, 13 – 16 December 2010, London, United Kingdom.

Fanni, F., Van Zyl, I.J., & Rega, I. 2011. The value of measurement in research practice: Evaluating ICT training in education. *CIRN Community Informatics Conference*: *"To measure or not to measure: that is the question"*. 9-11 November, 2011, Monash Centre Prato, Italy.

Fereday, J., & Muir-Cochrane, E. 2006. Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *International Journal of Qualitative Methods*, 5(1): 80 – 92.

Fernald, D.H., Coombs, L., DeAlleaume, L., West, D., & Parnes, B. 2012. An Assessment of the Hawthorne Effect in Practice-based Research. *Journal of the American Board of Family Medicine*, 25(1): 83 – 86.

Fidler, D.P. 2011. Was Stuxnet an Act of War? Decoding a Cyberattack. *Security & Privacy, IEEE,* 9(4): 56 – 59.

Fine, G.A. 1992. Agency, Structure, and Comparative Contexts: Toward a Synthetic Interactionism. *Symbolic Interaction,* 15: 87 – 107.

Flanagin, A.J., & Bator, M. 2010. The Utility of Information and Communication Technologies in Organisational Knowledge Management. In: Canary, H.E., & McPhee, R.D. (eds), *Communication and Organisational Knowledge: Contemporary Issues for Theory and Practice*. pp. 173 – 321. Routledge.

Fredette, J., Marom, R., Steinert, K., & Witters, L. 2012. The Promise and Peril of Hyperconnectivity for Organizations and Societies. In Dutta, S., & Bilbao-Osorio, B. (eds.), *The Global Information Technology Report 2012: Living in a Hyperconnected World.* pp. 113 – 119. Geneva: World Economic Forum.

Friedman, T. 2005. *The World is Flat. A Brief History of the Twenty-First Century*. Farrar, Straus & Giroux.

Gallivan, M., & Tao, Y. 2013. A Scientometric Analysis of Research Appearing in Post-Millennial IFIP 9.4 Conferences. *Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries*, Ocho Rios, Jamaica, May 2013. pp. 144 – 165.

Geertz, C. 1975. *The Interpretation of Cultures.* London: Hutchinson.

GeSCI (Global eSchools Community Initiative), 2011. African Leadership in ICT Assessment of Environmental, Institutional and Individual Leadership Capacity Needs for the Knowledge Society in South Africa: A Situational and Needs Analysis. *African Leadership in ICT, ALICT.* Retrieved 8 February 2012 from African Leadership in ICT, http://www.gesci.org/african-leadership-in-ict-alict.html

Giddens, A. 2000. *The Third Way and its Critics*. Polity Press: Cambridge, United Kingdom.

Ginsburg, F. 2008. Rethinking the Digital Age. In Wilson, P., & Stewart, M. (Eds.), *Global Indigenous Media*. Atlanta: Duke University Press.

Gjerde, P.F. 2004. Culture, Power, and Experience: Toward a Person-Centered Cultural Psychology. *Human Development.* 47(3): 138 – 157.

Goffman, E. 1959. *The Presentation of Self in Everyday Life.* New York: Doubleday, Anchor.

Goffman, E. 1974. *Frame Analysis: An Essay on the Organization of Experience*. New York: Harper & Row.

Gomez, R., Baron, L.F., & Fiore-Silfvast, B. 2012. The Changing Field of ICTD: Content analysis of research published in selected journals and conferences, 2000-2010. *Proceedings of ICTD '12,* 12 – 15 March, Atlanta.

Gonzales, A.L., & Hancock, J.T. 2011. Mirror, Mirror on my Facebook Wall: Effects of Exposure to Facebook on Self-Esteem. *Cyberpsychology, Behavior, and Social Networking*, 14(1-2): 79 – 83.

Google Dictionary, 2012. "Nonproprietary". Retrieved 16 April 2012, http://bit.ly/HZvDgT

Grimshaw, D.J., & Gudza, L.D. 2010. Local Voices Enhance Knowledge Uptake: Sharing Local Content in Local Voices. *Electronic Journal of Information Systems in Developing Countries*, 40(3): 1 – 12.

Grint, K., & Woolgar, S. 1997. *The Machine at Work: Technology, Work and Organization.* Cambridge: Polity Press.

Gudmundsdottir, G.B. 2010a. From digital divide to digital equity: Learners' ICT competence in four primary schools in Cape Town, South Africa. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 6(2): 1 – 22.

Gudmundsdottir, G.B. 2010b. When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language. *Information Technology for Development*, 16(3): 174 – 190.

Haig, E. 2004. Some Observations on the Critique of Critical Discourse Analysis. *Studies in Language and Culture*, 26(2): 127 – 150.

Hall, B., & Howard, K. 2008. A synergistic approach: Conducting mixed methods research with typological and systemic design considerations. *Journal of Mixed Methods Research*, 2(3): 248 – 269.

Haraway, D. 1991. A Cyborg Manifesto. Science, Technology, and Socialist-Feminism in the Late Twentieth Century. *Simians, Cyborgs and Women: The Reinvention of Nature (New York; Routledge):* 149 – 181.

Harris, C.A., & Harris, R.W. 2011. Information and Communication Technologies for Cultural Transmission among Indigenous Peoples. *EJISDC*, 45(2): 1 – 19.

Hays, S. 1994. Structure and Agency and the Sticky Problem of Culture. *Sociological Theory*, 12(1): 57 – 72.

Heeks, R. 1999. 'Information and communication technologies, poverty and development', Development Informatics Working Paper no.5, IDPM, University of Manchester.

Heeks, R. 2008. ICT4D 2.0: The Next Phase of Applying ICT for International Development. *Computer – IEEE Computer Society*, 41(6): 26 – 33.

Hinton, K., Baliga, J., Feng, M., Ayre, R., & Tucker, R.S. 2011. Power Consumption and Energy Efficiency in the Internet. *IEEE Network*. Retrieved 15 July 2012, http://bit.ly/NST2Xx

Housing Development Agency (HDA). 2012. *South Africa: Informal settlements status. Research reports.* Retrieved 31 August 2012, http://bit.ly/T1IQys

International Telecommunication Union (ITU). 2011. *Measuring the information society*. Telecommunication Development Bureau, Geneva, Switzerland. Retrieved 22 June 2013, http://bit.ly/dedHgq

Isaacs, S. 2007. ICT in Education in South Africa. *Survey of ICT and Education in Africa – Country Reports*, 2(53): 1 – 29.

Jenkins, H. 2008. *Convergence Culture: Where Old and New Media Collide.* NYU Press. *Journal of African Studies*, 40(3): 496 – 523.

Jensen, K.L., & Marsden, G. 2012. Enabling New Interaction Forms and Applications through Next Generation Mobile Platforms for Urban and Rural Africa. *E-Infrastructure and E-Services for Developing Countries.* Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, 92(2): 258 – 259.

John, V. 2012. *Right to education: Pupils can wait, says Motshekga.* Mail & Guardian Online. Retrieved 17 August 2012, http://mg.co.za/article/2012-08-03-pupils-can-wait-says-motshekga/

Johnson, H. 1995. Chapter I1 – A Methodology for Frame Analysis: From Discourse to Cognitive Schemata. In Johnson, H., & Klandermans, B. (eds.), *Social Movements and Culture.* Minneapolis, University of Minnesota Press.

Johnson, T. E., O'Connor, D.L., Pirnay-Dummer, P.N., Ifenthaler, D., Spector, J.M., Seel, N. 2006. Comparative study of mental model research methods: relationships among ACSMM, SMD, MITOCAR & deep methodologies, in Cañas, A.J., Novak, J.D. (eds), *Concept Maps: Theory, Methodology, Technology, Proc. of the Second Int. Conference on Concept Mapping*, San José, Costa Rica

Keegan, D. 2002. *The future of learning: From eLearning to mLearning.* Ziff papiere 119: Fern Universität Hagen.

Khanya. 2011. *Summary of the Project***.** Retrieved 15 November 2012, http://bit.ly/UrRJyJ

Kim, U., & Berry, J.W. 1993. *Indigenous Psychologies: Research Experience in Cultural Context.* Newbury Park: Sage.

Kinash, S. 2010. *Ontology.* Bond University Online. Retrieved 15 October 2012, http://bit.ly/QGywJW

Kleine, D., & Unwin, T. 2009. Technological Revolution, Evolution and New Dependencies: what's new about ICT4D? *Third World Quarterly*, 30(5): 1045 – 1067.

Koper, R., Giesbers, B., Van Rosmalen, P., Sloep, P., Van Bruggen, J., Tattersall, C., Vogten, H., & Brouns, F. 2005. A design model for lifelong learning networks. *Interactive Learning Environments*, 13(1-2): 71 – 92.

Koranteng, K. 2012. *Access and Use of Information and Communication Technology for Teaching and Learning amongst Schools in Under Resourced Communities in the Western Cape, South Africa*. Masters thesis. Cape Peninsula University of Technology.

Krauss, K. 2012. Towards Self-Emancipation in ICT for Development Research: Narratives about Respect, Traditional Leadership and Building Networks of Friendships in Rural South Africa. *African Journal of Information Systems*, 4(2): 46 – 60.

Kshetri, N., & Dholakia, N. 2009. Global Digital Divide. *IGI Global, Global Information Technology*, 1664 – 1670.

Kuhn, T. 1996. *The Structure of Scientific Revolutions (3rd edition).* University of Chicago Press.

Lacroix, A. 2007. Social Impacts of ICTs: A Canadian perspective. *WPIE-WPIIS Workshop, London, May 22, 2007.* Science, Innovation & Electronic Information Division, Statistics Canada.

Latour, B. 2005. *Reassembling the Social: An Introduction to Actor-Network-Theory*. New York: Oxford University Press.

LeBeau, R. 2011. *Is Google Making Us Smart? An Essay on the Effects of the Internet.* An Interactive Qualifying Project Report submitted to the Faculty of Worcester Polytechnic Institute.

Lee, S.A., & Park, H.S. 2012. Influence of Temporal Distance on the Perceived Importance of Career-Related Self-Efficacy and Outcome Expectations. *The Career Development Quarterly,* 60(3): 194 – 206.

Leff, B., & Finucane, T.E. 2008. Gizmo Idolatry. *Journal of the American Medical Association (JAMA),* 299(15): 1830 – 1832.

Leiner, B.M., Cerf, V.G., Clark, D.D., Kahn, R.E., Kleinrock, L., Lynch, D.C., Postel, J., Roberts, L.G., & Wolff, S. 2009. A Brief History of the Internet. *ACM SIGCOMM Computer Communication Review,* 39(5): 22 – 31.

Levi-Strauss, C. 1969. *The Raw and the Cooked.* New York: Harper & Row.

Lincoln, Y.S. & Guba, E.G. 1985. *Naturalistic Inquiry.* London: Sage.

Living Labs in Southern Africa (LLiSA). 2012. *What Is Living Labs?* Retrieved 1 September 2012, http://llisa.net/what-is-living-labs/

Livingstone, S., Haddon, L., Görzig, A., and Ólafsson, K. 2011. *Risks and safety on the internet: The perspective of European children*. Full Findings. LSE, London: EU Kids Online.

Lycett, J., & Dunbar, R. 2000. Mobile phones as lekking devices among human males. *Human Nature,* 11(1): 93 – 104.

Madden, R. 2010. *Being Ethnographic: A Guide to the Theory and Practice of Ethnography.* London: SAGE.

Maines, D. R. 2001. *The Faultline of Consciousness: A View of Interactionism in Sociology*. Chicago, Aldine.

Malinowski, B. 1932. Argonauts of the western Pacific: an account of native enterprise and adventure in the archipelagos of Melanesian New Guinea. *Studies in economics and political science,* 65(2). Routledge: University of Michigan.

Manning, P., & Smith, G. 2010. Symbolic Interactionism. In Elliot, A., (ed.), *The Routledge Companion to Social Theory*. New York, Routledge. pp. 37 – 55.

Marnewick, A. 2011. *A look at Khanya and ICT in schools with Kobus van Wyk.* Retrieved 19 October 2012, http://bit.ly/UPuJKj

Marzillier, J., & Eastman, C. 1984. Continuing Problems with Self-Efficacy Theory: A Reply to Bandura. *Cognitive Theory and Research*, 8(3): 257 – 262.

