# Digital Colonialism: South Africa's Education Transformation in the Shadow of Silicon Valley

A thesis submitted in fulfillment of the
requirements for the degree of

DOCTOR OF PHILOSOPHY

of

DEPARTMENT OF SOCIOLOGY
RHODES UNIVERSITY

by

**Michael Kwet**

March 2019

# Abstract

This dissertation investigates the societal implications of technology choices for the emerging e-education transformation of the South African basic education sector. In October 2015, then President Jacob Zuma launched Operation Phakisa Education (OPE), an initiative designed behind closed doors to fast-track digital education into all South African public schools. This study identifies and analyzes policy choices and perspectives regarding the technology considered and deployed for the national e-education rollout. It documents the OPE proposal, and examines how e-education policy choices relate to humanitarian objectives.

This study draws upon libertarian socialist theory (anarchism) to examine the sociology of education technology policy. Using anarchist theory, it assesses the perspective, aims, and choices of e-education policy at the national level. It also draws on the Free Software philosophy for society as articulated by Richard Stallman and Eben Moglen. Finally, it compares classic colonialism with global power in the digital era, and posits a theory of digital colonialism. Synthesizing anarchism and the Free Software philosophy into a single theoretical framework – placed into the context of colonial relations – it is the first work to apply anarchist sociological theory to education technology policy, and the first doctoral study on digital colonialism.

For its methodology, this dissertation utilizes two qualitative methods: document analysis and semi-structured interviews. Interview subjects include high-level e-education policymakers and administrators in government, key stakeholders, and experts at the intersection of technology innovation and human rights. These methods were used to both identify and interrogate e-education policy as it relates to the humanitarian objectives of education policy at the national level.

The findings demonstrate that South African education policy is beholden to largely United States-based corporations and models for e-education. The study found that the types of technologies for consideration in education are rooted in surveillance capitalism, which is spreading across the world. It contends that current e-education policy choices will entrench the power and exploitation of US state-corporate power in South African education, economy, and society. It argues that an alternative set of choices, People’s Technology for People’s Power, is consistent with the spirit of South African technology policy, and should be chosen for South African schools in order to counter foreign power and resist surveillance capitalism.

This dissertation is the first publication to document and analyze what the new government e-education policy is about and how it relates to equality and human rights. It argues that present South African e-education policy constitutes a new form of digitally-driven technocratic neoliberalism which ultimately favors ruling class interests in the United States and South Africa. It also argues that OPE violates South Africa's Free and Open Source policy and the spirit of democracy outlined in the Phakisa methodology and the Batho Pele principles.

This study found that OPE replicates the latest trends in e-education implementation promoted by US-based tech corporations, who are providing both the products and models for use in South Africa. The dissertation concludes that US technological and conceptual dominance in South African e-education constitutes digital colonialism. It emphasizes the need for public inclusion in the policy process, and proposes alternative policies and technologies for e-education based on the idea of People's Technology for People's Power. It also argues that current scholarship on education technology neglects the political and sociological importance of People's Technology to education, economy, and society, as well as the global significance of Big Tech dominance vis-a-vis digital colonialism, and that subsequent literature would be enriched by addressing these issues.

# Acknowledgments

This dissertation took a number of years to research and complete. Along the way, generous assistance from friends and family provided me the support to complete this work.

First, and most importantly of all, the deepest thanks to my mother, Linda Basel Kwet, who read over everything I wrote, held hundreds of conversations, and offered her insight. My father, Fred Kwet, provided the much-needed family support to see this dissertation through. I am truly lucky to have you both in my life. I would also like thank my grandparents, Lillian and Edward Basel (Yiayia and Papou), for their lifelong love and support. You are the best grandparents I could imagine being part of my life.

I would like to thank my supervisor, Professor Michael Drewett, for his outstanding input, feedback, and guidance. Professor Drewett has been supportive, generous with his time, and a pleasure to work with. I couldn't have asked for a better supervisor. I would also like to thank my friends and colleagues at Rhodes University. Spending time in Grahamstown was a life-changing experience, and gave me the opportunity to learn through conversation over the many days and evenings spent in town and on campus.

I would like to thank the folks at ICT4RED for allowing me to join them in Cofimvaba on trips to schools and educator training sessions, and to visit them at the CSIR in Pretoria. The ICT4RED team is a fantastic group and I wish them the best of luck. Many thanks to the numerous people who took time out of their busy lives to conduct interviews with me – members of the DBE, GDE, DTPS, DST, as well as implementers on the ground, stakeholders, and others on both sides of the Atlantic.

Special thanks to the Sociology Department for their support, including Professor Lucien van der Walt for his early assistance, as well as Professor Kirk Helliker, and Juanita Fuller. Many thanks to the Rhodes University Library staff – especially Rina Goosen – and the Postgraduate Financial Aid office. John Gillam, Liezel Strydom, and Nichole de Vos were particularly amazing. I cannot thank them enough for going the distance on numerous occasions to help me obtain financial assistance. Without them, this work would not have been possible. Also a big thank you to the National Research Foundation for providing the financial support needed to conduct my research.

And finally, thank you to the many kind people in South Africa I met along the way, who inspired me to stay motivated and complete this project.

# Contents

**Chapter 3**
**The Theoretical Context** **73**



**Chapter 4**
**Methodology** **121**

# A Note on Terminology

## Definitions and Key Concepts

Technically speaking, a definition is comprised of *that which is individually necessary and jointly sufficient*. On this criteria, precise and complete definitions are difficult to come by, even in mathematics and the hard sciences (Chomsky, 2003). This section offers a set of succinct, non-exhaustive definitions for key terms as they are used in this study.

**Big Data**: Like surveillance, the term Big Data lacks rigor and scholarly consensus (Mayer-Schönberger and Cukier, 2013, p. 6; Ylijoki and Porras, 2016). Given that large data sets have long been kept (say, in census surveys) and are therefore nothing new, scholars initially distinguished Big Data by a set of "V's", such as: volume, variety, velocity (the speed of processing), value (it is data worth knowing), and veracity (the data is trustworthy, accurate, not missing critical information, and so on) (Demchenko, De Laat and Memberty, 2014). Big Data is an ecosystem (*ibid*; boyd & Crawford, 2012, p. 663) that links together millions and billions of individual pieces of data algorithmically (Thatcher, O'Sullivan and Mahmoudi, 2016, p. 991), providing data miners the "capacity to search, aggregate, and cross-reference large data sets" (boyd & Crawford, 2012, p. 663).

Big Data also refers to many different *kinds* of data. The Square Kilometre Array satellites in South Africa collect enormous amounts of data about outer space for astronomical investigations, while molecular biologists use Big Data analytics to understand protein folding. These projects are very different than collecting massive troves of data about humans, especially that which allows data miners to understand and evaluate individuals, groups, and communities. For e-education, when adaptive learning software tracks a learner's every click, mouse move, piece of literature read, and more, the software is surveilling the learner. When mobile apps and advertising firms insert software development kits (SDKs) in mobile phone apps that collect contact lists, record swipes, or keep track of in-app journal entries, they are conducting surveillance, much like a government or private investigator. This dissertation therefore deems Big Data, when applied to human traits and behaviors, *surveillance* because it sources data from software that surveils everyday behavior. It also uses the term "Big Data" to refer to practices about humans (not, say, the weather) – as is typical in the field of digital studies (e.g. boyd and Crawford, 2012; Zook et al., 2017) – while understanding that Big Data covers other subject matter.

**Big Tech**: The term "Big Tech" refers to large technology corporations. In the West, "Big Tech" typically denotes US-based multinationals, but the term could also refer to dominant tech corporations inside any country, such as MTN in South Africa.

**Cloud**: Sometimes people refer to "the cloud" as if it is simply the Internet, or some amorphous thing. However, "the cloud" is actually a service hosted by servers, usually on server racks located in warehouses, which offer computer services like storage and computing experiences (Stokes, 2009; Ruparelia, 2016). Third parties, in other words, offer services on their own clouds: Google hosts Gmail via the Google cloud, Facebook hosts the Facebook platform via the Facebook cloud, and so on. "Cloud" in this dissertation refers to the technology of cloud services and actual instances of third party clouds, depending on the context.

**Digital ecosystem**: The digital ecosystem refers to the fundamental components of digital technology: hardware, software, and network connectivity (Moglen, 2004).

**Digital revolution**: This refers to rapid penetration of digital technology into most facets of human society. While the computer concept itself dates back to Charles Babbage and Ada Lovelace (Isaacson, 2014), it was not until the invention of the transistor and then the spread of affordable personal devices coupled with ubiquitous Internet connectivity that digital technology drastically altered human society as we experience it today.

**E-Education**: The term "e-education" is used in South Africa to denote "electronic education", i.e. computer-driven education. In the Global North, the termed most commonly used is "education technology". This dissertation uses both terms interchangeably.

**Free Software (FS)**: Free Software refers to any software licensed according to terms that grants users the freedom to study, share, modify, and use the software as they see fit (Gnu.org, n.d.-a). Free Software is sometimes called "Free and Open Source Software" (FOSS), "Free/Libre and Open Source

Software" (FLOSS), or "Open Source Software" (OSS).  This could be confusing to first-time readers, but they all refer to the same thing.  In the literature and in computer culture, the term Free Software is most frequently selected among these terms to denote a political commitment to human freedom (hence the slogan, "free as in freedom, not as in beer").  Open Source, by contrast, is chosen to denote a philosophical commitment to Free Software to be about a development methodology (see Section 3.2.2).

**Operation Phakisa: ICT in Education (OPE)**: According to the South African government, Operation Phakisa: ICT in Education (for short, "Operation Phakisa Education") is simply a model to fast-track digital technology into education.  However, as explained in Chapter 5, the South African government plans to use digital tech to *transform* the education system with some or all computer technologies developed and trending in the West: blended learning, flipped classrooms, adaptive learning, dashboard analytics, Big Data surveillance, and so on.  While the government maintains OPE is based on the 2004 *White Paper on e-Education*, that paper envisioned a fundamentally different e-education arrangement (utilizing computer labs, for example, rather than data-driven personalized learning).  Therefore, the OPE model is fast-tracking a new and different education system than the one envisaged in 2004.  For this reason, this dissertation uses OPE in a broader sense than the government does to refer to both the fast-track model and to the latest Western vision of education technology.

**People's Technology for People's Power**:  I coined this term (Kwet, 2017c) to refer to the broad set of technologies designed to facilitate human rights and empowerment.  "People's Technology" includes Free Software, Free Hardware, Free network connectivity and decentralization, and open standards and protocols.

**Surveillance**:  This term has no rigorous or commonly-accepted definition.  Consistent with literature on surveillance capitalism, this study uses the term "surveillance" to denote uses in the private sector as much as does the use of surveillance by the state.  Thus, the practice of, say, collecting data from smartphone apps via hidden SDK trackers (Kwet, 2018c), the constant watching and analysis of learners through adaptive learning software, and the tracking of web browsing history through cookies are all deemed surveillance because they entail the systematic observation, collection, storing, and analysis of information about individuals, groups, and/or communities.

# List of Abbreviations

**4IR:** Fourth Industrial Revolution

**A2K**: Access to Knowledge

**AI**: Artificial Intelligence

**ANA**: Annual National Assessment

**ANC**: African National Congress

**CIA**: Central Intelligence Agency

**CSI**: Corporate Social Investment

**CSIR**: Council for Scientific and Industrial Research

**DA**: Democratic Alliance

**DBE**: Department of Basic Education

**DDD**: Data Driven Districts

**DHET**: Department of Higher Education and Training

**DoC**: Department of Communications

**DoE**: Department of Education

**DPME**: Department of Planning, Monitoring and Evaluation

**DPSA**: Department of Public Service and Administration

**DTI**: Department of Trade and Industry

**ECD**: Early Childhood Development

**EE**: Equal Education

**EFF**: Economic Freedom Fighters

**EFF-US**:[1] Electronic Frontier Foundation

**FBI**: Federal Bureau of Investigation

**FET**: Further Education and Training

**FTC**: Federal Trade Commission

**FS**: Free Software

**FSM**: Free Software Movement

**GCHQ**: Government Communications Headquarters

1 The acronym for the Electronic Frontier Foundation does not usually include "-US". This was added to distinguish the Economic Freedom Fighters from the Electronic Frontier Foundation, which both go by the acronym, "EFF".

**GDP**: Gross Domestic Product

**GET**: General Education and Training

**GITOC**: Government Information Technology Officers' Council

**GPL**: GNU General Public License

**HCT**: Human Capital Theory

**HE**: Higher Education

**HSCR**: Human Sciences Resource Council

**IBM**: International Business Machines Corporation

**ICT**: Information and Communication Technology

**ICT4RED**: Information Communication Technology for Rural Education Development

**IPR**: Intellectual Property Rights

**ISP**: Internet Service Provider

**IT**: Information Technology

**JCSE**: Joburg Centre for Software Engineering

**KZN**: KwaZulu-Natal

**LMS**: Learner Management System

**LTSM**: Learning and Teaching Support Material

**M&E**: Monitoring and Evaluation

**MSDF**: Michael & Susan Dell Foundation

**NACI**: National Advisory Council on Innovation

**Natu**: National Teachers' Union

**NCC**: National Communications Centre

**NDP**: National Development Plan

**NP**: National Party

**NPC**: National Planning Commission

**NSA**: National Security Agency

**NSC**: National Senior Certificate

**NQF**: National Qualification Framework

**OBE**: Outcomes Based Education

**OECD**: Organisation for Economic Co-operation and Development

**OLPC**: One Laptop per Child

**OPE**: Operation Phakisa Education

**OSS**: Open Source Software

**PIRLS**: Progress in Reading and Literacy Study

**PNC**: Presidential National Commission

**SA**: South Africa

**SA-SAMS**: South African School Administration Management System

**SaaS**: Software as a Service

**SACMEQ**: Southern and Eastern Africa Consortium for Monitoring Educational Quality

**Sadtu**: South African Democratic Teachers' Union

**SAPS**: South African Police Service

**SCA**: Supreme Court of Appeal of South Africa

**SGB**: School Governing Body

**SITA**: State Information Technology Agency

**SONA**: State of the Nation Address

**SSA**: State Security Agency

**TVET**: Technical and Vocational Education and Training

**TIMMS**: Trends in International Mathematics and Science Study

**UK**: United Kingdom

**US**: United States

**WEF**: World Economic Forum

# Chapter 1

## Introduction

### 1.0: Introduction

This study is about the policy choices and perspectives for the use of Information and Communications Technologies (ICTs) in the South African basic education sector. In 2015, the Presidency initiated Operation Phakisa Education (OPE), a plan to fast-track deployment of ICTs to all public schools. This thesis details OPE and examines the policy choices and perspectives for e-education at the national policy level. The use of ICTs for education is intended to transform and improve the quality of education in South Africa. Additionally, the introduction of technology into schools aims to bridge the digital divide, stimulate pro-poor socioeconomic development, and prepare South Africa for the digital society.

This chapter provides an introduction to the dissertation. Section 1.1 gives brief background information about the educational and socioeconomic context. It provides a snapshot of the post-apartheid society and basic education, as well as information about ICTs in South African society and education. The next section presents the theoretical framework and methodologies, which provides the framework to analyze the empirical findings in Chapters 5-7. Following that, the research problem for the thesis is identified and explained. The chapter then discusses the debates, contextualizing them within the relevant academic literature. It also outlines the research questions and aims, and the justification for the study. It explains the researcher assumptions, limitations, and ethical considerations. The chapter concludes by outlining the organization of the thesis over the remaining chapters.

### 1.1: Preamble on the Social and Educational Context

In 1652, Europeans began settling in what became the Cape Colony. Over the succeeding centuries, whites imported slaves, put the indigenous peoples to work as servants, and dispossessed the natives of their land. They created a deeply segregated society, which culminated in apartheid in 1948. The resistance movement to colonialism and the apartheid state captivated the world, as it was based on a commitment to democracy and a vision for equality and socioeconomic justice. In 1994, the African National Congress (ANC) was elected to government with Nelson Mandela as president, and many have celebrated the post-apartheid era as a triumph of the human spirit (Meredith, 2007; Lapierre, 2009).

In the time which has passed since the transition to democracy, the ANC has made *some* modest improvements. In particular, they have built several million homes under the Reconstruction and Development Programme (RDP), and they have delivered social welfare grants to millions of women with children and the elderly. Under their governance, a small black middle class has grown larger, and a tiny black elite has emerged (Madlingozi, 2017; Terreblanche, 2002, pp. 132-138; McKinley, 2017; Southall, 2016).

Nevertheless, all is not well in the society. During the transition period, the ANC and the National Party (NP) negotiated a settlement which would create a universal franchise on the condition that elite incomes would be protected from taxation and expropriation by the poor black majority (Inman and Rubinfeld, 2013, pp. 4-5). Famed economist Sampie Terreblanche had pressed the Afrikaner establishment to issue a tax for wealth redistribution at the time of transformation, but was rebuffed (Terreblanche, 2018). Instead, the ANC, the NP, and big business formed an “elite pact” that has entrenched apartheid-era inequalities and prompted reconsideration of how the ANC handled the transition period (Bond, 2014; Terreblanche, 2002, pp. 23-149; Desai and Pithouse, 2004; Madlingozi, 2007; Kasrils, 2013; Madlingozi, 2017). During the negotiations, the ANC consulted with the World Bank and the International Monetary Fund (IMF) to inform their thinking. They bought into the “Washington Consensus” model of neoliberal development that set the path for the coming decades (Bond, 2014, pp. 150-197; Terreblanche, 2012).

Twenty-five years into “post” apartheid, South Africa has become the most unequal country on the planet (Sula and Zikhali, 2018). It is true that income inequality has fallen *between* races, a small black middle class has expanded, and a tiny black upper-class has emerged (Southall, 2014). Nevertheless, income inequality has increased *within* races (Marais, 2011, pp. 134-139). A recent study found that *wealth* inequality is even more extreme:

> ...tax and survey data suggest that 10% of the population own at least 90% to 95% of all assets, although they earn ‘only’ about 55% to 60% of all income… The next 40% of the population… earn about 30% to 35% of all income but own only 5% to 10% of all wealth. The poorest 50%

of the population, who earn about 10% of all income, own no measurable wealth (Orthofer, 2016a).[1]

With poverty, inequality, and unemployment at outstanding levels, apartheid inequalities endure. Over 27 million South Africans – more than half the population – live in absolute poverty (the income threshold below which people are unable to meet their basic needs) (Africa Check, 2016). Race and gender inequities are pervasive: few whites fall below the poverty line set by government bodies and non-governmental experts; large race-based discrepancies span the entire income/wealth spectrum; and females are generally less employed and make less than males (Sulla and Zikhali, 2018). Sixty-three percent of African/black persons (25,311,744 total) live below the upper poverty line of R779 per month, compared to 37% of coloured, 6.9% of Indian/Asian, and 0.9% of whites (42,115 total) (Wilkinson, 2016).[2]

Unemployment is among the highest in the world.[3] In 2016, the official rate rose to 26.7% (about a 10-year high) while the expanded rate, which includes discouraged job-seekers, has hovered around 36% (often higher in rural areas) (Merten, 2016). Racial disparities are sharp: as of 2014, black African unemployment stood at 40% (down 3% since 1994), coloured at 28% (up 4%), Indian/Asian at 18% (up 1%), and white at 8% (up 1%) (Statistics South Africa, n.d., p. 32).

Residential apartheid defines spatial patterns of housing settlement. More than one third of South Africa's population remain in the former homelands (NPC, 2012, p. 47). In early 2016, photos of stark housing inequality captured by an aerial drone circulated across international news outlets (Gbadamosi, 2016; Banerji, 2016). The images, published as a series called *Unequal Scenes*,[4] depicted large wealthy houses on spacious properties juxtaposed against tightly packed shack dwellings.

Disease and poor health are also concentrated into poor black neighborhoods. South Africa has the fourth-highest adult HIV prevalence rate in the world at 19% for ages 15 to 49 (UNAIDS, 2014, p.

1 White and Indian households are wealthier generally, and "wealth inequality within the majority black population exceeds nationwide wealth inequality by far". Orthofer's (2016a) findings on wealth are "consistent with findings on income inequality, according to which the highly unequal income distribution is increasingly shaped by growing inequality within race groups rather than inequality between race groups" (Orthofer, 2016a).

2 Using a statistic from another study which put the poverty line at R1,042, Africa Check found 73% of African/black persons, 48.1% coloured, 11.8% of Indian/Asian, and 1.8% of white persons fall below that poverty line (Wilkinson, 2016). White South Africans have the largest household income at R387,011 compared to R69,632 among black South Africans (Heard, 2016). In 2014, the average South African worker earned R3,033 per month, while 60% earned less than R5,000 per month (Mojapelo, 2016).

3 See Wilkinson and Chiumia, 2013 (referring to IMF calculations); BusinessTech, 2016b (referring to the IMD Global Competitiveness Report and ILO South Africa figures); and Orthofer, 2016b.

4 See http://unequalscenes.com; Jameel, 2017.

34) – 17% of the global total (Mayosi and Benatar, 2014). SA also features one of the worst tuberculosis epidemics in the world. Malnutrition is commonplace, as low-income households underspend on food by about 56%, leaving them about R7 to spend on food per day (Naicker, 2015; BusinessTech, 2015b).[5] While crime is down slightly since the end of apartheid, the murder rate remains among the highest in the world (Chutel, 2017).

Education, as we will see in Chapter 2, suffers greatly. The most robust study of learner performance, published in 2017, found that approximately 80% of fourth graders cannot read for meaning (Howie et al., 2017). Childhood education is in shambles, with little prospect for steady improvement in sight.

Finally, corruption is rampant in *both* the corporate sector and the state. In June 2017, the "Gupta leaks" detailed the looting of billions of state funds by three Indian emigres, the Gupta brothers, in cooperation with President Jacob Zuma, his son Duduzane Zuma, a network of supporters in government and at state-owned enterprises, and leading corporations (such as KPMG, SAP, and McKinsey) (Desai and Vahed, 2017). In addition to state-corporate theft, illegal capital flight costs South Africa an estimated R147 billion per year (Evans, 2014).

In the context of post-apartheid failures, some scholars have deemed South Africa a "neo-apartheid" state (Madlingozi, 2017; Ray, 2016; Jagarnath, 2018). Yet despite the failures of neoliberal policy dating back to 1994 – and the misery they have reproduced – the government has stayed the course. As a "grand" strategy for development, the National Planning Commission (NPC) (2012) designed the *National Development Plan 2030: Our future – make it work*, with hopes of realizing 5% annual GDP growth to 2030 (p. 39). The NPC aims to eradicate poverty and hopes export earnings can be partially attained "with better public infrastructure" and by "improving skills and innovation" as well as education (*ibid*).

Employment is highly correlated with formal educational credentials. The employment value of a matric without a diploma or degree is minimal.[6] In contrast to 10-20 years ago, a matric only offers a marginal advantage to those seeking employment. By 2015, "The unemployment rate for those without

5 Once poor households cover mandatory expenses such as transportation, education, electricity, and debt, they are forced to underspend on food (see Smith and Abrahams 2015, p. 7).

6 For a graph depicting employment trends by highest level of education completed, see (Van Broekhuizen, 2013, p. 48). Diplomas include all post-secondary certificate and diploma qualifications or their equivalents (*ibid*).

a matric was just two percentage points higher" (Yu et al., 2016).[7] Moreover, the structural composition of the South African labor market has changed such that:

> ...demand for relatively less educated, unskilled labour, for example in primary industries such as agriculture and mining, has continued to decline. This explains why there is a greater demand for older, highly educated workers. They have longer years of work experience and are more skilled to match the requirements of employers, particularly in economically advanced provinces like Gauteng and the Western Cape (*ibid*).

Yu et al. conclude "those without a post-matric qualification face gloomy prospects in finding work. Their education and skills levels are not high enough to meet the current skills requirement of employers" (*ibid*).[8]

Obtaining a matric does appear to have some economic value, despite its negligible value to employment. According to Van der Berg et al. (2011), wages for black workers who obtained a matric with university exemption (endorsement) were 94% higher than for those who failed matric and 30% higher for those who passed without university exemption (p. 9).

The Department of Basic Education (DBE) (2011) holds that "the low number of learners qualifying for Bachelors studies each year is a key reason behind the skills shortfall in the country, including the under-supply of teachers. Much of the challenge lies in improving the situation in schools serving poorer communities" (p. 66). For the government, then, the prospect for economic growth is highly reliant upon the development of education and skills, starting with the young and the poor.

The notion that improving educational outcomes will bring about individual economic prosperity as well as societal economic growth and innovation is widely espoused by the government, media, and prominent academics (SA News Gov, 2017; Spaull, 2011; Van der Berg et al., 2011;

7 Other data compiled by SAIRR suggests a slightly more significant value in obtaining a matric. In 2015, the unemployment rate for those with less than secondary school completed was 29.4% with an absorption rate of 33.1%; those who completed secondary education in 2015 were at 25.6% with an absorption rate of 51.1%; and those who completed tertiary education had an unemployment rate of 11.5% with an absorption rate of 76.7% (SAIRR, 2016, pp.437, 556-557). According the first in-depth study on post-schooling and employment, published in 2010, South Africans who obtain a post-school education degree earn on average between 2.5 and four times more than people who do not complete schooling (MacGregor, 2009). This may suggest a substantial enough economic benefit to entice some learners to obtain their matric; however this assumes the economy is equipped to employ increasing numbers of matriculants (see Section 1.16).

8 The extent, meaning, and importance of the skills gap is contested. For example, according to Dr. Sizwe Nxsana, chairman of the National Education Collaboration Trust, there are 3,000 vacancies in the ICT sector (Mabotja, 2015). ICTs are often championed as critical to South Africa's future, yet a shortage of 3,000 jobs does not suggest a vast supply for the many millions seeking employment in the near or even medium term.

Kretzman, 2017; Harrison, 2016**)**. It is also contested by critics who argue such a contention is a neoliberal position which overemphasizes the impact of education on the economy, blames the victim for poverty, inequality, and unemployment, and reduces the role of education to a narrow conception of economic value at the expense of human rights, democracy, and a healthy, egalitarian economy (Vally and Motala, 2014a; Allais, 2014; Chisholm, 2015).

In the context of severe educational under-performance, as well as a world where all facets of society are merging with digital technology, government policymakers have turned to digital technology for two primary reasons: 1) tech in schools, they believe, can help *transform* the education system for improved outcomes, and 2) the delivery of tech to school children can bridge the digital divide and help prepare South Africa for the digital era (DoE, 2004; Schrueder and Meyer, 2016; Zille, 2016a; ANC, 2017a, 2017b, 2017c).

To this end, in 2015, the Presidency launched Operation Phakisa for Education (OPE), an initiative to fast-track digital technology into schools. This agenda – to use technology for education, economy, and society – is the subject of this dissertation. This thesis will detail the social, educational, and digital context in Chapter 2, and the OPE initiative itself in Chapter 5.

## 1.2: Theoretical Context

This thesis draws upon anarchist sociological theory for policy analysis, as well as the Free Software philosophy. The anarchist philosophy and Free Software philosophy have strong theoretical affinities, while the anarchist movement for social justice and the Free Software Movement are in strong alignment (Moglen, 1999, 2013; Benkler, 2013; Curran, 2007; Curran and Gibson, 2013; Coleman, 2017). Both philosophies apply well to education, economy, and society. Let us consider each in turn.

As noted above, wealth and power has concentrated during the post-apartheid period. Old white elites have maintained a stranglehold over the private sector, while a new black elite has taken hold of the state. "At the heart of the New South Africa," sociologist Lucien van der Walt notes, "is a balance between two ruling class sectors based on *mutual dependence*: the (largely black) state elite and the (largely white) private corporate elite, allied against the (largely black) working class (as well as the Coloured, Indian and white working class)" (Van der Walt, 2013b, p. 8). For "classic anarchist theory," Van der Walt continues, "the ruling class has two wings: private capitalists centred on means of production in corporations, and state managers, centred on means of administration and coercion in the state" (*ibid*). In South Africa, "the corporate elite uses its private wealth to access state power, and the state elite uses its state power to access private wealth. Both ruling class wings share lives of privilege and wealth..." (*ibid*). Van der Walt's assessment tracks closely with aforementioned assessments of the black ruling elite, sometimes characterized as "black Boers" (Madlingozi, 2017). It also confirms the warnings posed by Frantz Fanon, describing the dangers of elitist transitions of power in the postcolony (Fanon, 1963 [1961]; Pithouse, 2016, 2017).

At its core, anarchism posits two elements: anti-authoritarianism and radical egalitarianism. As an anti-authoritarian philosophy, it opposes and is actively committed to abolishing arbitrary and unjust authority, at the individual, group, and institutional levels, and is dedicated to replacing relations of unjust authority with relations of equality. Anarchists also oppose "all forms of political, social, economic, sexual, and cultural inequality" (Jun, 2013, pp. 88-89).

Such a theoretical disposition is philosophical and is therefore timeless and universal. Yet what we call "anarchism" today emerged as a formal, self-conscious, and rigorous philosophy and movement in the mid-nineteenth century in opposition to slavery and exploitation under industrial capitalism (Van der Walt, 2013a). A term coined by Pierre-Joseph Proudhon, anarchism took a broad approach to political, social, and cultural life, linking the exercise of power over people to domination and oppression. Authoritarianism, for anarchists, was the central problem afflicting humanity. For anarchists, a *libertarian* socialism which rejects authoritarian social and political forms is ideal for society. As Mikhail Bakunin puts it, "Freedom without socialism is privilege and injustice; socialism without freedom is slavery and brutality" (Bakunin, 1971, pp. 127).

According to classical anarchist theory, capitalism and the centralized state have developed hand-in-hand, as interdependent entities (Kinna, 2012, p. 6). The abolition of all forms of inequality, exploitation, and alienation preoccupy anarchist praxis. A libertarian approach to socialism is distinct from state socialist approaches in that anarchists reject the notion of transferring power to a liberation party, including Marx and Engels's call to "centralise all instruments of production in the hands of the [proletarian] State" in the *Communist Manifesto* (p. 26). Anarchism also rejects reductionist substructure/superstructure conceptions held by some classical Marxists in favor of holistic approaches (Albert et al., 1986). It thus harmonizes with intersectionality approaches to identity politics expressed in feminist and cultural studies scholarship (Dupuis-Déri, 2016; Shannon and Rogue, 2009).

Thus, the broad libertarian socialist tradition has been committed to the abolition of capitalism (in favor of socialism), a centralized state (in favor of direct democracy and federation), institutional forms of domination (in favor of mutual aid and the exercise of "power with" other people instead of "power over" by elites), group forms of domination (in favor of equality among all races, genders, sexes, sexualities, nationalities, linguistic groups, and the like), as well as the tyranny of the majority (in favor of individual liberty based on voluntary association in harmony with community interests).

To develop a society based on anarchist principles, anarchists have stressed the need for prefigurative organization, whereby individuals, groups, and organizations act according to the social relations of the desired future society in the here and now. For instance, it is not acceptable to have white males dominate a group or organization if the eradication of white male dominance is a goal of the movement. This imperative is similar to the notion that "the personal is political" common to feminist praxis. However, for anarchists, the prefigurative politics extends to relations of general *organizational* power irrespective of identity. Horizontal organizational forms organized on the basis of consensus, popular vote, constitutional principles, and federation are favored wherever possible.

Building an equality within the throes of an unequal present is a difficult task. Just as Marx did not concern himself with "recipes for the cook-shops of the future," (Marx, 1976 [1867], p. 99), many anarchists strive towards positive change in accordance with principles of freedom, but maintain the need for experimentation and flexibility in their approach to change. As such, building equality is an incremental task which precludes the possibility of fully formulaic approaches: life is complex, while technologies, institutions, and historical conditions change. The growth of the Internet underscores this point: while most socialists have maintained the need for international solidarity, detailed blueprints that do not account for computer technology are somewhat out-dated (see, for example, Michael Albert's plans for "parecon" in Albert, 2003).

While anarchists strive to abolish and replace the dominant structures of power – capitalism and the centralized state – other institutions and daily environments offer lower hanging fruit. Education and schooling is one of these domains. For anarchists, schooling is an essential component of socialization into the future society. As Joel Spring (1975) puts it, "Libertarian theories of education are a product of the belief that any successful radical change in society depends upon changes in the character structure and attitudes of the population: a new society cannot be born unless a new person is born that can function within it" (p. 1). While public schooling has been fashioned for assimilation into an unequal status quo in the West (Nasaw, 1979) and in apartheid South Africa (Tabatha, 1980 [1959]), radical education restructures schooling on libertarian grounds to transform society. Anarchist education attempts to drive the society towards direct democracy through the cultivation of democratic norms in education from an early age. Anarchists typically endorse independent schools such as "free schools" organized on libertarian socialist principles (Avrich, 2006 [1980]). However, they also support sufficient funding for poor public schools and teachers in opposition the encroachment of neoliberal privatization (Armaline and Armaline, 2012; Chomsky, 2013).

Control over digital technology offers another lower-hanging fruit ripe for anarchist shaping. Both Marxists and anarchists have recognized that international solidarity among the working classes is required to build a socialist society. The global division of labor, unequal geographic distribution of resources, and likelihood of capitalist and state socialist repression in the face of a successful libertarian socialist experiment – as occurred for a period of time during the Spanish Revolution (Dolgoff, 1955) – points to the need for coordination across vast numbers of people and locations. Computer-based networking provides one possible solution for decentralized collaboration across borders and mass democratic participation in shaping the global norms (Wachhaus, 2012).

Moreover, digital information has a near-zero marginal cost, making it practical for every person on earth to be able to own or access any published works for free. With the means to produce a free information system in reach, digital technology affords humanity equal access to published information for the first time in history (Barbrook, 2005; Moglen, 2003). The capacity to produce and share information as equals can also be democratized through a decentralized and distributed digital network (Benkler, 2006; Barabas, Narula and Zuckerman, 2017).

The freedom to produce, own, and share information through a digital ecosystem run on anarchist principles of non-domination has animated the Free Software Movement (FSM). As Columbia law professor Eben Moglen (2013) stated to the European Parliament, the revision to the world's largest software license, the GNU General Public License, was "a large scale, international legislative activity conducted without government organization or hierarchy: anarchist legislation, legislation without government". As we will see in Chapter 3, the principles of anarchism and the Free Software philosophy have strong affinities, and the two ideologies and movements should embrace each other as part of the same struggle.

Free Software (FS) is at the center of the FSM. It allows users the freedom to use the software as they wish, modify the software, share verbatim copies, and share modified copies. Access to the human-readable source code is a necessary precondition for Free Software to exist. The term "free" in "Free Software" refers to "free as in freedom, not as in beer". That is to say, the software is about individual and community freedom to control their computer experiences. That it is also almost always free as in "price" is a secondary benefit (which is especially beneficial to the poor).

The Free Software Movement was created by Richard Stallman when he was prevented access to the source code of a Xerox printer used at the MIT Artificial Intelligence Lab (Williams, 2002, pp. 1-12). Stallman, like hackers[9] of his age, was accustomed to freely sharing source code as the norm in the community. He recognized that proprietary software conferred by copyright monopoly threatened the freedom of users to control their computer devices. Within a short amount of time, Stallman expanded his considerations and recognized that control over computer infrastructure will increasingly confer control over people in the digital society (Tozzi, 2017, pp. 51-110).

Given that software defines and controls how a computer can operate (Moglen, 1999), it was, in the era of the personal computer, the primary source of control over the user. With Free Software, Stallman and others in the FSM reasoned, individuals and communities would retain the liberty to control their computer experiences. Professor Moglen (2004) expanded on this sentiment in a treatise delivered as keynote in Germany called *Die Gedanken Sind Frie*, where he postulated that a free digital society requires four things: Free Software, Free Hardware, Free Spectrum (Internet Connectivity), and Free Culture (access to published works). (We will return to this framework in Chapter 3.) Drawing upon the logic and success of the FSM, many governments across the world formed Free Software policy preferences for use in the public sector (CENATIC, 2010). Governments in the Global South were especially keen on deploying Free Software as a counter to the Microsoft monopoly. In 2007, South Africa adopted a "Free and Open Source Software policy preference" based on reasons derived from the Free Software movement (see Section 6.1).

However, as the Internet spread, the structure of the digital ecosystem changed. Computing experiences moved towards clouds owned and controlled by US-based corporations. With clouds, users have no control over the computer experience, even if the cloud services are running Free Software. In reaction to the rise of cloud centralization, in 2010, Professor Moglen launched the FreedomBox project. FreedomBox is Free Software that essentially provides people with the means to produce a smart router. Using the FreedomBox, people can run their own "personal cloud" to store and access their own data. It offers society the means to decentralize Internet services such as social networking, and it provides networking services such as onion routing through the Tor network to safeguard against third party surveillance of Internet traffic (Moglen, 2010; Dwyer, 2011).

9 The term "hacker" has always been akin to "playful cleverness" and is often used to denote a "software developer", not a malicious person breaking into a computer system. The latter definition emerged during the 1980s, but the former meaning is still used in the computer community and scholarly literature.

By leveraging centralized control of technological architecture, Big Tech corporations profit from rent (in the form of intellectual property and access to infrastructure) and surveillance (in the form of Big Data). By 2016, the rise of US-based Big Tech corporations in the digital ecosystem had become controversial within the Western press. In 2018, Silicon Valley multinationals comprised the five wealthiest corporations in the world, with a net worth exceeding $3 trillion (The Daily Records, 2018). As we will see in Chapter 3, they have come to dominate the core pillars of technology infrastructure, and with that control – combined with other dynamics, such as economies of scale and network effects – they are able to control user experiences in many domains of life.

With giant troves of data sitting in corporate clouds, governments piggyback off corporations to surveil the masses (Greenwald, 2014; Granick, 2017; Balkin; 2018b). Scholars term the state-corporate partnership in surveillance driven by commercial profit, "surveillance capitalism". The foundation of surveillance capitalism is Big Data — enormous data collections made intelligible by advanced statistics and artificial intelligence.

Given that the Internet is a universal system and that US-based corporations have overwhelming dominance over the digital ecosystem, the integration of digital technology into non-US territories results in the exercise of economic, political, and social control by US state-corporate power within those territories. This thesis argues that this form of control constitutes a new, insidious phenomenon, digital colonialism, and that what I call "People's Technology for People's Power" is necessary to counter digital colonization.

Digital colonialism is enacted through the US-based domination of the digital ecosystem at the infrastructural level. As Laura DeNardis (2014) puts it, "arrangements of technical architecture are also arrangements" which "embody specific forms of power and authority" (p. 7). In the current global context, arrangements of architecture are under the control of US entities. Recognizing that "Architectural choices are often politics by other means, under the cover of technical necessity" (Starr, 2004, p. 6), this thesis evaluates technological choices made for Operation Phakisa Education in relation to how they shape South Africa's digital ecosystem, with particular focus on the question of free (as opposed to nonfree) software. As such, contrary to the dominant approach in scholarship on education technology (reviewed in Section 1.3), the approach emphasizes both "technology in education" – the use of Microsoft Windows, Google Android, Google Cloud, and the like – *and* "education technology" (or "EdTech") when considering the significance of e-education to society.

To evaluate choices, the thesis merges the anarchist theoretical perspective (which calls for decentralized forms of power, direct democracy, collective ownership of private property, anti-authoritarian arrangements, the right to privacy, and individual and communal liberty) with the Free Software philosophy, which calls for similar values. For empirical applications, it foregrounds questions of software deployment, privacy and surveillance, democratic decision-making, and socioeconomic development. Consistent with the broad approach taken by an array of prominent South African scholars (e.g. Vally and Motala, 2014; Allais, 2014; Badat and Sayed, 2014), implications of *technology* choices for education are conceptualized holistically for education, economy, and society, and call for *structural* change in the digital ecosystem. This is explained further in Chapter 3.

### 1.3.1: Research Problem: The Choice to Focus on Education and Technology

Given the extreme disparities in wealth and access to infrastructure, the poor black majority has been largely excluded from the digital society. At best, poor South Africans have a feature phone or a cheap smartphone, with zero or minimal access to the Internet, limited by expensive data plans. Yet this "digital divide" is changing fast. High speed fiber broadband and free WiFi Internet is spreading in urban areas, while Internet Service Providers (ISPs) like Vumatel are working on extending fibre Internet connections to the townships. South Africa's incorporation into the digital era marks a new era for the society.

The deployment of digital technology into all public schools via Operation Phakisa for Education is a particularly important proposal. By delivering computer devices like laptops, tablets, or small computers like Raspberry Pis to township schools, children will have access to the full digital experience (rather than a small screen on a cheap phone) for the first time. If the children can bring the devices home, it will also spread this experience to households. If those children are provided Microsoft Windows, Google Android, or GNU/Linux, they will grow up accustomed to those software ecosystems. Moreover, the small subsection of students who become programmers and engineers will be biased towards development inside of those environments. There is therefore a distinct and powerful path dependency (Starr, 2004, p. 2) that will shape South Africa's digital ecosystem in large part shaped by technology chosen for OPE.

Despite the enormous shifts in technological deployment and changing significance of the political economy due to digitization (Kwet, 2018a; Kwet, 2018b), scholarship on the subject is minimal in South Africa. As University of Witwatersrand Vice Chancellor Adam Habib put it in June

2017, “much of our public discourse on radical economic transformation and economic inclusion seems oblivious of the technological innovations in artificial intelligence and robotics” (Habib, 2017). The “Fourth Industrial Revolution”,[10] he continued, will “fundamentally transform the workplace in the coming decades,” yet “considerations of these challenges have not even entered the public discourse and we are at a collective risk of once again merely being victims of economic forces and processes beyond our control (*ibid*). The only solution to this looming challenge,” he argued, “is that we collectively become the architects of our own destiny, by recognising and acknowledging the technological innovations and proactively establishing an educational system and work regime that allows us to develop the skills and innovations necessary to compete in this globalised knowledge economy” (*ibid*).

Other prominent scholars have come to similar conclusions. Allison Gillwald (2010), a leading scholar of ICTs in South Africa, notes a “poverty of ICT policy, research, and practice in Africa” is linked to “the paucity of critical research that acknowledges the political dimensions of policy reform and economic regulation” (p. 80). Gillwald (2016) repeated this observation in 2016, stating that “In the Global South, and in Africa particularly, the absence of public-interest research in the areas of ICT policy and regulation in universities, as well as a lack of think tanks, means there is little independent participation in public-policy processes, even where public consultations take place” (p. iii). In his study of Facebook and youth activism, Admire Mare (2016a) similarly notes that literature on youth, social media, and political participation in “non-Western societies in general and Africa in particular” is “not comparable to trends in Western societies where these issues have occupied the minds of scholars for a long time” (Mare, 2016a, p. 11).

This study affirms these sentiments, finding that research on important themes in South Africa remain wholly unaccounted for, or barely scratched in isolated outlets and periodicals. This is especially true in the domain of basic education, the control of foreign corporations over the digital ecosystem (digital colonialism), and the relationship between the two. For this reason, it is high time to research technology choices for education in South Africa.

Although digital technology deployment in society and education has lagged behind in South Africa, it is finally making inroads. Yet despite the implications of Big Tech dominance in South Africa, scholarship on the politics of digital technology has typically missed the subject altogether. Works critical of contemporary tech in South Africa have typically focused on state surveillance

10 We will unpack this concept in Chapter 3.

through the use of ICTs (Duncan, 2014a, 2014b; Mare, 2016a, 2016b; Right2Know, 2015, 2016, 2018; Swart, 2016). In one notable exception, Murphy, Carmody, and Suborg (2014) evaluated the role of foreign intermediaries in the wood and tourism sectors inside South Africa and Tanzania – a valuable but narrow study that leaves most digital topics untouched (e.g. news media, governance, EdTech, e-commerce, and Big Data), including at the technical architectural level. Admire Mare (2016a) touched upon the problems of Facebook as foreign intermediary that spies on its users very briefly in his PhD dissertation, but he did not pursue the topic at length. A couple of news articles took up the topic of foreign encroachment on local markets in late 2017 and early 2018 (Harber, 2017; Haffajee, 2018). My publications are the first (and presently only) works to explore the subject of Big Tech colonization (Kwet, 2018a, 2018b), especially as a systemic and structural problem.

Other publications addressing digital technology in South Africa focus on access to technology – especially broadband Internet and data affordability – but do not problematize the *form* of technology to be integrated into South Africa. For example, Allison Gillwald's work focuses on rolling out ICT infrastructure effectively (Gillwald, 2010, 2016; Cloete and Gillwald, 2014). Duncan et al. (2014) focus on Internet policy as it pertains to freedom of expression in the context of local censorship and regulation, as well as downsides of non-access to the Internet. In his book, *God, Spies and Lies*, famed journalist John Matisonn (2017) laments that South Africa "missed the information revolution", but only focuses on the rollout of ICTs (pp. 379-393). Each of these accounts follows a "catching up to the West" narrative which uncritically presume that digital technology will benefit South Africans, and fail to distinguish between People's Technologies and technologies built for state and corporate power. This follows a pattern of scholarship in Africa that, Gagliardone et al. (2015) remark, provide thin empirical evidence on the successful use of ICTs to promote peacebuilding (and, we can add, political liberty and socioeconomic development), mimic scholarship from the Global North, and exhibit "a simplistic assumption that ICTs will drive democratic development without sufficient consideration of how ICTs are actually used by the public" (p. 1). Even in this respect, Galiardone et al. take the mainstream form of technology for granted for "use by the public", thereby ignoring the possibility of deploying and shaping People's Technologies for African contexts.

South African scholarship includes a powerful body of work critiquing the state of traditional, non-digital education, referenced above and in Section 2.2. In particular, the edited volume produced by Vally and Motala (2014) critically interrogates much of the educational terrain with an approach which links education, economy, and society. These works are essential reading for South African education, and inform this thesis. However, South African scholars have not yet taken up technology in basic education from a critical sociological perspective. Much of the research on the topic in SA has been published in Masters and PhD theses (Brandt, 2006; Maholwana-Stoashe, 2007; Prince, 2007; Mbane, 2008; Mooi, 2011; Vandeyar, 2011; Osah, 2012; Botha, 2014; Anley, 2015; Ndlovu, 2015; Ramoroka, 2016; Mukhari, 2016; Sehuhula-Mooketsi, 2016; Odero, 2017) or in a small collection of journal articles (Mayisela, 2013; Vandeyar, 2013, 2014, 2015; Vandeyar and Killen, 2007; Botha and Herselman, 2015; Hart and Laher, 2015; Paydayachee, 2016, 2017a, 2017b; Goosen and Vorster, 2018). These works focus on the status of implementation of ICT in schools (i.e. whether or not ICTs are being deployed), beliefs and attitudes about implementation, and the efficacy of implementation strategies. Across the board, the authors bypass considerations of which kinds of ICTs are selected for implementation and concomitant issues such as corporate colonization, Big Data surveillance, privacy, algorithmic decision-making, adaptive learning, and the like.[11] (For an explanation of these topics, see Section 2.5 and Chapter 3.)

A handful of South African scholars, led by Paul Prinsloo and Sharon Slade, offer an important exception in education technology studies in South Africa (Prinsloo et al., 2015; Prinsloo and Slade, 2017). Their work focuses on the higher education sector, and addresses the role of Big Data, learner privacy, and algorithmic decision-making and systems. This scholarship, however, does not address broader issues of digital colonialism in education, and most of it does not address South African empirical contexts, or does so without going into great depth. My research helps fill this gap.

EdTech scholars outside of South Africa have produced the majority of works on education-specific technologies like Big Data education platforms, privacy and surveillance (in education), adaptive learning, learner management systems, and flipped classrooms. Audrey Watters maintains a prominent column on her website dedicated to challenging the EdTech status quo. Her writings focus on the history of education technology, and how it deviated from the constructionist vision of (South African born) Seymour Papert (that is, one where the child programs the computer) to a system where the computer programs the child. Watters (2014) argues that the EdTech industry reinforces "traditional powerful forces, powerful markets, powerful ideologies". Education technology, she argues, "has become about control, surveillance, and data extraction" (*ibid*). Her work offers critical

11 Porter et al. (2016), in describing the implementation of mobile phones in education, illustrate the political concerns of this body of literature in raising the issues of class disruption from pupils' and teachers' phones, time spent on social networks, bullying, pornography, and the wisdom of spending money on devices in resource-constrained environments (pp. 27-33). Considerations of corporate-state surveillance of children and teachers, Big Tech product placement, infrastructural control, and the other considerations raised in Chapter 3 are not addressed, even though they are of great significance.

insight into the history of the EdTech, especially within a United States context. Similarly, Ben Williamson has published an array of articles and a book on Big Data in education. Williamson contends that “real-time Big Data systems” have displaced “traditional governance of education” (2014a, 2014b, 2015a) and that software products are the “hidden managers” of today’s education systems (2015b). Echoing Prinsloo and Slade (2015), Williamson and Lupton (2017) demonstrate that “There remains little evidence that specific instruments to safeguard children’s rights in relation to dataveillance have been developed or implemented, and further attention needs to be paid to these issues” (p. 780; see also, Khalil, Prinsloo and Slade, 2018). In proposing People’s Technologies for e-education, this dissertation helps fill this gap.

The above-listed approaches focus on education-specific technology, such as the collection of data by schools and universities, Massive Open Online Courses (MOOCs), education platforms offered by companies like Pearson and IBM, and the like. The authors seem to take Big Data as an inevitable part of 21st century education, and do not consider the option of replacing Big Data technology altogether with technologies that do not surveil the education system (learners and teachers) using any form of software, education-specific or not. As we will see in Chapter 3, solutions offered within this kind of scholarship tend to leave the structure of Big Data intact. Electronic civil liberties organizations like the Electronic Frontier Foundation (EFF-US) (2015) similarly narrowed their considerations in this regard when they castigated Google for collecting student data for possible use in advertising, rather than calling into question why Google should collect any data about students at all. This dissertation offers a solution to both education-specific surveillance *and* more general computer software surveillance inside South African (and all country’s) schools through the deployment of People’s Technologies in education.

Some studies on education technology have offered historical accounts or sociological models to help understand education technology policy. However, these works tend to revolve around the Global North, and fail to enlighten the policy situation in South Africa. For example, Joel Spring’s (2012) book, *Education Networks*, uses New York State to show how a “shadow elite” operates in the public education sector. According to this model, a shadowy network of corporate tech employees and public officials have pushed for the digitization of New York public schools. While this may be true in New York, it is unclear that it is true for other states in the US, much less in South Africa. This research found no evidence that Microsoft, Google, or IBM employees form a shadow elite in SA, despite the fact that South African policymakers opt for Big Tech corporate software in education. Neil

Selwyn (2013a), by contrast, has attempted to offer global perspectives on EdTech in his book, *Education in a Digital World*. However, the study is unbalanced – Africa, for example, is given minimal coverage, and is typically lumped together as part of an undistinguished "sub-Saharan Africa" (South Africa is mentioned twice and most African countries are not mentioned at all). Moreover, despite Microsoft's long history of tech imperialism in the Global South, Selwyn deems Microsoft's Partners in Learning program an "impressive… philanthropy programme", rather than a colonial force (for more on Microsoft in South Africa, see especially Sections 3.3 and 7.2).

Stephen Ball, Carolina Junemann, and Diego Santori (2017) make a first attempt to cover the politics of education technology in South Africa in their book *Edu.net*. However, they assess the use of technology in a case study of Curro independent (private) schools. At the time of writing, Curro lists 60 schools in South Africa, and the schools have no known relationship to influence on the public education sector (which sports approximately 26,000 schools). Thus, the research, while interesting, has no present application for the overwhelming majority.

Other researchers, such as Elana Zeide, have done interesting work covering how data-driven instructional platforms have a privatization effect on schools' decision-making. Zeide (2017) argues that virtual learning environments undermine privacy through constant data collection, constrain teacher autonomy, and shift agenda setting and decision-making to private entities "without public scrutiny or pedagogical examination" (pp. 164, 169-170). Based on their review of US policy documents, industry advocacy white papers, and research monographs, Roberts-Mahoney, Means, and Garrison (2016) have likewise argued that Big Data and adaptive learning "transfer educational decisions from public school classrooms and teachers to private corporate spaces and technologies" (p. 1).

Contentions about computer-based privatization derive from arguments that have been internalized by the Free Software community for years. In *Code: And Other Laws of Cyberspace*, Lawrence Lessig (2006) famously argued that "code is law" – meaning that computer code regulates rules, norms, and behaviors in computer-mediated environments in ways similar to how physical architecture constrains and regulates behavior in physical space.[12] As a result, code can usurp legal, organizational, and social traditions in society (Nissenbaum, 2011). Extending code owned and designed by private corporations into the classroom logically extends their influence over the education process. Academics operating in various university circuits have made great use of this critical insight

12 This idea was first formalized in Joel Reidenberg's (1998) lesser known and insightful work, "Lex Informatica: The Formation of Information Policy Rules Through Technology". See Lessig (2006), p. 5.

for fields like copyright law (Samuelson, 2003; Grimmelmann, 2005), free speech regulation (Balkin, 2004), Internet governance (Carr, 2015; Bygrave and Bing, 2009), privacy (Harbour, 2011; Hartzog, 2018), and even torts (Crootof, 2018, forthcoming). Nevertheless, the field of education technology has made little use of this concept, and the leading authors referenced earlier have yet to interrogate the power relations of technical architecture.[13] This dissertation breaks new ground by taking these issues head-on (see especially Chapter 3).

There are some accounts of Free Software in education, but they tend exist at the margins in short articles or book chapters (see, *inter alia*, Gómez-Diago, 2014; Huett, Sharp and Huett, 2010; Katz, Lundell and Gamalielsson, 2016; Pezer, Lazić and Odak, 2017; Deepty and Gupta, 2018). As with the South African e-education scholarship referenced above, they commonly cover implementation or fail to address the major themes of EdTech deployment. While many education systems are not using People's Technologies, Free Software has been deployed with success in India (Babu, 2011; Rekha and Adinarayanan, 2014; Agur, 2016; MHDR, 2014; Chawla, 2018).[14] The Kerala province's IT@School project, launched in 2001,[15] stands as the largest FS in education project in the world, impacting 6 million students and 200,000 teachers (Thankachan and Moore, 2017). That Kerala, a province with a long communist history, has embraced FS is no coincidence, and suggests the salience of political ideology in the implementation of technology in schools.

Despite notable exceptions, research on FS in education is scarce, and for South African schools, it is even harder to come by. One study of the Western Cape found that despite a *Free and Open Source (FOSS) policy preference* passed by the Cabinet in 2007, implementation in education has seldom occurred, and Microsoft remains dominant in schools (Johnston, Begg and Tanner, 2013). (South African implementation will be detailed in Chapter 5.)

As with the field of education technology, the subject of technical architecture and infrastructure is presently absent from digital sociology scholarship. Deborah Lupton's (2015) book, *Digital Sociology*, makes no mention of how technical architecture of the digital ecosystem relates to power in society.[16] Kate Orton-Johnson and Nick Prior's (2013) edited volume, *Digital Sociology: Critical Perspectives* features twenty-two authors covering a wide variety of topics, yet none of them touch

13 Audrey Watters states that "infrastructure *is* ideology" in a 2005 essay, but her work does not pursue the point which, I argue in this dissertation, should frame one's understanding of power in the digital era, including education technology (Watters, 2015a, emphasis in original).

14 Deployment in India is unbalanced, and that poverty, education, and infrastructural barriers challenge the prospect for fast implementation (see The Times of India, 2017; Kasinathan, 2018).

15 IT@School was initially designed by Intel and Microsoft, but transitioned to a FS project from 2005-2008 (Agur, 2016, p. 66).

16 Lynch (2015) likewise ignores the politics of Free Software and technical architecture.

upon infrastructure, software licenses, and other critical components that affect power relations in the digital society.  Manuel Castells, perhaps the most renowned sociologist of communications, has likewise relegated "open source" to the margins and neglected the Free Software Movement (Castells, 2010, p. xxv-xxx; Castells, 2009), while prominent authors in media studies have completely missed the subject (McChesney, 2007, 2013; Mosco, 2014; Tufekci, 2015, 2017).

Some scholars have done an excellent job explaining the politics of Free Software.  Sociologist Johann Söderberg's (2008) book, *Hacking Capitalism*, details the Free Software Movement inside the United States from a Marxist perspective, while several works by Gabriella Coleman – most notably, *Coding Freedom* – provide an anthropological account of the Debian GNU/Linux developer community (Coleman, 2012; 2017).  Christopher Tozzi (2017) recently published *For Fun and Profit*, the first book-length history of the Free Software Movement.  Harvard's Yochai Benkler has devoted significant attention to the politics of Free Software in several works, including the esteemed *The Wealth of Networks*, and he explored links to anarchism in his journal article, "Practical Anarchism" (Benkler, 2006; 2013).  Free Software expert Eben Moglen has likewise expressed affinities to anarchist philosophy in writings and speeches (Moglen, 1999, 2013b), as has Richard Barbrook (2005, 2007), in relation to intellectual property and the "high-tech gift economy".  A few prominent anarchist scholars have voiced support for Free Software, including Uri Gordon, Giorel Curran, and sociologists Dana Williams and Jeffrey Shantz, but they have not developed the analysis (Gordon, 2009; Curran, 2007; Williams and Shantz, 2014, pp. 184-185; Shantz and Tomblin, 2014).

In addition to anarchism and Free Software philosophy, this dissertation utilizes anti-colonial scholarship to inform current digital practices.  It compares traditional colonialism to the digital era, finding that similar to the railroads of empire, digital colonialism features structural power relations rooted in the ownership and control the digital ecosystem at the infrastructure level.  Cloud centralization – along with proprietary software and other mechanisms of control (such as closed standards) – has given rise to corporate power and colonization in the digital environment.  Given that the Internet is a global system, and given the recent centralization of the computer experience into corporate clouds, the ability to escape US multinationals is nearly impossible without a replacement by People's Technologies that enable direct democracy and decentralization.  (This argument is developed in Chapter 3.)

The subject of digital colonialism is just beginning to formalize in the academic arena.  As we will see in the next section, most accounts have reduced the topic to concrete examples (such as the deployment of Free Basics in India) without conceptualizing it as a systemic phenomenon. Some exceptions include Andres Gaudamuz and Renata Avila, who see also colonialism via the US-based domination of infrastructure. This dissertation offers a first theoretical and conceptual framework for digital colonialism – one which should be discussed and debated in dialogue with people from many walks of life across the globe.

### 1.3.2: Debating the Digital: Education, Economy, and Society

At the time of writing, scholars, journalists, politicians, and concerned members of the public are asking the question: is Big Tech too powerful? And if so, what should be done about it? As noted above, GAFAM, in addition to other tech giants, have become super-giants that many consider monopolistic entities. Indeed, the following features are all dominated by a handful of US-based multinationals: search engines (Google); web browsers (Google Chrome); smartphone and tablet operating systems (Google Android; Apple iOS); desktop and laptop operating systems (Microsoft Windows); office software (Microsoft Office); cloud infrastructure and services (Amazon, Microsoft, Google, and IBM); social networking platforms (Facebook and Twitter); transportation (Uber and Lyft, and in South Africa, Taxify); business networking (Microsoft LinkedIn); streaming video (Google YouTube, Netflix, Hulu); and online advertising (Google and Facebook) (Kwet, 2018a; Kwet, 2018b).[17]

The problem of "Big Tech" began to gain traction around 2016 and 2017, when journalists began shaming the power of tech giants. In December 2016, *The Guardian* declared the past twelve months "the year Facebook became the bad guy". Ten months later, *The New York Times* followed suit, stating "Tech Giants, Once Seen as Saviors, Are Now Viewed as Threats" (Streitfeld, 2017). That December, Olivia Solon's (2017c) year-end summary read, "Tech's terrible year: how the world turned on Silicon Valley in 2017," while John Naughton (2017) similarly opined that "It's time to face the facts about our digital world" (observing the exploitation of the gig economy). Early in 2018, Erin Griffith of *Wired* magazine announced, "Everyone Hates Silicon Valley, Except Their Imitators." It had finally become commonplace to express strong criticisms of the tech industry.

"Finally" is the important term in this context, because the criticism was on record long before it went mainstream. Skepticism of centralized power arising in the digital ecosystem goes back to the decision to build ARPANET – the foundation of what we today call the Internet – around principles of distributed and decentralized architecture (Isaacson, 2014, p. 250). By the late 1970s and 1980s, anti-

17 There are other functions also dominated by big corporations, such as microprocessors and networking hardware.

apartheid activists took aim at the computer industry, led by IBM, for aiding and abetting the apartheid state (including the private sector) (see Section 3.3.4).

In 1995, Marxist scholars Richard Barbrook and Andy Cameron penned a (now-famous) essay in which they took aim at what they call "the Californian Ideology". The essay was prescient in some respects: they identified a right-wing libertarian strain that runs through Silicon Valley which hails the "free market", criticizes the state, and tacks on some counter-cultural sentiments popular among the left. However, the essay was beset by vague platitudes and sweeping statements, and was short on empirical evidence for some claims. A 2017 Stanford study found more than 600 elite tech entrepreneurs are more left liberal than libertarian, including on issues of social welfare, race, taxing the rich, global inequality, environmental protections, immigration, and wealth redistribution (Brookman, Ferenstein and Malhotra, 2017; Coren, 2017; see also, Chiel, 2016). Barbrook and Cameron misrepresented New Left politics, which included a wide range of organizations by people of color, indigenous peoples, feminists, war resistors, and solidarity movements across the world. Their essay cast the "New Left" as white hippies and writers in magazines like the *Whole Earth Catalog*. Thus, the incorporation of New Left politics into the "Californian Ideology" is questionable. Moreover, Barbrook and Cameron missed the Free Software Movement and GNU/Linux, which had by 1995 picked up steam. Barbrook did address the topic shortly thereafter, however, arguing that Free Software and information sharing provides concrete proof that "anarcho-communism" is a beneficial force in the "high-tech gift economy" (Barbrook, 2005, 2007).

Anarcho-communist sentiments have been expressed by Eben Moglen, who in the late 1990s and early 2000s warned of the threats posed by commercialization of the Internet (Moglen, 1997), extolled the virtues of Free Software and anarchist economics (Moglen, 1999), and agitated for the end of copyright paywalls (Moglen, 2003). At the time, the forces of left-wing production and distribution were ascending online, and by the mid-2000s, it was rational to express some optimism about the state of digital technology. In a presentation at Columbia Law School, Moglen and Benkler deemed this period the "high-water mark" for digital freedom, where Free Software was spreading, standards and protocols were open, and information flows were more decentralized (Benkler with Moglen, 2017). The climate was by no means certain to favor human rights and equality, but there were important victories worth celebrating.

Popular perspectives of the mid-2000s into the early 2010s are often divided into two camps: celebrants (also considered utopians or optimists) and skeptics (also considered dystopians or pessimists) (Mansell, 2012, pp. 1-2; McChesney, 2014, pp. 5-12; Carr, 2016, pp. 2-5; Morozov, 2011, pp. 19-31; Mare, 2016a, pp. 19-25).[18] In the first camp, the celebrants, scholars like Clay Shirky (2010) praise digital technology for its liberatory effects. Shirky believes the Internet will unleash a "cognitive surplus" that will radically improve global society. Also quite optimistically, Manuel Castells (2012), has stated that "Internet social networks," spaces which are "largely beyond the control of governments and corporations that had monopolized the channels of communication as the foundation of their power," have enabled the sudden overthrowing of dictatorships "with the bare hands of the people" (pp. 1-2). Writing in 2012, Castells was understandably enthused about the eruption of people power in the Occupy and Arab Spring movements, but he missed warning signs from whistleblowers (beginning in 2006 with Mark Klein's testimonies about AT&T), the rise of the cloud, and growing market concentration within the tech industry. With respect to the economy, Jeremy Rifkin (2011) optimistically contends that humanity is experiencing a "Third Industrial Revolution" whereby distributed energy and communications technologies combine to decentralize power and economic wealth, for the benefit of humanity. Rifkin's scheme is interesting and, if environmentally sustainable, worth serious consideration, but his vision has yet to engage with the vast concentration of power in the digital ecosystem that favor centralized control (see Chapter 3).

The second camp, the skeptics, see destructive effects in digital technology. In *The Net Delusion*, Evgeny Morozov (2011) argues that the same technologies used by protesters in the Arab Spring are harnessed by state powers against them, and therefore present a risk to freedom and democracy.[19] In *The Filter Bubble*, Eli Pariser (2011) theorized that the Internet creates "filter bubbles" which herd people into homogeneous groups (according to identity, beliefs, and other shared attributes) and threaten to undermine democracy and cohesion by segregating online spaces. In *The Master Switch*, Tim Wu (2011) warned of the impending centralization of "information empires". That same year, Siva Vaidhyanathan (2011) criticized Google's control over the web, as well as its surveillance model for revenue generation, in *The Googlization of Everything (And Why We Should Worry)* – a long-form treatise on research he began publishing in 2006. By 2013, Robert McChesney's book, *Digital Disconnect*, explained, in part, how "The tremendous promise of the digital revolution has been compromised by capitalist appropriation and development of the Internet" and "the new digital giants" (pp. 97, 130-171). These publications contradicted popular accounts venerating Silicon Valley

18 In many instances "utopians" and "cynics" are somewhat caricatured into opposing camps. In reality, most scholars have mixed views regarding the net impact of digital technology on society.

19 It is sometimes overlooked that Morozov's critique in *The Net Delusion* is more targeted outside the United States than within. It was not until later works that Morozov began changing his views towards the US.

corporations, such as Steven Levy's (2011) *In the Plex*, which detailed Google's inner plumbing, but was light on criticism,[20] as well as David Kirkpatrick's (2011) celebration of Facebook as a force for information democracy in *The Facebook Effect.*

In the past few years, the scholarly landscape in the West has become increasingly pre-occupied with the power of Big Tech – especially the rise of surveillance and monopoly power – and what to do about it. We can delineate perspectives into a three strains: tech boosters, tech moderates, and what I'm calling "People's Technology" advocates. Let us consider each in turn.

Tech boosters advocate for what they regard as the latest and greatest technologies endorsed by ruling class elites in Western society: Big Data, "the cloud", artificial intelligence (machine learning, deep learning), the Internet of Things, smart cities, ubiquitous high-speed Internet, as well as sophisticated robotics and biotechnology. These accounts may offer mild criticisms of Western technologies, but they more or less embrace them as a force for good. For example, in his book, *The Fourth Industrial Revolution*, World Economic Forum founder Klaus Schwab (2016) claims that society is experiencing a "Fourth Industrial Revolution" (4IR) based on the fusion of the physical, digital, and biological worlds. Schwab criticizes government surveillance and the threat of automation to millions of jobs, giving the appearance of a balanced take on technology. However, the former singles out the government for mass surveillance (while absolving corporations), and the latter seems to target the private sector. According to Dean Baker (2015, 2016, 2017), the claim that automation is killing jobs fits a neoliberal narrative which blames technology instead of ruling class policies as the source of economic inequality.[21] Whether Baker is right or wrong, Schwab's take on technology is far from critical, and privileges the private sector while attempting to extend Western technology to the far corners of the globe.