Maxwell, J.A. 2005. *Qualitative Research Design. An Interactive Approach (2nd edition).* London: SAGE.

May, H. 2005. Whose participation is it anyway? Examining the context of pupil participation in the UK. *British Journal of Special Education*, 32(1): 29 – 34.

McLuhan, M. 1962. *The Gutenberg galaxy: the making of typographic man*. University of Toronto Press.

McLuhan, M. 1967. *The Medium is the Massage. An Inventory of Effects.* Bantam Books.

McTaggart, R. 1991. Principles for participatory action research. *Adult Education Quarterly*, 41(3): 168 – 187.

Meraka Institute. 2007. *About / ICT in Education Research and Innovation Group.* Retrieved 23 August 2012, http://www.meraka.org.za/ICTeducation.htm

Michalski, M.P. 2013. Symbolic meanings and e-learning in the workplace: The case of an intranet-based training tool. *Management Learning*, 1 – 22.

Miles, M. B. & Huberman, A. M. 1994. *Qualitative data analysis (2nd ed.).* Thousand Oaks, CA: SAGE.

Miller, H. 1995. The Presentation of Self in Electronic Life: Goffman on the Internet. *Embodied Knowledge and Virtual Space Conference*, Goldsmiths' College, University of London.

Mlitwa, N. 2010. *Factors of Integration and Use of ICT for Teaching and Learning in South African Higher Education Institutions*. Doctoral Thesis, University of Cape Town.

Mindset Network. 2008. *About Us.* Retrieved 25 August 2012, http://www.mindset.co.za/about

Moore, J.D. 2012. *Visions of culture: an introduction to anthropological theories and theorists.* United Kingdom: AltaMira Press.

Naughton, J. 2011. *The internet of things: it's big but it's not always very clever…*. Retrieved 03 July 2012 from The Observer online, http://bit.ly/gMJpY6

NEPAD. 2012. *NEPAD e-schools Initiative*. Retrieved 23 August 2012 from NEPAD e-Africa Commission, http://www.eafricacommission.org/projects/127/nepad-e-schools-initiative

Neubauer, R. 2011. Neoliberalism in the Information Age, or Vice Versa? Global Citizenship, Technology, and Hegemonic Ideology. *tripleC,* 9(2): 195 – 230.

Newman, T., Olle, M., & Bradley, C. 2012. Social Interaction as a contributor to significant learning outcomes in online instruction. *International Journal of Instructional Technology and Distance Learning*, 9(5): 59 – 66.

Nickel, J.C. 2010. Seduced by a Robot. *BJU International*, 105(5): 581 – 582.

Nor, R.M., & Muhlberger, R. 2011. Community Exchange: Designing to Support Empathy and Interaction of Hope. *World Journal of Social Sciences*, 1(1): 137 – 147.

Oja, S.N., & Pine, G.J. 1987. Collaborative Action Research: Teachers' Stages of Development and School Contexts. *Peabody Journal of Education,* 64(2): 96 – 115.

Ojiako, U., & Aleke, B. 2011. Symbols as cultural expressions of technology diffusion. *Society and Business Review,* 6(3): 198 – 213.

Olivier, B. 2010. *The Seductions of Technology (1).* Retrieved 6 February 2012 from the Mail & Guardian Online, http://bit.ly/cMUrdb

Orlikowski, W.J. 2010. The sociomateriality of organisational life: considering technology in management research. *Cambridge Journal of Economics,* 34: 124 – 141.

Outram, D. 1995. *The Enlightenment.* Cambridge: Cambridge University Press.

Oyedemi T.D. 2009. Social Inequalities and the South African ICT Access Policy Agendas. *International Journal of Communication,* 3: 151 – 168.

Pade-Khene, C. 2012. Assessing ICT4D Project Design: A Programme Theory Assessment of the Siyakhula Living Lab. *6th International Development Informatics Association (IDIA) Conference*. Istanbul, Turkey, September 2012.

Palfrey, J., & Gasser, U. 2012. *Born Digital: Understanding the First Generation of Digital Natives.* ReadHowYouWant.

Parmar, V. 2009. A Multidisciplinary Approach to ICT Development. *Information Technologies and International Development*, 5(4): 89 – 96.

Pather, S., & Gomez, R. 2010. Public Access ICT: A South-South comparative analysis of libraries, telecentres and cybercafés in South Africa and Brazil. *Proceedings of the Sixteenth Americas Conference on Information Systems*, Lima, Peru, August 12-15, 2010.

Peña-López, I. 2009. ICTs, Development, disciplines and acronyms. Retrieved 13 June 2012, http://ictlogy.net/review/?p=2660

Penuel, W.R., Fishman, B.J., Cheng, B.H., & Sabelli, N. 2011. Organizing Research and Development at the Intersection of Learning, Implementation, and Design. *Educational Researcher*, 40(7): 331 – 337.

Pieterse, J.N. 2005. Digital Capitalism and Development: the Unbearable Lightness of ICT4D. In Lovink, G., & Zehle, S. (eds.), *Incommunicado Reader*, pp. 11 – 29.

Pinch, T. J., & Bijker, W. E. 1984. The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit from Each Other. *Social Studies of Science*, 13(3), 399 – 441.

Popper, K. 1978. *Three Worlds. The Tanner Lecture on Human Values.* Delivered at The University of Michigan April 7, 1978. Retrieved 15 October 2012, http://tannerlectures.utah.edu/lectures/documents/popper80.pdf

Posner, P.L. 2009. The Pracademic: An Agenda for Re-Engaging Practitioners and Academics. *Public Budgeting & Finance*, 29(1): 12 – 26.

Prasad, P. 1993. Symbolic Processes in the Implementation of Technological Change: A Symbolic Interactionist Study of Work Computerization. *Academy of Management Journal*, 36(6): 1400 – 1429.

Presidential National Commission on Information Society and Development (PNC on ISAD). 2012a. PNC Mandate. Notice 187 of 2002, *Government Gazette.* Republic of South Africa. Retrieved 12 May 2012, http://www.pnc.gov.za

Presidential National Commission on Information Society and Development (PNC on ISAD). 2012b. *Information Society*. Retrieved 12 May 2012, http://www.pnc.gov.za

Prus, R. 1996. *Symbolic Interaction and Ethnographic Research. Intersubjectivity and the Study of Human Lived Experience.* New York: State University of New York Press.

Pruulmann-Vengerfeldt, P. 2006. Exploring Social Theory as a Framework for Social and Cultural Measurements of the Information Society. *Information Society*, 22(5): 303.

Pule, D. 2012. Department of Communications (DoC): ICT Policy Colloquium Discussion Document. Defining a new era in ICTs for all South Africans. *Government Gazette,* 13 April 2012. 35255, Notice no. 308, 3 – 43.

Qureshi, A., Weber, R., Balakrishnan, H., Guttag, J., & Maggs, B. 2009. Cutting the Electric Bill for Internet-Scale Systems. *Proceedings of the ACM SIGCOMM 2009 Conference on Data Communication*, Barcelona, Spain, 123.

Ranganathan, A. 2005. Using ICT to place Indigenous Knowledge Systems at the heart of Education for Sustainable Development. Paper presented at the *Education for a Sustainable Future: International Conference*, Ahmedabad, India.

Rantanen, T. 2006. Digging the global mine. An interview with Saskia Sassen. *Global Media and Communication*, 2(2): 142 – 159.

Rapetti E., & Cantoni L. 2012. Reconsidering "Gen Y" & Co: from Minding the Gap to Overcoming It. In Paulsen, M. & Szucs, A. (eds.), *Open Learning Generations. Closing the gap from Generation "Y" to the mature lifelong learners*. Eden 2012 International Conference (Porto).

Rasool, F. 2011. *'Gauteng Online is failing'.* ITWeb. Retrieved 23 August 2012, http://bit.ly/OX900h

Raval, H., Mckenney, S., & Pieters, J. 2011. Contextual factors that foster or inhibit para-teacher professional development: the case of an Indian non-governmental organization. *International Journal of Training and Development*, 16(1): 23 – 38.

Rega, I. 2004. *Study on existing collaboration in the teacher training field between Switzerland and developing countries.* Report for the ICT4D-Educa Program.

Rega, I. 2010. *What do local people think about telecentres? A key issue for sustainability.* Dissertation submitted to the Faculty of Communication Sciences, University of Lugano, February 2010.

Rega, I., & Fanni, F. 2012. Measuring Primary Schools Teachers' Perception of ICT through Self-Efficacy: A Case Study. *Journal of Universal Computer Science,* 18(3): 410 – 428.

Remender, P.A. 1990. Social Facts and Symbolic Interaction: A Search for the Key Social Emergent in Durkheim's Sociological Analysis. In Hamilton, P. (ed.), *Emile Durkheim. Critical Assessments.* London: Routledge. pp. 343 – 350.

Rist, G. 2002. *The History of Development: From Western Origins to Global Faith.* Zed Books.

RLabs. 2012. *About.* Retrieved 3 September 2012, http://www.rlabs.org/about

Robinson, L. 2007. The Cyberself: the self-ing project goes online, symbolic interaction in the digital age. *New Media and Society*, 9(1): 93 – 110.

Rotter, J. B. 1954. *Social learning and clinical psychology*. New York: Prentice-Hall.

Ruxwana, N.L., Herselman, M.E., & Conradie, D.P. 2010. ICT applications as e-health solutions in rural healthcare in the Eastern Cape Province of South Africa. *Health Information Management Journal,* 39(1): 17 – 29.

Sahay, S. 2013. "Are we building a better world with ICTS?": Empirically examining this question in the domain of public health in developing countries. *Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries,* Ocho Rios, Jamaica, May 2013. pp. 18 – 20.

Said, E. 1978. *Orientalism.* New York: Pantheon Books.

Schiffer, M. 2002. Studying technological differentiation: the case of 18th-century electrical technology. *American Anthropologist*, 104(4): 1148 – 1161.

Sabbagh, K., Friedrich, R., El-Darwiche, B., Singh, M., Ganediwalla, S., & Katz, R. 2012. Maximizing the Impact of Digitization. In Dutta, S., & Bilbao-Osorio, B. (eds.), *The Global*

Information Technology Report 2012: Living in a Hyperconnected World. pp. 121 – 135. Geneva: World Economic Forum.

Saccol, A.Z., Barbosa, J.L.V., Schlemmer, E., & Reinhard, N. 2011. Mobile Learning in Organizations: Lessons Learned from Two Case Studies. *International Journal of Information and Communication Technology Education (IJICTE),* 7(3): 11 – 24.

Sachs, J.D. 2003. The Global Innovation Divide. *Innovation Policy and the Economy*, 3: 131 – 141.

Sachs, J.D., & McArthur, J.W. 2005. The Millennium Project: a plan for meeting the Millennium Development Goals. *Lancet*, 365: 347 – 353.

Säljö, R. 2012. Schooling and Spaces for Learning: Cultural Dynamics and Student Participation and Agency. In Hjörne, E. et al. (eds.), *Learning, Social Interaction and Diversity – Exploring Identities in School Practices*, pp. 9 – 14.

Sassen, S. 2006. *Territory, Authority, Rights: From Medieval to Global Assemblages*. Princeton, NJ: Princeton University Press.

Sassen, S. 2013. Digital Formations of the Powerful and the Powerless. Keynote presentation. *Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries*, Ocho Rios, Jamaica, May 2013. pp. 363 – 374. pp. 17 – 18.

Scholte, B. 1972. Toward a Reflexive and Critical Anthropology. Hymes, D.H. (ed.), *Reinventing Anthropology*, pp. 430 – 457.

Schutz, A. 1967. The phenomenology of the social world (G. Walsh & F. Lehnert, Trans.). Evanston, IL: North Western University Press. (Original German work published 1932)

Sellen, A., Rogers, Y., Harper, R., & Rodden, T. 2009. Reflecting Human Values in the Digital Age. *Communications of the ACM,* 52(3): 58-66.

Selwyn, N. 2004. Reconsidering Political and Popular Understandings of the Digital Divide. *New Media Society*, 6(3): 341 – 362.

Sen, A. 1997. Human capital and human capability, *World Development*, 25(12): 1959 – 1961.