Stephen Goldsmith and Susan Crawford (2014) are two high-profile intellectuals that offer a boosterist take on "smart cities" in their book, *The Responsive City*. They would like to see the private sector partner with city governments to perform Big Data analytics (and surveillance) in order to promote economic growth and increase efficiency, transparency, and sustainability in city governance. Goldsmith and Crawford, along with other smart cities advocates, believe the explosion of "smart" city technology, based on sensors, Big Data collection, and advanced analytics is the way of the future (Goldsmith and Crawford, 2014, p. 173; Schaffers et al., 2011; Zanella and Vangelista, 2014). Critics,

20 Levy was granted "unprecedented" access to Google employees, who he joined on a trip in 2007 (p. 3).

21 Other scholars on the left, such as Robert McChesney and John Nichols, take the threat of automation very seriously (e.g. McChesney and Nichols, 2016.)

by contrast, decry the smart city's technocratic, privatized governance structure and its mass surveillance component (Hollands, 2008, 2015; Sadowski and Pasquale, 2015; Angelidou, 2017, pp. 79-81).

In South Africa, there has been little discussion of smart cities. Some journalists have lauded the concept for its economic and crime-fighting potential (e.g. Sidler, 2016; Mzekandaba, 2017). On the skeptical side, my own work (2017a, 2017b) provided a first in-depth expose criticizing the policing and surveillance component of smart cities, especially in light of the apartheid legacy and racially charged inequality. Nora Loidean (2017) has also addressed Cape Town's smart and safe city initiative, providing a moderate critique which leaves the surveillance initiative intact, but calls for evidence-based policy, community consultation, and regulations to protect privacy. In 2018, Jane Duncan echoed Loidean's concerns and added her voice to the conversation (Duncan, 2018).

The smart city debate underscores the growing centrality of Big Data to the digital economy, including digital studies over the past few years. One strain of academic inquiry deems the rise of government and corporate surveillance "surveillance capitalism". The concept was discussed during the 2000s and early 2010s (e.g. Turrow, 2006; Moglen, 2007; Rushkoff, 2011; Andrews, 2012; McChesney, 2013; Morozov, 2013), but it was only coined as a term by a collection of prestigious Marxist scholars in a summer 2014 special issue of *Monthly Review* called "Surveillance Capitalism".[22]

The popular book *Big Data* by Viktor Mayer-Schönberger and Kenneth Cukier (2013) sets the frame for the debate over the corporate side of the surveillance capitalism coin: Big Data. They claim that the Big Data "revolution" will "transform how we live, work, and think". Public health, commerce, finance, marketing, retail, credit scoring, insurance, content curation, and myriad other aspects of life will be "datafied" (quantified) and driven by analytics for the betterment of society. At the same time, privacy and democratic freedom will be threatened because so much data is collected. The solution, in their view, is to *tame* Big Data "governance" by 1) requiring Big Data users to become "more accountable for their actions"; 2) preserving the human agency to guarantee judgment on real actions, "not simply big data analysis" of probability and prediction; and 3) providing transparency and creating oversight by experts (pp. 175-184). Antitrust regulation would further be enacted to ensure the "data barons" do not monopolize the market.

What we can call "critical digital studies" more or less operates within this framework. The essence of the Big Data revolution is not seen as fundamentally problematic. Frank Pasquale puts the

22 For origins of the term and concept, see Monthly Review, 2016.

zeitgeist succinctly: “the help and the harm of information collection lies not in the information itself but how it is used” (Pasquale, 2015, p. 56). Pasquale maintains “surveillance is an inevitable concomitant of online life” and we should “tame the power that surveillance entails” rather than pursue “illusory… surveillance-free alternatives” (Pasquale, 2013a; see also, Pasquale, 2013b).[23]

Microsoft researchers dana boyd and Kate Crawford take a similar position. In their heavily cited essay, “Critical Questions for Big Data,” they argue that Big Data has the potential to do good or bad, depending on how it is used (boyd & Crawford, 2012). Their “six provocations” for Big Data call attention to the need to: 1) assesses “inbuilt flaws of the machine tools”; 2) outline bias and limitations; 3) select data size critically (bigger is not always better); 4) manage context to avoid false or misleading conclusions; 5) think critically about the ethics of Big Data collection and use in light of privacy; and 6) effectively negotiate the Big Data “digital divide” between the “Big Data rich and the Big Data poor”. More recently, Zook, boyd, Crawford, Pasquale, Narayanan, and several other leading scholars (2017) wrote a similar paper on “responsible big data research” that “maximizes the good while minimizing harm” (p. 8).

Attempts to “tame” Big Data surveillance can undoubtedly benefit society. Scholarship on “algorithmic discrimination” has shed light on the dangers that Big Data poses to people of color, women, the poor, and other vulnerable and marginalized groups. In one prominent study, Julia Angwin et al. (2016) found that algorithms used to predict future criminals in the US criminal justice system are biased against blacks. In another study, Harvard professor Latanya Sweeney (2013) found unintended racial bias in Google’s advertising technology. Other scholars have recently published works on algorithmic discrimination and class bias (Eubanks, 2018) as well as racial discrimination in search engines (Noble, 2018).

Data abuse scandals and leaks have created additional anxiety about Big Data among the public and intellectual community. In early 2018, the media reported a private company, Cambridge Analytica, had collected the personal data of at least 87 million Facebook users through deceptive practices enabled by Facebook’s permissive data collection policy. In reaction, many scholars are pushing for data protection regulations. In the United States, one such proposal is Jack Balkin and Jonathan Zittrain’s “information fiduciaries”, which proposes that organizations of a sufficient size have duties of care and trust when collecting and handling client data (Balkin and Zittrain, 2016; Zittrain, 2014; Balkin, 2016). In Europe, the General Data Protection Regulation (GDPR) puts some

23 In this context, Pasquale is referring to the online platforms like Facebook, Twitter, and Google.

restrictions on the collection and use of data, while in South Africa, the Protection of Personal Information Act (POPIA) places similar obligations on responsible parties.

As technology firms have increased in size, scholars are also debating antitrust measures to tame the Big Tech monopolies (Khan, 2016; Khan and Vaheesan, 2017; Rahman, 2018; Blumenthal and Wu, 2018a). The fine details are presently posed as open questions: is it sufficient to enact legislation that will create another Facebook, or ten of them, that all make money through surveillance? How can we prevent network effects from re-concentrating social networks? Should platforms become public services, like utilities companies?[24]

Education technology debates have largely followed in this vein (see Section 1.3.1). Scholars are typically critical of Big Data education technologies, but are not calling into question Big Data itself – or the underlying architecture that has led to the Big Data revolution. Moreover, they are almost universally concerned with education-specific technologies chosen for the education system, rather than the wider set of technologies placed on education devices. A student or teacher using Google or Microsoft are under Big Data surveillance – as well as NSA surveillance – and the use of those technologies further entrenches their products and models in the society. Nevertheless, there is virtually zero debate on these topics. This dissertation fills this gap.

In contrast to more mainstream approaches of digital studies, this thesis argues that the centralized ownership and control of the digital ecosystem is itself a structural form of domination that fails to comport with human rights and equality. In Chapter 3, we will see that Big Data, cloud computing, proprietary software, and other technologies of control are technologies of domination, exploitation, and repression. Digital studies scholars in the mainstream, centered in the West, often assume these technologies are here to stay, and with them, the corporate behemoths that own, develop, and administer them, or they fail to politicize and take a stance on centralized clouds, proprietary software, hardware ownership and control, and protocol politics. Yet ultimately people socially construct technologies, and it is not pre-determined that the technologies we have are the only ones possible. As we will see in Chapter 3, Western digital technologies are built for domination as a matter of design, and the replacement of them with People's Technologies is necessary to realize human rights and equality in the digital society.

This dissertation further posits that technologies like centralized cloud computing and Big Data systems are tied to corporate and state power centered in the United States. The infrastructural

24 For additional debate, see Federal Trade Commission (2018) hearings; Wu, 2018b.

domination of the digital ecosystem thus enables the exercise of US political, economic, and social power over the Global South, and constitutes digital colonialism. As explained in Chapter 3, this is an empirical matter: Big Tech corporations are dominant in South Africa and are overtaking local industries and threatening local control over digital technology. Most scholarship in the West has not yet addressed this issue. When John Herrman (2018) of *The New York Times* asks, "Have the Tech Giants Grown Too Powerful?", he never considers, "for who?" US citizens? Europeans? South Africans? The exercise of power over the rest of the world is seldom discussed, despite the fact that tech giants are multinationals with global reach and dominance. The same generally rings true across the digital studies spectrum: the impact of Big Tech outside of the United States and Europe is rarely considered, and when it is, Global South countries are often mentioned in passing.

Digital colonialism currently exists at the margins as a discussion just starting in the press, but will likely grow as the digital revolution penetrates the Global South. In 2014, the Just Net Coalition in India published "The Delhi Declaration for a Just and Equitable Internet," calling for democratization of the architecture of the Internet, as well as the use of Free Software (Just Net Coalition, 2014). Most other writings exploring the concept have focused on single companies or incidents of foreign domination in individuals countries, such as Free Basics in India (Moglen and Choudhary, 2015; LaFrance, 2016; Kuchler, 2016; Solon, 2017a), the power of Google and its relationship to the US military empire (Keane, 2015), DNS supervision (Forrest, 2016), and platform-based political manipulation (Crabtree, 2018). A few intellectuals have posited digital colonialism as rooted in or linked to infrastructural domination (Just Net Coalition, 2014; Purkayastha and Bailey, 2014; teleSUR, 2017; Guadamuz, 2017; Avila, 2018a, 2018b; Das, 2018). These positions often espouse a Free Software philosophy, with emphasis on its value to the Global South (Guadamuz, 2009; Guadamuz, 2010; Avila, 2018b).[25]

Despite extensive US tech domination in the Global South, nearly all scholarship is entirely devoid of the subject. This is a major problem in the field. The Internet is a global system, and given the centralization that has occurred in the digital ecosystem – especially outside of autocratic countries like China and Russia – the systems that US multinationals build have a direct impact upon the entire world. This means that it is not enough for US and European intellectuals to only consider US and European life experiences when thinking about social justice in the digital age. While there are works on Internet governance (Goldsmith and Wu, 2006; Brown and Marsden, 2013; DeNardis, 2014; Carr,

25 Petar Jandrić and Ana Kuzmanić (2016) have also produced interesting work on themes of digital colonialism, albeit without a structural or systemic theory.

2015), the subject of US dominance does not receive the attention it deserves in digital studies.[26] Now that many countries in the Global South are rapidly adopting digital technology, the power of "Tech Giants" must be viewed from a global perspective. This requires a paradigm shift in thinking from outcomes on the surface (such as the practices of Facebook or algorithmic racism) as experienced in the West to structural power relations at the architectural level as it impacts upon the global community. This dissertation helps fill this gap.

### 1.4.1: Research Question and Objectives

The objective of this dissertation is to discover and explain how concerns about education, economy, and society inform policy choices and perspectives regarding technology choices for South African e-education. The main research question of this study is:

> What technology choices are being considered or selected for the national e-education policy, and why?

The dissertation asks the following sub-questions to fulfill the broad research objective:

- How do government officials, key stakeholders, and experts envisage the relationship between technology in education to education, economy, and society?
- What is the potential impact of e-education on education, economy, and society?
- Why are certain policies being chosen or planned, and not others?
- What are the best digital technology choices for the South African education system?

26 Laura DeNardis (2014) does an excellent job detailing global Internet governance, but her work focuses on multi-stakeholder governance and Internet infrastructure such as the DNS system. Madeline Carr (2015) wrote an elegant and provocative book on US power in the Internet, but she restricts her inquiry to Internet governance and cyberwar, and does not address the digital ecosystem as a whole. Neither study devotes attention to the power of Big Tech in the Global South.

### 1.4.2: Assumptions of the Study

Consistent with a social constructionist perspective on digital technology, this dissertation assumes that societies shape the direction of digital technology through political processes and ideologies, just as technologies shape political, economic, and social outcomes (Carr, 2015). It rejects instrumentalist positions positing that technological design is neutral. However, it also rejects determinist positions that hold that technology moves along a fixed path that society is powerless to change, in favor of a position articulated by the Free Software Movement, which holds that technological infrastructure is inherently political, contested by competing interests, and shaped by society, power, and ideology.

This dissertation also assumes that path dependencies constrain the direction of technological deployment and development (Starr, 2004, p. 2). For example, Tim Berners-Lee's choice to license World Wide Web technology under free and open licensing (using Richard Stallman's GNU General Public License), without patents, pushed communications across the Internet towards an interoperable, universal space instead of one based on walled-off, proprietary communities (Isaacson, 2014, pp. 405-414). Twenty-nine years later, Berners-Lee maintains the web is "failing" due to the power of Big Tech centralization, raising the question whether or not the "other half" of the world not yet connected should *want* to connect to the web we have today (Solon, 2017b; Berners-Lee, 2018). Given that the trajectory of the digital ecosystem is socially constructed, this thesis assumes that technology policy made in South Africa carries path dependencies that actively shape the trajectory of the digital experience in South Africa and beyond.

I also assume that South African policymakers have the power to choose People's Technologies for the education system. Reams of scholarship demonstrate how the United States has coerced countries into adopting domestic policies favorable to US political and corporate power (e.g. through structural adjustment programs) (Tandon, 2015). However, there is no evidence that South Africa cannot choose to implement People's Technologies at the expense of US political and corporate interests.

### 1.4.3: Significance and Justification of the Study

This study makes several unique contributions to the academic literature on digital technology. First and foremost, it is the first major study on digital colonialism, and it provides the first in-depth theoretical understanding of the topic. As noted in Section 1.3.2, publications have either focused on individual instances of digital colonialism or theorized digital colonialism as rooted in or linked to infrastructure in short editorials published online.[27] This dissertation details empirical instances of digital colonialism – especially Operation Phakisa Education – and formulates a conceptual framework for digital colonialism as a structural/systematic phenomenon.

Due to a Western bias in digital studies, and, perhaps, the slow integration of digital technology into poorer countries, considerations of the Global South have been marginalized or non-existent.[28] Moreover, mainstream approaches to digital studies make assumptions about digital technology without adequate critical analysis of technological design. This dissertation addresses this problem by challenging the current trends in the digital society – Big Data, intellectual property, centralized clouds, automation, corporate- and state-driven algorithmic decision-making, and surveillance capitalism – as Western constructs built for domination (through control of the digital ecosystem) internal to Western societies *and* as colonial force in the Global South. This dissertation is the first "big picture" study covering the core components of the digital ecosystem in South Africa. It breaks new ground theoretically (for the sociology of digital technology as well as digital colonialism) and empirically (for the exploration of Western technological deployment in a Global South country), and demonstrates that the field of digital studies needs to engage deeply with the global impact of US technological domination.

This dissertation is also the first in-depth study of the digital ecosystem taken from an anarchist perspective. As noted in Section 1.3.1, anarchists scholars have taken interest in the digital revolution and the Free Software Movement, but they have not pursued it in depth. Similarly, digital scholars have taken interest in anarchism, but have only pursued short explorations on the subject in a handful of journal articles. This dissertation provides a first study of the digital ecosystem, digital colonialism, education technology, and digital technology policy from an anarchist sociological perspective.

Finally, this thesis provides new theoretical and empirical contributions to the study of education technology. As noted earlier, most scholarship in the education technology academic circuit focus on education-specific technology used in schools. This narrow approach poses a limitation for developing a deep understanding of the sociology of technology in education, economy, and society. Scholarship in the field typically fails to politicize the technical architecture of the digital ecosystem (such as cloud computing and proprietary software). For this reason, education technology scholars

27 In this regard, my formulation of digital colonialism dates back to thesis drafts written over the past few years. Guadamuz and Avila, perhaps among others currently investigating the topic, have independently arrived at very similar conclusions regarding the concept of digital colonialism as linked to infrastructural control and centralization, from the perspective of the Free Software Movement.

28 This is similar to a Western bias in media studies; see Mare's (2016) comments in the context of his study on the use of Facebook in South Africa and Zimbabwe (pp. 30-31);

miss the relationship between deployment of technology in schools and the shaping of the tech ecosystem in society – including the Big Data surveillance they frequently condemn. Moreover, education technology studies are commonly focused on the Global North and lack sufficient attention to education technology in the Global South. This is the first sociological study on digital technology choices for South African public schools, and the first to detail Operation Phakisa Education. It is also the first study explore the relationship between technology deployment in schools and digital colonialism.

## 1.5: Research Methodology

This study is a qualitative policy analysis that utilizes semi-structured interviews, primary source document analysis, including government policy documents, parliamentary committee proceedings, press releases, and speeches published online, and secondary source materials, such as academic journal articles and reports. In-depth interviews provide the first detailed look at Operation Phakisa Education, including many of the empirical realities behind the initiative as well as the planning and thinking behind it. The semi-structure technique deployed is informed by procedures set forth by Whiting (2008), Hashmnezhad (2015), Nunan (1992), Atkinson and Flint (2001), and Babbie (2014). The semi-structured method provides a consistency in questions across interview subjects which enables comparison and analysis according to institutional location and role. Policy documents systematically exhaust policy studies and policy papers on Free Software and on e-education, while parliamentary committee proceedings and speeches add additional insight and context to the policy discussion.

Interview subjects in this dissertation were selected according to purposeful and snowball sampling (Atkinson and Flint, 2001; Flint, 2014, pp. 201-202). Interviewees include individuals from government, industry, NGOs, and experts. Members of government were consulted to get direct access to the thinking behind key officials driving e-education policy. Industry employees and members of NGOs provided their own thoughts relative to their position as company participants, while experts in the field offered their own assessments. By interviewing a handful of individuals from each of these sectors, this study was able to suggest linkages in perspective to institutional location of interview subjects.

My methodological philosophy draws upon critical policy analysis (Gale, 2001; Babbie, 2014; McMillan and Schumacher, 2014), complemented by a “mitigated skepticism” approach to philosophy and truth (Popkin, 1979; Chomsky, 2009). This approach acknowledges that critical theories are based on multiple theoretical lenses (Gale, 2001, p. 384). It recognizes that data is not just "out there" but is based on the theoretical underpinnings of the researcher (Babbie, 2014). Qualitative methods were chosen in order to fulfill the goals of the policy analysis, which entailed identifying the policy choices and perspectives and interpreting them in light of the theoretical lenses chosen for the policy analysis. Qualitative methods allowed me to address the variety in background and expertise among interview subjects, which precludes quantitative sampling (Barriball and While, 1994, p. 329). Additionally, they provided me access to an insider view on the topic of study (Bryman, 1988) and allowed me to obtain the wide range of descriptions, nuanced viewpoints, contextual understandings, and expert insights needed to build a complex, holistic picture of the policy (Creswell, 2007, pp. 36-41, 122).

The thesis conducts a policy analysis, which seeks to critically identify and analyze policy goals. According the Kirst-Ashman (2017), a policy analysis provides a systematic evaluation of how policies address target populations and attempt to meet people's needs and goals (p. 195). Following the framework laid out Jimenez et al. (2015), this study addresses five elements of government policy, which address the social problems, determine the objectives, evaluates the effects of the policy, considers the implications, and considers the alternatives consistent with social justice. The findings chapters triangulate the semi-structured interviews with primary and secondary source document analysis to enhance the robustness of the findings. Data was represented and interpreted through the lenses of anarchist and Free Software philosophy accounts of digital technology development, consistent with leading scholars in the field of anarchist studies (Chomsky, 1970; Jun, 2013; Van der Walt, 2013a, 2013b; Ramnath, 2012; Shannon, Nocella II and Asimakopoulos, 2012); digital technology studies (Benkler, 2006; Lessig, 2006; Moglen, 1999; Stallman, 2010), postcolonial studies (Rodney, 1981 [1972]; Fanon, 1963 [1961]; Freire, 2005), and education (Vally and Motala, 2014; Allais, 2014; Williamson, 2017a; Watters, 2015a; Prinsloo and Slade, 2016). Data was coded through note-taking in the margins of transcribed audio interviews and documents (Whiting, 2008, pp. 36-37), which were categorized using thematic analysis (McMillan and Schumacher, 2014, p. 406-408).

## 1.6: Organization of the Thesis

This dissertation is divided into eight chapters. This chapter sampled the social and theoretical context to establish a brief snapshot of how the dissertation is framed. It then placed the research problem into the context of the literature available, as well as the debates on the relevant subject matter. This was followed by a statement of the research question, sub-questions, and aims; assumptions of the study; its significance and justification; and the methodology.

Chapter Two provides a full treatment of the social, educational, and digital context. It reviews South Africa from colonial conquest to post-apartheid, details the state of education in SA, analyzes neoliberal currents promoted by the influential Stellenbosch School in the education system, and provides an overview of how education technology works. It concludes by outlining the state of general digital technology integration in South Africa.

Chapter Three further develops the theoretical framework for the study. It works through the anarchist worldview, merges the anarchist tradition with the Free Software philosophy, and proposes a theory of digital colonialism.

Chapter Four details the methodology. It outlines the research paradigm and ontological perspective, describes the research problem, provides the approach to policy analysis, reviews the research design and methods used in the study, explains the procedures used for data analysis, and addresses reliability, trustworthiness, and ethical considerations. It also explains the evolution of the study.

Chapter Five presents the empirical research findings with respect to what Operation Phakisa is and how it is being implemented on the ground.

Chapter Six presents research findings with respect to policy documents and interviews, according to the themes of Free Software and Privacy. It is divided into three sections: an overview of software policy in South Africa, respondents' perspectives on Free Software, and respondents' perspectives on Privacy.

Chapter Seven analyzes OPE with respect to its implications for education, economy, and society, as well as why certain policy choices and plans are being made and not others. For the former, it focuses on the new hidden curriculum for e-education, the loss of autonomy for teachers, and the corporate colonization of South Africa through e-education. For the latter, it focuses on corporate influence on policy and policy mobility, policymaker competencies and self-interest, and democratic procedures. It concludes with considerations of OPE as digital colonialism.

Chapter Eight concludes the dissertation. It summarizes the key arguments and findings, offers recommendations for e-education policy, and makes suggestions for further research.

## 1.7: Conclusion

This chapter provided background to the dissertation by presenting the context, approach, and content to follow in this thesis. By detailing the social context, it offered a general backdrop against which the reader can understand South African policy. The theoretical context was next outlined so that the reader may understand the philosophical approach of the study. Literature review and the relevant debates were detailed next, revealing that literature has not adequately problematized the relationship between control over the core pillars of the digital ecosystem and education, economy, and society. Moreover, it noted that there is a paucity of research available on digital colonialism, the sociology of digital technology in South Africa, and education technology policy in basic education. It also reviewed Western literature on the politics of digital technology, finding that it tends to be Eurocentric, with little or no attention to the Global South. In light of this scholarly backdrop, this chapter noted how the thesis conducts a policy analysis designed to discover what technology choices are being made for the national e-education policy policy – and why. It reviewed how the dissertation utilizes semi-structured interviews and primary source publications to describe Operation Phakisa Education and analyze national education technology policy. The chapter concluded by outlining the organization of the thesis.

The next chapter reviews the social context for the dissertation. It presents a brief history of colonial conquest and education, analyzes the current state of education, explains how e-education works, and provides a snapshot of the digital economy and society in South Africa.

# Chapter 2

## The Educational and Technological Context

### 2.0: Introduction

The previous chapter introduced the social context of the general challenges South Africa faces in the post-apartheid period. This chapter provides an overview of the social and educational context for e-education policy in South Africa. The first section expands on the educational context briefly mentioned in Section 1.1 by presenting the basic data, metrics, and inventory of factors leading to poor educational outcomes in South Africa. This includes an overview of endogenous and exogenous factors in education that bear upon educational outcomes. With a strong empirical foundation established, it then evaluates the popular neoliberal educational doctrine marshaled by the Stellenbosch School of intellectuals to challenge the integrity of public education and teacher autonomy. It argues that although the neoliberal education doctrine is fraught with narrow and unsupportable contentions, it has helped set the stage for corporate control and digital colonization in education via Operation Phakisa in Education, which is explored in Chapters 5-7. Section 2.5 explains models for contemporary mainstream education technology – blended learning, flipped classrooms, adaptive learning, and dashboard learner management systems. The following section reviews the digital divide in South Africa as context for later discussions about the implications of e-education policies for the broad digital society.

### 2.1: Education in South Africa: Basic Data

In 2013 there were 30,027 basic education schools in South Africa. 24,136 were ordinary public schools, 1,584 were ordinary independent schools, and 4,307 were other education institutions (including early childhood development centers and special needs schools). There were 12,883,888 learners in all sectors of the basic education system with 11,975,844 (93.0%) in ordinary public schools, 513,804 (4.0%) in ordinary independent schools, 277,736 (2.2%) in early childhood development (ECD) centers, and 116,504 in (0.9%) in special schools. Educators serving the sector numbered 447,149. Countrywide, the average school size was 486 learners (DBE, 2015b, pp. 3-6).

The government spends a significant percentage of its budget on education. Approximately 79% of the education budget is spent on personnel (educator compensation), a figure comparable to other developed and developing countries (Juan, n.d.).[29] The remaining proportion is devoted to other educational needs, such as textbooks, workbooks, school building infrastructure, computers, and science laboratories. Annual government expenditure on the education sector comprises the largest share of its budget and ranks high by global standards (Biko, 2013, p. 185). General government spending on education during 2013/2014 was R249 billion (Statistics South Africa, 2015), comprising 19.7% of the total national budget (with 16.7% devoted to basic education) and 6.7% of the Gross Domestic Product (GDP) (SAIRR, 2016, p. 437; Butho, 2016).[30] Spending on the poorest fifth of schools is six times that of richest fifth in effort to offset apartheid-era educational inequities (Van der Berg et al., 2011, p. 3). However, inequalities in resources between formerly whites-only (ex-Model C) schools and black schools for the poor black majority persist, in large part due to the fee structure that partially privatizes public schools (Sayed and Motala, 2012; Badat and Sayed, 2014). These problems are illustrated in Section 2.3.

## 2.2: Educational Performance Metrics

The government considers education an apex priority for South Africa (DBE, 2011, 2015a; Zuma, 2017a). The central document guiding national policy, *National Development Plan 2030: Our future – make it work*, lists "Improving the quality of education, skills development and innovation" as a top-three objective for the *National Development Plan* (NDP) (NPC, 2012, p. 27). According to the NDP, "Education, training and innovation are critical" to "eradicating poverty, reducing inequality and growing the economy" (*ibid*, p. 297). Education and skills are likewise considered crucial to "building an inclusive society, providing equal opportunities and helping all South Africans to realise their full potential, in particular those previously disadvantaged by apartheid policies, namely black people, women and people with disabilities" (*ibid*, pp. 296-297).

29 Other country expenditures as a percentage of total expenditure in 2011: Mexico (92.9%), Japan (86%), UK (82.6%), USA (81.3%), Brazil (76.7%), and Australia (76.3%) (Visser and Juan, 2013).

30 In 2018/19, the government will spend over R240billion (17.5% of the consolidated budget) on basic education (Gordhan, 2017), much in line with previous years (Gordhan, 2016). Throughout the post-apartheid period, the South African government has spent around 18-20% of its budget on education, which amounts to around 5-7% of its GDP. The late apartheid-era government spent approximately the same portion of its GDP on education, with 22 to 24 percent of its total budget spent on education in the late 1980s and early 1990s (Fiske and Ladd, 2005, p. 50; Financial and Fiscal Commission, 1998, pp. vi-vii, 31, 35-38). For annual budget spending starting in 1996/97, see SAIRR, 2016, p. 439.

Despite strong government commitment to education in policy and purse, the post-apartheid public educational system performs poorly. South Africa continuously ranks at or near the bottom of cross-national standardized tests. While standardized tests can be overemphasized at the expense of non-quantifiable elements important to education (Kamanetz, 2015), they provide a valuable assessment of elementary competencies. Let us then evaluate educational performance according to standardized metrics.

South Africa participates in three cross-national standardized testing systems: the Trends in International Mathematics and Science Study (TIMSS), The Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ), and the Progress in Reading and Literacy Study (PIRLS).[31] These exams compare pupils across countries, as well as to South African cohorts over time (DBE, 2011, p. 73). In each of the tests, South Africa ranks at or near the bottom. The TIMSS examination tests the mathematics and science knowledge of fourth and eighth grade learners. In the 2011 exam, Grade 9 South African students performed worse than any other middle-income country and placed among the bottom of 45 participating developing countries (HSRC, 2012, pp. 4-5).[32] Low achievement scores extended across the performance spectrum, as "the *average* scale score of the top seven countries exceed[ed] South African performance at the 95th percentile" (*ibid*, p. 5, emphasis added). South Africa's mathematics results were also the most unequal among participating countries (DBE, 2011, p. 75).[33] In 2015, new TIMSS scores were released. The results were similarly discouraging: two thirds of Grade 9 learners cannot perform basic mathematics and science (HSRC, 2017, p. 23). Performance differed according to race and class: 81% of Grade 9 learners at independent

31 A fourth study, the World Economic Forum (WEF) Global Competitiveness Index, recently ranked South Africa last out of 140 countries for the quality of its math and science and 127 in quality of primary education (Schwab, 2015, p. 327). The WEF study has been roundly criticized for its methodology, which merely polls the opinions of business executives and ranks countries according to their opinions. For example, the 2015 study samples 50 South African executives; using a 7-point scale, it asks: "In your country, how would you assess the quality of math and science education in schools?" (*ibid*, p. 377). As such, it is little more than a satisfaction of index for 50 wealthy businessmen (DBE, 2015c; Wilkinson, 2014; Spaull, 2014; Ndlovu, 2015). Nevertheless, the report makes for sensationalist headlines in the South African press, often without critical context (Masondo, 2015; BusinessTech, 2015a; Kalenga, 2015; MyBroadband, 2015).

32 The TIMSS survey was completed in 2002, 2011, and 2015. In South Africa in 2002, both Grade 8 and Grade 9 pupils were tested. In 2011, only Grade 9 pupils were tested in South Africa, Botswana, and Honduras (DBE, 2015a, p. 27).

33 "The top 5% of performers in South Africa fared worse than their counterparts in countries such as the Philippines, Egypt and Indonesia. The bottom 25% of learners performed at about the same level as their counterparts in Ghana, but well below their counterparts from all other participating countries" (DBE, 2011, p. 75). Note that South Africa's TIMSS ranking may be artificially low by comparison to other countries (DBE, 2015a, p. 27). Less than half of all countries worldwide participate in the TIMSS study and, on the DBE's account, those who do "tend to to be countries which take education seriously" while those who do not are "generally countries with particularly weak education systems" (*ibid*). The TIMSS 2011 test was administered in English and Afrikaans (TIMSS and PIRLS, n.d., p. 5), which likely disadvantaged students who speak a different first language at home.

schools, 60% at fee-paying schools, and just 19% at public no-fee paying schools achieved maths scores above the minimum level of competency score of 400 (Reddy et al., 2016, p. 8).[34]

The SACMEQ system offers the most comprehensive study of education in Sub-Saharan Africa (Wilkinson, 2013). SACMEQ asks Grade 6 learners multiple-choice questions about Reading, Maths, and Health, and gathers demographic and home background data. In the 2007 test, South African students placed 8th in maths and 10th in reading by comparison to the 15 participating Southern African countries (Hungi et al., 2010, pp. 12-23).[35] Among SA learners, 27.2% were categorized as "non-readers" and 40.2% "non-numerate" (i.e. lacking the basic skills required for literacy and numeracy) (Maloi and Chetty, 2010, p. 57). In 2016, results of the 2013 SACMEQ IV examination were published. While they demonstrated "improvements" across many countries, they were calculated differently than SACMEQ III, and weaker students were excluded from the final results. For this reason, some researchers dismissed the findings (e.g. Spaull, 2016).

Critics of SACMEQ IV were vindicated with the publication of the third international study, PIRLS. The 2017 report found that a shocking 78% of Grade 5 learners cannot read for meaning – 20% higher than previous estimates (Mills et al., 2017).[36] Not surprisingly, the groups at greatest risk track with poverty: "those in deep rural areas and townships, those learning in African languages, and boys" (Chambers, 2017). Given that reading is required to build more advanced forms of knowledge, the report revealed the crisis in South African education is worse than previously thought.

The National Senior Certificate (NSC), also known as "matriculation" (matric), is the final metric for consideration. The NSC is a high school diploma and school-leaving certificate for Grade 12 learners. To obtain an NSC, pupils must pass an examination of four mandatory subjects (two official languages, with at least one as a home language; life orientation; and mathematical literacy or mathematics) and three NSC-approved subjects chosen by the pupil. Various levels of performance determine the distinction that qualifies students for tertiary education (see Independent Examinations Board, n.d.).

---

34 Given that South Africa placed second-to-last in maths and last in science, some critics characterized Motshekga's positive representation of the results as self-serving spin (BusinessTech, 2016a; Davis, 2016a; Phakathi, 2017a) or expressed guarded optimism (Govender, 2016a). Upon further reflection and media discussion, Motshekga revised the DBE's initial optimism, stating that "progress" may have been "misplaced" as "the extent and depth of the problem is often underestimated" and "[t]he cold hard fact is we are moving from a low base" (African News Agency, 2016).

35 Participating countries were: Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania (Mainland), Tanzania (Zanzibar), Uganda, Zambia, and Zimbabwe.

36 By comparison, in the US it is only 4%, in England just 3%. Of the other two participating African countries, Egypt was at 55% and Morocco was at 47% (Mills et al., p. 55). South Africa placed last of fifty countries, but most of the countries were High Income countries.