Shields, R. 2011. ICT or I see tea? Modernity, technology and education in Nepal. *Globalisation, Societies and Education, Education Reform in Nepal: From Modernity to Conflict*, 9(1): 85 – 97.

Silverman, S. 2002. Foreword. In Fox, R.G. & King, B.J. (eds.), *Anthropology beyond Culture*. Oxford, UK. pp. xv – xix.

Sloep, P. 2012. *Week 1 pedagogical challenges*. Stories to TEL. Retrieved 19 May 2012, http://pbsloep.blogspot.com/2012/04/week-1-pedagogical-challenges.html

Smaling, A. 1989. Münchausen objectivity: A bootstrap conception of objectivity as a methodological norm. In Baker, W.J., Heiland, M.E., Van Hezewijk, R., & Terwee, S. (Eds.), *Recent trends in theoretical psychology*. New York: Springer Verlag.

Smith, D. 2006. Cell phones, social inequality, and contemporary culture in Nigeria. *Canadian Journal of African Studies*, 40(3): 496 – 523.

Snow, D. 2001. Extending and Broadening Blumer's Conceptualization of Symbolic Interactionism. *Symbolic Interaction*, 24(3): 367 – 377.

Spradley, J.S. 1979. *The Ethnographic Interview*. Fort Worth: Harcourt, Brace, Jovanovich.

Stajkovic, A.D., & Luthans, F. 1998. Social Cognitive Theory and Self-Efficacy: Going Beyond Traditional Motivational and Behavioral Approaches. *Organizational Dynamics*, 26(4): 62 – 74.

Stallman, R. M. 2010. *Free Software, Free Society: Selected Essays of Richard M. Stallman*. Boston: Free Software Foundation.

Standing, A. 2003. The social contradictions of organised crime on the Cape Flats. *Institute for Security Studies (ISS) Paper 74*, pp. 1 – 14.

Stewart, J. 2002. *Encounters with the Information Society: Personal and social issues in the appropriation of new media products in everyday life: adoption, non-adoption, and the role of the informal economy and local experts.* PhD Thesis, University of Edinburgh.

Sturm, F. 2009. *Coop 2.0 interview: Anriette Esterhuysen.* Retrieved 10 February 2012, http://ict4d.at/2009/07/09/coop-20-interview-anriette-esterhuysen/

Swartz, L. 1998. *Culture and Mental Health: a South African View*. Cape Town: Oxford University Press.

Taylor, B. 2004. Postmodern theory. In May, S. & Mumby, D. (eds.), *Engaging organizational communication theory and research*: *Multiple perspectives*, pp. 113–140. Thousand Oaks, CA: SAGE.

Taylor, R., & Zhang, B. 2007. Measuring the Impact of ICT: Theories of Information and Development. *Telecommunications Policy Research Conference*. September 26-28, 2007, Washington, D.C.

TED, 2009. *Ted Talks – Chimamanda Adichie: The danger of a single story.* TEDGlobal 2009. Retrieved 20 February 2012, from http://www.ted.com/talks

Thierer, A.D. 2012. *Technopanics, Threat Inflation, and the Danger of an Information Technology Precautionary Principle.* Working paper no. 12-09, February 2012. Mercatus Center, George Mason University.

Thutong. 2012. *South African Education Portal.* Retrieved 25 August 2012, http://www.thutong.doe.gov.za/

Toffler, A. 1970. *Future Shock.* Random House.

Tschannen-Moran, M. & Hoy, A.W. 2001 Teacher efficacy. Capturing an elusive construct. *Teaching and Teacher Education*, 17: 783 – 805.

UNDP, 2010. *Communication for Empowerment. Global Report*. UNDP Oslo Governance Centre, Communication for Social Change Consortium, Funded by the UN Democracy Fund, May 2010.

UNDP. 2013. *Human Development Report 2013. The Rise of the South: Human Progress in a Diverse World. Explanatory note on 2013 HDR composite indices – South Africa*. 1 – 6. Retrieved 13 June 2013, http://hdrstats.undp.org/images/explanations/ZAF.pdf

Unwin, T. 2009. *ICT4D: Information and Communication Technology for Development.* Cambridge University Press.

Van Inwagen, P. 2009. *Metaphysics: Third Edition.* Boulder, CO: Westview Press.

Van Offenbeek, M., Boonstra, A., & Seo, D. 2012. Towards integrating acceptance and resistance research: evidence from a telecare case study. *European Journal of Information Systems.* Retrieved 10 July 2012, http://dx.doi.org/10.1057/ejis.2012.29

Van Wyk, K. 2002. *Khanya, Technology in Education Business Plan*. Retrieved 17 January 2013, http://www.khanya.co.za/projectinfo/?catid=22

Van Wyk, K. 2011. *A new era for technology in schools in the Western Cape.* Retrieved 12 March 2013, http://www.e4africa.co.za/?p=3915

Van Wyk, K. 2012. *A call to action: Invest in technology in education.* Retrieved 12 March 2013, http://www.e4africa.co.za/?p=4170

Van Zyl, I.J. 2010. *What have we been up to?* Retrieved 12 March 2013, http://bit.ly/bvPVv4

Van Zyl, I.J. 2010. *Community Ltd. and the Spirit of Ethno-enterprise: Exploring Cultural Incorporation and Branding among the Makuleke*. Masters thesis, University of Stellenbosch.

Van Zyl, I.J. 2011. Mutual Isolation and the Fight for Care: An Ethnography of South African Home-based Healthcare Contexts. *Journal of Health Informatics in Developing Countries,* 5(1): 15-37.

Van Zyl, I.J., & De la Harpe, R. 2012. AT-HOME 2.0 – A collaboration model for informal learning in home-based healthcare. *Journal of Universal Computer Science, Rethinking Education in the Knowledge Society Special Issue*, 18(3): 429 – 453.

Van Zyl, I.J., & Delen, A. 2011. The intersection of ethnography, design, and development: technological innovation in home-based healthcare. *Design, Development and Research (DDR) Conference,* 23 – 27 September, 2011, Cape Town, South Africa

Van Zyl, I.J., & Rega, I. 2011. Critical approaches and varied impacts: Understanding the role of educational technology in disadvantaged schools. In: International Development Informatics Association (IDIA), 26-28 October. Lima, Peru: School of IT, Monash University.

Visser, C. 2012. *Textbook shambles has been a long time in the making*. Mail & Guardian Online. Retrieved 17 August 2012, bit.ly/LenoQm

Wagner, W. 1996. Queries about social representation and construction. *Journal for the Theory of Social Behaviour*, 26: 95 – 120.

Walker, D.T. 2010. Being a Pracademic – Combining Reflective Practice with Scholarship. *Keynote address AIPM Conference*, Darwin, 10-13 October 2010.

Wang, F., & Hannafin, M.J. 2005. Design-Based Research and Technology-Enhanced Learning Environments. *ETR&D*, 53(4): 5 – 23.

Warschauer, M. 2003. *Technology and Social Inclusion: Rethinking the Digital Divide*. Boston, MIT Press

Wellman, B. 2004. The Glocal Village: Internet and Community. *idea&s*, 1(1): 26-29.

Wentworth, P. 2010. BingBee @ RaglanRoad – a Field Trial with Unattended Educational Kiosks. *IST-Africa 2010 Conference Proceedings.* Retrieved 31 August 2012, www.ist-africa.org

Wertlen, R.R. 2007. *An Overview of ICT Innovation for Developmental Projects in Marginalised Rural Areas*. Retrieved 25 August 2012, http://ekhayaict.com/eKhayaICT4D.pdf

Western Cape Education Department (WCED). 2008. *Education Districts.* Retrieved 08 January 2013, http://wced.pgwc.gov.za/branchIDC/Districts/ED-funct.html

Western Cape Government. 2011. *KHANYA PROJECT: Western Cape Department of Education.* Retrieved 15 November 2012, http://bit.ly/UrRt2x

White, L.A. 1949. *A study of man and civilisation.* New York: Farrar, Straus.

Whitehead, N.L., & Wesch, M. 2009. Human No More. Digital Subjectivities in a Post-Human Anthropology. *Anthropology News: In Focus, December 2009.* Retrieved 15 July 2012, http://www.aaanet.org/publications/upload/50-9-Whitehead_Wesch-In-Focus.pdf

Whitehead, N.L., & Wesch, M. 2012. *Human No More. Digital Subjectivities, Unhuman Subjects, and the End of Anthropology.* Colorado: University Press.

Wierzbicka, A. 1984. "Apples" Are Not a "Kind of Fruit": The Semantics of Human Categorization. *American Ethnologist*, 11 (2): 313 – 328.

Williams, R.W. 2012. *Digital immigrant teacher perceptions of social media as it influences the affective and cognitive development of students: a phenomenological study*. A Dissertation Presented in Partial Fulfilment of the Requirements for the Degree Doctor of Education. Liberty University, July 2012.

Winschiers-Theophilus, H., Bidwell, N.J., & Blake, E. 2012. Community Consensus: Design Beyond Participation. *Design Issues,* 28(3): 89 – 100.

Winschiers-Theophilus, H., Winschiers-Goagoses, N., Rodil, K., Blake, E., Zaman, T., Kapuire, G.K., & Kamukuenjandje, R. 2013. Moving away from Erindi-roukambe: Transferability of a rural community-based co-design. *Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries*, Ocho Rios, Jamaica, May 2013. pp. 363 – 374.

World Congress on Information Technology (WCIT). 2012. *One vision for a global digital society*. Retrieved 22 June 2013, http://bit.ly/T2TS8m

Wresch, W. 1996. *Disconnected: Haves and Have-nots in the Information Age*. New Brunswick, Rutgers University Press.

Wresch, W. 2009. Progress on the global digital divide: an ethical perspective based on Amartya Sen's capabilities model. *Ethics and Information Technology*, 11(4), 255 – 263.

Wright, S. 1998. The politicization of "culture". *Anthropology Today,* 14(1): 7 – 15.

Zheng, Y. 2009. Different spaces for e-development: What can we learn from the capability approach? *Information Technology for Development*, 15 (2), 66 – 82.

Appendix

Annexure 1: data collection protocol

Project-level analysis: interview protocol

DEMOGRAPHICS

DESIGNATION	
NAME (WILL REMAIN ANONYMOUS)	
SURNAME (WILL REMAIN ANONYMOUS)	
AGE	
SEX	
NAME OF SCHOOL	
SCHOOL DISTRICT	
NUMBER OF YEARS IN SERVICE	
QUALIFICATION(S) EDUCATIONAL EXPERIENCE	
SUBJECTS TAUGHT	

PERCEPTIONS OF TEACHING

1. How do you feel about teaching at the moment? Rate in terms of positive and negative aspects:

POSITIVE	NEGATIVE

2. What are the main activities that you are involved with as a teacher?
3. What do you foresee for your career in the next 5-10 years? Would you like to continue teaching or perhaps change direction?

PREVIOUS ICT TRAINING

Did you receive any prior training in ICTs before you joined the MELISSA training programme?

- during your teacher training courses?

- when you attended in-service training activities?
- Other: please elaborate

If YES, do you have any certification in ICT skills? Please elaborate

ATTITUDES TO ICT

1. For the purposes of this interview, could you clarify what you understand as "Information and Communication Technology"?
2. How would you summarise your attitude to the use of ICTs in the primary school classroom?
3. In an ideal situation, do you think that ICTs for teaching and learning have any real purpose? Elaborate or explain your answer.

4. What do your colleagues think about the use of ICT for teaching and learning?
5. What do your students think of ICT with reference to teaching and learning?
6. What do your students' parents think of the use of ICT for teaching and learning?
7. How would you summarise your school's view on ICTs in the classroom? Are there clear policies? Are they going in the right direction? Please elaborate.

EXISTING USE OF ICT AND IMPACT ON APPROACH

1. Do you use ICTs in delivering the curriculum to your students?
2. if YES, what type of approach do you apply (if any)?
3. What kinds of technology/softwares do you recognise or use?
4. How often (daily, weekly, monthly, often/seldom, etc.)?

5. Do your learners use ICT? How? To do what?
6. How often do you get them to use ICT?
7. How would you rate their computer literacy levels?
8. What are the benefits for different kinds of learners?
9. What are some of the barriers you have faced in using ICTs to teach learners?

10. Do you use ICTs for any purposes other than teaching (preparation, research, administration)? Please elaborate.
11. Communication is a critical feature of being a teacher – What ICT-based ways do you use for communicating, when, and with whom?
12. Has your approach to teaching and the teaching profession changed since you (or your colleagues) started using ICT? How and why?
13. What factors motivate or demotivate you to use ICTs in teaching?

INVOLVEMENT IN MELISSA

1. What factors influenced you to take part in the MELISSA project?
2. Did you plan to use ICTs in some way before getting involved with MELISSA?
3. How have you found the MELISSA training? Please elaborate. Mention the positive and the negative aspects.
4. Did you attend the sessions regularly? Explain why or why not.
5. Which areas do you feel *were* adequately covered by this training?
6. What areas do you feel *have not been* adequately covered by this training?
7. When attending MELISSA training, how much do you remember from previous sessions?

Nothing *A little* *A lot* *Everything*

Motivate:

……
……

8. Do you practice what you have been taught after the training? Elaborate (why or why not)
9. On a scale of 1 to 10 how do you rate your computer skills before *and* after MELISSA training?
10. Do you feel more confident using ICTs after the MELISSA training? Why or why not?

CONCLUDING THOUGHTS

1. What are the main challenges you face when using or planning to use ICT in your educational activities? Which problems? How do you address/resolve them? Please provide examples.
2. How would you summarise your attitude toward ICTs? Please elaborate
3. Do you plan on being involved in future ICT-related training programmes, or up-skill yourself at home/at work?

As a possible side question: Why do you think there are more women attending the MELISSA training than men?

Meta-level analysis: discussion, observation, reflection

DATA COLLECTION FRAMEWORK

1. Context

Explore the following contextual issues

- Who am I in a hyperconnected world?
- Facets of culture, technology (artifacts), and education
- 'Storied reality' → ethnography
- Locate to Western Cape context: 6 schools, WCED policy, Khanya
- Build community insight

2. Data collection

Collect data in terms of the following

- 3 threads: interviews, observations, reflections
- Interviewing: 20-30 minutes (or longer, depending on availability and interest)
- Email interviews
- Participant observation: shadowing, course facilitation
- General observation and description: explore the surrounding environment
- (Photography: visual narratives?)
- Self-reflection: what do I (the researcher) experience?

3. Guiding questions

Reflect on the following / probe the respondent along these core themes

- What do you understand by "Information and Communication Technology"?
- What do you think about the use of ICT in schools?
- Explain the differences and similarities in the adoption of ICT in state vs. Model C schools?
- What do you think about ICT in general (personal, at home, in the community)?
- How do you interact with ICT?
- (How) do you think ICT forms part of your culture, both personally and professionally?
- Do you think you will be able to cope without ICT skills in the future? What about your students? Explain.
- What do you think about the statement that technology has become part of our "social fabric"?

Annexure 2: Sample of interview transcripts

Interview at experimental group school

--- Demographics withheld

R: Views on teaching as a principal

I: I find it makes me more on top of management. In fact, in my case as the new principal I got to look at the management of the school as a whole. When I got here, there were a lot that was supposed to be done and having teaching now in the classroom... I'm offering arts and culture and life orientation. So I'm also teaching as a principal and I'm also giving support as well and also look after the non teaching staff as well, because they are also monitored by me SPMDF evaluation sheet, as you know for the teachers the IQQMS for the evaluation. So it goes hand in hand for the none teaching staff it is SPMDF. I must also fill in that so it is a lot of work for me.

R: How long are you the principal now here?

I: I started last year October so it is not a full year for me now. So it is a bit stressing for me

R: Is this your first experience being a principal?

I: For the past, I was not a full time principal. I was an acting principal at another school.

R: For how many years were you an acting principal?

I: It was for 1.5 years because the person that was appointed to that school, there was a dispute so I had to act until the dispute was resolved. It didn't take two years. So there I gained a little bit of experience and I could use that experience by the time I was a deputy. Because most of the time the principal was sick, so every now and then when my principal was sick and then I had to take over, so It helped me a lot.

R: As a principal, you do not have as much time as the other teachers to prepare your lessons. When you are in the classroom what are your main activities - is it pen and paper-based activities, or...?

I: I try to do all of them. Because most of the time since I am doing it at home...I just give them the topic like I was doing the strengths and weaknesses this week , So I had to give them on Monday, go and do research. So when I meet them on Thursday they can give me feedback and then I can assist them.

R: Where do the learners do their research?

I: They do their research from home, from their library and they get it from their neighbour.

R: Five ten years from now where do you see yourself?

I: Pension. I am 50 years now so I am left with 10 years. Aren't you supposed to go on pension when you are 50?

R: According to the world health organisation you are only old age when you are 80, so you have another 20 more years to work

I: Eighty. No, Melissa, you must be crazy

R: So you are going to stay in teaching?

I: I'm going to stay in teaching until retirement. I don't have any options, because what I did was when I went to upgrade myself I did the teaching courses so there is no way that I can change now. Unless I can go for something that is like business of which I am not ...I am a businessperson but informally. I don't have the basics and that is the problem and you'd be having a problem with me.

R: So you don't see yourself moving up the leader maybe to the head offices?

I: I am intending to go to the head office - as an old lady and then I can be70 80 at the head office, be more relaxed.

R: Do you have any previous computer training?

I: I did. I went to Cape Tech and I was doing the MSWord and then the basics of the computer started there, even though I had informal...because my daughter taught me at home. My daughter was doing computer from grade 1, so whenever she comes back home she would teach me from the toys: "Mamma this is how to handle the computer, the keypad this and that." So when I got to Cape Tech I did have the informal background from home. Then I have done that course it was six months. and then after that I have forgotten all. And then 2004 I went back to university to do my Bed honours so I took computers as one of my courses.

R: So you are computer strong/ very literate?

I: So when I got to the school where I was coming from there was Khanya lab. So I was a level one so I had to be trained by the computer because I was a level one so that I can help the others at school

R: So do you ever help the teachers?

I: Yes, I do, I do...

R: But I suppose because your time does not allow you....

I: It doesn't, Melissa it doesn't. Sometimes when you are here, you have to attend a principals meeting. Sometimes when I am here I am finish what I could during the course of the day. Because most of the time the class work takes my private time. So I make it a point that all the office work I finish here at school so that at home I can do my marking, my recording , so that I look at what I'm going to do the next time I meet them.

R: Which means that you don't get much time to spend on the computer at home?

I: I don't. I've got a laptop that I've got here at school. That is the only thing that I use when I am relaxed on the bed.

R: Do you have internet at home?

I: I can say that laptop is internet connected, or wireless. If I want to email I can

R: Do you email a lot?

I: Not a lot

R: Facebook, Twitter?

I: No but things like MXit, because one of my colleagues told me that he child massed up her mind because she was so MXit focused. Even if the child is washing the dishes she would have the phone on the other side up to one day that phone fell in the Zink then the parents said yes thank you god, now my child will concentrate. So that is thus a bad thing. So I have this bad conception about MXit and whatever. Although my daughter is MXit-ing her friend.

R: But you have a negative feeling and attitude about MXit

I: A bad attitude because they will hide it and what is it that makes them want to hide

R: We use the abbreviation ICT for information and communication technology. If you have to give a definition to teachers about what ICT is what you will tell them. There is no right or wrong answer; I just want to know your perception about ICT

I: If I had to explain to them, I would say: You know in the computer who does access the information, we do feed the computer with information and that it is how we communicate. Because you can send emails, you can receive emails and because of the technology, you don't have to take a paper and write you can use technology. So technology wise it is the best, because the computer when it came it makes you to be focused and then time consuming as well. Because we use to spend lots of time doing research, but with the computer we can still research whatever you want. So whatever information you want to access you can just put it there and you can access it on the internet.

R: So you see the computer as an example of ICT. Is there anything else that you would also consider as an example of ICT?

I: I would also say the TV, the telephone, but I won't say the radio, but I won't say the radio. I am still waiting for the teacher to come and say to me

They demand it from me as the principal the radio to get access to information. And there are human resources. There is outside people like you. There is outside people from CEO. Whoever from the department, curriculum advisors.

R: What is your attitude toward ICT in the teaching and learning environment? Are you for it or are you against it?

I: I am for it; I am strongly for it. But the problem is the time. I don't even harass them when they are in the computer room because I know there is something that they need.

R: Is there anything bad about the use of technology in teaching?

I: No, No. There is a learner in my school: I always tell them that story telling literacy, we are asked to use the computer. Because the children accessing themselves. In my school, we have earphones and I let them use the earphones to open the stories. There are talking stories. So there is the visuals, so even their minds are actively involved the child is focussing there.

R: What is your experience about the teacher's attitude towards ICT? Are they as positive as you?

I: It is positive. I don't have a problem with them. It is positive.

R: And the learners?

I: The learners as well. [Vague]. Most of the time we are having this problem. Because of the poor access of resources. Most of the time the internet is off. Sometimes the computers are offline.

R: And the parents? What are they thinking about the...

I: Oh, I don't have a problem with the parents. The parents are all willing, but the problem with the parents is that some of them never had an opportunity with these things (Computers). There are more

percentages who don't understand and those who do understand. And those who understand most of them are not in the area where they can let their children come to my school. They take their children to the other side of the road (better school). I am supported mostly by the people from the shacks and Tambo Square. So they are unable to get computers.

R: So what are you saying: That people who are able to buy computers will take their children to other schools and those who cannot afford computers but know that their children can get computer lessons from your school will send their children here.

I: Yes

R: It puts a big responsibility on you

I: Yes, I am starting from scratch. As I was making the example of my child – my child was able to press the computer from the toys. It was even before she was in pre-school . There is this thing that they use to buy, what is it? At the school they had this thing where they connect to the TV game but there is something else, they call it, what is it?

R: Is it the Playstation?

I: Yes, my child also went and buy the Playstation, so she a Playstation, she had this TV game and even the...she like to punch, when she went to grade one she was exposed. They were doing it on the keyboard. After some time they got the computer for their school

R: Do you think the computer programs cater for all the children's different cognitive developmental levels?

I: I think so, because they are not of the same level. There is one that everyone can afford to do. Level one. A child that is ion level three will say: I'm done miss. But the one that is on level one will still struggle to do it. So I think there is all levels on the computer programs (*contradiction!)*. So I think there is all level on the computer program.

R: Any problems that you see with technology at your school? You mentioned one, namely the internet, the reception is poor, and the internet is off when you or the teachers need to use it.

I: The time - sometimes we are having one period that is too short. One period per class. So the next time the child has already forgotten and the teacher needs to explain again.

R: How long is a period?

I: 45 minutes - it is too short. They travel form the classroom to the computer room. Good 10 minutes before they settle down, another 5 minutes to switch on, because they won't just go back and know what to do. The teacher still has to explain what to do.

R: The schools are still working with Microsoft 2003, although there is already a 2007 and 2010 version out. How do you feel about what the world out there is doing and what we expose and train the teachers on?

I: To me it is better than nothing, because there are schools that have only one computer for the teachers and learners.

R: Is there anything that you as a principal would like to share with the academic community in connection with the role of ICT in teaching as related to your experiences?

I: In future, I would love my teachers to have computers in their classrooms and stop using the blackboards. Rather use computers and this overhead board and then the learners would see.

R: Are you referring to the interactive whiteboards?

I: Yes and then the learners would themselves at the end of the day the learners would be able to read themselves, because at the moment when we give the question paper to the learner they are unable to read on their own. The teacher must still be there. Most of them are getting low marks. So if they were used to the teacher teaching in the classroom and at the end they get a printout. In my previous school, I used to teach English because my school was mixed (meaning Xhosa and English) so when my kids came to grade 4 they already had a foundation. Those who were coming from the Xhosa were struggling. I am glad they introduced the CAPS from next year. When you introduce English, you find that the learners are willing. But now we are bounded by the curriculum.

R: So you feel that if you have the technology in the classroom, a lot of barriers will be overcome?

I: Yes and even the children will tell the parents before we will even tell them we are learning this way and we are learning this method. And how about those parents who can afford computers and who can get from somebody else and even the child to computers from home.

Interview at non-affiliated school

Basically, I just want to give you an idea of (what is your surname?)