Improving the NSC pass rate is important because it indicates educational achievement and qualifies learners for further education, training, and university studies. The current pass rate is around 75%, but the pass rate alone provides an incomplete picture. About half of all learners from a given age cohort drop out of school by the time they reach Grade 12. When including those who dropped out of school – 51.71% of learners from that age cohort – the *total* cohort pass rate drops to 36.4% (EE, 2016a).[37]
The three cross-national studies, as well as the matric pass rate, illuminate several points worth keeping in mind. There is a high degree of performance inequality *internal* to South Africa, and even the best students perform at a much lower level than their international counterparts. Many students lack basic reading and mathematical literacy from an early age and continue to struggle as they advance through school. Language of instruction presents an additional challenge for students who speak an African language as their first language. And finally, socioeconomic status and race are highly correlated to performance outcomes.

## 2.3: Educational Outcomes: Endogenous and Exogenous Factors

Schooling takes place within the context of the greater society. Learners and teachers are impacted by their families, their communities, broad trends in the economy, the availability of resources, and many other factors. This section reviews some of the most salient endogenous and exogenous factors contributing to poor outcomes in basic education. Each of the factors in this section is specific to education and add to the broader context of poverty, inequality, and unemployment detailed in Section 1.1.

*Physical Infrastructure*

Infrastructural problems pose major challenges to successful education, especially in poor areas. Visser and Juan (2013), evaluating 2011 TIMSS questionnaires, found that "Schools with physical assets and infrastructure, such as libraries, laboratories and computers, exhibit more positive educational outcomes, while indicators of inferior infrastructure and assets tend to be negative" (p. 20). Improvements to education will thus be limited to the extent that they are negatively affected by insufficient infrastructure.

37 Cohort rates are similar across recent years (see Table 2, EE, 2016a).

Spending on infrastructure (and education in general) is constrained by national economic policy and implementation. Infrastructure backlogs are accumulating, with little indication that the problem will subsist (DBE, 2011, p. 151; DBE, 2015a, p. 45). Unless the government is willing to spend more on education, there is little room to increase infrastructure spending (DBE, 2011, p. 28). Nevertheless, the DBE (2011) maintains that school infrastructure investment presents "[b]y far the largest financial need" (p. 27). A 2011 DBE *National Education Infrastructure Management System* report found that many schools lack adequate electricity, water supply, ablution facilities, stocked libraries, laboratory facilities, fencing, and computer centers. More recent data (EE, 2016b) found that several thousand schools still have unreliable water supply and electricity, while 4,624 schools still have pit latrine toilets and approximately 1,000 are built out of wood, mud, abestos, and brick (Heard, 2017). The deficiencies have tragic effects on poor black communities. In 2014, a six-year-old child, Michael Komape, died after falling into a pit latrine toilet – a story which went viral in 2017. In early 2018, five-year-old Lumka Mketwa also died after falling into a pit toilet.

Activist groups Section27, Equal Education, and other organizations have been pressuring the government to provide safe and adequate school infrastructure in accordance with the Minimum Norms and Standards for School Infrastructure legislation passed in November 2013 (Davis, 2018). In July 2018, the Bhisho High Court ruled in favor of Equal Education in *Equal Education v Minister of Basic Education*, holding that the government must realize proper infrastructural benchmarks with immediate effect as part of the unqualified right to basic education (Veriava, 2018). It remains to be seen what measures will be taken in response to the ruling, but for now, a sizable portion of children must cope with woefully inadequate or dangerous infrastructural constraints.

*Content Delivery*

Poor academic performance is correlated to textbook availability (UNESCO, 2016, pp. 3-4; Van der Berg et al., 2011, p. 5).[38] Textbook shortages, in turn, correlate to race and class. In their review of SACMEQ data, Van der Berg et al. (2011) found that "Among the poorest 20% of learners, 37% either did not have a Reading textbook at all, or had to share the book with two or more other children. Only 15% of the richest learners were in a similar position" (*ibid*). This creates disadvantages for the poor black majority, as students who are not provided textbooks on time will be disadvantaged academically.

38 As Statistician-General Lehohla puts it, "[y]ou seen (sic) when you're hungry you want food now, because if the food comes much later you'll be dead. It's exactly the same for schooling. You need everything that you need for schooling in the first quarter, rather than it coming in the second or third quarter" (Nkosi, 2016; see also, DBE, 2011, p. 120).

According to the DBE (2011), “Learning and teaching materials are in abundance and of a high quality” (p. 47). The 117 million textbooks “printed and distributed by just the national government for the 2011 to 2013 school years” supersedes the 74 million textbooks required “[i]f the national policy of one textbook per subject were achieved” (*ibid*, p. 38). “Access to books appears to [be] improving”, they maintain, but it “should be better” (DBE, 2015a, p. 12). Indeed, the timely delivery, use, and presence of learning and teaching support material (LTSM) still burdens many poor black schools (see, *inter alia*, Govender, 2016b; Chirume, 2016; Van Aardt, 2017). LTSM shortages made national headlines in December 2011 when the DBE failed to provide textbooks to Limpopo schools on time in the “Limpopo textbook crisis” (Chisholm, 2013).[39] In 2015, the South African Supreme Court of Appeals ruled that the Limpopo failures infringed on the constitutional right to a basic education.

*Curriculum Coverage*

Failure to cover the entire curriculum over the course of a year slows learner progress considerably. Most teachers only cover about 50% of the lessons they are scheduled to teach during a given year (Van der Berg et al., 2016, p. 28).[40] Without covering the full years’ curriculum, students fall behind – a problem which compounds over the years as students advance by grade. As a retention crisis accumulates there is pressure to pass students even when they have not met the proper standards for their particular grades. The DBE (2011) summarizes the issue noting that:

> In 2009, the percentage of learners dropping out at the end of their grade varied from approximately 3% in Grade 7 to 4% in Grade 8; 7% in Grade 9; and 12%” in Grade 10. To a large extent this is a reflection of under-achievement, grade repetition and learners being over-aged relative to their peers – all of which contribute to a sense of hopelessness amongst learners and abandonment of school (p. 64).

39 In 2012, it was revealed that the DBE had known about textbook shortages at least five years prior (Nkosi, 2015; John, 2012b.) By June 2012, as many as 22% of textbooks were still not delivered in Limpopo (ALC, 2015). Affected learners were primarily, if not exclusively, poor and black (De Vos, 2015).

40 However, as the DBE (2011) notes, “Research indicates that even in affluent countries, a large number of schools experience losses of learning and teaching time as great as 30% as a result of disruptions and administrative tasks” (p. 120). Results withing SA vary by province and socioeconomic factors (*ibid*, p. 119). A 2011 DBE survey analyzing exercise books in Grades 6 and 9 “found that only 53% of students nationally had covered the bare minimum number of exercises required for curriculum coverage”, with variation by province: 85% in Gauteng, 76% in the Western Cape, 27% in the Eastern Cape and 24% in the North West (Van der Berg et al., 2016, p. 49).

The ability to retain students and advance their education in a timely fashion remains a central challenge for basic education.

*Early Childhood Development*

There is a consensus that South African educational performance is heavily impacted by poor early education outcomes. If over half of all students cannot read for meaning by the end of Grade 4, then they cannot further develop their education. Thus, within the first few years of schooling, much of the battle has already been lost (DBE, 2015a, p. 31). For this reason, the NPC (2012) decided to "[m]ake early childhood development a top priority among the measures to improve the quality of education and long-term prospects of future generations" in the *National Development Plan* (p. 300). The NDP would like to make two years of quality preschool enrollment for four- and five-year-olds compulsory before Grade 1. For the government, early childhood development should be broadly defined to "[take] into account all the development needs of a child" (*ibid*).

Yet ECD is a poorly resourced, inequitable system. The DBE (2011) notes that "Public spending on pre-primary education has increased more than spending on any other area of education" and beyond the increase in enrollments (p. 80). Nevertheless, the "preconditions for quality teach and learning [are] uneven across the system and weak in many schools," especially with respect to class size and learning materials" (*ibid*). Low teacher quality and salaries also hinder the system (*ibid*, p. 82; Van der Berg et al., 2016, p. 20). ECD attendance is increasing; however, the results are mixed. The government believes variation in quality accounts for outcome discrepancies (DBE, 2015a, p. 28). The DBE thus states that "special emphasis needs to be placed on ensuring that Grade R is of an acceptable quality" (DBE, 2011, p. 29).

*Home Environment and Parents/Guardians*

The home environment – resources available to learners outside of school – has a decisive impact on learners (Howie et al., 2012; Visser, Juan and Feza, 2015).[41] Through an assessment of "three predominant factors… educational, general (socioeconomic status) and parents" Juan and Visser (2013) found "a positive association between the number of resources at home and the achievement of scores of learners – the more resources available, the higher the achievement scores" – both in South Africa

41 Resources include include both tangible items (such as books or computers) and intangible assets (such as formally educated guardians).

and internationally (p. 19). For SA learners, access to resources at school and at home were low by international standards (*ibid*, p. 21).

Learners with formally educated parents and high levels of resources have an enormous advantage over those without well-resourced households. Juan and Visser found a positive association between socioeconomic status and educational performance,[42] as well as “a strong relationship between learner achievement and parental education, especially that of female guardians” (*ibid*, pp. 20-21).[43] Not surprisingly, formal schooling and the literacy rates of parents vary according to race.[44] Evidence strongly suggests improving education and resources in the household are essential to learner achievement (Visser and Juan, 2013, p. 21). Speaking in 2015, then Deputy President Cyril Ramaphosa and DBE Minister Angie Motshekga stated that only 14% of South Africans are active book readers and only 5% of parents read to their children (Ramaphosa, 2015; Motshekga, 2015).[45] This is problematic, given that prePIRLS learners with parents who like to read (22%) scored 50 points more than learners with parents who do not (approximately 10%) (Howie et al., 2012, p. 62).[46] Moreover, access to many resources at home is higher among English and Afrikaans learners than the other nine language groups (*ibid*, p. 61).[47] Studies across the world show that improving adult literacy and resource allocation is critical to improving the education system (Clark, 2007), and it would help if South Africa could improve adult literacy rates through policy interventions.

*Community and Social Problems*

Learners and educators do not live or learn in an abstract education bubble. They are physically and mentally connected to their communities and broad life experience. Schooling and education is only *part* of society. When evaluating educational outcomes, non-academic life experiences and aspects of education must be weighted properly.

42 For a graph comparing class and basic reading, mathematics, and science results using General Household Survey, PIRLS, and TIMSS data, see TIMSS SA, n.d..

43 In 2011, 19% of parents had completed a university degree, compared to 11% in 2002. Higher parental educational status positively affected learner performance (Juan and Visser, 2013, p. 21).

44 With respect to adults (ages 20 and over), 6.2% African, 2.2% coloured, 2.0% Indian/Asian, and 0.2% white persons have had no schooling; 67.9% African, 69.4% coloured, 83.0% Indian/Asian, and 94.2% white persons completed Grade 9; and 5.3% African, 5.3% coloured, 15.9% Indian/Asian, and 27.5% white persons completed post-school education (SAIRR, 2016, pp. 451-453). For adult literacy (ages 20 and over), 80.1% African, 86.0% coloured, 92.4% Indian/Asian, and 98.6% of white persons are literate. With respect to adult numeracy (ages 20 and over; defined as the ability to calculate change for a purchase), 10.8% of African, 4.9% coloured, 2.5% Indian/Asian and 0.2% white persons are innumerate (*ibid*, pp. 456-457).

45 These statistics are attributed to the South African Book Development Council (Western Cape Government, 2014).

46 Internationally, 31% of parents were found to like reading (Howie et al., 2012, p. 62).

47 South Africans have far fewer household resources for learning than the international average. See Howie et al., 2012, pp. 61-62, 70-71.

Within the school system, safety, violence, and health issues pose problems for learners and educators (Reddy et al., 2015, pp. 24-27). In recent years bullying has been found to adversely impact South African learners. The 2011 PIRLS survey shows that “Bullying...emerged as a factor to blame for poor performance of the country's pupils. At least 55% of grade four pupils ‘report frequent bullying at primary school, the highest internationally’” (Nkosi, 2012). According to Howie et al. (2012), “[m]ore than half of the learners in Grade 4 experienced being bullied weekly, which is substantially different from all the other countries in the study. These children on average, tended to achieve more than 50 points fewer than learners who were not bullied as often” (p. xvii).[48] Visser and Juan (2013) report that 2011 TIMSS data show 75% of South African learners experience bullying on a monthly or weekly basis, with a higher proportion in public schools than in independent schools (p. 22; see also, Reddy et al., 2015, p. 27; News24, 2013a, 2013b; Louw, 2013).[49]

An array of other social and community problems have been found to impact education, including high rates of youth pregnancy (SAIRR, 2016, p. 485), corporal punishment (Röhrs, 2016a, 2016b; Chabalala, 2016), high rates of sexual assault ( University of the Witwatersrand Centre for Applied Legal Studies, Cornell Law School Avon Global Center for Women and Justice, and Cornell Law School International Human Rights Clinic, 2014, p. 7; UNAIDS, 2014, p. 141); HIV/AIDS among students (5.6% of adolescent girls aged 15-19) and teachers (13%) (UNAIDS, 2014, p. 17; UNAIDS, 2016, p. 228; Fiske and Ladd, 2004, pp. 197-199);[50] nutrition and visual impairment (DBE, 2011, p. 159, 2015a, p. 24); and drug and alcohol abuse (McGroarty and Parkinson, 2016; DBE, 2011, p. 159). These social, community, and health issues are broad social problems schools have little ability to change, yet they impact the education system and must be accounted for in explaining educational failures.

### *Ideology, Culture, and Content Relevance*

The DBE (2011) states that in order for education to be successful, learning must be fun and interesting in order to inspire a love of learning. As they put it, “It is a passion for education and not a fear of not meeting targets that must ultimately drive education” (DBE, 2011, p. 61). Howie et al. (2012) present

48 Internationally, 47% of learners are almost never bullied at school and 20% are bullied about weekly. In South Africa, only 17% are almost never bullied and 55% are bullied about weekly (Howie et al., 2012, p. 83).

49 In public schools almost half (42%) of independent school learners had almost never experienced bullying compared to one in four (24%) of public school learners (Visser and Juan, 2013, p. 22). More no-fee public school learners experience monthly or weekly bullying (82%) than fee-paying public schools (63%) (Reddy et al., 2015, p. 27).

50 South Africa has the largest population living with HIV (proportionally at 18% in 2013, and absolutely at approximately 7 million in 2015) (UNAIDS, 2014, p. 17; UNAIDS, 2016, p. 228).

empirical evidence to validate this sentiment. Learners who do not like to read performed worse on PIRLS (pp. 56-58), while higher confidence and motivation levels were correlated with better test scores (pp. 58-60).[51] "Teachers", the DBE (2011) adds, must also "be sufficiently motivated to undertake the training they require" (p. 109; see also, Heystek and Terhoven, 2014).

Curriculum content commonly fails to suit the lives of most teachers' and learners' interests, which could negatively impact interest in teaching and learning (Masola, 2016). Very often, curriculum reflects the interests and experiences of those with power and privilege. Writing in *Business Day*, Nomalanga Mkhize (2016) opined that her education at an elite Victorian high school in KwaZulu-Natal "was ostensibly offering the best available education under the sun, but it also seemed that it was teaching me nothing at all of what was going on around me. It was not that the education was bad — it was stellar in other respects — but it was intellectually thin and devoid of social intelligence (*ibid*)." As a concrete example, she recounted how despite her fear of "being butchered in the night" during post-94 civil warlord violence in the Midlands:

> ...once I entered the school grounds I had to act as though none of that mattered, that none of it existed. Of course, there were two or three courageous teachers who 'got it', and went against the grain. But for the most part I kept wondering: what kind of schooling is this, and what is its purpose? Moreover, I began wondering: what on earth is going to happen to all my schoolmates, most of them white and oblivious, once we grow up? Can they really contribute meaningfully to the reconstruction of this country if their education leads them away from local history? The paradox of elite education in SA is that it breeds an economic elite with very little social literacy, and who display contempt for the idea of social intelligence (*ibid*).

If the curriculum of elite schooling does not speak to local, social intelligence, and to the experiences of people of color and other attributes (genders, religions, etc.) – it will alienate those same people and perpetuate the legacy of apartheid. Many individuals attending elite schools who go on to become educators, intellectuals, and other professionals may reproduce the same ideologies they were fed growing up. Ensuring that learning and content is relevant, interesting, honest, and fun – especially for the poor black majority – is necessary to improve the education crisis.

51 Crucially, "The learners who were tested in Afrikaans or English appeared to be the most motivated, with three-quarters in the motivated category and achieving over 80 points more than their less motivated counterparts. In contrast, those tested in Xitsonga (53% motivated) and Sepedi (55% motivated) appeared the least motivated and, coincidentally, had the lowest (412 points) and third lowest (430 points) scores respectively" (Howie et al., 2012, p. 58).

*Language*

Language presents a major hurdle to equal educational outcomes. According to the 2011 Census, Xhosa and Zulu are the most common first languages (22.7% and 16.0%, respectively), with Afrikaans (13.5%) and English (9.6%) third and fourth, and the remaining seven official languages together comprising 36.2% (Lehohla, 2012, pp. 23-24). Thus the official African languages comprise 74.9% of first languages spoken, yet English remains the "universal" language in the country. According to Statistics South Africa (2014), mid-2014, the population numbered 54 million, and 80.2% were African, 8.8% coloured, 2.5% Indian, while just 8.4% were white (pp. 2-3).

The poor black majority not only faces socioeconomic and communal challenges, but most of their children are tasked to learn in English – a second language – from Grade 4 onwards in all schools. This is challenging for students with African languages in the home. Approximately 70% of all students Grades 1-3 learn in an African language,[52] but in Grade 4, approximately 90% learn in English. According to some researchers, students find it easier to transition to a second language once they have mastered their first language, but many South African learners have not mastered their first language by the end of Grade 3 (Van der Berg et al., 2016, p. 15; Taylor and Von Fintel, 2016).

Studies suggest humans develop preferences for native-language speakers early in life (Kinzler et al., 2007), with in-group/out-group social and political dominance implications.[53] The struggle over language policy is difficult to resolve in part because the English language is often a ticket to upward mobility. Mastery of English helps individuals obtain some of the best jobs, succeed in formal higher education, access the local and international print press (and other educational materials), and successfully avoid discrimination in interactions from those with money and power.[54] Even though they are a small minority with a history of brutal colonization, white people have not made great strides to help redress apartheid contexts by, say, demanding stringent requirements for the mastery of an African language in all public schools. Would white people be receptive to a school system pushing African languages on them? It seems unlikely. In the meantime, English language dominance poses a challenge to educational achievement and equity.

52 Taylor and Coetzee (2013) put the number at about 60% for Grade 3.

53 This is all too familiar in SA. Struggles over language prompted, for example, the Soweto uprisings. As Nelson Mandela put it, "if you speak to a man in a language he understands, you speak to his brain. But if you speak to him in his own language, you speak to his heart" (La Grange, 2014, p. 31).

54 According to BusinessTech (2017a), the government has found cases where learners are penalized for speaking African languages on school campuses.

*The Weight of History: Colonialism, Segregation, and the Apartheid Legacy*

Any honest discussion about South African society must acknowledge the enduring legacy of apartheid. In education, centuries of inequality, extending back to European settler colonization, has clearly led to the present situation. Prior to European arrival, education was carried out informally through families, oral tradition, folk lore, art, religion, recreational life, social culture, as well as formally through initiation rites and apprenticeship/craftsmen (Seroto, 2011, pp. 37-55). The first formal school was a slave school opened in April 1658, six years after the Dutch East India Company (Verenigde Oostindische Compagnie) established its Cape colony. Started by Jan van Riebeeck, it was formed to strip slave children of their native identities and subordinate them to Dutch Calvinists through authoritarian control and religious curriculum. After they had been captured and transported by the Amersfoort slave ship, some of the children rebelled against the colonial authorities by running away. Acts of resistance and agency were expressed through the pursuit of literacy by Khoikhoi people in Baviaan's Koof (with guidance from a German missionary, George Schmidt) and by Muslim slaves who started the first madrassah (religious school) at the Cape in 1793. Slave and native Khoisan children were sometimes permitted in white schools, but were usually kept out (Soudien, 2010).

Formal schooling for the Dutch began during the late 17th century, also under the auspices of the Dutch East India Company and Dutch Reformed Church. Their education revolved around the transmission of basic literacy for the purpose of readings the Bible to prepare them for church membership. Education for black people was to be conducted primarily through missionary schools during the colonial and segregation eras.

Prior to the 20th century, schooling was not a central feature of community life as it is today (Le Roux, 2011, pp. 104-116). Compulsory schooling became more prominent in the decades after industrial development with the discovery of diamonds and gold in the interior. During this period, white authorities shifted school goals for Africans from a (colonial) conversion to Christianity to more secular-based "[p]ractical learning or industrial training" (Soudien, 2010, p. 32). As these events unfolded, African peoples appropriated aspects of colonial education and adapted them to their own circumstances.

With the transition to the apartheid government, an abominable white supremacist blueprint for society was drawn up by the National Party. It imposed strict racial categories on the population (white, coloured, Indian, and African) and entrenched white domination over people of color – with the

African majority at the bottom of the hierarchy. The educational system devised was called “Bantu[55] education”. Hendrik Verwoerd, a chief architect of apartheid and Bantu education, explained his vision for apartheid education:

> When I have control of Native education I will reform it so that Natives will be taught from childhood to realise that equality with Europeans is not for them. People who believe in equality are not desirable teachers for the Natives. Education must train and teach people in accordance with their opportunities in life, according to the sphere in which they live (as cited in Tabatha, 1980 [1959], p. 6).

I.B. Tabatha (1980 [1959]) summarizes the purpose of Bantu education in *Education for Barbarism*:

> The African is to develop capitalism in South Africa, but he is not entitled to the fruits of his labour… The primary purpose of Bantu Education is not only to produce a docile black labour force, but also a labour force unable to perceive the social, political and economic contradictions. To defuse these contradictions, education for the blacks had to be re-tribalised (*ibid*).

While blacks were indoctrinated for servitude, the white masses were subjected to Christelik-Nasionale Onderwysbeleid (CNO) or Christian-National Education. CNO policy stated, “We will have nothing to do with a mixture of languages, of culture, of religion or of race” (*ibid*, p. 32). The policy stressed strict discipline (including teacher control) and the centrality of religion – even in secular subjects.

Much of today’s educational dysfunction and low performance outcomes are inherited from centuries of colonial oppression.[56] The apartheid legacy cannot be dislodged from serious considerations of education performance. As we have seen in this section, the empirical evidence demonstrates that post-1994 inequality is inextricably linked to the past.

55 “Bantu” became a term used by whites to label Africans, many of whom spoke languages from the Bantu language family as their mother tongue.

56 Interestingly, this may extend to the white population. As we saw in previous sections, for general skill sets, top South African learners include an over-representation of whites, but they tend to perform lower than European and other counterparts in the developed world on standardized cross-national tests (i.e. the top learners in SA perform only as well the average learners from many other countries).

## 2.4: Privatization and Neoliberalism: The USA and the Stellenbosch School

Neoliberal[57] education philosophy is characterized by the reduction of education to its economic value within a capitalist system. This frequently entails an exclusive focus on decreasing poverty, inequality, and unemployment in the interests of equal *opportunity* within the parameters of capitalist inequality. Teachers and teachers' unions are often blamed for poor educational outcomes based on the contention or tacit assumption that they are overpaid, lazy, and enjoy unjust union protection at a systemic level. It seeks to coporatize public schools through privatization and the transformation of public schooling on the corporate model using tools like standardized test scores ("teaching to the test") and performance-linked pay ("merit pay") to reward and punish teachers and schools based on quantifiable performance metrics and zero-tolerance policies (Saltman, 2009; Giroux and Saltman, 2009). Neoliberals orient education towards employment opportunities in the job market and assume marginalist notions of meritocracy to explain economic inequality (e.g. Van der Berg, 2005; Taylor and Yu, 2009, pp. 51-52). As proponents of "human capital theory" (Robeyns, 2006, pp. 72-75), they blame supply-side shortcomings (learner skills) for economic problems like poverty, inequality, and unemployment (Spaull, 2011; Van der Berg, 2005; Van der Berg et al., 2011, p. 12). In doing so, they discard the importance of rights, capabilities, and social justice (Robeyns, 2006, pp. 75-83; Tikly and Barrett, 2011) while ignoring structural problems on the demand side (such as exogenous factors like falling commodity prices and rising interest rates, power and interests, and fiscal policies) (Motala and Vally, 2014; Vally and Motala, 2014b).

Mainstream South African educational narratives are heavily influenced by a small collection of neoliberals centered at Stellenbosch University – what I call the Stellenbosch School – who derive their philosophy from the Global North. The popular US film, *Waiting for "Superman"* (*WFS*), provides a clear example of how the Stellenbosch School matches up to Northern doctrines. Created by the same people who made the Academy Award winning film, *An Inconvenient Truth* (2003), *Waiting for "Superman"* was released in 2010 to critical acclaim, high box office sales, and its own set of awards. The film provides a snapshot of the neoliberal educational philosophy and helped generate a wider audience for the movement to privatize public education through "school choice" and charter schools.

57 The term "neoliberalism" is sometimes considered a buzzword thrown about as the bogeyman of capitalism. Some seek to deny the fact of neoliberalism as a distinct form of capitalism (Monbiot, 2016). South Africa's eminent education scholar, Jonathan Jansen, claims students use neoliberalism as an "attack word" to "signal radicalism" while they may or may not know what the word means (Jansen, 2013). For Jansen, this signifies "schooled" individuals, not "educated minds". While neoliberalism has many variants (Marais, 2011, pp. 134-139), there is in fact an historical pattern of economic thought and policy appropriately called "neoliberalism" (see, *inter alia*, Stretton, 2000, pp. 1-64; Chomsky, 1999; Harvey, 2005; Stanford, 2008, pp. 40-49; Chang, 2008, 2014, pp. 66-78).

For these reasons, scholars note, *WFS* forms a critical "text" in the field of education (Swalwell and Apple, 2011; Apple, 2012; Hermansen, 2014).

The core argument of *Waiting for "Superman"* is that public education and unionized teachers are the cause of poverty and educational underperformance in US public schools. The inventory of factors emphasized in the film include alarmingly poor literacy rates, early learning deficits, excessive drop-out rates, and a risk to domestic innovation due to poor educational outcomes, especially in the high-tech sector, sciences, and emerging knowledge economy. Following the logic of human capital theory, *WFS* states that "for generations, experts tended to blame failing schools on failing neighborhoods. But reformers have begun to believe the opposite – that the problems of failing neighborhoods might be blamed on failing schools" (Chilcott and Guggenheim, 2010). Poor schooling, in turn, is the outcome of public schooling: government policy is incoherent, spending is inefficient, and administration is a failure. Public school teachers are largely to blame: their unions exercise power over the government through financial and political connections and prevent the firing of bad teachers, they are excessively tardy, and poorly performing teachers fail to complete curriculum on time. In short, public schools, teachers, and government bureaucrats have failed learners, and by doing so, they have created the "achievement gap" in education that has led to the concentration of poverty and inequality we see in the United States. Charter schools, by contrast, offer a superior model because they allow for the private ownership of schools, cut out the unions, and produce accountability through job insecurity, merit pay, standardized testing, and other forms of business-like administration.

The film's list of causes, indicators, symptoms, effects on society, remedies, as well as its continual focus on quantifiable metrics and a narrow conceptualization of education, economy, and society in neoliberal terms expresses the broad outlook of the private sector attack on public education. It represents the perspective and interests of a corporate-dominated drive to transform the public education system into a commercialized enterprise based on worker/teacher accountability mechanisms free from many public and private school regulations.[58] Swalwell and Apple (2011) have criticized *Waiting for "Superman"* for reorganizing legitimate criticisms of the education system to serve the interests of dominant groups in society. It neglects critical facts (such as the impact of No Child Left Behind on public schools), omits essential points (e.g. that the Finland schools lauded by the film are

58 For example, see the *New York State Charter Schools Act of 1998 (as amended)*, defining charter schools (under S 2854 – General requirements) as schools "exempt from [many] state and local laws, rules, regulations or policies governing public or private schools, boards of education and school districts, including those relating to school personnel and students, except as specifically provided in the school's charter or in this article" (New York City Charter Schools Center, 2010, p. 16). For a critique of US charter schools, see Ravitch 2013.

fully unionized), and the impact of structural inequities on education (*ibid*; Dutro, 2011; Gerstl-Pepin, 2015). By portraying stories of poor children of color hoping to gain entrance into a private charter school, *WFS* produces neoliberal tropes that reinforce hegemonic constructions of race that blame the victim by individualizing educational attainment and economic prosperity (Dumas, 2013). Since the film's release, studies have shown that on average, charter schools and public schools have essentially the same performance levels (Miron and Applegate, 2009; Maul and McClelland, 2013; Strauss, 2013) and that wealth – not enrollment in private schooling – accounts for student achievement (Pianta and Ansari, 2018).

Despite a long list of problems, the inventory of talking points in *Waiting for "Superman"* is repeated almost verbatim by dominant groups in South Africa – government, the private sector, university intellectuals, and journalists – in challenges to teachers' unions and the push for the privatization or business-like administration of public schools. These groups have placed heavy blame on teachers, teachers' unions, administrators, and the government for the troubled state of learner achievement (Van der Berg et al., 2011; Van der Berg et al., 2016; Masondo, 2015; Masondo, 2016a; Masondo, 2016b; Govender, 2016c; Jansen, 2014; Jansen, 2015; Paton, 2016; Davis, 2016b; Zille, 2013). These critics seek to reform education through the introduction of merit pay, the reintroduction of teacher inspectors, the use of biometric surveillance, and the increase of management through quantifiable metrics (especially through standardized testing and monitoring and evaluation) – all along the same lines of reasoning offered up by neoliberals in the United States (Reddy et al., 2015, pp. 23-24; Van der Berg et al., 2016, p. 47; Spaull, 2013a, pp. 52-53; SANews, 2014; Govender, 2016c; Masondo, 2016b; News24, 2013c; Reddy et al., 2010, p. xi, 88).

Concomitantly, the private sector, journalists, prominent voices in government, and university intellectuals are calling for privatization or quasi-privatization. Citing the value of charter schools, the Michael and Susan Dell Foundation (MSDF) is promoting "collaboration schools" in South Africa – schools that would experiment with severe reforms to public schooling along the lines of charter and charter-type schools in foreign countries (MSDF, 2016), with support from privatization advocates at the DG Murray Trust foundation (MSDF, n.d.).[59] In February 2016, Helen Zille (Democratic Alliance) announced five Western Cape pilot schools called "collaboration schools" which amount to a "public-

59 England's academy schools play a similar role to the US charter school movement in the drive towards privatization and teacher "accountability" (House, 2016). Controversy erupted in March 2016 when the Conservative government announced all public schools would be become academy schools by 2020 (Asthana and Stewart, 2016). They were forced to scrap the plan, which aimed to replace the local council-maintained school system, due to strong opposition from teachers' unions, teachers, and parents (Adams, 2016).

private partnership" to run the schools, based on partnership with non-profits and "philanthropic donors" (Ark EPG, 2016; Zille, 2016b). Zille (2016a) hailed these schools as "the greatest game changer of all" in her 2016 State of the Province speech. In July 2016, Jonathan Jansen called for the implementation of collaboration schools in South Africa based on reforms similar to United Kingdom (UK) academy schools: "in essence a public-private partnership in which the government retains overall responsibility for the school, but its operations are conducted by a range of partners, including private sector companies, donors and non-governmental organisations alongside, of course, parents and teachers" (Jansen, 2016a). He contended this model "can work for one principal reason: the choice of teachers is no longer based on jobs-for-cash, union loyalties, tribal affinity or simple political connections" (*ibid*).[60] Low-fee private schools are also spreading in Gauteng (Steyn, 2016).

The Stellenbosch School intellectuals are the most prominent advocates of the neoliberal education doctrine in South Africa. In 2011, twelve members of the Stellenbosch School – an all-white collection of former degree earners and current faculty at Stellenbosch University – co-authored a report, *Low Quality Education as a Poverty Trap*, detailing their views on the relationship between education and poverty in South Africa. In this report, Van der Berg et al. (2011) argue that overlapping issues of "race, language, culture, education level, and neighborhood" form "an insider-outsider dynamic" that "forge[s]… 'socially embedded' exclusion" (p. 3). Because variables like race and language are difficult to transcend, they contend, education is "the only viable avenue for poor people who want to enter the top end of the labour market, with all its attendant economic benefits" (*ibid*). Education has such enormous impact on neighborhood poverty that it even offers the "potential to unravel the apartheid-era social structure and create a more cohesive and less polarised society" (*ibid*). Education is thus the only possible means to transform general inequality. Blacks, the Stellenbosch School argues, ultimately perpetuate their own poverty because they lack skills and retard their youth's educational development:

> Our analysis of school surveys indicates that residents of poor and predominantly black neighbourhoods frequently attend schools with a lack of discipline, weak management and few

60 Jansen contends "What the private sector does better than the public, of course, is to demand accountability for investments made and this is one of the strongest benefits of collaboration. A competent and committed teacher has nothing to fear. What makes the unions jittery is that they know that the net effect of their rule over the poorest schools is to sustain a regime of non-accountability. That is why South Africans must support the collaboration schools initiative – it might be our one last chance of giving our most neglected youth in the most dysfunctional schools a clear shot out of poverty" (Jansen, 2016a). Jansen's article was retweeted by the New Leaders Foundation, a key partner of the Michael & Susan Dell Foundation committed to "transforming" South African education (New Leaders, 2016).

highly qualified and experienced teachers. This relationship between poverty and low-quality tuition is reinforced through several social mechanisms, including the influence of parents, the influence of the child's peers and a broader neighbourhood effect (*ibid*, p. 5).