[Withheld]

Q. I just want to tell you about my job. I work in the communications department at CPUT and… our focus is specifically about the communication in schools, but because I come from an anthropology background, I look at culture. I like personal stories in technology and your personal experience of technology and I'm not so interested in hardware and political aspects. I look more into experience so I am building a picture about the community and how technology and specifically IT affects the community and as person.

A. OK

Q. So it's basically just to give you a background. So how do you see IT?

A. Well it's a way of information, a way of communication, research it's a way that decreases the size of the world.

Q. Ok and at this school how do you use IT, in which areas would you suggest its use?

A. Are you talking about what the learners can learn?

Q. Yes that as well, and not necessarily what they learn but how they are taught.

A. I don't work directly with learners but directly with teachers. But what I think is in the first place it's for pupils to learn in the first instance how to use computers but in addition to what has been said, it doesn't matter in which profession you go, you have to have computer literacy. If you have clients and they ask you for an email address, the chances that that client will get someone else is very good. We teach the pupils that computers are part of life. It's the best and quickest way of communication with everyone and not only (I'm talking about social networks) Then also the teachers, it also cancels paperwork, I mean teachers receive email and that's it. If they need to hear something, they check email and that's done. It's not necessary for the teacher to send a pupil with a note where a pupil would have lost 10 minutes of teaching. The teacher could have spent 2 minutes to send an email they pupil would have taken much longer. I hope that I have answered correctly.

Q. Yes there are no right or wrong answers. It's all about your own experience. Can you give the setup of this school specifically? How many computers, how many labs, how many computers per class etc.

A. We have two computer locations, this one next door has 33 computers, and the other one has 20. The one next door is used for training, the pupils get trained in WORD, EXCEL etc. (All Office products) They learn basic computer skills like internet usage, PowerPoint presentations. All basic computer things are taught here.

Q. Windows?

A. Unfortunately yes. I personally feel that schools should move over to free software for example Linux

Q. I spoke with someone who said that the school should renew the virus database subscription while hundreds of free offerings exist

A. Yes it's not the only problem, there is now (I don't know how far) I heard last year that Microsoft's School volume licensing will be enforced. They want us to buy a licence for every computer in the school. I am talking about R1000.00 per computer and the school has 130 or 140 computers. I wouldn't have said that but is it good to work with Windows? The other centre is used for support. A teacher would take a class there to do extra maths or reading or also research. They can also do it this side. For example, the teacher has an assignment for which they want the pupils to do research for whatever reason they can take the pupils there. That's the only reason for the other centre; there is no permanent teacher on duty there. A specific teacher would go there and teach. On this side, there is a teacher full time who teaches. There is a computer in every classroom and every office. Everyone is linked to the network.

Q. And bandwidth?

A. We use 20 gigs which is our initial cap. Our actual use is approx. 33 Gig.

Q. That is one gap at schools where there are the most problems.

A. Yes it was a problem but I am very happy with our suppliers. It's not Telkom or Web or a big supplier. It's not a small company but a reasonably strong supplier based in Hermanus. There price is not the best, but their service over a five year period is good. (Internet downtime only once in 5 years.) It does happen during a power break or with a problem with Telkom as everything works through Telkom, further I know that Telkom is offline many times and one cannot get hold of them. I am very satisfied with our suppliers. They are a bit expensive but I know it's a problem at other schools. I assisted another school last year because their IT teacher just left and they had no one for IT. Some of the teachers received training from me so that they could at least just help themselves. I know for example that school has a cap, a very small one.

Q. That's a nightmare.

A. Yes that is a nightmare, especially if you started with communication with parents by use of email or something similar. Now your cap is used and immediately the communication is broken. That is frustrating. We started at the school with 3 Gig and then 5 Gig and later 10 GIG. Last year they brought a package where you take 20 Gig with top up. We top up a lot. The reason why we don't actually go uncapped I cannot see, I'm not talking about MWEB's offering I'm talking about real uncapped offerings. That is double that we are paying presently. There are many reasons why we are not doing it because funds are lacking. If you want to drive a Mercedes Benz, you have to be able to afford it. I don't think there is money in or budget. It will definitely become a must in the future. Technology, I know there are many schools that don't even have internet. I know about a school in Philippi. They did have and then they got cut off. It will become a must have. If you want all government schools to stay equal then you have to implement the same technology everywhere. It doesn't help if one school flourishes with communication and the next school stays down. Somewhere the kids will start competing with one another and there should be no comparison.

Q. How many classrooms have whiteboards?

A. 8 Classrooms have interactive whiteboards. There is another venue where classes are being taught with a projector. Here as well so say that there are nine. There are actually only seven interactive whiteboards. Some of them are at the grade 7s, at the grade 6s there is 1 whiteboard. (I'm not sure if they exchange or not) There is also one at the grade 5s.

Q. We spoke about school level. What about on a personal level? How does IT form part of your routine and day? Do you use it at home? Can you get by without it?

A. To be brutally honest, if there is a 10-minute power failure, I don't know what to do with myself. IT has formed a part of my life in the aspect of that is all that I do. When I get home at night, the only time when I leave my computer is when I have to eat or go to the bathroom. The chances of me going out are remote as I sit in front of my computer the whole day. This has a big impact on me as all my stuff is computerised. To be fully honest and that will sound weird. I can still write but I struggle. I only write when I go to the bank and I have to sign something. That's the only time when I use a pen. Technology has changed my whole life and I believe many other people as well, for me specifically a lot.

Q. Would you say it changed your identity as person?

A. Yes.

Q. What about your peers and the people in the community?

A. No, at school I was always s very outgoing and social. When I started working in IT, it's not like my personality changed but my mannerisms did. I would rather sit at home behind the computer and work than go out whereby my friends would do that. My friends only spend time with computers when they play games. My friends and I differ on that level, they know games, but when you ask them a simple

question on Word they would not know. I find it difficult for example, when I go to a barbecue I find that I sit there and I don't know what to talk about. Everything that I talk about or interests me is the total opposite to them. On the one side, it makes things difficult sometimes. I don't sit in front of the computer the whole day, I do go out and do not spend time with it the whole day, and yes it is difficult in that aspect as well. It's difficult to communicate with your friends, unless you have friends in the IT industry.

Q. What about social networks and online communities, Are you a part of Facebook or Twitter?

A. I'm not on Twitter; I don't see the need to share my life with everyone every 5 seconds. If you want to know how I am then call me. I do have Facebook, it's not a must but I enjoy it. I visit friends that I haven't seen for years, as I was born in the Transvaal. I cannot have contact with them every day, I don't even have their numbers, but I can talk with them on Facebook, when I go on Facebook. Yes on social networks, I use Facebook, but not really anything else. I do use MSN and Skype.

Q. like MSN messenger?

A. Yes things like that.

Q. Ok that's interesting, I think I have asked the most important questions. Yes, this is an important question. Do you think people in your peer group and younger generations would be able to cope without IT skills in the future?

A. No not at all. I think for the future if you are not computer literate, (sorry to say) you don't have a future. I think everything today, just look at cell phones; it can be your whole diary. Life has changed so much that the quicker one can complete something, the better, it's not like the old days where you have to wait for papers to go somewhere, mailed somewhere and then come back. Everything happens immediately. [Vague]. Made something that if you put someone in a place and the person has to do paperwork. At a stage, you have to place 3 people there whereas you could have installed a computer there that could have performed all 3 people's duties. The computer can perform the same duties quicker than all three people together. At the rate that IT people get trained at the moment the rate will only increase. I'm not saying it's going to happen at schools, maybe not in primary schools but maybe in High Schools. I heard about schools abroad where every learner has a laptop, and they receive all their material, books etc via the computer. They even write tests on the computer (I don't know how English tests will work) you can correct spelling on the computer. It's definitely a must, especially in South Africa it will increase substantially. At the moment as I told you yesterday the young teachers that are starting, in comparison with the older teachers here struggle a bit.

Q. Why is it that the younger teachers struggle more?

A. I will be honest with you; at school, I was guilty of the same thing. I blame MXit and Facebook; I won't say Twitter, because with Twitter you can't add a status. I blame these things because ask any

young person and they will be able to assist you with Facebook, but ask them to assist you with an Excel spreadsheet and they won't be able to assist. I don't blame Facebook but this has resulted in learners being caught in this habit, to Facebook and MXit and socialise. The socialising has become so severe that (Using my sister as an example) I get upset with her because what does she do the whole day? She is on Facebook and MXit. She doesn't learn anything new. She is busy on the computer, which is one of the great reasons. The other reason is that I would say at school. These children leave school and know how to use everything like Word etc, I know for example at the school that I attended that we were only allowed to use a certain part of the keyboard, like the spacebar etc to go to the next sum. In high school, we started learning about Word and because of my Dad, who was computer literate. In high school, we took IT as a subject. This is where the problems start, look at know at home one learns to know Word, but the moment you start doing more complicated things in Word, so I say this has to become a norm in schools, not as a compulsory subject, but should be part of a subject like Afrikaans, English etc.

I know many people will support me when they hear that I say this. I think this is a must because computers aren't going away, they will only become more, so that's why I say it's scary when I say that young teachers and students, here are students at the moment, they haven't asked me anything yet but a few years back there were students here and when they saw something they said "WOW" . I knew what it was and I knew it was a PowerPoint and they said WOW and asked me "How do you do that?" I show them and they see how easy it is. It is scary because I didn't do anything funny on PowerPoint as I just automated everything and they were very surprised. It was very scary.

Q. Yes it is scary. OK and yes you said it's important for those people to up skill themselves because in 5 or 10 years time it will be needed in forms of life including work and home.

A. Look, I'm not saying that social is wrong, I mean to be honest I also use MXit, but on my computer only and not on my phone. The only reason why use MXit is that it's cheap and a simple means of communication. If for example you have a girlfriend you use it. It is not wrong but if you are dependent on it, there is a problem.

Q. Ok just a last question, just to get back to the schools, my experience so far is in government schools and schools in poor communities like townships and informal settlements. Do you think there are big differences between there and here, if you think at the top of your head?

A. I'm going to be frank when I say that the differences are big. I know schools in those areas that flourish that are competitive because the teachers are motivated, they want to work. At other places the necessary motivation is lacking. One of the big problems is that at one of the schools that I know, as last year one of the female teachers that I know said to me that they are at their wits end. They get new computers, about 30 or so from the Education department, only to find a week or so later that they have been stolen. This is sad. Not that I am saying that the areas are bad, but you can think for

yourself. Other schools should get to our standard; we shouldn't lower to their standards. If you ask the question, what is education, what is school? One can say yes the schools compete against each other when they play sport. I would say that this nonsense should stop. Schools should work together, one school shouldn't be better than another because it's all about the learner. I'm not even a teacher and that is how I feel. If you for example take a grade 7 learner, the school gets for instance a set amount of money and another amount at another school. In the end both learners pass grade 12 and apply for jobs as they don't further their studies. The prospective employers look at both CVs and would be bias toward the "better" school. The learner from the poorer community did not have the same opportunities. Which one will stand out? Obviously the one that had the opportunities.

That's why I say that somewhere someone should try to make a plan to get learners in disadvantaged schools exposed to technology, because in 20 years time I guarantee that they will not find employment. I'm not talking about artisans and similar jobs. Everyone can't be artisans, then there will be too many, that's why I say if it doesn't happen this country will deteriorate. This is fact; I will say that at those schools some plans have to be made to get for example a community centre that can be used for that purpose. There are so many things that I can't even do and I don't even know where to start. I just know about this one particular school and I am not sure about other schools. This is my own experience of our own school versus the other school that I mentioned. I'm just going to say that in disadvantaged communities one would find more criminal activity. Not that I'm saying it won't happen here as it might just as well. The chances there are just greater. It saddens me to know that a school received 30 new computers and to find the next day that everything has been stolen. What they should also do at disadvantaged schools is (I Know of schools who have computers and no one knows how to use them)

Q. This is a nice school to start with research, as your ducks seem to be in a row as opposed to other schools that I visit. They use Excel for example to make payments and no one seems too able to utilise the technology properly. They have a 2 GIG cap for example with 20 computers.

A. That's one thing that we don't want to tell our learners" You have only limited access "The internet should be open to everyone. We have systems to block unwanted sites etc. I know for example a few simple words that you can type in Google that will get you to unwanted sites, although we try to limit it. Learners shouldn't be limited, as they are being put at a disadvantage when they are being blocked. That's why we encourage the learners to explore. This is what I experience of this generation learners at this school, they ask so many more questions, they are more spontaneous and they aren't scared to try new things.

If you arrive here, don't instruct the learners to operate in Word and word only for the rest of the year. One shouldn't do that; give them freedom. One should work according to the curriculum, but if the learner does something on the computer, don't limit him/her. Even if they damage the computer I will remove and reinstall a program. I believe that's the only way to learn. I promise you I only completed

grade 10 and didn't do any further studies or courses. What I know about IT I learnt through trial and error. I don't want to boost myself, but I have friends that studied IT, and they call me when they struggle. I'm not saying the universities are bad, but it's different to learn something from a book and write an exam. You might not encounter a problem for 2 years. I learned to solve problems on a practical way, and then you remember them far easier.

Q. You struggle with a problem for an hour or two and then you remember it.

A. Yes that's why I say I should complete grade 12 and start studying because I have had job invites from abroad, but I don't have the qualifications. Do you understand? The people know me and know my abilities but cannot employ me without formal schooling. This saddens me on the one side because I don't like studying. I will sit in front of a computer and fix something quicker than someone with qualifications.

Q. How old are you?

A. I'm 24. I have been busy with this for 6 years. I only wanted to do this for 4 years. My dad told me not to be impatient. I am probably changing my career, probably leave IT and move into photography.

Q. It's a very old concept that one should have Matric and a degree.

A. It is still important to have an education especially if you want to work abroad. I know that I can do A Microsoft Certified partner without Matric. You just enrol for the exam and either pass or fail. I may have 5 years experience and someone else may only have 2 years experience but they have a Network Administration certificate and they will get preference over me. Experience means a lot, over these past 6 years I learned a lot. I don't think one could have picked up my experience at a university as you deal with people and their problems the whole time. Each computer has a unique problem. That's why I don't phone Telkom when I fix someone's computer at home. They would say phone Telkom. What do the people at the call centre do? They sit with a manual. If you ask them to assist with your internet downtime, they start with step 1 and they read it back. If step 1 doesn't work then they read step 2.

Q. They did not learn by the trial and error method.

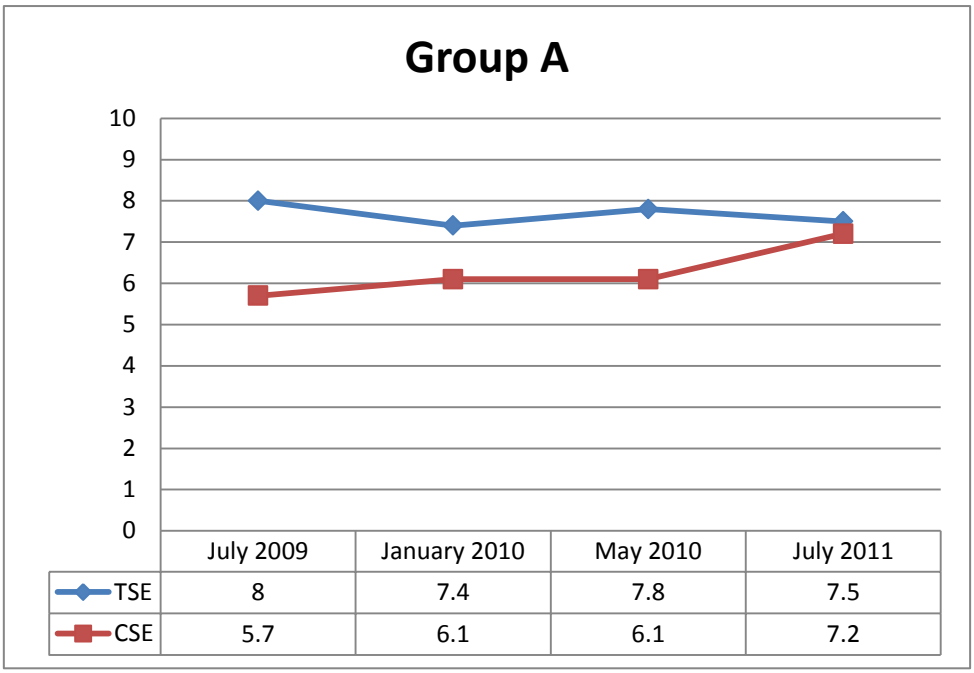
A. Correct ,probably all call centres consist of people that read from a manual, reasons being that the companies that employ the call centre staff won't pay the salaries that the real IT staff earn, so they are forced to place staff that can read from a manual.

Annexure 3: Sample of thematic analysis (Schutz, 1967)

SECOND ORDER CONSTRUCT		FIRST ORDER CONSTRUCT
SYMBOLISM: USE AND IMPACT	**INCIDENCE**	**DESCRIPTION**
Pragmatic (beneficial)	24 gr	Instances where respondents claim that ICTs are beneficial to either them, their learners, or the general school context. The quotation illustrates where exactly the benefit lies: in saving time, and in interactivity. Other codes explore this in more depth: saves time, interactive lessons, research, etc.
Communication	17 gr	All instances where ICT is specifically employed to communicate with others: email (with colleagues and parents), SMS (in some cases), and cellphone calls. This also speaks to the internet as communication medium
Ease of use	4 gr	One of the apparent advantages for teachers is that technology makes their job easier (see the quotation). Information travels faster, and is accessed quicker.
Frustration	11 gr	This code signifies all cases where respondents claimed to be frustrated in their use of ICTs, mostly due to technical issues (e.g. non-functionality) or their lack of knowledge/confidence in using the available technologies. Other instances of the code refer to frustrations related to the teaching profession - e.g. large learner numbers, etc.
ICT for learning	44 gr	All instances where ICT is utilised for learning. Most respondents talk about 'interactivity' being a significant advantage of ICTs/software (e.g. the internet, Encarta, etc.). It gives students mass that they would not otherwise have. I'm afraid though that even though the learning through ICTs does take place, it does not do so often enough. This is due to limited time spent in the labs.

Annexure 4: Extended MELISSA findings

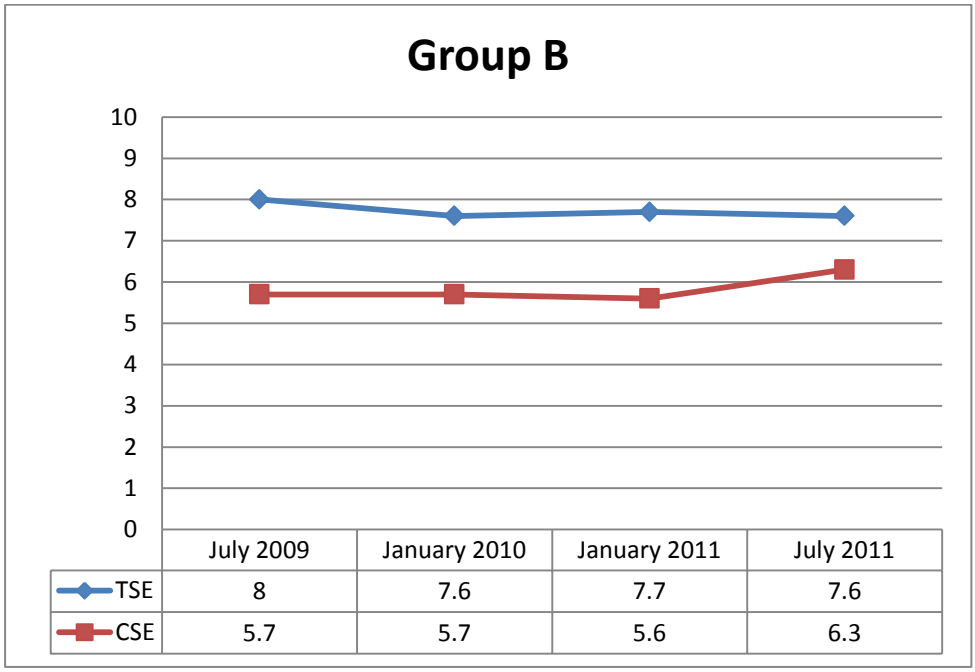
The impact of ICT on self-efficacy



Annex Figure 1: Group A – Computer and Teacher Self-efficacy before, during and after the course. Data is normalised to a 10-grade scale. (Fanni, Rega, & Cantoni, 2013:106)

The results of four questionnaires for *Group A* are charted above. Surveys were conducted at the beginning, middle and end of the course. A follow-up survey was conducted one year after having completed the training. At the outset of the programme (July 2009), there did not seem to be a significant correlation between the variables of TSE and CSE. During the course (January 2010), this trend persisted, with no obvious correlation between variables. CSE had increased slightly, whilst TSE remained statistically unchanged. By the end of the course (May 2010), CSE and TSE indicated similar values, with no correlation.

In a follow-up survey (July 2011), the team could observe overall changes in CSE and TSE values. This was achieved by comparing mean values between July 2009 and July 2011: CSE increased from 5.7 to 7.2 out of 10, while TSE decreased from 8 to 7.5 out of 10 (positive F-Test) (Fanni, Rega, & Cantoni, 2013). Yet, no significant correlation was detected between these values throughout the course.



Annex Figure 2: Group B – Computer and Teacher Self-efficacy before, during and after the course. (Fanni, Rega, & Cantoni, 2013:107)

Similarly, results of the surveys conducted with respondents from *Group B* are presented in the figure above. In light of a positive F-Test, the findings indicate little change in CSE and TSE perceptions. There is no statistically significant correlation between the two variables. However, the results for January 2009 and 2010 preceded the actual training intervention for Group B, and are thus to be expected. Due to logistical and organisational challenges, a survey was not conducted with this group at the beginning of their course (September 2010). During this time, teachers had a number of other commitments, both personal and professional, often at the expense of training sessions (Van Zyl & Rega, 2011). School operations were also disrupted by nationwide teacher strikes and the advent of the Soccer World Cup 2010 (ibid.).

When comparing mean values from July 2009 and July 2011, the value for CSE increased from 5.7 to 6.3 out of 10 (negative F-Test). In the same period, TSE mean values decreased from 8.0 to 7.6 out of 10 (negative F-Test). Here, a statistical correlation can be observed between the two variables. This is the only evident correlation in the project thus far (Fanni, Rega, & Cantoni, 2013). Considering both groups overall, the mean values for CSE did increase over time, confirming the first hypothesis. Conversely, TSE decreased over time, with no discernible

correlation or pattern in terms of the mean values of CSE. Statistical analysis could therefore not confirm the second research hypothesis.

The illustrated quantitative results give a reasonable indication of the effects of ICT on efficacy beliefs. For the original experimental group, only a slight increase in computer self-efficacy could be observed. Perceptions of being good educators also decreased (marginally). Furthermore, no clear impact of CSE on TSE had been detected. That is, any self-perceptions of being more technologically capable did not translate into any perceptions of being better educators (Rega & Fanni, 2012). There were parallels between the values of Groups A and B. Notably, the variable starting values for both groups – measured at the beginning of the curriculum – were much higher than expected. These 'self-confidences' may be attributed to the fact that teachers already judged themselves as good educators, capable of mastering digital technologies (ibid.).

That said, the quantitative results do not explain the many underlying, varied nuances of CSE and TSE constructs. In light of this, the research team endeavoured to study these constructs qualitatively. For this purpose, team members reengaged with the work of Albert Bandura (1977), with particular focus on those primary sources of influence relevant to self-efficacy. According to Bandura, such sources can serve as means of creating and strengthening *expectations* of personal efficacy. Efficacy expectations are ordered, conceptually, around four key dimensions: performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal. These are described below (Fanni, Van Zyl, & Rega, 2011; Rega & Fanni, 2012; Bandura, 1977):

- *Performance accomplishments*

  Also referred to as 'mastery experiences', performance accomplishments are the most influential means of self-efficacy expectations. Past successes raise mastery expectations; repeated failures lower them, especially if mishaps occur early in the course of events (Bandura, 1977). Repeated successes reduce the negative impact of occasional failures, and strengthen self-motivated persistence.