Van der Berg et al. (2011) do not explicitly state that blacks are to blame for their own poverty, but blacks constitute the members of the poor neighborhoods deemed responsible for poor youth education. The authors blame not just teacher knowledge and pedagogical skills, but also "the teacher's motivation and dedication" (p. 5). The motivation, discipline, judgment, and behavior of South African blacks – and their low level of skills – is thus considered the primary cause black poverty.[61]

The DBE (2015a, p. 35) and Spaull (2013b) hold that teachers either *cannot*, or *will not*, teach the curriculum. In the former case, accountability (such as performance-linked-pay) will not work if the teachers do not have the *capacity* to teach the content (e.g. if they have deficient content knowledge or pedagogical skill). In the latter case, accountability will not work if there are no proper *incentives* (such as compensation inducements) to motivate teacher effort. The solution, they contend, is to launch a "new accountability" movement to simultaneously increase capacity (support) and accountability mechanisms (incentives/pressure) (*ibid*, p. 55).

In 2016, five prominent individuals of the Stellenbosch School[62] released another report, *Identifying Binding Constraints in Education: Synthesis Report for the Programme to Support Pro-poor Policy Development (PSPPD).* Much like *Waiting for "Superman"*, Van der Berg et al. (2016) assert "the success or failure of the education system in South Africa hinges on one factor broadly defined: teachers" (p. 23).[63] Thus "the battle for improved education for the poor is won or lost on the appointment, allocation, training, supervision, competence and behavior of teachers" (*ibid*). The authors argue the most serious factors constraining learner performance – what they call the *binding*

61 In a previous publication, Van der Berg (2005) drew upon the work of Eric Hanushek, a senior fellow at the conservative US think tank, the Hoover Institution, to argue that devoting additional resources beyond what is already allocated is limited and will have little effect on outcomes (p. 31). Van der Berg believes that poor outcomes in black schools are largely due to performance inefficiency (i.e. black personnel) and that additional resources should *not* be provided to the education system (pp. 2, 18-31).

62 The authors of the paper are white, but they acknowledge "joint efforts by many researchers and officials", which includes persons of color (Van der Berg et al., 2016, p. 2).

63 Jonathan Jansen (2016b) makes similar comments alongside a call to reform South African public schools into collaboration schools based on England's academy schools.

*constraints*[64] to improving public education – must be prioritized to improve education. The constraints are:

1. Weak Institutional Functionality
2. Undue Union Influence
3. Weak Teacher Content & Pedagogical Skill
4. Wasted Time Learning and Insufficient Opportunity to Learn (*ibid*, pp. 5, 31-48).

Each binding constraint ascribes responsibility to government, educators, and teachers for poor educational outcomes. The four constraints are said to reach far and wide, but in many instances they reflect the neoliberal ideology of the authors. For example, they consider resource deficiencies the fault of "insufficient state capacity, which is itself a function of undue union and political influence in the appointment and promotion of personnel… i.e., binding constraint 2" (*ibid*, pp. 26, 29), rather than fiscal austerity, unrestrained wealth concentration, and low taxes on the rich (Madlingozi, 2017; Bond, 2014; Terreblanche, 2018).[65]

The authors maintain a relatively hostile posture toward teacher livelihoods. For example, they claim that teachers in some provinces have "swelled" salaries and are "overpaid" (*ibid*, p. 29). If teachers are "unable or unwilling" to relocate schools, they urge administrators to apply legal procedures that "retrench those in the former areas and hire new teachers in the latter ones" (*ibid*, p.39). They are upset that teachers' unions challenge standardized testing for learners, teacher diagnostic

64 A binding constraint is defined as "one that, if not addressed first, prevents sustained improvement in all areas" (Van der Berg et al., 2016, p. 23). That is to say, "addressing constraints that are not the binding constraint leads to wasted resources and no improvement in outcomes" (*ibid*). Thus the binding constraints must be prioritized and done well before lower-level constraints are addressed.

65 In 2016, the DBE released the *Report of the Ministerial Task Team Appointed by Minister Angie Motshekga to Investigate Allegations into the Selling of Posts of Educators by Members of Teachers Unions and Departmental Officials in Provincial Education Departments*, otherwise known as the "jobs for cash" report. Critics allege that Sadtu is responsible for "widespread" and "underreported" acts of corruption through the sale of jobs for cash, sexual favors, or other favors (Masondo, 2015; Masondo, 2016a; Spaull, 2016). In contrast, Nkosana Dolopi, Deputy General-Secretary of Sadtu, maintains that *individuals* are responsible and that the union is being "used as a scapegoat for the ills we are confronted with" (Taunyane, 2016). Moreover, Dolopi asserts, "[i]t can't be right that a union of 260,000 professionals...is brandished as corrupt … Only seven [Sadtu members] have a serious case to answer and we say they should be charged" (Phakathi, 2016). After reviewing evidence at her disposal, Minister Motshekga said, "[n]o evidence points to Sadtu, which has been instrumental in the improvements we have seen in rural and poor schools" (Joubert, 2017). Equal Education's spokesperson, Mila Kakaza, added: "Teachers' unions, including SADTU, are indispensable to the transformation of South Africa's education system" and we should avoid "turning valid criticisms of SADTU into reasons for undermining collective bargaining" (Davis, 2017).

testing, “weak” pay-for-performance schemes,[66] and performance contracts. The context and philosophy driving these reforms constitute a neoliberal agenda imported from abroad, and initiate steps toward public school corporatization. Given the set of beliefs just laid out, it is not difficult to imagine teacher testing leading to retrenchments or payment tied to professional development as an outcome of their suggested reforms.

In a rare reference to history, Van der Berg et al. (2016) invoke the need for sensitivity to the apartheid-era teacher surveillance, citing a journal article by Linda Chisholm (p. 28). This misses the point of Chisholm’s paper, which roots the problem in neoliberal ideology. Chisholm (1999) stresses “the importance of social context and agency in understanding the specific unfolding of [teacher resistance] issues in practice” which includes the links between “teachers’ resistance at the workplace manifested in high levels of absenteeism to the introduction of new controls brought about by structural adjustment austerity measures” (p. 112) – the precise framework from which the Stellenbosch School operates. She is concerned with how apartheid-era controls are “being reorganized within the context of a neo-liberal global hegemony” (*ibid*, p. 113). Despite the 1980s teacher challenges to “top-down, bureaucratic and authoritarian controls over teachers’ work”, at the moment of transition to democracy, “new forms of control over teachers’ work were finding their way into education policies of developing countries, including South Africa” (*ibid*, p. 116). At the center is “new discourses on marketing and management… to ensure the restructuring of controls over teachers” (*ibid*, p. 119). For Chisholm, it is problematic that “South Africa has sought to undertake massive social change while keeping social expenditure within limits without any expansion of the education budget” (*ibid*).[67] These narratives assume a fiscal conservatism consistent with neoliberal restructuring in the post-apartheid era. The upshot of these policies, according to Chisholm (1999), is that:

> The overall deteriorating financial condition of education has meant increased teacher absenteeism, as teachers are enjoined to work harder in already difficult circumstances, while pressures on salaries are forcing more teachers to take two or three additional jobs to make ends meet. The combined impact of these new policies is to diminish teachers’ motivation for innovative school change… The expansion of the field of ‘management’ is thus related in part to the proletarianization of professions and the management of compliance (p. 123).

66 By “weak” the authors mean schemes based on one-off payments rather than progressive salary scales based on notches (*ibid*, p. 40, note 15).
67 See *supra*, note 109.

The "policy mandarins of commerce and industry", she continues, have "sought to appropriate and give a new and different meaning to the issues" (*ibid*). Teachers were now:

> … presented as lazy and engaged in a useless paper-chase which had little effect on classroom practice except to remove them from the classroom. This representation produced its policy correlative: the need for appraisal of the performance of teachers and the use of performance appraisal for the control and discipline of teachers (*ibid*).

A "managerial mechanism of control rather than empowerment" is promoted by individuals who reject mass teacher resistance of the early 1990s.[68] Additionally, Chisholm is concerned with both the racial *and* gendered composition of the education system. Males, she observes, dominate the authority structure (principals, district officials, and so on)[69] while under apartheid, whites determined curriculum and assessment, despite the fact that "their insulation from the day-to-day realities of black schools was almost complete" (*ibid*, p. 114).

The Stellenbosch School authors cited above produce a large body of work, constantly reference each other, are widely cited in the media, and are entirely white. They do not engage with the feminization of the teacher work force and its implications. As they note themselves, 71% of school teachers are women (Van der Berg et al., 2016). An oppressed sub-section of the work force, black women, are being uniquely targeted and blamed for society's ills.[70]

As will be discussed in Chapters 3 and 5-7, components of apartheid-era surveillance are now descending upon education by means of digital surveillance. The SA state is using new capabilities provided by Western technology corporations to impose apartheid-era policies *and* neoliberal reforms in education. This includes a bureaucratic centralization of managerial authority enabling external supervision through computer-based dashboard systems capable of totalitarian surveillance far superseding the apartheid state. These systems are hinted at with approval by Van der Berg et al. (2016, p. 60) and separately by a prominent Stellenbosch School researcher (Gustafsson, 2016).

---

68 Van der Berg et al. (2016) complain that Sadtu power derives power from their political orientation to the ANC due to its historical development "out of a political struggle movement (rather than a professional movement)" (p. 35).

69 For data, see Chisholm, 1999, p. 123. Motshekga said in the public schools only 36% of school principals were female; there were 257,633 female teachers and 119,579 male teachers (City Press, 2013).

70 Some teachers are challenging the lower status of basic education teachers. In September 2016, the National Teachers' Union (Natu) demanded the government provide free tertiary education for the children of teachers and the "equalisation of basic and higher education workers" (Business Day, 2016).

Van der Berg et al. (2011) fail to grapple with emancipatory (or "People's") education (Sisulu, 1986; Vally, 2007, pp. 41-43) – education that extends beyond "cognitive skills" such as reading, numeracy, and computer literacy to incorporate liberation, local democracy, and equity (Badat, 1995, p. 146; Baatjes, Baduza and Sibiya, 2014, pp. 81-102; Sayed and Ahmed, 2014). The value of democratic participation (Mncube, 2008) and human rights is absent from their assessment, as if common conceptualizations of justice through education and principles of freedom do not have intrinsic value or impact the economy.[71] Education is portrayed as skills, and skills are what can be quantified.[72] However, as William Ayers puts it:

> Standardized tests can't measure initiative, creativity, imagination, conceptual thinking, curiosity, effort, irony, judgment, commitment, nuance, good will, ethical reflection, or a host of other valuable dispositions and attributes. What they can measure and count are isolated skills, specific facts and function, content knowledge, the least interesting and least significant aspects of learning (Sanchez, 2010).[73]

Creating an exciting and empowering environment for teachers and students, democracy in education, and a curriculum engaging personal and social justice is anathema to neoliberal thinking. The Stellenbosch School concedes that family and other environmental factors "*may* outweigh those of the school" but in their view "these factors are less amenable to policy" (Van der Berg et al., 2011, p. 7, emphasis added). They recognize that the legacy of apartheid "appears to have endured" (*ibid*, pp. 5, 7). Yet they never mention the other side of the coin: the enduring legacy of racial and class domination, as if one exists without the other. White domination of wealth and income, ideology, residential settlement, access to services, language and culture,[74] and other sources of power

71 In Gustafsson et al. (2010), a mere two of 47 pages address the relationship of "values" to literacy and democratic participation. Questions of the relationship between literacy and capitalism, class consciousness, corporate power, wealth and income distribution, racial justice, reparations, and the like are not mentioned (see *ibid*, pp. 26-27).

72 There is slight qualification from certain authors. For example, Spaull (2013b) notes how pedagogy cannot be fully prescribed due to the fact that "education is complicated" and "the service provided is highly discretionary, variable, and transaction-intensive" (p. 54).

73 Quite likely, the Stellenbosch School would recognize limitations to quantification (see, for example, Spaull, 2011, pp. 3-4). However their approach and body of work is hardly changed by qualifying statements.

74 To take one example of cultural racism, in August 2016, black schoolgirls were forced to straighten their hair by white school teachers (News24, 2016a). "I have a natural afro, but a teacher told me I need to comb my hair because it looks like a birds nest," one school girl stated (News24, 2016b). Students also claim "they are not allowed to speak their mother tongue and that a teacher called them monkeys when they were singing and chanting in class" (News24, 2016c). See also GroundUp (Anonymous), 2016 and GroundUp Staff, 2016. For a critique of ex-Model C schools by a white student, see (Stewart, 2016).

accumulated through centuries of plunder, exploitation, and institutional arrangements remains intact (with a tiny black elite to share in the spoils) (Madlingozi, 2007, 2017; Van der Walt, 2013b). Within a capitalist society, wealth begets wealth through inheritance and the exploitation of capital assets (Hahnel, 2002). Yet correcting racialized historical injustices with strong policy interventions are not deemed "amenable to policy" by the Stellenbosch School. Class-based division of labor, the prospect of credential inflation, the casualization of skilled labor, failed neoliberal policies, and other barriers to equality (Marais, 2011) are not explained. It is as if "cognitive skills" are the all-powerful determinant of life outcomes, irrespective of other factors.

A static, narrow notion of education conceptualized within the neoliberal paradigm is thus held to be the cause of and solution to inequality. Education, from their perspective, is essentially a "pre-labour market" (Van der Berg et al., 2011, p. 8). "The labour market," in turn, "is at the heart of inequality, and central to labour market inequality is the quality of education" (*ibid*, p. 12). Highly racialized forms of hierarchical domination pervasive to society are thus insignificant in comparison to the "cognitive skills" from which they supposedly derive (and can transcend with improvement). The mass redistribution of wealth through progressive taxation, large-scale public works, a universal basic income, and a living wage for all workers is off the table.[75] So too is the issue of class war and theories of economic value which challenge the marginalist notion of "meritocracy."[76]

Instead, neoclassical "human capital theory" (HCT) underlies the Stellenbosch School perspective on education and economy. According to its advocates, HCT is "the skills and knowledge which enable an individual to produce outputs that earn money" (Harrison, 2016).[77] Spaull (2011), one of the most cited Stellenbosch School members, gives his explicit endorsement: "The received wisdom in economics dictates that an individual's labour market prospects are directly correlated with their stock of human capital, which itself is correlated with the quality and duration of schooling" (p. 3). Spaull believes inequalities in human capital causes an intergenerational poverty trap in the black community.

75 Van der Berg et al. (2011) dismiss redistributive programs by noting how an *average across-the-board* increase of 30% in real wages would hardly dent inequality (pp. 11-12). This fails to account for other pro-poor redistributive schemes.

76 For challenges to the marginalist concepts of value, see Ackerman, 2014, particularly his conclusion that "history and custom, as well as politics, laws and struggle, will determine who gets what." Van der Berg et al. (2011) hold that more jobs would have a "beneficial effect on poverty but only a minor effect on inequality" (p. 11). This misses that universal employment, in combination with a strong social security net, would strengthen the bargaining power of labor.

77 Also of note, the CEO of DG Murray Trust, Dr. David Harrison, argues that economic power is "concentrated in children" and objections to human capital theory "hold some water" but "we must be pragmatic" and "[talk] the language of...capitalism...business and economics" (Harrison, 2016).

Human capital theory is quite popular in South Africa. Motala and Vally (2014) decry how "The nation, and regrettably even organisations that seek to represent the interests of the poor and working class, are now hostage" to this "received wisdom" and "are largely paralysed by it" (p. 2).[78] Their assessment fits neatly with Chisholm's (1999) finding that the neoliberal educational philosophy is concerned:

> … on the one hand with the reduction of public expenditure and consequent intensification of teachers' work, and on the other with changing teachers' roles such that they become simply the producers of human capital for an increasingly competitive global market, rather than citizens concerned with democratization of society in all its forms (p. 125).

HCT fails to account for "the conditions for the reproduction of capital, its composition, the social conditions for its investment, global financial flows or even the resistance of labour to the form of its investment" (Motala and Vally, 2014, p. 8). Moreover, there must be a readily available supply of jobs for learners who upskill through education (Allais, 2012, p. 639). State regulation and enterprise, the automation of labor, capital mobility, international treaties and trade agreements, and social and qualitative factors must also be considered.

Of course, the failure to obtain the most basic skills in reading and numeracy is different from the achievement of higher-level thinking, and test scores relating to basic skills are arguably more meaningful than test scores for advanced skills (Baker, 2007). One would hope that an improvement in basic skills would materially benefit the poor black majority. However, it is questionable how much this alone can actually improve the situation. In recent years, youth unemployment is trending upward despite higher matric rates. In 1995, 36% of youth aged 18-24 were unemployed, but that number reached 50% by 2011 – despite an increase in the proportion of 18-24-year-olds completing Grade 12 from 1995 to 2011 (Van Broekhuizen, 2013, pp. 46-47). Assessments of the relationship of education to employment, poverty, and inequality are only serious to the extent that they address the wide array of issues exogenous to education. This is absent from the Stellenbosch school and like-minded journalists in the media who view education through a narrow, economistic lens.

The Stellenbosch School is skeptical of the value of resource redistribution to poor schools (Van der Berg et al., 2011, p. 8; Van der Berg et al., 2016, pp. 81-83) despite the extreme resource

78 See, for example, SECTION27's website post of the Center for Development and Enterprise's "*South Africa's Education Crisis: The Quality of Education in South Africa 1994-2011*".

deficiencies outlined in Section 2.3. Van der Berg et al. (2016) invoke intuition and data to support their binding constraints. Yet empirical evidence and common sense elude the Stellenbosch school's picture of the world. Their ideology neglects that the primary "binding constraint" on educational transformation is the perpetuation of highly racialized and diverse structural forms of domination which reproduce apartheid relations. How much educational and economic improvement can be expected when half of all South African children live on R32 or less per day, are frequently hungry, housed in tightly packed communities of shacks, surrounded by disease and poverty-induced crime, deprived of essential resources including basic services such as electricity, proper sanitation, medical care, disadvantaged by English language domination, and faced with the enduring legacy of white cultural hegemony, a mere two decades away from apartheid (Bantu) education, in a economy structured such that wealth begets wealth? The empirical evidence, outlined in Sections 1.1 and 2.1-2.3, suggests very little – an assessment backed by prominent critics sampled above.

The primary culprit for the plight of black people identified by the Stellenbosch School and like-minded voices in the media – black teachers, their unions, their administrators, their communities, and their lack of skills – constitutes an attack on poor black people. They seldom if ever mention solutions like desegregation and attempts to transform the broader society – initiatives outside of education that would improve outcomes inside schools. Yet as we have seen, this doctrine is not unique – it parrots the victim-blaming privatization movement popular in the United States.

## 2.5: Mainstream E-Education in South Africa

The neoliberal attack on public schools set the stage for the introduction of education *transformation* through the digitization of the education system. In 2015, the national government formulated Operation Phakisa Education (OPE), a program to fast-track digital technology for the transformation of public education. As we will see in the next section, the national implementation of e-education to schools engenders a multitude of dramatic changes extending far beyond the education space. In addition to altering and improving South African education, a national rollout to all public schools aims to digitize the entire society. We will address a broad conceptualization of the digital society in Chapter 3. For now, let us discuss what is called "e-education" in the present moment.

Contemporary education technology aims to "personalize" education. To do so, it utilizes new models like blended learning, flipped classrooms, and adaptive learning. Each model aims to cultivate

21st century skills[79] while catering to individual student needs. Blended learning mixes online learning with traditional "brick-and-mortar" learning (Garrison and Kakuna, 2004; Staker and Horn, 2012). Digital multimedia (such as lectures made freely available by the likes of Kahn Academy and EdX) as well as content provided through learner management systems (LMSs) allow teachers to begin blending a student's self-directed and independent study with one-on-one consultations by teachers. With flipped classrooms, content – such as readings or video lectures – is digested by students at home, allegedly "reserving class time for collaborative work and concept mastery exercises" (Knewton, n.d.). Expository instruction is replaced with "active learning" and in-person teacher guidance as students conduct their work in class (Herreid and Schiller, 2013). In blended and flipped classrooms, teachers often use software to monitor the minutiae of student activity. Computers streamline teacher paperwork, giving them more time and better tools to provide differentiated instruction.

"Learning analytics" is at the center of current trends in education technology. A commonly cited definition describes learning analytics as "the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs" (LAK, 2016). The use of learner analytics currently centers on student behavior modeling, predictive analytics, and early identification of "students at risk of academic failure or withdrawal" (Sclater, 2017, pp. 15, 35-43). Surveillance is a key (and expanding component): the more data about who the students are and what they do (such as their physical presence on campus), the more accurate the predictions (*ibid*, p. 35).

In an interview, The Head of IBM Education, Lin Zhou (2017), provided a concise description of how learning analytics evolved. He reviewed the history of e-education models as a progression of four waves leading up to the latest advances:

> Over the past 20 or so years, there have been four waves of big shifts in e-education. The first wave was characterized by the use of electronic textbooks. With the digitization of the textbook, a teacher could have, say, a PDF version of a textbook. They could now do things like project the material on the screen for use in the classroom.
>
> The second wave came about though Learning Management Systems. With an LMS, teachers and students can conduct learning and teaching at home and in the classrooms. Teachers could now schedule classroom activity, do online quizzes, and digitize student

79 For comparison of industrial-era skills to 21st century skills, see Herselman and Botha, 2014, p. 86.

information – the test score, the attendance, family finance information, medical history, disability, and all of those things get put together to one big system. The system is used for teaching and learning. The LMS enables learning and teaching anytime, anywhere. This opened up the flipped classroom.

The third wave came about with the development of analytics of the student data. If John Smith, for example, is learning algebra, multiplication in 2-digit numbers – that info, combined with other performance in the school, as well as other information, for example, about his family finance, his disability, and his interaction with other students, can predict whether he has a risk to fail his SAT or ACT two years down the road. The analytics shift, where you can predict student mastery or learning risks, characterizes the third wave.

The fourth wave is where we are today. Whereas the third wave is a one-time snapshot, say at registration time (where you get a risk score), or at best a periodical predication, today we have comprehensive artificial intelligence embedded into the education. This models students and remediates at real-time as they interact with the system. We no longer need to occupy classroom time with quizzes, which is not the best way to assess their mastery. The best method builds the assessment in as part of the learning process: you can assess student mastery as they conduct their work. The analytics is real-time and the student is not aware there is assessment going on. By assessing how they interact with the system (such as how fast they learn and answer the questions, through the timely return of the homework, activities with group study, and other things), you can compute where the student has risk (or not) and adaptively instrument the learning accordingly. This is an example of IBM cognitive education solution. This capability advances education, and will grow tremendously, because where the learning occurs is where the computer is learning. Just like a teacher learns and assesses continuously, the cognitive education being built today moves in that direction.

Artificial intelligence is considered the most powerful tool in today's EdTech movement. AI powers adaptive learning, which "adapts" to students through Big Data-based real-time analytics (Schlater, 2017, pp. 51-60). The resulting human-machine combination is said to make learning more efficient. While teachers cannot provide much individual attention to each student (say, a classroom of thirty), machines can, thanks to the power of artificial intelligence to assess each learner. With AI, students can be given content they need, as they need it.

While primitive "intelligent tutoring systems" date back to the 1960s and 1970s (Urban-Lurain, 1995), they advanced by leaps and bounds in the past decade with the introduction of adaptive learning made possible by the advancement of computer power and the Big Data revolution (Watters, 2015b). Adaptive learning is an EdTech system that uses complex analytics to tailor its learning to each individual student based on the individual student's interactions with the system *and* in light of the history of interactions by millions of other users on the same system. The Bill & Melinda Gates Foundation has poured tens of millions of dollars into developing adaptive learning (Gates Foundation, 2014), and according to the most rigorous large-scale study to date (commissioned by the Gates Foundation), it has so far produced limited success improving learner scores (SRI Education, 2016).

Education technology company Knewton pioneered much of the marketing and philosophy behind what we now call "adaptive learning", and has provided useful explanations to the public about how it works. Led by the supremely confident, Johannesburg-born founder and former CEO, Jose Ferreira,[80] Knewton harnesses vast troves of digital data for advanced computerized education. Knewton's analytics engine performs real-time data analysis which allows cloud-based software to customize curriculum and testing for each individual, as well as evaluate a variety of learner traits in the context of the total data set. Their services work as follows: let's say "Lerato" is a learner using Knewton-powered software. The software is cloud-based, and Lerato logs into the Knewton-powered education website where she is provided educational curriculum, assignments, and tests. As Lerato reads her subject material, Knewton records her behavior, taking note of her text readings, media (such as video tutorials), or other forms of curriculum content. She is given questions (say, multiple choice) with right or wrong answers. As Lerato answers these questions, Knewton takes note of which ones she gets right and which ones she gets wrong. As she engages with curriculum content and answers questions, Knewton cross-references her history of behavior and responses against their database of millions of other students. Their analytics engine seeks out students who study and answer questions just like Lerato does and then discovers which ones carried on with the greatest success. Knewton can thus "adapt" to Lerato's current level of knowledge and "personalize" her curriculum content and test questions in part based on the success stories of other students who are very similar to Lerato.

Ferreira contends this is made possible by the fact that "education happens to be today the world's most data mineable industry by far" (Ferreira, 2012). While Google, Amazon, and Netflix also

80 Ferreira is the son of billionaire Teresa Heinz Kerry, a former University of Witwatersrand graduate, widow of former US Senator H. John Heinz III (heir to the ketchup factory H.J. Heinz Co.), and wife of current US Secretary of State John Kerry.

have vast troves of individual data points like web searches and purchase histories, the correlations between, say, the purchase of spy novel and the search for toothpaste are very weakly correlated. But in education, where questions have clear answers (in mathematics, the basics of certain sciences, language and aspects of prescriptive grammar, and so on), correlations are very rich. If Lerato understands how to solve for the hypotenuse of a right triangle using the Pythagorean theorem, and perhaps a few other concepts, it is extremely likely that she understands tens of other concepts as well.[81] As Ferreira explains, "Everything in education is correlated to everything. Every single concept is correlated in a predictable way to everything else using psychometrics… You do the little bit of work for Knewton and we use established science of psychometrics to cascade out hundreds of other data" (*ibid*).

Thus ten minutes of work in Google may produce "a dozen data points for Google" (*ibid*). But using techniques like "programmatic taxonomy models and item-response theory", Knewton currently "gets five to ten million actionable data [points] per student per day" (*ibid*). For this reason, Ferreira claims at Knewton they "literally have more data about our students than any company has about anybody else about anything and it's not even close" (*ibid*). Adaptive learning allows Knewton to "produce a unique syllabus for each student each day… optimized for each kid down to the atomic concept" (*ibid*). Utilizing predictive analytics, Knewton claims "we know you're gonna fail, we know in advance, and we can prevent it in advance" (*ibid*). Thus they aim to assess students with data analytics and optimize education with customized content "dynamically generated in real-time" based on "the combined data power of the entire network" (*ibid*).

Ferreira promises the power of Knewton's analytics is ultra-precise. When using hypothetical case example for presentations, Ferreira uses figures to suggest they offer a fine-grained level of insight and optimization:

> Because Knewton can figure out things like, you learn math best in the morning between 8:40 and 9:13am, you learn science best in 42 minute bite-sizes, at the 44-minute mark your click rate always begins to decline, you start missing questions you normally get right. You learn

81 According to Ferreira, "when you took the SAT [Scholastic Aptitude Test], there might be forty different concepts about equilateral triangles that are tested on all the SATs ever given in any one year. But you didn't get all forty questions, you got two questions on equilateral triangles. Because they figure if you're in the top 14th percentile at those two questions – you know 13th percentile on this one, and 15th percentile on that one – if you're in the top 14th percentile on those two questions in equilateral triangles, the odds are 90th percentile chance that you're in the top 14th percentile at every concept in equilateral triangles. And there's a 96th percent chance that you're in the top 15th percentile at all triangle concepts – three four five, thirty sixty ninety, isosceles, etc etc" (Ferreira, 2012).

> social studies best with video clips or 22% video to 78% text, or whatever your optimal cocktail [is]. We can tell when we should return content to you for optimal attention (*ibid*).

Knowing that students in a class have different levels of understanding and varied, nonlinear growth rates, this type of education technology is said to cater to individual learning rates so that students with greater understanding may finish their final examinations more quickly than those struggling. Ferreira provides real-life examples from Arizona State University where one student is assessed as ready to complete the final course examination with an A grade 14 days into the class, whereas other students may take as long as two semesters. The system is efficient and fair: why make a student who understands the course material drag along for 15 weeks? Why devote teaching resources to those students when struggling students could gain greater focus from teachers? (Ferreira, 2013).

The technology cannot work for attributes of education that cannot be quantified, and it will therefore emphasize quantified, standardized results. Recognizing these points as a potential weakness, Ferreira responds:

> We can teach you all the facts, the simple critical thinking skills surrounding causes of the civil war, and then you can get into class and have a debate on state's rights versus slavery. All the really good stuff, the stuff that makes human beings human beings – let Knewton do the dirty work with Big Data so you can get to that stuff. We've been going in the opposite direction in this society over the last few decades. We're teaching much more of the rote stuff in class, it doesn't make any sense (*ibid*).

Ferreira's 2012 speech (quoted above) took place at the "Education Datapalooza" conference held in Washington, DC. At that conference, other presenters offered products that would harness the power of longitudinal data systems to further understand, guide, and intervene in education. For example, education firm eScholar is using data from over 20 million individual students – pre-K through grade 20 (university) and into the workforce – to conduct data analytics on the "life-cycle" of students. Its CEO, Shawn Bay, who previously conducted Big Data analytics for corporations like Walmart, is developing a service to provide young learners with analytics that show them how to achieve their goals based on the career paths of other individuals who succeeded in what they aspire to accomplish –

doctors, engineers, and so on. Thus for a child who feels “nobody like me goes on to do anything”, Bay (2012) says:

> I can look in the data and see… in any block, in any neighborhood, however you describe yourself, and however you think about it, there’s somebody like you who has gone and done something great. And we can show you how to get there. So what we build is an application to use those data to show someone how to get there and progress along that path, and drive it off of data – we’ve got the data about how people actually got there.

eScholar’s service helps learners set goals “all the way down to the level of the class you’re in” (*ibid*). The software relates students’ academic performance to their goals and helps them “set goals and see goals” and chart their progress. Bay says he was in need of guidance as a child in an isolated part of America (Kentucky). Perhaps a child from the township or rural farmland would be the target market in South Africa.

IBM is also building systems to evaluate career paths with Big Data analytics. Zhou (2017) explained that Watson analytics “can perform longitudinal data evaluation” that becomes more accurate as the student advances in time. “The AI can make suggestions to you based on who you are, and the data we have about you, and, say, for people who are similar to you (e.g., these become more successful, these go to college, these become a plumber, etc.)”, Zhou added:

> As we progress towards graduation, predictions become much more accurate. We can provide much more precise predictions about possible successful career for ninth and tenth grade students than lower grade levels. Ultimately it’s up to students, parents, and teachers to look at the suggestions, evaluate them, and agree or disagree with the suggestions. Using those recommendations, students and their guardians can decide where they want to be when they graduate (*ibid*).

Moreover, learning analytics often works best when collecting *social* data. As Zhou (2017) explained, IBM Watson’s “360 Degree View” software “goes beyond” how learners perform on their tests:

> The view of students should include the attributes which would impact the outcomes of learning. For example, research suggests that younger children with more educated parents will perform much better than those without. Similar outcomes arise for children of a single-parent family or a family in poorly financed situations. If we have a 360 degree, we should include information such as the finance, the disability status, and other relevant information where they can actually impact the student outcome. Using a 360 Degree View approach we, as the education solution provider, will harvest that data and make that available to the teachers, so that can help the teacher to understand the students, and provide a personalized education solution.

This seems necessary to provide robust predictive models, as computers simply execute commands and do not conceptualize people. Yet we know that social life is connected to educational performance, and social data would need to be included if it impacts likely outcomes. This raises the specter of privacy violations and socioeconomic profiling (Alacorn et al., 2014).

The use of Big Data analytics, primarily driven by artificial intelligence, underlies the shift towards Big Data education. As Zhou (2017) put it:

> Artificial intelligence is needed to personalize education because teachers cannot work with many students on an individual basis. AI makes personalization possible. Everybody is different, and we can use AI-based solutions to understand why they are different, where they are different, and because of their difference, which different learning content and pathways should be put out. That's where the value of IBM cognitive learning comes in as the solution.
>
> This is also where one of its disruptive natures comes in. The term *class* is a collection of students grouped by their age. However, age doesn't always reflect their academic performance. Some students are more advanced, some are less advanced, but they still get grouped into the class. We shouldn't be doing that. The aim of personalized learning is to break that class (i.e. the class is not desirable) so that individuals, each of whom are different, can progress on their individual pathways at different learning velocity (*ibid*).

The goal, then, is to completely remake the classroom, with AI driving the process. Some responses to adaptive learning and longitudinal analytics are in order. First, we should expect a system like Knewton's to drive education further toward quantified and standardized education (Thompson, 2016).[82] Adaptive learning advocates claim to be able to assess ability, aptitude, work ethic, and understanding "to the atomic concept level" (Ferreira, 2012). Moreover, they provide individual assessments against other students. For example, let's say Lerato is in the upper 14th percentile for right-angle triangles. This *necessarily* implies standardization, quantification, and testing. Adaptive systems are continuously assessing students' every click, test response, content viewing, and any other "actionable data point" they can feed into their system. Testing therefore takes place all day, every day, from the time of first use (say, Grade 4) until the time of graduation, under the watchful, judgmental eye of corporate and state Big Data systems. As will be detailed in Section 3.3.6, this could have severe chilling effects on learners and teachers.

If these issues are not bad enough, adaptive learning is inextricably bound to mass surveillance. As we noted in the last chapter, Big Data is typically a form of mass surveillance (see also, Chapter 3). Ferreira himself notes, we are heading toward "a totally data-mined existence" – one in which he (enthusiastically) likens to the film *Minority Report* (Ferreira, 2012). Knewton has pledged not to release student data to parents for fear that other institutions may start demanding access to the profiles (Kamanetz, 2013). However, there is no guarantee against a change in policy or the emergence of a competitor that will release the data – or, say, keep the data internal but share algorithmic scores and rankings for each individual with other institutions (such as universities or employers). Integration of data sets is part of the "totally data-mined existence" Ferreira heartily embraces. Even with privacy policies in place, then, adaptive learning is predicated on continuous surveillance.

Adaptive learning and data integration systems may also end up tracking certain students into unequal paths (Alarcorn et al., 2014). If students are to have their education paths shaped in light of their job prospects from an early age, the computer systems may lock them into "likely" career paths that encourage those already excelling to shoot for the stars, and those already doing poorly to "accept" the likely chance of a lower class job. It is not clear why young children should be considering future jobs, rather than a love for learning, while they develop their education.

While adaptive learning is slated for South African e-education (see Chapter 5), it is not the only Big Data technology planned. The DBE is also using learning management systems (LMSs) to

82 At the time, eScholar's application was using Common Core standards – a controversial system for standardized education across the United States – to evaluate learners and set goals (Bay, 2012).

manage e-education. In South Africa, the Michael & Susan Dell Foundation's (MSDF) Data Driven Districts (DDD) Dashboard system is the major player in this space: as of July 2018, it covers over 20,000 schools and over 10.5 million learners. The MSDF DDD Dashboard is a data analytics service for administrators. Various types of data are first collected from a system called South African School Administration Management System (SA-SAMS). The DDD Dashboard then breaks down the data into visually readable parts where administrators have varied access to data about individual learner, teacher, school, circuit, district, and provincial tiers of the education system.

The Dashboard system features a slick interface which allows easy navigation for administrators to see what is going on in the participating school systems. Each actor (school, district, etc.) has a series of data color-coded in ways that indicate performance so that administrators may be able to sift through large amounts of data and flag problems in need of intervention. One metric kept by SA-SAMS is teacher and learner attendance. If teacher attendance reaches a certain level the system considers low (say, 80%), then the "attendance" field turns red, indicating performance is below proper levels. District officials might see that a particular circuit's pie chart is red for "attendance". The official might then click on the circuit to see which schools are colored red. The official then clicks on the red schools and can see which particular teachers have good attendance. Thus, the system works in a way that allows officials to "zoom in" on poor performance across hundred or thousands of schools with many thousands (or millions) of learners and teachers. If performance is not meeting proper standards, there can be administrative intervention.

Some categories in the DDD system include teacher and learner attendance (including calendar views), task coverage, academic achievement (exam test scores, school based assessment pass rate, Annual National Assessment pass rate, matric pass rate) by grade and by subject, grade promotion, and learner and school count. The "About" field for individual learners includes: Grade, Age, Date of Birth, Gender, Ethnicity, Home Language, Instruction Language, Here Since, Social Issues, and Disabilities.[83]

## 2.6: Access to Digital Technology in South Africa

While education-specific technology occupies the attention of "education technology studies", this dissertation argues that the more general choices for technology in schools (operating systems, software licenses, centralization vs. non-centralized systems) play a critical role influencing on education,

83 A demo of the MSDF DDD Dashboard system using dummy data is currently available online at: https://eddashboard.co.za.

economy, and society, and are therefore critical to e-education policy. It is thus important to survey the general state of technology deployment in South Africa to get a sense of the digital divide and the use of general digital technologies in the country. As we will see in Chapter 5, this comports with the position taken by the government, which sees technology as both a tool for education and a means to subsidize digital technology to the broader society.

For South Africa to bridge the digital divide, scholars not only need access to hardware, broadband connectivity, and affordable data, but must also have digital literacy skills and content available which is relevant to their lives and available in a language they can read (Gillwald, 2017). With respect to hardware, the majority of South Africans own a mobile phone, which can provide them access to the Internet. Feature phones are still dominant among the poor black majority, but low-end smartphones are starting to replace them. Smartphone penetration has mixed reports, ranging from 37% to 60% (MyBroadband, 2016; We Are Social, 2018, p. 71). Far fewer individuals use a laptop, desktop, or tablet.[84] Almost all use a smartphone as the dominant means to access the Internet (We Are Social, 2018, p. 77). In 2016, about one fifth of households (21.4%) owned one or more computers (Statistics South Africa, 2017, p. 5).

South Africa has close to a 100% mobile network data coverage, with near-universal coverage on 3g or 4g networks, and a 58% 3g or 4g broadband connection rate (We Are Social, 2018, p. 93). However, the cost of data is among the highest in the world and inhibits access for the poor (Abrahams and Pillay, 2015). The cost of smartphone devices are likewise prohibitive. Access to the Internet is unevenly distributed among the country's nine provinces as well as across the urban/rural divide and income brackets (Statistics South Africa, 2017). Those with a monthly income of more than R30,000 (~$2,300) have an 82.4% penetration rate, whereas those earning below R2,500 (~$200) per month have under 30% access (McLeod, 2017).

Overall connectivity increased by 5.8% in 2016, but fixed line connectivity did not increase during this same time period (Shezi, 2017). This is important because home connectivity provides fast speeds and larger (or unlimited) data transfers. If the digital divide is to be truly overcome, the laying out of fibre to the home is ideal.[85] The "full" digital experience that includes a quality smartphone, access to a laptop or desktop for productivity activities, and an affordable high-speed Internet connection is almost exclusively available to the middle- and upper-class people in urban and peri-

84 According to We Are Social (2018), about 24% use a laptop or desktop, and 12% use a tablet (p.71). Quite often, We Are Social's percentages are higher than other surveys.

85 South Africa's fixed line broadband is expensive by global standards (Point Topic, 2017).

urban areas.[86] Commerce is still very limited: only 1% of retail purchases in South Africa are made over the Internet, totaling R9 billion annually. Yet overall growth is expanding at over 20% (World Wide Worx, 2016)[87] and in business, the Internet is rising (World Wide Worx, 2018). Social media marketing is "indispensable" to marketers, with the vast many major South African brands utilizing the four major social media networks (Facebook, YouTube, Twitter, and LinkedIn) to market their products (World Wide Worx and Ornico, 2016).

The Department of Telecommunications and Postal Services (DTPS) is responsible for broadband policy. The South Africa Connect strategy prioritizes fibre rollouts directly to public institutions, with priority given to schools and health clinics (DTPS, 2016, p. 36). Once those facilities are connected, more fibre optic cables can be laid out to connect the surrounding communities. SA Connect aims to connect 90% of the population to broadband by 2020, and 100% by 2030. It will almost definitely take longer to meet these benchmarks, and private sector innovation, such as Vumatel's program to connect townships with fibre Internet, could speed up the process.[88]

While it may take ten years or longer before South Africans meaningfully bridge the digital divide, access is increasing with each passing year. The more technology reaches the poor black majority, the more important e-education policy becomes. Technology choices for education, we will see in the coming chapters, can have a critical impact on *how* the tech ecosystem evolves in the country.

## 2.7: Conclusion

This chapter established the critical background necessary to analyze basic education, e-education, and digital society in South Africa. It began by describing the basic data and performance metrics in public schools. Cross-national standardized tests have shown that South Africa has a poorly performing education sector, including by comparison to other middle-income and Southern African countries. A shocking 78% of Grade 4 learners cannot read for meaning, while two thirds of Grade 9 leaders cannot grasp basic mathematics. Internally, academic performance correlates to racial and class divisions established during prior epochs of colonial and apartheid oppression. After recalling forms of

86 According to World Wide Worx (2017), there is no substantive data divide by gender (p. 4).

87 There are over 3 million online shoppers, which constitutes over 60% of the online population (World Wide Worx, 2016, p. 2). According to data compiled by We Are Social (2018), about 47% of the population have searched for a product or service to buy online, and 30% of the population report having purchased a product or service (p. 98). The average annual revenue per user of consumer goods was $146 (*ibid*, p. 101).

88 Progress on this goal is questionable, as many observers are skeptical the government will deliver on its goals in a timely fashion given its previous failures to stated targets (Vermeulen, 2015).

inequality described in Section 1.1, the following sections described a wide variety of factors that contribute to poor academic performance. These include inadequate physical infrastructure (such as mud buildings and access to furniture and desks), insufficient access to learner and teacher support materials (such as the late delivery of textbooks), incomplete curriculum coverage, low rates of access to quality early childhood development programs, poorly resourced home environments, extensive community and social problems (including bullying, corporal punishment, youth pregnancy, sexual assault, HIV/AIDS, nutritional and visual impairment, and drug and alcohol abuse), irrelevant curricular content divorced from the lives of the poor black majority, difficulties transitioning to English as a second language, and the weight of colonial and apartheid history on present social arrangements.

With these factors established, the chapter next analyzed popular neoliberal educational narratives by dominant groups in South Africa. It found that the inventory of criticisms espoused by SA neoliberals match the neoliberal philosophy espoused in the United States, as expressed in the popular film, *Waiting for "Superman"*. Following this observation, it identified the influential Stellenbosch School of education economists as neoliberals and interrogated their philosophy. The Stellenbosch School blames teachers, teachers' unions, and government bureaucrats for performance issues in schools, drawing on the same perspective and talking points as presented in *WFS*. Like their US counterparts, the Stellenbosch School blames the victim – black people – for their educational struggles while downplaying the significance of historical and exogenous factors (outlined in Sections 1.1 and 2.3) impacting black education and poverty. This ideology sets the stage for the introduction of a neoliberal e-education system (to be unpacked in Chapters 5 and 6).

The chapter next turned its attention to e-education itself. It introduced how the South African government plans to fast-track digital tech into schools and detailed how contemporary e-education works. Models and technologies such as blended learning, flipped classrooms, learner management systems, and adaptive learning were explained. Given that this dissertation places great emphasis on the how e-education choices impact education, economy, and society, the final section described the general state of digital technology deployment in South Africa. The next chapter provides the theoretical and conceptual framework that guides this study.

# Chapter 3

## The Theoretical Context

---

### 3.0: Introduction

The previous chapter provided the empirical and historical context relevant to e-education policy choices. It reviewed the “brick-and-mortar” social/educational context, as well as the broad concepts and trends in contemporary e-education. This chapter develops the conceptual and theoretical framework this dissertation uses to evaluate e-education policy in South Africa. It combines two theoretical lenses for policy analysis. First, it outlines the anarchist perspective that forms the general sociological foundation for policy analysis. This framework addresses general power dynamics, education, economy, and technology. Second, it incorporates the Free Software philosophy, as well as Internet decentralization, and combines those two elements under the banner, “People’s Technology for People’s Power”. By merging anarchism with the Free Software philosophy, this chapter presents an anarchist interpretation of digital technology and power. Next, the chapter takes on the question of digital technology deployment in the context of US power. It makes the case that US state-corporate domination of the digital ecosystem gives rise to digital colonialism, based on five related core elements: 1) economic domination, 2) imperial control, 3) global surveillance capitalism, 4) imperial state surveillance, and 5) tech hegemony. The following section presents possible objections to core elements of the theoretical framework, and situates the framework chosen against other popular approaches. The chapter concludes noting how People’s Technologies could bolster freedom in the digital era, and are of critical importance to e-education policymakers.

### 3.1: Anarchism

Anarchism – sometimes called “libertarian socialism” – begins with the premise that authority is not self-justifying. Anarchist sentiments extend back to ancient times (Graham, 2005; Jun, 2013; Graeber, 2004, pp. 4-5), but its modern character is rooted in Enlightenment thinking (Chomsky 2005 [1970]).[89] As expressed by Noam Chomsky (2013), anarchism is “a tendency in human development that seeks to

89 Anarchist sentiments extend back to ancient times (Graham, 2005; Jun, 2013; Graeber, 2004, pp. 4-5).

identify structures of hierarchy, domination, authority, and others that constrain human development" and subject them to justification. Where they cannot be justified (say, in special circumstances or in principle) they should be abolished and reconstructed from below (*ibid*; Jun, 2013, p. 88). Using this ethical approach, anarchism is relentlessly committed to materializing radical forms of equality in institutional, organizational, political, economic, social, and interpersonal relationships. With a commitment to challenging authority and bringing about equality in the here and now, anarchist philosophy is characterized by anti-authoritarianism and egalitarianism.

Ruth Kinna and Alex Prichard (2018) recently put forth that anarchism constitutes a robust theory of non-domination. Anarchism as a formal ideology, Kinna and Prichard note, arose at a time when the question of human freedom was contrasted against slavery. At mid-nineteenth century, Pierre-Joseph Proudhon (1840), the first person to self-identify as an anarchist, began his famous essay, "What is Property?" by comparing property – by which he meant productive property (not personal possessions) – to a form of "theft" that dispossess the people of the means of production and turns them into wage slaves. According to this logic, slavery was merely *transformed* into a new form of slavery, wage slavery, instituted by the owners of capital.

In South Africa, the shift from chattel slavery to wage slavery is illustrated by the famous Christian missionary, Dr. John Philip. An enthusiastic student of Adam Smith (Ross, 1989), Dr. Philip sought to "liberate" Africans from the cruel regime of slavery instituted by Afrikaners during the nineteenth century. Yet in his vision of an alternative economy, slaves would be "freed" and "equal" to whites, but only in law. He understood that legislation which wiped clean race-based discrimination would not leave Africans (or others) in a *condition* of equality. In trying to persuade whites to abandon slavery, he assured boers (Afrikaner farmers) that civil and economic rights would not disrupt their dominance. Rather, the native population would make "most excellent servants… in the service of the boors" and enjoy the accumulation of property as compensation for labor (Philip, 1828, pp. 323-325). Philip continued: "On a superficial view of the subject, it may be thought that this [free market] system would injure the property of the slave proprietor" (*ibid*, p. 325). Yet with "free" labor, the slave proprietors would enjoy "ample compensation" from the increase in supply of former chattel (*ibid*, p. 326). The new system, he concluded, should "permit the natives to choose their own masters" (*ibid*, p. 329).

Thus, the global transition period from slavery to wage slavery influenced anarchists to define freedom in the context of property relations. The institution of wage slavery has endured to the present neoliberal era (see Section 1.1). Following Proudhon and Bakunin, Kinna and Prichard (2018) argue that making ex-slaves property owners or tracking individual interests in the state retains unjust elements of domination. Instead, direct action against pervasive power relations that structure all societies is needed to secure freedom for everyone.

Classical Marxism proposes an economic substructure (i.e. base) and a superstructure (i.e. political, social, and psychological processes conditioned by the substructure) where "The mode of production in material life determines the general character of the social, political and spiritual processes of life" (Marx, 1904 [1859], p. 11). Anarchists, by contrast, often reject an economic base upon which other domains of life rest, even if in a reciprocal relationship (Albert et al., 1986). Historically, they have emphasized political and economic emancipation, characterizing the state and private sector a "joint ruling class" (Van der Walt, 2013b). On the state side, anarchists reject democracy based on elected representatives in favor of direct democracy through the decentralized federation of delegates, mutual aid, debate, popular ownership of the means of coercion and administration, and civil rights and liberties for all. Governance by elites from above is rejected in favor of governance determined collectively from below. On the economic side, anarchists reject capitalism based on the rule of private property, production for profit, class divisions, and the concentration of wealth in favor of a classless, socialist economy based on collective ownership of private property, participatory planning and decision-making, production for use, and decentralized federation of workers' assemblies, councils, and unions (Shannon, Nocella II and Asimakopoulos, 2012; Kinna, 2005).

Yet for anarchists, domination is not reducible to the state and capitalism. Rather, institutions, organizations, and social relations often feature forms of domination (hierarchy, racism, heteronormativity, etc.) that are "reproduced and enacted within *and* outside this apparatus" (Shannon, Nocella II and Asimakopoulos, 2012, p. 15, emphasis in original). Similar to the race/class/gender approach of intersectional third wave feminism (Davis, 2008; Crenshaw, 1991), anarchists take a broad approach to various oppressions – including governmental, economic, racial, sexual, organizational, educational, and environmental – and seek to replace them with new forms of non-domination. Yet in doing so, they also acknowledge that forms of oppression vary across space and time, and some forms of oppression might be more dominant than others in any given situation (Van der Walt, 2017, p. 518).

The severe material deprivation that the poor and working classes experience in the townships can take precedence over other political agendas, even though other forms of oppression intersect and burden groups and individuals living within those communities (Albert et al., 1986; Newman, 2005).

To drive society towards freedom and liberation, anarchists promote direct action and prefiguration. The former is “the insistence, when faced with structures of unjust authority, on acting as if one is already free”, without the intermediation of authorities (Graeber, 2009, p. 203). This, in turn, entails prefiguration, an anarchist concept which holds that the construction of relations people would like to see in the future society must be implemented in the here and now (*ibid*; Franks, 2003). Similar to the feminist slogan, “the personal is political”, anarchists maintain that everyday interactions have a political dimension. As Van der Walt (2013a) puts it, for anarchists, means do not justify ends, because they shape them (p. 197). This distinguishes anarchism from hierarchical forms of Marxism in that anarchism calls for drastic changes to the rhythm of daily life by demanding direct democracy in day-to-day relationships in the family, schools, workplace, unions, and other organizations. Along with various other socialists, anarchism promotes equality along racial, sexual, and national identities, with support by and for immigrants, women, queer sexuality, people of color, religious freedom, and movements in the Global South (Gemie, 1996; Hirsch and Van der Walt, 2010; Shannon and Willis, 2010). For anarchists waging anticolonial struggles, Maia Ramnath (2011) argues, “there was no question of base and superstructure,” because colonization pervaded all aspects of life (p. 27). “Tackling capitalism and the state” thus requires decolonial resistance “without reducing the struggle to either the material or ideological/discursive plane” (*ibid*).

Anarchists have historically clashed with Marxists advocating submission to the will of a political vanguard, such as the “dictatorship of the proletariat” and the Marxist schools of Stalinism, Leninism, and Trotskyism (Newman, 2005; Graham, 2015). Well before the rise of the Soviet Union, they warned that a transitional period of dictatorship would result in a new form of oppression whereby the “liberation party” would beat the people with “the People’s Stick” (Bakunin, 1873, p. 338). Under state socialism, they argued, capitalist organizations would shrink from many to one – the state (Kinna, 1995, p. 262). Bakunin’s prediction turned out to be accurate, as Marxist regimes (especially Bolsheviks) murdered, jailed, and repressed anarchists and other socialists that collectively seized the means of production and established local control of political and economic life (Bookchin, 2004, pp. 290-312; Shub, 1953). In present times, however, conflicts between the two schools can be overstated, and take the form of “caricatured non-debate” (Van der Walt, 2011, pp. 193-194; Blackledge, 2010).

Support for Stalinism has long gone by the wayside, and many brilliant intellectuals and activists describe themselves as "little m" or "autonomist" Marxists who have moved closer to anarchism and advocate socialism from below (Raekstad, 2017).

In the digital era, differences of opinion about state authority could resurrect a source of tensions between Marxists and anarchists. With the growth of tech monopolies, discussed in Section 3.3, many are calling for state interventions like data localism (Moglen and Choudhary, 2018) or socialization of technology services (Corbyn, 2018; Mason, 2018; Bassett, 2018). Socialization could entail anarchist and autonomist conceptions based on collective ownership that preserves individual liberty and collective control. Alternatively, it could shift the power of tech into the hands of the state. Most would seem to favor the former, as calls to drastically rein in Big Tech are wary of state surveillance (Morozov, 2018). However, some have called for "good" Big Data that is used not to exploit workers and consumers, but to build socialism or benefit workers (Mehta, 2015). Thus, the argument for benign centralized surveillance could fracture left resistance to tech corporations or even lead to a shift of power, repression, and exploitation from the private sector to the state. Arguments about how to address the power of Big Tech are just emerging, and it is worth thinking through Marxist and anarchist theoretical traditions as the digital era unfolds.

One subject missing from theories about digital technology and power is the role of education and schools in (re)producing the technological status quo. This chapter will argue that the global public can create a different digital world based on different digital architecture, but they need to make the technology robust and implement it at scale. Schools could be an effective place to deploy alternative technologies that re-wire the digital ecosystem, as well as a place to develop critical consciousness. Before we get there, let us consider broad anarchist conceptions of education.

For anarchists, education and schooling should be transformed on principles of direct democracy and preconfiguration (Graeber, 2009, p. 203). Writing in the late 18th century, William Godwin, a radical individualist who helped shape anarchist thinking, argued for the need to grant autonomy to learners, abolish the role of pupil/master, and ensure that educators as encourage and support the learner's *intrinsic* inclinations (Smith, 1983, pp. 9, 16; Spring, 1975, pp. 14-21; 1983). Following these principles, in 1876, Mikhail Bakunin (1971) proposed that children organize their own activities, participate in arbitration over disputes, and choose their own teachers as friends (p. 374). "The principle of authority," Bakunin wrote in *God and State* (1970 [1882]), must "diminish as fast as education and instruction advance, giving place to increasing liberty" with age (p. 41), as it is “incompatible with an enlightened system of education” (Bakunin, 1971, p. 374). Schools should be based on principles like “scientific development of reason” (rather than faith) and “personal dignity and independence” (rather than piety and obedience) (Bakunin, 1970 [1882], pp. 40-41). Alexander Berkman (2005) likewise rejected authoritarian “education to ‘crush’ independence” and “non-conformity” (p. 288). He argued that authoritarian arrangements in institutions like school socialize people into obedience to authority (*ibid*, p. 277). Society should instead provide “training in human dignity and self-reliance, beginning at home and school” to “produce a new race with a new attitude to life” (*ibid*, p. 288).

Beginning in the late nineteenth century, anarchists began building their own schools. Paul Robin started a school in France in 1880, and two French anarchists, Madeline Vernet and Sébastien Faure, followed with their own. Soon thereafter, the League of Libertarian schools was born. From this nexus of events, Francisco Ferrer started his own “free school” in Spain. Fourteen other free schools soon sprouted elsewhere in Spain. In 1909, the Spanish government accused Ferrer of fomenting insurrection (during the “Tragic Week”), and executed him. The event sparked a wave of protest in Europe and the United States, shining a spotlight on his free school model (Smith, 1983, pp. 1-6). Anarchists took notice, and soon thereafter other free schools, called “modern schools”, were formed, in part to honor his memory (Avrich, 2006 [1980], pp. 3-35). In these schools, children were given autonomy (rather than disciplined with “extrinsic motivation”), principles of rationality were encouraged, and considerations of how school should be built for integration into an anarchist society were theorized.

We will see in the next section that Free Software advocates would like to institutionalize core principles of freedom and science into computer software so that people can control their own experiences using them. This has direct relevance to education. The anarchist challenge to authoritarianism and call for communal ownership dovetails with the Free Software philosophy, which stresses the need for individual and collective ownership and control of software, and the ability to take direct action to control computer-based experiences. We turn to these subjects next, first by outlining the Free Software philosophy and movement, and then by considering how the Free Software philosophy has strong compatibility with anarchist principles and objectives.

### 3.2.1: The Free Software Philosophy and People's Technology for People's Power

Free Software and, more generally, People's Technologies, are a central component of human rights, empowerment, and freedom in a computer-mediated society. The central idea of Free Software revolves around the ability for individuals and communities to use, understand, and control software as they see fit. Free Software was developed in reaction to proprietary software during the 1980s, when personal computers were becoming affordable in wealthy countries, but before cloud computing and the explosion of devices into billions of people's hands. As time marched on, ecosystem changes that concentrated power into the hands of centralized organizations prompted Free Software advocates to address hardware and network connectivity in greater detail. We can label Free Software, along with other technological dynamics outlined in subsequent sections designed to empower the global public with the freedoms granted by Free Software, as forming *People's Technology for People's Power* (or *People's Tech* for short). As we see in Section 3.2.5, the Free Software philosophy has strong affinities to anarchist philosophy. Yet before we get there, we begin our conversation with Free Software.

### 3.2.2: The Free Software Philosophy

Every task on a computer requires a set of instructions called software. As such, software is "key to the generic function of ICT, i.e. the sharing and processing of information" (NACI, 2004, p. 7).[90] Because software determines what your computer does (and does not) do, it shapes your level of digital freedom. This insight led MIT computer programmer Richard Stallman to found the Free Software Movement in 1983 (Stallman, 2010a, pp. 25-41; Tozzi, 2017, pp. 51-110). Stallman recognized that if you would like to change how a feature on your computer works, fix a bug with a patch, or remove a feature imposed on you by the software, then you must be able to access and modify the program's source code. Certain freedoms are thus necessary for users to be able to control the way their devices work, so that they may control their computer-mediated experiences.

90 Anthony Scott (2006), Chief Information Technology Officer of General Motors, states, "Virtually everything we do at General Motors has been reduced in some fashion or another to software" (p. 48). Scott highlights the 65 microprocessors used to control a high-end automobile as a case in point. He remarks that software is integrated into "everything" at General Motors, even its product line to online auction services which allow automobile dealerships "to fine-tune on a continuous basis the exact inventory he or she wants on the lot without having to wait for a physical auction to take place" (*ibid*, pp. 47-48). See also, Schneier, 2018b, pp. 59-64.

Four essential freedoms define Free Software (FS):

- *Freedom 0*: The freedom to run the program as you wish, for any purpose.
- *Freedom 1*: The freedom to study how the program works, and change it so it does your computing as you wish. Access to the source code is a precondition for this.

- *Freedom 2*: The freedom to redistribute copies so you can help your neighbor.
- *Freedom 3*: The freedom to distribute copies of your modified versions to others. By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this (Gnu.org, n.d.-a).

Freedoms 0 and 1 give users "*individual* control of the program… each user separately has control over what that program does for her" (Stallman, 2012). The source code must be open and not a "binary blob" (machine-readable code composed of a set of 1's and 0's that cannot be read by humans) so that humans can read, study, and understand how the program works.[91]

However, *individual* freedom is not enough to ensure user control of their devices. Most users don't know how to write code, and individual programmers cannot modify all of the millions of applications commonly in use. Therefore we need Freedoms 2 and 3 to provide *collective* control whereby "any group of users are free to work together to control a version that they use" (*ibid*). Together, these four freedoms "make it possible for a group of users to work together, changing the program to what they together want it to do" (*ibid*). They provide individual and collective control essential for computer user freedom. Any software that includes the four essential freedoms is called "Free Software", which is also called "Libre Software".[92]

91 For a more detailed explanation, see Guadamuz, 2008. For an historical overview of Free Software, see Tozzi, 2017; Moglen, 1999; Stallman, 2010a.

92 For English speakers, the term Free Software is a bit of a misnomer. The term "Freedom Software" is trademarked and so "Free Software" instead became the term of choice. The word "Free" in Free Software refers to "free as in freedom, not "zero price". Sometimes FS advocates say "free as in free speech, not as in free beer". In other words, "Free" is about user rights, similar to "free speech" or "liberty". It is not about paying money or purchasing software. However, because Free Software allows users to make copies and share them for free, people can gain access without paying. Thus FS is often "free as in price" – an important benefit to the poor – but this is a secondary detail.

*Proprietary and Nonfree Software*

Software that does not grant all four freedoms is nonfree software, also termed "user subjugating proprietary nonfree software" (*ibid*). Nonfree software is typically proprietary software that features proprietary source code. Proprietary software is owned by an individual or company. Its source code is almost always kept secret (in binary form) so that others may not "steal" their code. If software is like a cooking recipe, proprietary software is like a trade secret: the owner does not want anyone to know how it works.

In an effort to coerce payments out of individuals, proprietary software typically keeps the source code closed and prevents use without purchasing some form of access. By preventing users from being able to understand and control their software, the owner of the program exercises power over the user through control of the program. As Stallman (2010a; 2012) observes, this has led to increasing amounts of exploitation. Over the years, owners of proprietary software have become aware of their power and used it to add malicious features – such as spyware (software that collects data about users or watches their behavior on their devices) – for the purpose of control and profit. For example, some nonfree software includes universal back doors which allow a company to remotely install or delete software on your computer without user consent (Gnu.org, n.d.-b; Hoover, 2007; Bright, 2015; Keizer, 2011; Beaumont, 2008). While this may be used for positive purposes, it can also be used for malicious purposes and is especially dangerous in an age where corporations are collaborating with (or forced to help) governments spy on their users. Free Software provides source code transparency, which, by facilitating peer review and empowering people to modify their software, provides a necessary safeguard against malicious features (O'Brien and Kwet, 2018).

*Free (and Open Source) Software Varieties*

Software licenses govern author and user rights (Rens, 2014). A "copyleft" license stipulates that all subsequent modified or extended versions of the software under the license must continue to grant the same terms as the original license (Stallman, 2010a, pp. 27-36; Gnu.org, n.d.-c). Examples of popular copyleft licenses include the GNU General Public License (GPL), Creative Commons share-alike (CC-SA), and the Open Software License (OSL). Copyleft software is designed to ensure that software continues to be free and open as it evolves. In this way, the developer community continues to replenish the software commons.

The term “open source” is sometimes used to describe software. It became popular in 1998 when a group of prominent software developers held a conference to declare the use of the term “open source” instead of Free Software as a *political* point of emphasis. The open source camp was unhappy that Free Software advocates stressed ethical reasons underpinning the imperative to use Free Software licenses. In an attempt to court business corporations, open source advocates created the Open Source Initiative, an organization dedicated to their movement. They based their criteria for the Open Source Definition on the Debian Free Software Guidelines.

While open source and Free Software licenses are essentially the same, the split into two camps is an important part of software history. Those who opted for the term “open source” did so with little concern for anything but the practical improvement of software (i.e. they disregard questions of individual and communal liberty, social justice, and the integration of technology with power). In their view, software code should be free and open not for the purpose of politics, but to make better functioning software. From the perspective of the Free Software philosophy, the politics of source code is about individual and communal freedom (Grodzinsky, Miller and Wolf, 2003; Söderberg, 2008).

### 3.2.3: The Digital Ecosystem: A Holistic Framework

Whereas Richard Stallman created an early philosophy for freedom in the digital era, Columbia law professor Eben Moglen offers a wider framework for how to make sense of freedom and human rights in the digital age. Moglen’s framework links issues of power and control over information and the digital ecosystem to three “core pillars” of the digital revolution: hardware, software, and connectivity. In *Die Gedanken Sind Frie*, Moglen (2004) lays out a basic framework for how freedom and power operates in the digital ecosystem. He states that four components of the digital revolution – hardware, software, network connectivity, and culture – interact to produce conditions of freedom (or domination) in the digital age.

For Moglen, Free Hardware – computing, data storage, and the like – must be free of corporate and state control. Free Hardware has three central elements. First, users retain ownership of hardware (which is to say, their computing and storage capacity remains on their devices and is not centralized in the cloud).[93] Second, hardware does build in “locks” that prevent users from placing the software they desire on their devices. If a hardware manufacturer, for example, sets the device to erase software

93 For additional context, see Hassan, 2017.

modifications on boot, or bricks (destroys) the device after the software is modified, or blocks the distribution of modified code, then hardware is unfree.[94] And third, hardware design is "free and open" to use, study, modify, and share both verbatim and modified copies of hardware design. Software, in turn, must be "Free Software" (see above). And finally, "Free Spectrum" (and more generally, Internet connectivity) should be unlicensed, must include bandwidth for all people on equal terms. The Internet would be ideally networked in decentralized fashion through technologies like wireless mesh networking with remaining networking infrastructure (such as the fiber-optic cables to tie them together) controlled by communities. Government regulations should ensure network neutrality – essentially, requiring Internet service providers to route traffic without discrimination, as if they are common carriers (Wu, 2003).[95]

Moglen outlines his version of Free Culture in *The dotCommunist Manifesto* (2003). Given that information in the digital age has a near-zero marginal cost of production, he argues, digitizable published works should be made available to all people everywhere on earth, for free. In colloquial terms, this means downloading and streaming all published works should be legal. The three "pillars" of Free Software, Free Hardware, and Free Spectrum form the platform for Free Culture. They intersect, often holistically, to produce outcomes which shape or even dictate control over information flows.

*Power in the Digital Ecosystem: A Case Example*

To understand how this works, let us consider a simple example. Current copyright law places many published works behind a temporary monopoly,[96] a "copyright", that constitutes a paywall for the public. A book, for example, might be copyrighted for the life of the author plus 70 years after death, at which point the manuscript enters the public domain and may be accessed for free. With the control accorded to people by the combination of Free Software, Free Hardware, and Free Spectrum, however, copyright faces an existential crisis. Free Software frustrates attempts to prevent making extra copies of an e-book. For example, Digital Rights Management software might code a rule which restricts access to copies of a proprietary e-book. However, if that software is Free Software under the control

94 For a further explanation, see the Linux Information Project's (2007) discussion of Tivoization.

95 The DTPS (2016) endorses net neutrality as a matter of official policy (pp. 47-49). Because the education system has little bearing on net neutrality, it is not discussed in this dissertation. However, the importance of net neutrality could be taught in schools at an appropriate age.

96 For a discussion of copyright as a temporary monopoly, see Baldwin, 2014, pp. 65-88.

of the user, then the user can change that code to remove the restriction. In this example, control over software powerfully shapes the ability to enforce copyright.

Another way to enforce copyright paywalls is through centralization of access to the information through the "cloud".[97] Imagine users in society own their own computers (e.g. a smartphone or a laptop) – but there are no more high-capacity storage drives in their devices and they instead keep all their data on third party servers. Copyright could then be enforced with ease because the capacity for mass public copying and distribution of copyrighted works would be lost. People could no longer take, say, George Orwell's *1984* e-book, make additional copies on their computers, and share them with other people through the Internet without paying.[98] *Control of the infrastructure* gave them the power to erase the information off the devices of users who bought them. If data storage becomes centralized in the cloud, Free Culture would not be possible, especially given the persistence of the copyright monopoly. Decentralized ownership of hardware is thus essential to the fight for Free Culture.[99]

In a similar way, software that is executed as a service by third parties instead on a user's own machine nullifies the freedom granted by Free Software. If, for example, each personal computer did its computing through the cloud, then end-users lose the ability to control their computing experience. This is happens with Software as a Service (SaaS) platforms, such as Google Docs. Users send data as requests to Google's servers which in turn do the computing for the user. Even if the software running Google Docs is Free Software, users cannot change the software because it is under the control of Google. In that sense, the service offered is nonfree.