- *Vicarious experiences*

  Individuals do not rely solely on personal accomplishments; many expectations are derived from vicarious experience. Seeing others perform threatening activities without adverse consequences can generate expectations in observers that they too will improve if they intensify and persist in their efforts (Bandura, 1977). Simply stated, observers persuade or motivate themselves based on others' accomplishments.

Vicarious experiences and the expectations induced by social comparisons are likely to be weaker and more vulnerable to change (ibid.).

- *Verbal persuasion*

  Through verbal reinforcement and suggestion, individuals are persuaded that they can cope successfully with activities that have hindered them in the past. Efficacy expectations induced in this manner are likely to be weaker than those that arise from the actual accomplishment, as they do not provide an authentic experiential base (Bandura, 1977). If an individual has a long history of failure with a given activity, or a sudden experience of failure, any positive verbal influences are diminished.

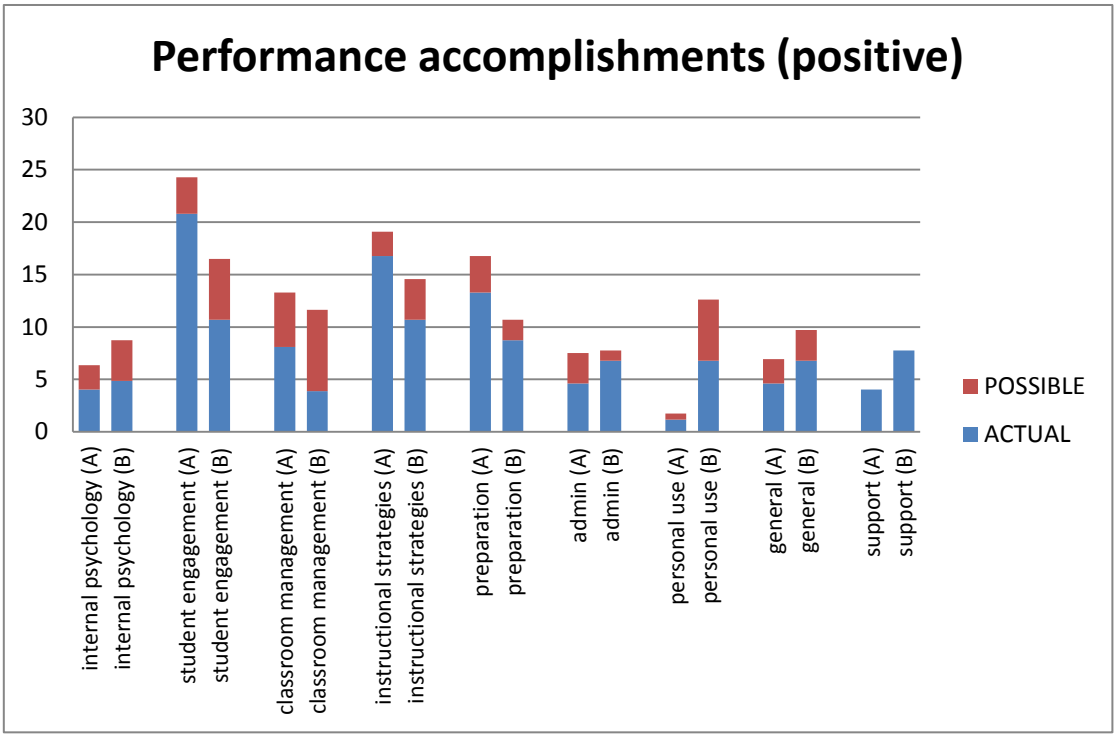
- *Emotional arousal*

  Stressful and demanding situations generally have an emotional impact and may affect levels of self-efficacy. Individuals judge their ability to perform tasks partly on their state of physiological arousal. High arousal usually weakens performance. Individuals are more likely to expect success when they are not beset by aversive arousal than if they are tense and agitated (Bandura, 1977). Fear responses further inflate self-arousal and can greatly inhibit performance.

The MELISSA team, myself included, coded the set of verbal interviews (up to August 2010) according to Bandura's formulae of efficacy expectations. This was in an effort to depict, qualitatively, a state of self-belief among the two teacher groups, thus reinforcing (or augmenting) quantitative findings. Incidentally, CSE and TSE constructs were not analysed distinctly, as in the quantitative case. This was due to an inductive coding procedure as opposed to a deductive hypothesis test. Additionally, interview data was coded along an efficacy scale proposed by Tschannen-Moran and Hoy (2001), outlining three components to teacher efficacy expectations: student engagement, classroom management, and instructional strategies. These refer, respectively, to the ability of teachers to communicate with students, to manage classroom activities, and to plan and deliver lessons.

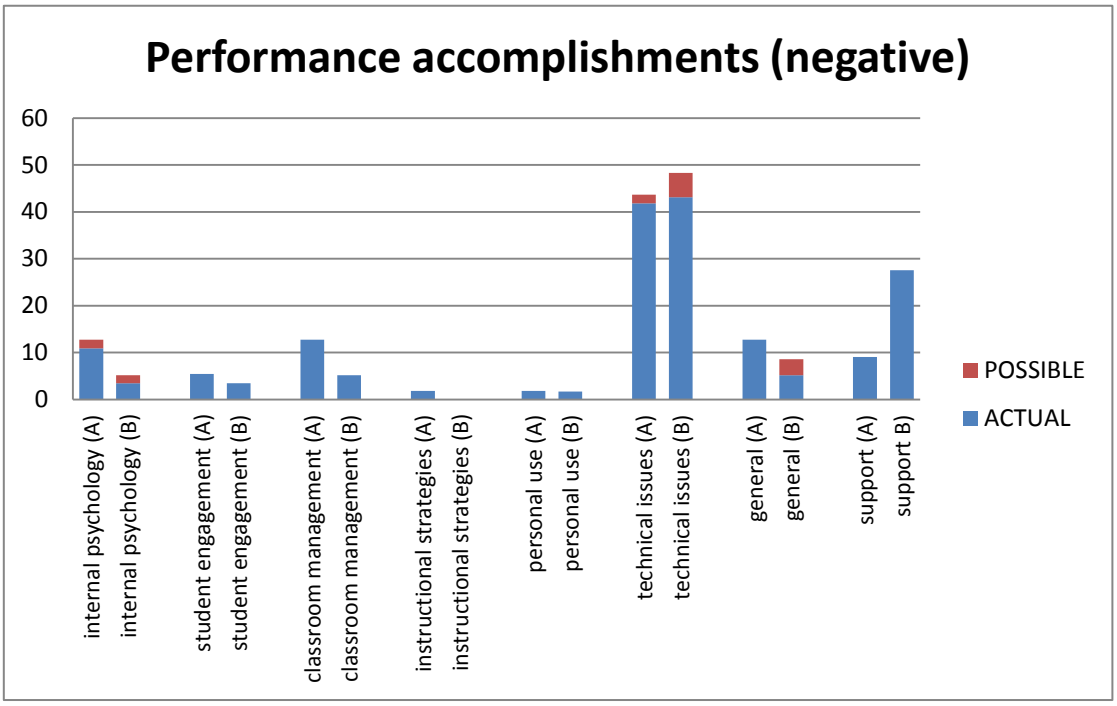
Each component of teaching activity was analysed according to the four sources of efficacy as earlier described. Additional influences emerged as the coding process continued (for example, administration, personal use, support, and preparation). Furthermore, sources were coded as 'positive', 'negative', or 'neutral', depending on the expressed effect or experience of the respondent. This raises a debate as to whether such categories reduce the inherent complexity of responses. I will consider this aspect in due course. Finally, the four efficacy sources were also

analysed in terms of whether they represented actual teacher experiences or ideational expressions (possibilities, potential risks, and the like). I list the key findings for mastery and vicarious experiences below. Incidences of verbal persuasion were coded as 'support'; emotional arousal was coded as 'internal psychology'. These categories were thus integrated (or sub-categorised) within the two more salient efficacy sources.



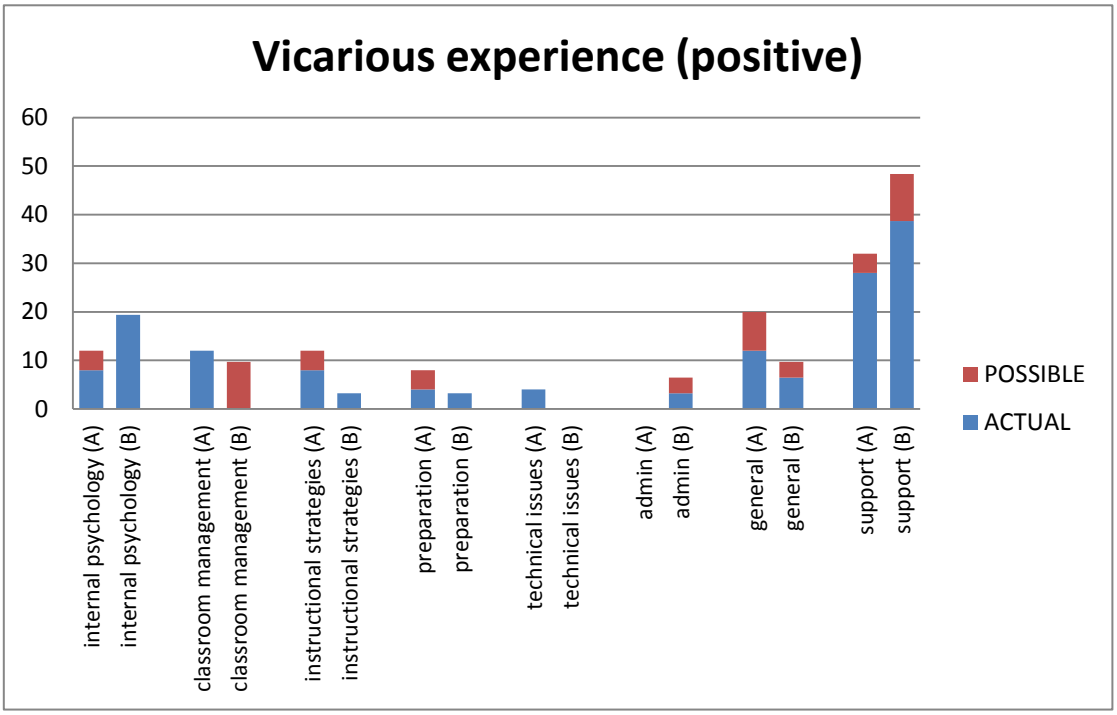
Annex Figure 3: Positive performance accomplishments (mastery experiences) measured in terms of key efficacy sources. Possible and actual expressions are listed for both groups. (Fanni, Van Zyl & Rega, 2011:8)

According to the incidence of performance accomplishments, Group A had a higher number of positive mastery experiences. 'Positive' here refers to any constructive, beneficial, or valuable encounter with digital technology. All categories of use are represented here, with 'student engagement' being the recurring application of ICT. Group B was not initially exposed to ICT training. The results do indicate the minor application of technologies for educational purposes here (instructional strategies, student engagement, and the like), preceding the actual training intervention. The research team also noted a higher incidence of *possible* experiences in Group B. This may be because they have not yet acquired the necessary skills in utilising ICT in educational practice, despite some pre-intervention knowledge. The high number of potential 'classroom management' experiences further evidence limited practical knowledge of ICTs (see Fanni, Rega, & Cantoni, 2013).