### 3.2.4: Internet Decentralization

Indeed, the present configuration of the Internet is centralized in ways that contradict the original intentions of some of the Internet's designers. Bob Taylor, one of the Internet's central architects, stated, "My bias was always to build decentralization into the net… That way it would be hard for one

97 The cloud is sometimes used synonymously with the "Internet", but that is technically incorrect. The cloud is "a utility computing model that involves a dynamically growing and shrinking collection of heterogeneous, loosely coupled nodes, all of which are aggregated together and present themselves to a client as a single pool of compute and/or storage resources" (Stokes, 2009). It "is always owned by one institution, regardless of whether use of the cloud is open to clients outside that institution or not (i.e. whether the cloud is public, private, or hybrid)" (*ibid*). See also, Ruparelia, 2016.

98 With a touch of irony, Amazon remotely erased *1984* from Amazon Kindle devices even though its users paid for it (Stone, 2009).

99 Of course, as we saw in Chapter 2, culture is not *accessible* unless people have the needed resources and capabilities, as when websites are not offered in the language native to the user.

group to gain control. I didn't trust large central organizations" (Isaacson, p. 250). With the rise of cloud computing handled by third party services, users lose the ability to control their computer experiences. The present client-server network model has billions of users as clients at the edge requesting information from a small number of corporations as servers in the center who process, store, and deliver information back to the clients. This configuration is problematic from a social justice perspective, as it confers enormous power to large central organizations, who own and operate the clouds. As we see in Section 3.3, in a global context, this model results in colonial dispossession.

As an antidote to this dilemma, the Free Software Movement is building decentralized networking alternatives. In February 2010, Eben Moglen and his colleagues launched the FreedomBox concept in reaction to cloud centralization (Moglen, 2010). The FreedomBox is Free Software designed to run a secure, personal server that protects user data and privacy and provides infrastructure for communities to network their online activities without the need for centralized intermediaries. On this model, each person has a small, inexpensive device plugged into their wall in their home. The device operates as a personal cloud: it offers a wireless access point, and it has a hard drive that stores user data, so users can access their personal information from any device over the Internet when away from home. It operates as a personal privacy protector: with the click of a button, you can enable Tor, and it will route user traffic through the Tor network to provide them with anonymity and bolster their privacy (Feigenbaum and Koenig, 2014; Chowdhury et al., 2014; Verma, Kshirsagar and Khan, 2013). It offers other services, such as private email and ad blocking. Crucially, FreedomBox allows the decentralized hosting of alternative platforms built for privacy, such as Mastadon and GNU Social, through either peer-to-peer or highly decentralized networks with servers based in local communities. FreedomBox can also run on a laptop or in a router, and it can be installed for groups to use in schools, businesses, or other organizations. On the FreedomBox model, each unit functions as a client and a server. The technology is explicitly designed to retrofit decentralization into the Internet.[100]

Beginning around 2016, efforts to re-decentralize[101] the Internet have gained momentum, and are backed by leading technologists such as Tim Berners-Lee, the inventor of the world wide web, and Vint Cerf, the co-inventor of TCP-IP (Finley, 2016). MIT scholars conducted a feasibility study on Internet decentralization in 2017, which prominently featured FreedomBox (Barabas, Narula and

100 See Moglen, 2017. Of note, Moglen reaffirmed his commitment to the framework he outlined in *Die Gedanken Sind Frie* in a speech on FreedomBox hosted by Yale University (*ibid*).

101 The term "re-decentralize" is used by scholars to denote the fact that the Internet was initially designed to be decentralized at the architectural level, but corporations have built services on top of the stack that effectively centralize the flow of information. See Barabas, Narula and Zuckerman, 2017, pp. 8-14.

Zuckerman, 2017, pp. 33-38). They found that decentralization can address "platform mega-consolidation", but that they face challenges, including the need for greater funding, further developing (e.g. to ensure solid security suitable to mass adoption), and difficulties scaling up to a mass user base (*ibid*, pp. 104-112).

Decentralization technologies require a number of conditions for success: they have to be user-friendly with simple interfaces accessible to the masses; millions and then billions of people need to use them instead of surveillance services; devices must be affordable to the poor; ISPs must be prohibited from throttling decentralization and privacy technologies such as Bit Torrent and Tor; and sufficient funding is needed for development. Because technology designed this way strikes at concentrated state-corporate power located in the United States, it will need a strong movement driving it from below. This means popular participation is necessary, which requires activism and understanding of how technical architecture integrates with power and social justice. Anarchism provides an excellent lens from which to approach the topic.

### 3.2.5: Anarchism and the Free Software Movement

Anarchism, we have seen, is a theory and movement that seeks to challenge authoritarian relationships and abolish them where they cannot be justified. It opposes forms of control and exploitation derived from private property and the state. Anarchists seek to collectively own and control the forces of production and distribution by breaking down the status quo through direct action, prefigurative politics, and by supporting near-term reforms that weaken power and bolster social justice and immediate relief for poor and marginalized people.

On occasion, prominent scholars have compared the Free Software philosophy and movement to anarchism. In "Anarchism Triumphant", Eben Moglen (1999) writes that intellectual property rights (in the form of patent and copyright monopolies) are not necessary for the production of quality and numerous intellectual works, while treating ideas as property creates social inequality and cultural hegemony. Anarchism, he argues, is a "viable political philosophy" in the network society, especially due to the fact of near-zero marginal cost in the production and exchange of digital works (*ibid*, p. 20). Moglen subscribes to a vision of human nature found in classical liberal and socialist thought (Chomsky, 2005 [1970]) which theorizes that common people are alienated by industrial labor productions and excessive divisions of labor, but under conditions of freedom they will produce intellectual works because it satisfies the desire to create, share, express oneself, and improve society (Moglen, 1999).

The Free Software programmers have “use[d] intellectual property rules to create a commons in cyberspace” – copyleft code – “is the central institutional structure enabling the anarchist triumph”, Moglen argues (*ibid*, p.22). While Moglen does not tie his work to anarchist scholarship, copyleft itself expresses anarchist principles: it prevents ownership of code as property; it permits use, modification, and sharing by individuals and communities; and it prioritizes the moral imperative to secure individual and communal liberty, as well as sharing in a knowledge commons. Its near-zero marginal cost radically reduces transactions costs and makes free exchanges the norm, while the network society increasingly improves the possibility of coordination among diverse masses without geographic limitation. It is thus practical to share information without charging a price on the market because it would democratize knowledge while bringing humanity closer to coordination of the global society across borders. Given its strong affinities to anarchism, Moglen characterizes Free Software as “anarchist production” and deems it an “anarchist counter-strike” to software as private property (*ibid*, pp. 23-24).

Esteemed Harvard Professor Yochai Benkler, (2013) penned his own piece on Free Software and anarchism in his article, “Practical Anarchism”. Exploring several case examples of major projects in the digital tech world,[102] Benkler addresses “working anarchies” which he defines as “peer mutualism” or voluntaristic cooperation absent coercive relations from state-backed property-based systems. Benkler argues that “FOSS provides a crisp example of large-scale, society-wide and economy-wide production that is based on a nonstate, non-proprietary model, and that many, although not all, projects also exhibit characteristics of relatively diffuse power, and nonhierarchical relations within the voluntary associations that make up the projects. Moreover,” he continues, “it is an example of a domain in which this model of production has successfully challenged, competed with, and bested or at least equaled a proprietary model of production” (*ibid*, p. 226). In each of the models sampled, Benkler identifies strong elements of anarchic relations, but not full anarchist models. We can add to this that Benkler’s working definition of anarchism focuses on internal organizational structure, but does not address that anarchist praxis is explicitly committed to libertarian socialist aims in society. It is not clear where the groups sampled stand on more general political applications of their technologies

102 These are: the Internet Engineering Task Force (IETF) (a voluntary organization which sets standards for TCP/IP); the World Wide Web (W3C) consortium (the main international standards organization for the World Wide Web); the Internet Corporation for Assigned Names and Numbers (ICANN) (a nonprofit ); FOSS software (Debian, Apache, and others); and Wikipedia.

to society, though it is safe to say most of the organizations discussed (e.g. IETF, Apache, Wikipedia) are not anarchist organizations.

In a study on hacktivism, McGill professor Gabriella Coleman (2017), a leading authority on hacker movements, notes that "Across Europe, Latin America, and the United States, anticapitalist hackers run collectives—many doubling as anarchist associations—providing privacy-enhancing technical support and services for leftist crusaders aiming for systemic social transformations" (*ibid*, p. 592). Indymedia hosts alternative media, while around 28 organizations offer technical infrastructure as Internet service providers "organized around consensus-based, anarchist principles" (*ibid*, p. 98). In countries where anarchism is more entrenched, she adds, "leftist hacker projects [are] more present and robust" (*ibid*, p. 99). These organizations serve as a better example of Benkler's "practical anarchism" in action, even though they are less impactful on the digital ecosystem than large-scale projects like Wikipedia. Though Coleman didn't add other possible examples into the study, it is worth noting that many other organizations, such as the Tor project, LibrePlanet, and Chaos Communications Congress, embrace strong formal commitments to equality on the basis of race, class, nationality, gender, and sexuality, and frequently support immigrants, religious liberty, privacy, and similar political causes.[103]

Anarchism and Free Software clearly have strong affinities in theory and practice. Both philosophies stress communal property ownership and control, the harmony of individual and communal liberty, the use of direct action to restrain political power, a strong demand for freedom and liberty in the here and now, the desirability of non-heirarchical relations, and skepticism towards power. For this reason, this dissertation merges anarchism and the Free Software philosophy to analyze e-education policy.

### 3.3.1: Digital Colonialism – A Structural form of Domination

As we have seen, the ownership and control of digital technology is a major source of power in the digital society. As noted in Section 3.2.3, software, hardware, and network connectivity intersect in ways that structure power over computer experiences. Proprietary and non-free software, cloud centralization, and control over network connectivity, by contrast, are used to exercise power over individuals and communities. Today, US technology corporations have obtained near-absolute dominance over the digital ecosystem at the technical architectural level. This gives rise to five related forms of domination: 1) *economic domination*, in which the monopoly power of US based corporations

103 See, for example, the yearly speakers at Libre Planet, the leading annual Free Software conference (e.g. https://libreplanet.org/2017/program/speakers.html).

allows them to extract resources through rent and surveillance, 2) *imperial control*, whereby the domination of architecture gives the US control over political, economic, and cultural forms of computer-mediated experiences, 3) *global surveillance capitalism*, in which surveillance capitalism is extended to countries integrating with US-based products on the open Internet, 4) *imperial state surveillance*, in which the Global North, led by the United States, spies on the Global South, and 5) *tech hegemony*, in which US elites have persuaded most people that society must proceed according to its own ruling class conceptions of the digital world. Each of these five features will be discussed in turn.

### 3.3.2: Economic Domination

During the colonial period, corporations colonized territories settled by indigenous peoples in the "pathological pursuit of profit and power" (Bakan, 2004). In 1602, the Dutch East India company was established. By 1650, they formed the first European colony in Southern Africa, the Cape Colony. In the following years, white settlers stole land from the native peoples, imported slaves, put the indigenous people to work, imposed racist laws, carried out horrific acts of physical and psychological violence, and propagated racist doctrines that rationalized colonial conquest (Lapierre, 2009).

Over the next two decades, white settlers stole large swaths of land from the local inhabitants. Soon after the discovery of diamonds (1867) and gold (1876), a struggle for mineral-rich land soon culminated in the Anglo-Boer War. By 1910, the British and Afrikaners put aside critical differences and created the Union of South Africa. United in a racist pact, they further dispossessed blacks of their land and entrenched racist laws for white minority rule. Within a short amount of time, a handful of corporations came to dominate large parts of the economy. The Oppenheimer family dynasty controlled almost all the country's diamonds, half the gold and platinum, and a quarter of the coal. With their accumulated riches, they obtained critical stakes in many other industries, including banking, steel, auto, electronics, and agriculture (Sharife and Bond, 2011).

Today, a new form of corporate colonization is taking place. Instead of the conquest of land, Big Tech corporations are colonizing digital technology. The following functions are all dominated by a handful of US multinationals: search engines (Google); web browsers (Google Chrome); smartphone and tablet operating systems (Google Android, Apple iOS); desktop and laptop operating systems (Microsoft Windows); office software (Microsoft Office, Google Docs); cloud infrastructure and services (Amazon, Microsoft, Google, IBM); social networking platforms (Facebook, Twitter);

transportation (Uber, Lyft); business networking (Microsoft LinkedIn); streaming video (Google YouTube, Netflix, Hulu); and online advertising (Google, Facebook) – among others. GAFAM now comprise the five wealthiest corporations in the world, with a combined market cap exceeding $3 trillion (The Daily Records, 2018). If South Africans integrate Big Tech products into their society, the United States will obtain enormous power over their economy and create technological dependencies that will lead to perpetual resource extraction.

As an empirical matter, this point has been understudied. Nevertheless, early research and anecdotes suggest the economic impact of Big Tech intermediaries is detrimental to local African industries. Murphy, Carmody, and Surborg (2014) studied the role of ICTs among small, medium, and micro-sized enterprises (SMMEs) in South Africa's and Tanzania's wood and tourism industries. They found that ICTs introduced the dominance of information intermediaries. Increased use of ICTs also led to greater worker surveillance in some instances. They concluded that ICT integration is, on balance, benefiting foreign-owned businesses and corporations.

Similar conclusions can be derived from press accounts of the transportation industry. Uber, for example, began operating in Johannesburg in 2013 with disastrous consequences. In 2016 and 2017, several Uber drivers were burned alive by metered taxi drivers, and one driver had acid thrown in his face in the "South African taxi wars" (Pijoos, 2017). While Uber is said to benefit South Africans by improving taxi services through technological innovation (Fairweather, 2015), this ignores several important points. First, Uber receives 25% commission for each transaction, while drivers have to pay additional "hidden" costs (such as booking fees, vehicle maintenance, and tolls) (Ridester, 2018). This means that one quarter of all revenue for e-hailing taxi transactions are now extracted by a foreign corporation. Second, Uber prices are artificially low due to the fact that they are able to operate at a loss – to the tune of billions – thanks to backing from Wall Street firms and other wealthy investors (Horan, 2017, pp. 28-44).[104] Moreover, the economic efficiencies said to be gained from e-hailing services over traditional taxi services have no objective, empirical foundation (*ibid*, pp. 62-63). Their strategy, Cooper (2017) remarks, is to harness "powerful high-tech tools" to "undercut competition with investor-subsidized fares, and then when everyone else is driven out of business, jack prices through the roof and collect monopoly profits" (see also; Akoob, 2017b).

A couple of other case examples demonstrate the growing dominance of US tech corporations in South Africa. In November 2017, Anton Harber of the *Financial Mail* ran an article declaring

104 While Uber is secretive about its internal data, Horan (2017) estimates it recovers about 41 percent of costs while wealthy investors subsidize the rest (p. 41).

Google and Facebook the “nemesis of the press”. The two firms, the article explained, completely dominate the global advertising industry. In South Africa, Google takes about 70% of online ad revenue, while social media – led by Facebook – take another 12%. Just 8% of local online advertising revenue goes to the South African media. If this continues, Harber exclaimed, “the big two could have a devastating effect on the media’s role in defining democracy” (Harber, 2017).

By May 2018, MultiChoice, provider of the major premium subscription television service, DStv, announced 115,000 subscribers abandoned the service, with many likely switching to Netflix (Haffajee, 2018). While moving to streaming media itself may seem the solution for South African broadcasters (e.g. MultiChoice has its own Netflix-like service, Showmax), international competitors have deep pockets and are buying up rights to broadcast local media (e.g. Netflix is purchasing a library of shows in Turkey, the Middle East, and Africa; see Chutel, 2018). CEO Calvo Mawela has added that Netflix employs very few people (approximately 4,000 worldwide) while South Africa’s MultiChoice has 8,000 employees in South Africa alone (87% black and 51% women). Losing business to “streaming giants like Netflix and Amazon” could threaten South African jobs (Vermuelen, 2018).

These case examples – Internet-driven intermediation in the wood and tourism industries, e-hailing services in the taxi industry, the dominance of Google and Facebook in online advertising, and the shift to streaming video on demand provided by US-based multinationals like Netflix and Amazon – illustrate that a new “scramble” for Africa’s emerging digital economy has commenced. However, it would be a mistake to view these incidents as disconnected, wholly economic, or isolated from the nature of digital infrastructure, as most analysts do. Instead, we need to consider how control of digital architecture is at the root of much of digital colonialism.

### 3.3.3: Imperial Control

Colonial conquest typically entails dispossession of valuable resources from the native peoples and the ownership and control of critical infrastructure by colonial powers which facilitates foreign control. In many parts of the Global South, critical infrastructure such as railways were designed by colonial powers not to benefit the indigenous population, but to service the mother country. In the arrangement that emerged through European colonialism, raw materials were extracted by exploited local labor and shipped back to the empire. In some cases, colonial forces would import the cheap, machine-made industrial products to the villages, undermining local artisans and the capacity to build competitor industries.  In Africa and elsewhere, railroads were built from the country interior straight to the ports and military stations, with little “spread effect” to connect up the indigenous people.  The architectural design of the production system was not engineered to benefit the local inhabitants, but to “serve immediate European needs” (Azevedo, 1981; Stavrianos, 1981, pp. 176-191; Pirie, 1982; Jedwab, Kerby and Moradi, 2017).

Under digital colonialism, foreign powers, led by the United States, are planting infrastructure in the Global South engineered for its own needs, enabling economic and cultural domination while imposing privatized forms of governance.  To accomplish this task, major corporations design digital technology to ensure their own dominance over critical functions in the tech ecosystem.  This allows them to accumulate profits from revenues derived from rent (in the form of intellectual property or access to infrastructure) and surveillance (in the form of Big Data).  It also empowers them to exercise control over the flow of information (such as the distribution of news and streaming services), social activities (like social networking and cultural exchange), and a plethora of other political, social, economic, and military functions mediated by their technologies.

The control of code is foundational to digital domination.  In *Code: And Other Laws of Cyberspace*, Lawrence Lessig (2006) famously argued that computer code shapes the rules, norms, and behaviors of computer-mediated experiences in ways similar to architecture in physical space (e.g. imperial railways designed for colonization).[105]  As a result, “code is law” in the sense that it has the power to usurp legal, institutional, and social norms impacting the political, economic, and cultural domains of society.  This critical insight has been applied in fields like copyright, free speech regulation, Internet governance, blockchain, social media platforms, privacy, and even torts (see Section 1.3.1).  What has been missed by the intellectual community, however, is how US dominance of code – and other forms of digital architecture – usurps sovereignty in foreign countries.  The power of the United States over code and other digital infrastructure constitutes a new form of imperialism.

As we have seen, digital forms of power are linked together through the three core pillars of the digital ecosystem: software, hardware, and network connectivity.  US multinationals have designed digital architecture which allows them to accumulate vast fortunes based on rent or data extraction.  In the case of copyright, control over software, hardware, or the Internet are each used to protect the copyright monopoly in the name of intellectual property rights.

105 See also Reidenberg, 1998.

Facebook's Free Basics service offers another case example of how Big Tech corporations expand empire in the Global South. With Free Basics, Facebook decides which content and websites the poor can access – while of course offering Facebook itself within the app. The app not only has Facebook playing Internet gatekeeper of the poor, it also violates net neutrality laws: zero-rated offerings place content providers on unequal footing. Several countries have terminated Free Basics, in part due to popular backlash (Hatmaker, 2018). However, Internet.org has put over 100 million users from over 60 countries – including South Africa – into the Facebook platform, which channels them towards the Facebook ecosystem.

Integrating platforms like Facebook outside the US does more than drain local advertising revenue: it undermines various forms of local governance. Seventy-five percent of web publisher's traffic now comes from Google (46%) and Facebook (29%) (Parse.ly, 2018). Centralization of services into their hands provides them with centralized control over communications – by way of code. These two firms filter search results and news feeds with proprietary black box algorithms, granting them enormous power to shape who sees which news. Leftist outlets have published data suggesting that Google censors socialist views, while Facebook has been found to favor mainstream liberal media (Wakabayashi, 2017; Nunez, 2016).

Platforms also regulate freedom of speech and association (Balkin, 2018a; Swire, 2012; Schneier, 2018a). If an online social network detects certain keywords and forms of speech, they can censor it, or ban the user. Moreover, they can prohibit the right to associate with others in the pursuit of social, political, economic, cultural, and religious ends. This has been carried out against Palestinians (e.g. with the removal of the page for the political party, Fatah), as well as the far-right (Greenwald, 2017). As private overlords of critical information infrastructure, US multinationals have the power to regulate the press, speech, and association in foreign territories, as they see fit.

These examples demonstrate how structural domination of the tech ecosystem undermines local sovereignty through privatized forms of political, economic, and social governance. This helps the US perpetuate copyright paywalls, control information flows, spread their platform monopolies, supplant local autonomy, filter communications, and deepen dependency on the US. In turn, corporations increasingly profit from Big Data surveillance, an exploitative human rights transgression against the Global South.

### 3.3.4: Global Surveillance Capitalism

*Surveillance Capitalism: A Brief History*

As noted in Chapter 1, in the past few years, digital studies has become increasingly preoccupied with surveillance, and the public in many parts of the world have become distressed by the dramatic increase of both corporate/commercial and state surveillance as a feature of what some scholars call "surveillance capitalism". From an historical standpoint, surveillance capitalism is nothing new. During the days of slavery, slave holders used racial phenotypes to track fugitive slaves and police black bodies (Parenti, 2003, pp. 13-32; Brown, 2015). In colonial South Africa, skin brandings were administered by whites to enforce racist pass laws (Van Sittert, 2014).

Surveillance has always been developed in tandem with science and technology. In the late nineteenth century, the United States integrated new technologies for its own imperialist excursions. As Alfred McCoy documents in his seminal study, *Policing America's Empire*, during the "first information revolution", the US harnessed Thomas Edison's quadroplex telegraph (1874), Philo Remmington's commercial typewriter (1874), Alexander Graham Bell's telephone (1876), Melvil Dewey's Dewey Decimal System, and Herman Hollerith's punchcard system (circa 1889), and police telegraph/telephone call-box systems (McCoy, 2009, p. 24). Adding biometric analytics and new statistical methods (such as statistical regression) to the mix, US intelligence forces spun together a new surveillance system designed to pacify the Filipion/a population and target its leadership with blackmail and misinformation (McCoy, 2015).

In South Africa, pass laws were first issued on paper, and could be easily swapped or forged. In order to improve their surveillance capabilities, the colonists created a skin branding system to enforce racist pass laws and police livestock theft (Van Sittert, 2014). Surveillance in South Africa would next advance thanks to contributions from Britain's Sir Francis Galton, the (then) celebrated statistician and Social Darwinist who coined the term eugenics. As Keith Breckenridge (2014) documents in *Biometric State*, Galton embarked on a two-year trip from the Cape Colony to present-day Namibia, where he developed racist opinions of Africans that would inform his ideology. Galton went on to invent the statistical concepts of correlation and regression to the mean, which formed the basis for his Social Darwinist theories of race-based heritability of "general" intelligence and moral qualities (of which Africans were inferior). Galton created the field of biometric science and the developed the modern techniques of biometric fingerprinting. The British police commissioner Sir Henry Edwards spent time as a police commissioner in India in service of British imperialism. He was redeployed to

South Africa in 1901 to overhaul the police forces in Johannesburg, and did so in part by implementing fingerprinting for surveillance passes administered to African workers in the mines.

During the mining period, white land-owners quickly amassed claims to the most valuable land. Because mining requires many hands, they demanded a steady stream of labor. At the Kimberley mines, whites created the segregated housing arrangement foundational to South Africa's iconic migratory labor system. Initially, black laborers stayed in compounds with white diggers or housed themselves in tents or sheds. New laws eventually herded blacks into fenced and guarded barracks owned and controlled by the mining magnates. The closed compound system, as it came to be known, was based on a convict station built by the De Beers mining company in 1885. At the station, black "convicts" were housed and fed by the company while they performed unpaid compulsory labor. Mining companies copied the model for black wage slaves as a mechanism of worker control (Meredith, 2007, p. 45; Crush, 1993). Restricted by fences a barbed wire, the system provided a means to police diamond theft and the mobility of workers. By the mid-1880s, "there was little discernible difference between the workplace, the compound, the location, and the jail in Kimberley; all were part and parcel of the same system of labor control" (Worger, 1987, p. 146). A similar process unfolded in the Transvaal. On the gold mines, semi-closed compounds could close off premises to the outside world, but permitted workers to enter surrounding townships and slums – provided they secured passes.[106]

By the 1950s, new technological developments again enticed state and private sector elites to construct novel forms of surveillance. With the shift to apartheid, the National Party used punched card machines to administer national identity cards based on a fixed, legal regime based upon race. Cards were affixed to special "reference books" (also called *Dompas*, meaning "dumb passes") designed to continuously profile and surveil the African population.

The apartheid ideology aimed to produce precisely regulated segregation (racial quotas measured according to ratios) to keep race "pure" while ensuring the continued supply of black labor for white exploitation. The Nationalists thought it necessary to extract and process vast collections of data for effective administration. The previous Prime Minister, Jan Smuts, had remarked, "you might as well try to sweep the ocean back with a broom", referring to African movements to the cities (Uys, 1965, p. 19). Comprehensive data was needed to stem the tide and enforce residential quotas. A "mania for measurement" thus pervaded the Department of Native Affairs, rooted in the impulse to

106 By 1910, "there were over fifty compounds on the Witwatersrand, housing 200,000 miners" (Crush, 1993, p. 306, see pp. 305-311 for pictures).

"count and control". According to Deborah Posel, "a concerted bid to 'modernise' racial domination" through a state "sufficiently large, powerful, bureaucratically expert and knowledgeable to keep each race in its proper place economically, politically and socially" made apartheid distinct from the prior era (Posel, 2000, p. 116, 126).[107] Put differently, white elites understood that "data is the new oil".[108]

To convert the surveillance system from conception to reality, the NP imported computers from IBM to make data management practical.[109] However, the technology was not sufficiently advanced to collect, organize, process, and administer the data that poured into intelligence centers. Africans would lose their passbooks or tear out pages, which meant that administrative backlogs for passes quickly accumulated, while increasingly large numbers of staff had to be trained to read and distinguish fingerprints (a process that was not yet computer-automated). The ultimate vision for a near real-time, all-seeing surveillance state failed, but not without wrecking havoc on the African population. According to government data, 637,584 Africans were arrested for not carrying official identity documents in the ten years prior to 1985. (By contrast, two coloureds, zero Indians, and zero whites were arrested.)[110] More than anything else, the Dompas provided a thin legal cover for mass incarceration and police brutality.[111]

As time marched on, the United States became increasingly involved in surveillance inside the country. During the early colonial period, the US has virtually no involvement. When white settlers discovered mines, wealthy US capitalists became major investors and its engineers became powerful figures in the mining communities (Higginson, 2007). One engineer, Sydney Jennings, praised the "most excellent" pass laws, testifying that "if properly carried out, and efficiently administered, [they] will enable us to get complete control over our kaffiri labourers" (The Witwatersrand Chamber of Mines, Johannesburg, S.A.R., p. 44; Breckenridge, 2014, pp. 67-68). Once the society shifted to apartheid, the US again increased its involvement. First, IBM supplied the specialized punched card

---

107 Deborah Posel, "A mania for measurement: statistics and statecraft in the transition to apartheid," in Saul Dubow, ed., *Science and society in Southern Africa* (New York, NY: Manchester University Press, 2000): 116; 126; 131.

108 In this regard, some of the techniques currently employed by Big Data and artificial intelligence systems were envisioned for National Party governance. For example, Posel remarks that the Department of Native Affairs "imagined the possibility of its own omniscience in the form of all-encompassing racially disaggregated and elaborately cross-referenced statistical data, which quantified the extent of a host of 'problems' confronting the state and the manner of their 'solutions'" (Posel, 2000, p. 116).

109 Similar attempts at surveillance were made by private companies for the mines during the 1980s and early 1990s (Crush, 1993).

110 Over seventeen million Africans were arrested for violating pass laws between 1916 and 1981. In 1982, Parliament was told pass law arrests averaged one person every two and a half minutes. About 60% of Africans were convicted on their first appearance in court. See Omond, *The Apartheid Handbook*, pp. 123-130.

111 See especially, Breckenridge, 2014. The true extent of the policing system is likely lost to history: the apartheid police services destroyed their records in 1992 during the transition to democracy (Edwards and Hecht, 2010, p. 634).

machines needed to register the census data and impose racial categorization on the whole population. IBM lost a bid to Britain-based International Computer Limited to service the African dompas, but at the end of the 1970s, it won the contract to supply computers for the extension of the reference books to the rest of the population. Western corporations provided the lion's share of computer equipment needed to make the apartheid state, military, and business sector function with efficiencies demanded. Sanctions and political pressure eventually restricted the sale of computer equipment to apartheid elites, and the transition to democracy in 1994 marked a brief reduction of active (or known) US-supported surveillance in the country.

*Big Data as Structural Domination Linked to Technical Architecture*

However, with the spread of digital technology, US surveillance has now reached new heights through digital era surveillance capitalism. Broadly speaking, scholars use the term to denote the rise of corporate surveillance for commercial purposes, coupled to partnerships with states who often request or coerce the data out of the corporate sector. Surveillance capitalism is thus a state-corporate phenomenon restructuring today's capitalist societies (Mayer-Schönberger and Ramge, 2018).

Global surveillance capitalism is leading to a new form of colonization whereby US multinational corporations, driven by profit, harness surveillance for political, economic, and cultural domination. Big Data is the centerpiece of this new form of commercial surveillance. By collecting massive troves of information about as many people as they can, corporations are able to discern patterns about individuals and groups for personalized interactions such as ranking (e.g. financial credit scores or insurance premiums), targeted advertising, content curation, educational assessment, and other computer-mediated experiences.

In order to accomplish these tasks, corporations utilize digital technology to conduct ubiquitous surveillance. For example, Google Android assigns each device a "device ID" that Google and Android app publishers use to track people's behavior on their phones. Researchers at the ICSI Haystack Project, led by UC Berkeley and IMDEA Networks, have found about seven in ten apps in the Google Play store incorporate hidden trackers in the form of Software Developer Kits (SDKs) that track mobile phone activity (Vallina-Rodriguez and Sundaresan, 2017; Razaghpanah et al., 2018). These trackers are mostly creations of advertising corporations offering services to app publishers for targeted advertising purposes. Data collected are extensive and can include any permissions granted to the user's app. For example, the Airbnb app includes trackers from giants like Google and Facebook, as well as niche companies like Braze and mParticle. The app's permissions include access to coarse and fine-grained location, camera, reading contact data (addresses) stored in your phone, making phone calls, and changing the WiFi settings (Exodus, n.d.). Most apps have several hidden trackers packaged into each app, usually to monetize surveillance (Nguyen, 2018). In the most extreme examples, companies package in software that allows a smartphone user's physical location to be tracked to the square foot using inaudible sounds broadcast within a store, akin to a dog whistle (Kwet, 2018c).

Attention to the tracker ecosystem spread throughout global media in November 2017 with the publication of articles in *The Intercept* and *Le Monde* based on research conducted by Exodus Privacy in France in conjunction with myself and my colleague Sean O'Brien at Yale Privacy Lab (Grauer, 2017; Untersinger, 2017a, 2017b).[112] It is expected that the Apple App Store apps have the same integration of advertising trackers, as nearly all advertising companies offering trackers publish SDKs for Google Android and Apple iOS (O'Brien and Kwet, 2018).[113]

The presence of hidden app trackers in Google Play and Apple iOS provides empirical evidence of how nonfree software leads to surveillance and exploitation. Both Google Play and Apple iOS are proprietary app repositories under the control of Google and Apple (*ibid*; De Blanc, 2018). Ostensibly, most people who download a weather or video game app do not know companies may be turning on their microphone to determine the television show playing in the background (Maheshwari, 2017), or tracking their precise physical location to induce "impulsive" purchases while shopping in a store (Fidzup, n.d.). They don't know that companies like SafeGraph are collecting location data to determine who has political arguments based on party affiliations during Thanksgiving (Jeffries, 2017), or that Microsoft, Google, and Apple build device IDs into their operating systems so they can track their users (Kwet, 2018c).

Yet both the operating systems of the Free Software world (e.g. GNU/Linux and LineageOS) and the app stores they offer (package managers and F-Droid) do not hide surveillance into their products. Rather, they consciously scan their packages to *protect* users *against* invasive and manipulative features. F-Droid, for example, carefully vets the apps in the F-Droid repository to screen out surveillance and tracking features while keeping the repository free and transparent (Steiner, 2017).

Through the building of a chain-of-trust, combined with the tools to directly control technology, the FS ecosystem affords resistance to undesirable anti-features (O'Brien and Kwet, 2018). When the maintainer of the Ubuntu distribution of GNU/Linux, Canonical, enabled integration of the desktop

112 Our research was featured by over 100 media outlets in over 30 countries.
113 See profiles of tracker reports I wrote spanning over 100 pages at: https://github.com/YalePrivacyLab/tracker-profiles.

search with an Amazon.com search, they were scorned by the user base. GNU/Linux programmers, in turn, had the power to fork Ubuntu (or Debian GNU/Linux, etc.) and offer the OS with the feature stripped out. In the face of community backlash, Canonical was forced to remove the feature (Stallman, 2018a). Microsoft, Google, and Apple, by contrast, do not face the prospect that people release modified versions of their operating systems without tracking IDs or app repositories without surveillance.