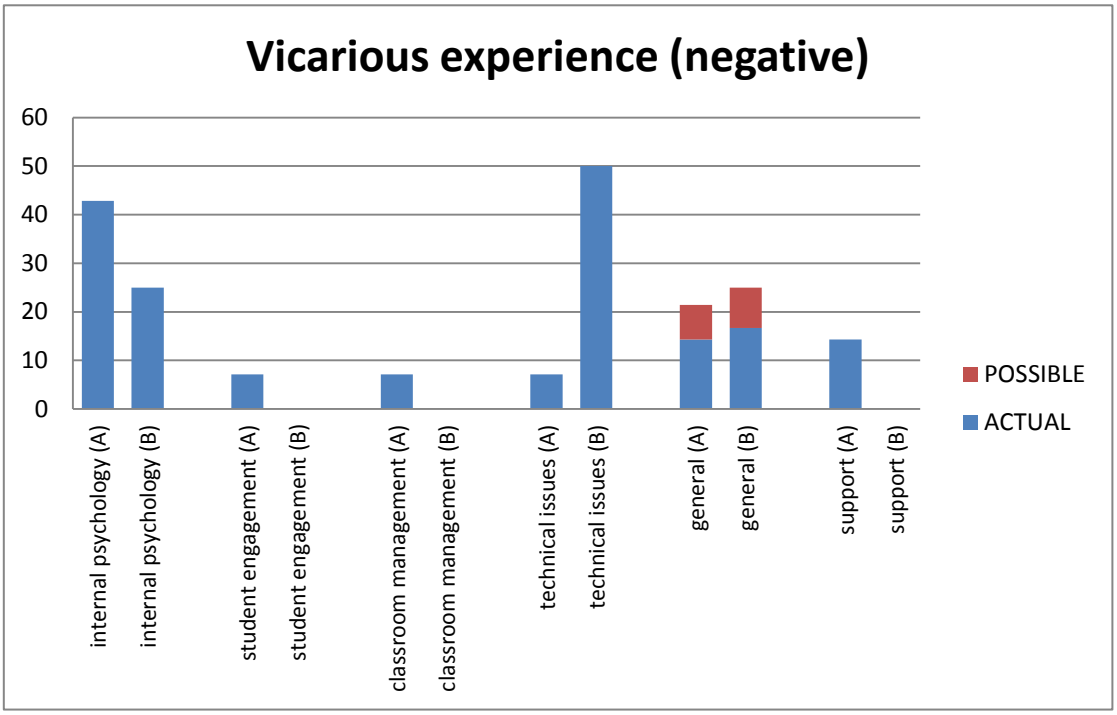
Annex Figure 4: Negative performance accomplishments measured in terms of key efficacy sources. (Fanni, Van Zyl & Rega, 2011:9)

When comparing the incidence of negative mastery experiences, the results indicate similarities between Groups A and B. 'Negative' here refers to any failure, disappointment, or otherwise obstructive encounter with digital technology (and associated activities). The self-explanatory category, 'Technical issues', represents a significant challenge for both groups. Group B also experienced much difficulty in the category of technical support. This may again be due to group members not having been exposed to potential problem-solving tools and techniques. Group A, conversely, seemed more capable of overcoming technical difficulties (see Fanni, Rega, & Cantoni, 2013; Fanni, Van Zyl & Rega, 2011). Other negative incidences were minor, although not of lesser significance (see Chapter VI).



Annex Figure 5: Positive vicarious experience measured in terms of key efficacy sources. Fanni, Van Zyl & Rega (2011:10)

The chart above depicts those efficacy expectations derived from observing others perform 'threatening activities' without detrimental consequences. In this case, threatening activities referred to technology encounters along the outlined categories. Support is the more significant category here, and denotes any peer-to-peer support activities (social and technical assistance). This indicates that group members (observers) had motivated themselves positively based on others' support experiences. The reliance on or importance of peer-to-peer support is potentially negated when teachers receive training (as is evident in Group A). Despite the minor incidence across other categories, vicarious experience is recognised as a consequential influence in self-efficacy beliefs. This is precisely because of its natural and frequent occurrence within educational communities. However, the precise extent of its influence, especially in sustaining efficacy levels, is challenging to decipher.



Annex Figure 6: Negative vicarious experience measured in terms of key efficacy sources (Fanni, Van Zyl & Rega, 2011:10).

Significantly, no teaching related category (student engagement, classroom management, instructional strategies) is listed as a negative vicarious encounter for Group B. This may again be due to group members not having had exposure with ICTs through a training intervention. It thus became challenging for them to reflect on actual vicarious experiences related to technology use in educational settings. Both groups expressed 'internal psychology' as a significant influence on efficacy levels. This category pertains to a state of psychological and emotional arousal, described by Bandura (1977) as a noteworthy expectation of personal efficacy. Incidences of fear, anxiety, and general apprehension toward technologies are represented here. Members from both groups deemed their peers and colleagues afraid or shy of (new) technologies in educational settings. Group B, furthermore, vicariously experienced high volumes of technical issues.

The study of social meaning (critical discourse analysis)

The term "discourse" may refer to everyday conversation, in the sense of "talk" or "speech", which represents the social order at a micro level. Those discourses characterised by power, dominance, and inequality represent the macro social order (Bladergroen et al., 2012). A study of such narratives would reveal those conceptual processes that enact or authenticate social relations. In the MELISSA case, the study of teacher narratives was structured around the exploration of those 'dominant' discourses around ICTs in educational contexts. Recent work on CDA (Brown, 2010) revealed a number of prevailing discourses in South African higher education institutions: globalisation, learning, determinism, liberation, productivity, and disembodiment.

Dominant themes: micro and macro-level discourses

Many of the micro discourses as expressed by teachers convey broader political implications. For one, educators felt disenfranchised by the system of provincial education that governs their profession. They felt, moreover, that the rights of learners overshadowed those of educators. For them, the emphasis on rights-based learning provokes rebellion against authority (Bladergroen et al., 2012:112):

> We have those different kinds of learners, these days learners have more rights than the teachers; secondly the department is always against the teachers … sides with the learners most of the time.

> Badly behaving children hey … Yes it can become very stressful because you have to do the basic things of discipline. Stay in your seat … listen … you know? Basic, basic things in a Grade 3 class, so yes it can make you feel like you're not progressing. You're not making enough progress.

The position of educator, indeed, is one of authority. This is systematically undermined and exploited by learners. The provincial Department of Education also failed, ostensibly, in providing adequate teacher support. In terms of ICTs, this extended to a lack of training provision, disrupted management structures, and slow technical response times. Moreover, in their daily practice, teachers often assumed the strenuous role of 'social worker'. Many learners in local under-resourced schools grow up in volatile social environments. Learners are exposed, continually, to incidences of violence, alcoholism, divorce, child-headed households and abuse. These circumstances were said to breed a culture of disrespect toward teachers, resulting in a general lack of interest in school activities (Bladergroen et al., 2012). Lacking accountability on the part of parents further inflated the challenge.

Conditions of such severity seem to deprive teachers of the basic rights that (should) guide educational practice. Respective discourses, then, were dominated by the perception of disempowerment within the teaching context (Bladergroen et al., 2012). These beliefs were most palpable in the actual delivery of the ICT training curriculum at the six participating institutions. Here, resources were generally inadequate and poorly maintained. Repairs were time-consuming and costly. Aside from notable exceptions (at Rosmead, for example), it was felt that the administration of computer laboratories lacked the impetus of leadership. At some schools, labs were locked for most of the day, rendering them highly inaccessible. In addition, the scheduling of computer sessions was not administered properly, depriving many teachers and learners of minimum weekly lab time.

The many challenges that characterise the use of technology at local primary schools do not define the full 'ICT experience' here. Most teachers could identify positive and beneficial qualities of digital technology: it aided in and simplified administrative work, improved learner literacy, and increased productivity in the classroom. This teacher observed that ICT offered 'global benefits' (Bladergroen et al., 2012:112):

> The teacher benefits but the learners also benefit. The teacher saves much of his time, because if you look for information on the internet it does not take much time. The whole community and South Africa…because we are exposing our learners at primary school: already there will become a computer literacy at primary level so the nation will benefit from them. One day they will be parents and coach their children. So the whole world will benefit from this ICT.

The example referenced here accords with what Brown (2010) terms as the 'globalisation discourse': ICTs are equated with progress and innovation; they are conceived of as inevitable. Common elements that support this discourse include global opportunity and the possibility of entering the information society. The globalisation discourse is also strongly associated with empowering 'disadvantaged' persons and communities. Interviewees mentioned a number of related advantages of ICT: it advances learning, promotes independent thinking, expands knowledge. The relief of administrative duties is one particularly welcome advantage as indicated by respondents (Bladergroen et al., 2012:133):

> It makes the work easier…like when you use it for administrative purpose, for example, you type the register once, and you can print it many times and use it for different purposes. It is so convenient.

In light of these general advantages, further discourses emerge: learning, liberation and productivity. Learning discourses regard digital technology as a facilitative mechanism in the process of pedagogy. Commonly associated elements include references to learning or studying

activities in terms of their efficiency and effectiveness (Brown, 2010). The learning discourse is differentiated from others beyond the mere advantage of productivity, however, and is concerned with the pedagogic principles underlying technology adoption. The liberation discourse regards the use of ICTs as a means of acquiring information, and the beneficial effects associated thereto. This discourse is strongly associated with knowledge attainment, 'liberating' students from positions of ignorance and critical inability (see Brown, 2010). Incidentally, teachers have not indicated liberation as relevant to their own positions as educators. Rather, processes of liberation were recognised as primarily student oriented.

Finally, the productivity discourse is self-explanatory: technology is viewed as a mechanism to make life easier, to reduce workload, and to lessen stress levels (Brown, 2010). A commonly associated theme is the notion of 'technology as producer', where human effort is minimised and efficient outcome is maximised. This was characteristic of the sample group of teachers, where most respondents indicated the productivity advantages of ICTs in their teaching contexts. The manifestation of these discourses – globalisation, learning, liberation, productivity – suggests an overly positive perception around the use and integration of ICT in primary schools. Despite this, the general adoption of ICT in participating schools was felt to be minimal – much lower than what any dominant discourse could reflect.

Conversely, an analysis of some discourses also revealed the notion of disempowerment (unlike the kind associated with disrespectful learners and ill management). Many teachers observed that they were in a persistent state of helplessness, and in need of external support. Their locus of control was external; they experienced their own professional development to be dependent on a trainer, thus resisting learning through discovery (Bladergroen et al., 2012). Moreover, some respondents noted the inability to keep up with the latest technology developments, and felt increasingly excluded from imminent advances in their professional environments. This did not necessarily evoke fear or anxiety towards ICTs – although, in many instances, it did – but rather suggested widespread confusion, and diminished self-assurance.

Educators were seemingly not able to reconcile the explicit ambitions of the provincial government and the inherent responsibility of adapting in/to a knowledge society. This may have affected attitudes towards ICT in the classroom, to the extent where educators felt that technology was being forced upon them (Bladergroen et al., 2012). Yet, negative experiences did not completely outweigh the positives, as many of the aforementioned discourses would attest. But the role and incorporation of ICT was doubtful and ill conceived, nevertheless. Management bodies did not appear to be equipped with the necessary resources; teachers were not equipped

with the necessary skills. These factors contribute to a volatile environment in which ICT impact is negated in the face of politics, both within and beyond the school environment.

Contextual factors

At this point, many of the contextual factors that influence the technological adoption process are well known and well researched. These include, but are by no means limited to, inadequate and mismanaged resources, ineffective management and support structures, little (access to) physical means, a dearth of skills, opaque policy, and volatile social environments. A notable avenue of exploration yet emerged in analysing teacher discourses. This is the manifestation of the 'technological imperative', resonant of a now archaic argument (see Chapter I). The technological imperative was presented as an implicit directive that characterised many of the reasons for using technologies: we use technology out of the blind belief that it is good for us (see Bates, 2000; Ginsburg, 2008; Brown, 2010).

In light of this theorem, it is possible that both Khanya and MELISSA instilled the purpose for using technology in the classroom, but not the *capability* (Bladergroen et al., 2012). In this way, the technological imperative was sustained as the status quo. This accords with the deterministic discourse as uncovered by Brown (2010): the view of technology as being essential; the skills to use ICT are more highly valued and necessary than other skills. This may explain why teachers appear to be publicly and openly in favour of ICTs, when this is formally (and imperatively!) promulgated at professional level. Within this context, it becomes almost impossible for teachers to convey negative attitudes toward technologies (at least, publicly) in fear of being labelled as ignorant, backward, and obstinate (Bladergroen et al., 2012; Brown, 2010).

In practice, the technological imperative is undermined by low adoption rates, sparked by indifference, anxiety, and frustration. And coupled with a number of disabling factors – lacking personal motivation, inadequate compensation, arduous working conditions, low skill levels – the use of ICT gradually declines (Bladergroen et al., 2012). In keeping with the direction as offered by Brown (2010), this context is marked by a sense of inevitability: teachers (and students!) do not feel that they have any agency in deciding to use or not use technologies. Any negative attitudes and feelings are veiled by broader determinism and the powerful ideologies presented by the status quo. These are important considerations in understanding the role of contextual forces in shaping technology integration.