The contrast between Google, Microsoft, and Apple with GNU/Linux is a product not just of culture, but of power politics at the architectural level. As a matter of empirical fact, the only commonly used operating system and app repository free of surveillance today is Free Software, while proprietary software and cloud-based systems are directly linked to mass surveillance (Stallman, 2018b).[114] This is because Free Software provides the prospect of collective ownership, control, and direct action against undesirable features – a form of direct accountability – whereas corporate giants fashion their products to prevent community participation and control. By designing technology that deprives the people of control, corporations are able to create a multi-billion dollar surveillance-based ecosystem. When considering that Big Tech corporations have global reach, as noted above, surveillance capitalism becomes an issue of digital colonialism. In this scenario, Big Data surveillance – the centerpiece of surveillance capitalism – leads to a concentration of power due to the structural dynamics at play. Let us consider these dynamics in turn.

First, network effects leads towards market concentration in services. With network effects, each additional node adds value to the network. For example, the more people on a phone network, the better it is for each additional person. Nobody wants to have fifty different phones on fifty separate networks, so people congregate towards a singular network that everyone else uses. A similar dynamic is in effect for e-hailing apps, search engines, and e-commerce platforms. The “winner-takes-all” (or “most”) outcome, in turn, concentrates data into the winners’ hands. Thus Big Data tends to concentrate wealth and power.

Second, Big Data miners have to use advanced statistics – especially artificial intelligence and machine learning – to make sense of the massive troves of data they collect about thousands, millions, or billions of people. But artificial intelligence is not “intelligent” in the human sense – in order to “learn” about a given topic, such as how to recognize a face, it must be fed massive amounts of data

114 This can be verified by scanning apps in platforms like Exodus (https://reports.exodus-privacy.eu.org/analysis/submit) and the Haystack Lumen Privacy Monitor (https://play.google.com/store/apps/details?id=edu.berkeley.icsi.haystack). See also, O’Brien and Kwet, 2018.

(say, a million photos) to "train" the algorithms. A human, by contrast, does not have to view a million different faces to recognize a person they just met. Machine learning works by assessing massive amounts of data about individuals and groups, including history, so it can identify patterns and predict the future (i.e. perform predictive analytics) (Alpaydin, 2016). In other words, artificial intelligence depends on massive amounts of data, which results in mass surveillance.

Third, the *types* of data collected uniquely favor powerful incumbents. Facebook has sensitive information about two billion people's "likes", friend networks, advertisement clicks, and so on; Google has a vast repository of search inputs and tracks website visits to the majority of the top million websites; and Amazon has the combined browsing history of product searches within Amazon and actual purchases made (in advertising parlance, the market funnel) (Simonite, 2016). Because a handful of companies each dominate various functions in the digital ecosystem, giving them unique *kinds* of data, they have an enormous advantage over competitors.

Fourth, economies of scale pose high barriers to entry. Google, Facebook, Amazon, and others have dedicated, redundant server farms servicing their products. Just as deep gold reefs located on the Witwatersrand favors market concentration (given that heavy machinery and chemical treatments are necessary to harvest gold deep underground), electronic data mining infrastructure favors market concentration because it is very expensive to run. Moreover, each of these corporations have tens of thousands of workers specializing in advanced data science, graphic design, programming, as well as a team of lawyers to withstand data privacy and intellectual property threats. Add to this mix "really existing capitalism" impacted by corporate lobbying and revolving doors with government, and it becomes clear the playing field favors established incumbents.

In the face of severe market concentration, even corporations and countries *within* the Global North are beginning to express concerns about the data monopolization tied to Big Data and AI (House of Lords, 2018).[115] Scholars and NGOs have issued lengthy reports detailing how corporations like Google, Microsoft, IBM, and Apple have eroded privacy and exploit mass commercial surveillance for profit and manipulation (Christl, 2017; Jewler, 2014). However, simple reforms will not fix the problem, because the *structural design* of the ecosystem favors concentration. There is little reason to believe the Global South will produce viable competitors. With surveillance the new revenue model for tech, the world's people are subjects of the state-corporate ruling class in the US. Under this arrangement, the overly capacious term "Big Data" has been used to gloss over surveillance activity

115 *House of Lords* (Select Committee on Artificial Intelligence), "AI in the UK: ready, willing and able?" 16 April 2018 (https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf).

and power dynamics.  When applied to humans at an individual, granular level, Big Data is little more than a euphemism for surveillance.  Extraction and monetization of sensitive human information yields substantially different economic and ethical outcomes than oil extraction by machines.  Producing "ethical Big Data" for people – as some scholars advocate (Zook et al., 2017) – is akin to "clean coal" for the environment.

Surveillance capitalism thus presents society with a privacy downgrade that leaves the Global South disadvantaged.  Like the railroads of empire, capitalists extract data out of the Global South, process it in the metropolitan center, and spit back information services to colonial subjects, who cannot compete.  US domination of the digital ecosystem at the infrastructural level positions it to maintain ownership and control of the digital society and build dependency into the Global South while increasing the power of Big Tech multinationals.

### 3.3.5: Imperial State Surveillance

To make matters worse, recognizing the value of the pristine, organized databases held by these megacorporations, US intelligence agencies have partnered with US tech corporations to obtain access to their data.  Beginning in the mid-2000s, a succession of whistleblowers detailed the extent of some of these programs, culminating in the Snowden leaks.  A former CIA operative and NSA contractor, Edward Snowden revealed that the National Security Agency, along with Western allies, has erected a global mass surveillance apparatus intimately tied to corporate surveillance.  The NSA utilizes two primary methods for data collection: partnerships to corporations (such as Microsoft, Yahoo, Google, Facebook, PalTalk, Skype, YouTube, and Apple via the PRISM program), and the tapping of the Internet backbone (via the UPSTREAM program).  According to NSA whistleblower William Binney (2013), the facilities collect trillions of phone calls and emails, in addition to sources like banking and social networking.

Western intelligence agencies have used surveillance to target economic and human rights organizations.  For example, Britain's Government Communications Headquarters (GCHQ) attempted to retrieve the briefings of the South African delegates to G20 and G8 summit meetings.  They also breached the European Convention on Human Rights for spying on the South African-based Legal Resources Centre (LRC), a public interest clinic dedicated to defending human rights (The Guardian, 2013; TimesLIVE, 2015).

This follows an inglorious history of US intelligence in the Global South (Blum, 2014). In South Africa, the CIA covertly supported white, liberal, anti-communist factions in the South African university system (Ray, 2016, pp. 129-176), and government officials allege they helped arrest Nelson Mandela in 1962 (Albright and Kunstel, 1990; Garcia, 2016). In July 2018, thousands of declassified documents revealed FBI surveillance of Nelson Mandela and extensive investigations into the anti-apartheid movement (Stoddard, 2018). With many examples in South Africa and other Global South countries, there is reason to be concerned the deployment of Big Tech products in South Africa extends the eyes and ears of foreign intelligence.

### 3.3.6: E-Education in the Context of Digital Colonialism

To bring this conversation back to e-education policy, it is worth considering what *kinds* of technology are placed in schools. In particular, are "People's Technologies" like Free Software, Tor onion routing, Mastadon, Signal, and ProtonMail under consideration? Or will Microsoft, Google, Apple, and US intelligence agencies piggybacking off their data collections be pre-installed on devices and forced on children and teachers in the schools? If so, what is the justification?

As Andrew Hope (2015) notes, neoliberal governance is strongly linked to "increased security, improved efficiency, the desirability of techno-surveillance devices and desensitization to pervasive monitoring" (p. 845). He adds that the "the devolution of state power, the marketization of education, increased responsibilization and the nature of observation in the viewer society" – features advocated by the Stellenbosch school and the Minister of Basic Education, Angie Motshekga[116] – "all help to explain the emergence of 'surveillance schools'" (*ibid*, p. 841).

Surveillance schools driven by US corporations can have a multitude of adverse impacts on South African education, economy, and society. With respect to education, technologies like cloud-based dashboards and real-time analytics can undermine teacher autonomy by placing teachers under the constant scrutiny of surveillance, much like inspectors under apartheid (Kwet, 2017c). Moreover, as Ben Williamson put it, "a new software layer has been superimposed on to the political layer of education, in ways that are producing novel kinds of interventions and programs in the practice layer of the school and classroom" (2017, p. 66). The imposition of corporate and proprietary code and systems as a software layer to mediate education effectively privatizes educational practices and constrains teacher autonomy (Zeide, 2017).

116 Motshekga eventually backed off issues she once promoted, such as biometric surveillance for teacher attendance, the Annual National Assessments, and heavy blame on teachers' unions for South African educational failures.

What is more, new forms of digital surveillance pose a dangerous chilling effect on the speech, inquiry, and behavior of learners and educators – both as people involved in formal education and as citizens and inhabitants of the country (Kwet, 2017c). With growing concern about the radical expansion of surveillance in the 21st century, Neil Richards (2013) argues that "intellectual privacy" should be safeguarded and "chilling effects protections" – laws that protect against government surveillance – should be extended to "intellectual surveillance" (p. 1950). Moreover, government and private sector surveillance threaten speech, behavior, and inquiry, and as such, we should include "corporate watchers" just as we do with government. "Total surveillance" is illegitimate, Richards adds, and should be abolished (*ibid*, pp. 1935-1936).

Empirical evidence documenting chilling effects in society has grown in recent years. In a widely publicized study, John Penney (2016) demonstrated that "government surveillance and similar actions impact online activities, including access to information and knowledge online" (p.117). His study found that traffic to national security and terrorism-related Wikipedia pages decreased following news about NSA/PRISM revelations in June 2013. Other recent studies have found adverse impact on speech and behavior by acts of surveillance. This includes a similarly structured but shorter-term 2015 study which found a reduction in terrorism-related and personally embarrassing Google searches after the NSA/PRISM revelations (Marthews and Tucker, 2015); two PEN survey studies on US-based and international writers published in 2013 and 2014, respectively, which found reports of self-censorship in writing, conversation, and inquiry (PEN America, 2013; PEN America, 2015); and a 2016 Facebook study which revealed that various types of individuals are prone to conformist political posting when they believed they are being monitored (Stoycheff, 2016). A study by Admire Mare (2016b) in South Africa found that activists, journalists, lawyers, and academics were self-censoring their career and personal political activities.[117]

The capacity to profile and predict individual personalities and behaviors is of particular concern to participants in education. Studies on machine learning and other computer- and human-based statistical techniques of profiling user data reveals that a rich array of facts can be learned about people from limited samples of their "digital footprint" – web searches, Facebook likes, purchases, telephone call records, and other forms of metadata. A study of 86,220 volunteers found that computer predictions about one's personality based on Facebook likes were more accurate than those made by participants' Facebook friends, based on a personality questionnaire. In addition, it found computer

117 See also, comments by Jane Duncan (Makoni, 2011).

personality judgments have higher external validity when predicting life outcomes such as substance use, political attitudes, and physical health. In some instances accuracy was even higher than self-rated scores (Youyou, Kosinski and Stillwell, 2015).

The prediction of behavior using surveillance – the *modus operandi* of technology slated for South African schools (see Chapter 5) – is especially problematic. As Kevin Miller (2014) notes, "Predictive systems amplify and multiply the chilling effect of surveillance in several ways" (*ibid*, pp. 132-133). One is by constraining behavior through integration into opaque and restrictive systems. Without knowing exactly which behaviors will lead to punishment in the future, people will likely become conscious of the risks of punishment and resort to conformity.[118] Another way surveillance constrains freedom, Miller notes, is by inducing people to "self-censor [and] conform to an illusory model of normality" in the form of a "predictive straw man normal" – conformity that adapts to how predictive analysis is perceived to work (*ibid*, 2014 p. 133). Automation, combined with pervasive surveillance, intensifies the threat because it can allow punishment and normalization "to become total, inexorable, and non-discretionary" (*ibid*, p. 134).

Chilling effects literature has not addressed Big Data or predictive systems in education technology studies. Only a few empirical studies have been conducted on its impact upon individuals in school, with an almost exclusive focus on CCTV (Taylor, 2012, pp. 228-229; McCahill and Finn, 2010). This research, however, suggests that "surveillance in schools potentially undermines privacy, erodes trust, makes pupils feel criminalized and can have a 'chilling effect' on creativity and interaction" (*ibid*, p. 229; Taylor, 2013, p. 107). In some instances, school children have resorted to subversive activities (e.g. moving the camera directions or using gummy fingers to register absent classmates). In Waltham Forest, UK, students walked out of school and refused to return until CCTV cameras had been turned off (Taylor, 2011, p. 13). One of the major researchers of school surveillance and chilling effects, Emmeline Taylor (2012), argues that:

> [surveillance] technologies do little to safeguard young people, do not represent financial savings or increased efficiency, but yet they strip pupils of their privacy, undermine their trust in

118 South Africa provides a concrete example: after the #FeesMustFall protests, the press reported that a student, who asked not to be named, discovered that, after applying for a job, she had a criminal record due to a mass arrest during a sit-down protest. She had only become aware of the record because the company was kind enough to inform her (Akoob, 2017a). Upon hearing these kinds of stories, students may decide against participating in constitutionally protected protests, especially in light of expanding forms of predictive analytics used to screen jobs, facial recognition in CCTV camera networks, and the like – all of which are being implemented in South Africa (see, for example, Kwet, 2017a, 2017b; Ni Loideain, 2017).

> others and create an atmosphere of suspicion. Importantly, the incessant use of omnipresent technological surveillance has the ability to displace the very building blocks of democratic society (p. 231).

Jon Penney's (2017) study is perhaps the most thorough empirical study on chilling effects to date. In a first-of-its-kind study, Penney not only found a substantial effect along multiple scenarios, including in the private sector (from surveillance by a private Internet company) and the public sector (from surveillance by the government), but he also found the impact is strongest among women and the youth. Moreover, he found secondary chilling effects from online surveillance – effects due to surveillance threats experienced not by the person in question, but by others in their social networks receiving legal processes (e.g. threats or notices for downloading copyrighted material).

Taken together, these studies provide strong evidence that when the youth and teachers become aware of the extent of surveillance during their educational experience, they will be more likely to conform to the status quo. According to Miller (2013), the combination of total surveillance, Big Data, and predictive technology is "privacy's perfect storm" in the criminal justice system (p. 105). Software infrastructure that integrates surveillance with tightly linked surveillance-based targeted advertising ecosystems (e.g. software provided by Microsoft, Google, and Apple); education-specific software like predictive analytics, adaptive learning, education dashboards hosted in third party clouds; and CCTV cameras placed at schools present a similar "perfect storm" in education. Such an outcome works against basic freedom in education and society, including civil rights and liberties.

Corporate expansion and neoliberal ideology is a driving force behind turning education systems into digital surveillance schools and surveillance societies. In 2017, *The New York Times* reporter Natasha Singer ran a series of feature articles explaining how Silicon Valley corporations are "remaking America's schools" (Singer, 2017a, 2017b). Schools are an ideal place to plant products, as capturing the youth early leads to future profits (Schor, 2005). In the domain of software infrastructure, not only can corporations habituate learners to their own infrastructure (e.g. Microsoft Windows, Google Android, or Apple macOS and iOS), but they can also bias future generation of software developers towards their own ecosystems. As Grodzinsky et al. (2003) observe, "[open source coders] typically use the software themselves as it is being developed; therefore, the users are involved in the software development from the beginning" (p. 196). Microsoft users may very well neglect production for GNU/Linux if they do not use GNU/Linux themselves.

It is no coincidence, then, that Big Tech corporations are pumping money into education for emerging markets in the Global South. Microsoft has a history of aggressive tactics to ensure its products are used by the public (McDougall, 2007), for government (Fuller, 2003)[119], and for education. In 2008, *The Wall Street Journal* reported that "Microsoft proposed paying $400,000 last year under a joint-marketing agreement to a government contractor it was trying to persuade to replace Linux with Windows on thousands of school laptops… In Namibia and Nigeria, where it has sought government contracts, the company hired family members of government officials" (Stecklow, 2008). In 2005, Nigeria's then president Olusegun Obasanjo pledged to purchase 1 million laptops from US nonprofit One Laptop per Child (OLPC), which was then promising Free Software laptops for $100 per unit. Microsoft "had hired the president's son, Dare Obasanjo, in 2002; a year later, it signed a software-licensing agreement with the government. Microsoft says the younger Mr. Obasanjo was hired on his own merit, and that his hiring was not connected to winning the government business" (*ibid*).

Big Tech corporations have also been aggressive in the South African e-education space. In 2002, Microsoft announced a planned "donation" of its software to cover all schools in South Africa. Despite the government's rhetoric about commitments to Free Software, President Thabo Mbeki accepted the offer, and six thousand schools received Microsoft software for free by 2004 (bridges.org, 2005, pp. 17, 28). In May 2016, Google's SA country director, Luke McKend, said that Google is taking advantage of the untapped South African market. As McKend explained:

> Google is fortunate to be in SA because it is still a growing Internet market, which is somewhat different to more mature Internet economies where Internet penetration is already extremely high. That is great news for companies like Google because it means literally for every second of every day, there are more potential customers. That's a unique situation to be in because few industries can say they have a new customer to reach every second of every day (McKend, as cited in Moyo, 2016).

By planting products in Africa, Microsoft, Google, and Apple perpetuate dependency on the mother country. Through proprietary ownership and control, Africans are prevented from understanding and modifying critical software architecture. "Code is law", as Lessig notes, and that code is under the absolute control of foreign powers. Computer-mediated experiences come under their control,

119 In 2003 Microsoft chief sales executive Orlando Ayala stated that Microsoft offers "steep discounts" to prevent competitor software – and to "Under NO circumstances lose against Linux" (CNN, 2003).

undermining local sovereignty and perpetuating economic dependency and resource extraction, as the technology is designed by Big Tech corporations, for Big Tech corporations.

Moreover, in the education domain, the Big Tech corporations support neoliberal initiatives extending the Stellenbosch School neoliberal mentality to the digital domain. Big Tech initiatives and philanthropists are promoting technologies that drive privatization, marketization, standardization, accountability, vocationalization, and narrow conceptualizations of education. Bill Gates, we have seen, is a major proponent of the *Waiting for "Superman"* doctrine, and has lavishly supported charter schools, standardization, and tech-driven personalized learning (Kovacs, 2011; Reilly, 2018). The Michael and Susan Dell Foundation is pouring money into collaboration schools deemed to bring public schools closer to privatization (MSDF, 2016). IBM promotes P-TECH schools that merge analytics with vocational curricula during the teenage years, while Google's venture-backed Alt Schools feature surveillance-driven corporate platforms that drive pedagogy and undermine teacher autonomy (Williamson, 2018). Pearson is likewise shifting its model to Big Data software services, including adaptive learning technology (Wermuth, 2017). As with general infrastructure mentioned above, the EdTech software layer – as well as centralized cloud infrastructure – is under the complete domination of US multinationals and philanthropists, with the same outcome as other software products: dependency, resource extraction, loss of sovereignty, and zero ability for local design of the infrastructure itself, which is owned and controlled by foreign corporate giants. Big Tech in the education sector is a colonizing force for South African education, economy, and society.

### 3.3.7: Tech Hegemony

Digital colonialism is more than an act of dominance exercised through ownership and control of infrastructure, political maneuvering, backing from powerful state-corporate actors, and unequal bargaining power. It is an *ideology* formed to justify conquest and perpetual domination. This is nothing new to the colonial form. In South Africa, Afrikaners appealed to select passages in the Bible to cast themselves as God's chosen people for settling occupied land (Lapierre, 2009, p. 4). During the nineteenth century, Europeans formulated the theory of biological race in service of capitalist exploitation. Britain's Francis Galton played a key role in South Africa through the development of Social Darwinist theories, statistical analytics, and biometric science (Breckenridge, 2014; Ewen and Ewen, 2011, pp. 291-292, 305-307).

Indeed, doctrines of domination – be it through religious missions, racial ordering, appeals to nationalism, or "civilizing" duties – pervaded colonial society (Fanon, 1963, p. 161; Friere, 2005 [1970], p. 140; Bricmont, 2006). Under apartheid, Africans received dumbed down "Bantu education" designed to instill deference to Europeans in preparation for a life of menial labor and servitude (Tabatha, 1980 [1959]). As Walter Rodney (1981 [1972]) put it, "Colonial schooling was education for subordination, exploitation, the creation of mental confusion and the development of underdevelopment" (p. 241).

In the 21st century, Big Tech corporations have fashioned a new Manifest Destiny for the digital age. According to Western doctrines, Big Data, centralized clouds, proprietary systems, smart cities littered with surveillance, automation, predictive analytics, and similar inventions are an inevitable part of technological expansion. Commentators may acknowledge potential deficiencies – the loss of privacy, job losses to machines, or algorithmic discrimination – but consider the core technologies a fact of our future. In South Africa, this narrative is espoused via World Economic Forum founder Klaus Schwab's theory of the so-called "Fourth Industrial Revolution" (4IR). Schwab's vision privileges the private sector and promotes the trending instruments of domination characterizing digital capitalism. South African politicians, journalists, and intellectuals (featured in the media) have internalized his doctrine: scarcely an article or radio show discussing technology fails to mention the 4IR.

According to the 4IR, the physical, digital, and biological worlds are merging technologically to form a new, "fourth" industrial revolution. Schwab's two books on the subject review the latest trending technologies (e.g. 3d printers, blockchain, virtual reality, and AI) and models (e.g. smart cities, e-government, and e-commerce) to argue a new era has dawned upon us. While Schwab (2016) attempts to offer a critical lens in registering concerns about mass job losses due to automation and a tiny nod to privacy concerns (pp. 72-72, 103-104), he provides no critical analysis of the neoliberal context or technical design features and dynamics leading industry concentration, mass surveillance, and colonization. His narrative instead reflects the makeup of the WEF board, which includes many of the richest corporations and powerful government officials in the world (WEF, n.d.-a). Schwab's WEF is happy to partner with all of the Big Tech giants for technological development and political maneuvering. His San Francisco center features Microsoft, Accenture, Salesforce, IBM, and Pentagon partner Palantir (WEF, n.d.-b).[120] After meeting with government officials in June 2018, Klaus Schwab

120 Palantir is frequently criticized for supplying analytics to the US military, intelligence, police forces, and immigration and customs enforcement.

announced the WEF will be opening one of its soon-to-be twelve centers in South Africa to cultivate public-private partnerships focused on eight technologies, including AI, blockchain, drones, Big Data, and precision medicine. Just as South African officials embraced the Washington Consensus during the transition to democracy, they are now pushing for a technological restructuring of society designed to funnel profits and power back to the US empire and benefit local elites.

Despite the ramifications of going digital, published voices are calling for assimilation, with no media debate. As University of Witwatersrand Vice Chancellor Adam Habib (2017) observes, "Considerations of [technological innovations] have not even entered the public discourse and we are at a collective risk of once again merely being victims of economic forces and processes beyond our control." Yet like so many others in South Africa, however, Habib has thus far bought into the 4IR narrative, illustrating the depth of hegemonic control exerted by the Global North. As Madeline Carr (2016) puts it, hegemony is "not only a preponderance of power but the ability to set the agenda and shape the preferences of others" (p. 118). In South Africa, the WEF is doing just that.

To become empowered participants in the digital society, the world's people must forge an alternative path. Just as decolonization requires re-designing colonial railroads or panoptic mining compounds, digital equality requires re-designing technology for communal control and decentralization. To this end, South Africa could develop and implement Free Software, decentralized Internet services, and technologies designed for social justice and pro-poor development. This would socialize technology from below on anarchist principles, preventing ownership of technical architecture by states or private entities. Grassroots activists could play a leading role by pressing for freedom-respecting technologies in the public sector – especially in the education system. Open and honest conversations should be tabled before to the public, with widespread debate and participation from learners, teachers, parents, communities, and intellectuals.

## 3.4: Objections and Replies – Anarchism and the Free Software Philosophy

It may be objected that anarchism and the Free Software philosophy offer inappropriate theoretical lenses to view e-education policy analysis. Anarchism, for example, is often construed as a violent movement dedicated to chaos, or, alternatively, a hopelessly utopian philosophy. Critics may argue that anarchism is not practical, and is thus a useless philosophy. Moreover, it might be objected that People's Technologies cannot be implemented within the constraints of neoliberalism, or that Free Software programmers pursue an elitist technocratic agenda. It may also be said that the case for

People's Technologies in education is premised on a deterministic way of looking at technology in society. Let us address each of these contentions in turn.

Many popular depictions of anarchism cast it as a doctrine and movement of violence, chaos, terrorism, and lawlessness (e.g. Phakathi, 2017b; Ritchie, 2018; Debusmann, 2011). Protesters are frequently attributed a derisive and misinformed anarchist label: David Everatt, Head of Wits School of Governance, states the 2016 #FeesMustFall protests were "colonised" by political parties and "anarchists" carrying out "racist abuse" and "thuggish violence", with a goal of "state capture" (Everatt, 2016) – a mistaken attribution of anarchism to behavior which violates the essence of anarchist goals. Within the tech world, adjectives like "structureless" and "global chaos" have accompanied the hacktivists operating under the banner Anonymous (Greenberg, 2016; Sydell, 2018). In the media, anarchism is often associated with extremism. For example, in the 2018 film, *Mission: Impossible – Fallout*, the protagonist, Ethan Hunt, battles against "anarchists" seeking to reform civilization by killing one third of the world's population with nuclear weapons (Abrams et al., 2018).

Other intellectuals have deemed anarchism hopelessly utopian and therefore contrary to human nature (Pinker, 2002, pp. 300-301, 331; Marshall, 2008, p. 661; Sussa, 2008). Sociologist Robert Michels has argued that complex organizations inevitably develop into oligarchies out of technical and practical necessity, and that it is not feasible to produce direct democracy outside of small numerical contexts (Michels, 2001 [1915], pp.26-27, 240-241). From this perspective, anarchism is unachievable so long as humans organize themselves into large coordinated organizations. Anarchists and democratic unionists counter that organizations also successfully resist oligarchy in favor of democracy (Diefenbach, 2018; Cornforth, 1995).

Popular accounts of anarchism, according to these two polar opposite interpretations – chaotic violence and unrealistic utopianism – go back more than a century. In her 1910 essay, "Anarchism: What It Really Stands For," Emma Goldman explains that anarchism has two principal objections: "First, Anarchism is impractical, though a beautiful ideal. Second, Anarchism stands for violence and destruction, hence it must be repudiated as vile and dangerous" (Goldman, 1910, p. 55). Both the intellectual and the common people ascribe to anarchism these interpretations, Goldman notes, though they often derive from "heresay or false interpretation" (*ibid*). In *What is Communist Anarchism?* Alexander Berkman (1929) similarly begins noting that anarchism is not "disorder and chaos" or "impractical and utopian" – as many contemporary Bolsheviks claimed (pp. 67, 99-103).

Thus, these two positions, while popular, have long been used to dismiss the philosophy (Hong, 1992; McLeod and Detenber, 1999; White and Williams, 2014, p. 956; Mbah and Igariwey, 2009, pp. 14-17). As a counter these positions, one might stress that if people are to aim for social justice, they must be honest about patterns of oppression rooted in authoritarian relationships all around us, and propose alternatives that embody true equality. This is as true for government and capitalism as it is for jobs, families, schooling, and computer technologies. Thus anarchism is, at minimum, a valuable theoretical lens for *analyzing* society and imagining a more equal and democratic society (Dirlik, 1991, p. 4). With respect to implementation, anarchists retort that there are plenty of examples an *anarchistic* inclanations and projects. Regarding the former, the instinct for mutual aid and cooperation forms part of the human instinct (Kropotkin, 1902; Kinna, 1995). While humans possess the capacity for both positive and negative behaviors, we should attempt to build institutions and cultures that embody principles like mutual aid, cooperation, sharing, and equality. Regarding the latter, there is no shortage of anarchist or anarchistic projects in existence, from workers' cooperatives to the "electronic commons" (Shannon, Nocella II, and Asimakopoulos, 2012, pp. 204-236). In the very short term (say, a single generation), anarchism cannot scale up to cover entire societies. Neither can autonomist Marxist or other models requiring fundamental institutional change through grassroots and democratic struggle. Across decades or generations, however, humans can build *towards* an anarchist society.

In this regard, some anarchists have noted that technology, if used as a tool to benefit the people, rather than to benefit power, can help alleviate conditions of need that produce wage slavery and thereby bolster the prospects of building an anarchist society. In *Post-Scarcity Anarchism*, Murray Bookchin (1986) theorizes that with advanced machinery, "we can begin to provide food, shelter, garments, and a broad spectrum of luxuries" that can alleviate mindless labor and unleash time for the application of our "creative energies" (p. 12). This insight goes back many decades. In 1930, John Maynard Keynes raised the specter of "technological unemployment" from automation. Keynes believed this would be a temporary phase, and that automation could ultimately benefit humanity by liberating us from menial labor. These concerns continued into the post-World War II period, and have been resuscitated in recent popular works like Brynjolfsson and McAfee's (2014) *The Second Machine Age* and McChesney and Nichol's (2016) *People Get Ready*. McChesney and Nichols, both Marxists, see in the advancements of automation dystopian possibilities marked by mass job losses, or a new chapter of history in which technology makes serves the people and makes everyone wealthier, freer, and happier. They argue the outcome will turn on shaping the new tech-driven society in the context of political and economic struggles.

In the digital information domain, the near-zero marginal cost of data has created a "post-scarcity" element in the digital ecosystem (Moglen, 2003; Rifkin, 2014). As we have noted, digital works – from books and music to video games and software – can be exchanged at near-zero marginal cost due to the low expense of information storage, processing, and transmission made possible by advances in digital technology. Years ago, it would have been impossible for a collection of thousands of books, songs, or pieces of software to become affordable to each person on earth. However, at this stage of digital era, we have approached the threshold where even the poorest person can now possess any piece of knowledge or culture put to digital form. Of course, intellectual producers must be remunerated for their contributions. Nevertheless, it remains possible to socialize the ownership of digitizable human knowledge and distribute it equitably among all. This is not possible with physical materials, because they cannot be "copied and pasted" in digital devices. Moreover, information is non-rivalous, so any person who consumes a piece of information does not exclude the next person from consuming that same information. As Eben Moglen (2003) puts it in "The dotCommunist Manifesto," if we could copy and paste a loaf of bread and supply it to everyone, what would ever be the justification for starvation?

The information arena is, then, close to a post-scarcity economy, with respect to copyrighted works and *ideas* that can be put to use (industrial design, software code, medicine). The rules against sharing information favored by ruling class elites – the copyright industry, pharmaceutical corporations, Big Tech corporations, and the like – prevent the socialization of knowledge. One can argue that the free exchange of information protected by state-granted monopolies (copyright and patents) is needed to remunerate intellectual workers and incentivize further production (Spinello and Bottis, 2009). However, leading economists have countered that copyrights and patents can be severely weakened (Baker, Jayadev and Stiglitz, 2017), or that society can abolish them by constructing alternative remuneration schemes like tax vouchers for entertainment (Baker, 2003, 2012).

One might concur that building a Free and Open technology ecosystem built to give individuals and communities control over their devices, facilitate knowledge sharing, protect privacy, bolster local development and customization, and enhance democracy sounds good in theory – but is not a practical goal within neoliberalism. Apps that protect privacy (such as Signal) or facilitate decentralization in social networking (such as Mastadon) might become popular among a privacy-focused niche, but

Facebook, Microsoft, Google, Apple, and other tech giants possess the resources to subvert and perpetuate their dominance. Free Software, for example, is utilized by these corporations (including in Microsoft Azure), who supplant user control in other ways (such as cloud centralization or digital locks). Without shifting out of a neoliberal economy first, the attempt to socialize the technology ecosystem will never move beyond a niche movement.

This criticism collapses when considering that authoritarian control of digital technology is now part and parcel of the global neoliberalism system, and cannot be treated as separate from it. Two conclusions can be drawn from this dynamic: 1) to transition away from neoliberalism to a socialist society, technical architecture that bolsters neoliberal tools like intellectual property and corporate mega-platforms must be reconfigured *alongside* other efforts to undermine neoliberal power and build the socialist society that will replace it, and 2) there is no compelling reason to wait for a socialist future to construct socialist technology. Climate change, labor exploitation, patriarchy, racism, and other deep-seated social problems are linked to capitalism, but that does not stop activists from pursuing green energy, the right to strike, a living wage, or gender and racial equality. Moreover, there are many *anarchistic* practices within capitalist societies, such as non-monetized and non-exchanged labor, volunteer initiatives, worker cooperatives, and commons-based peer production (Gordon, 2012; Benkler and Nissenbaum, 2006). While it will be difficult to socialize digital technology, it is not an all-or-nothing battle.

Others have argued that Free Software is now widespread, but it does not seem like the ideals of the open source movement have led to a "victory". Martin Weller (2014) ponders this point, for example, in his book, *The Battle for Open*. Weller states the "general direction [of open] is positive" (p. 22) but that the ideals movement have become more complex. However, Weller expresses an inaccurate reading of the Free Software philosophy, or, at the very least, fails to distinguish important forms of power relations at work (such as those raised in this chapter). Crucially, he reviews the Free Software and Open Source Software factions in the first chapter, but fails to address cloud computing adequately. The "cloud" has a single mention in the book, as an *example* of a use case for open source. Yet the Free Software camp has long iterated the fact that their philosophy is *not* restricted to source code *alone*, and that Software as a Service on the cloud *negates* the freedom granted by Free Software (Stallman, 2010b; Moglen, 2010, 2017). This is an essential part of the conversation, and helps explain the complexity of the reconfiguration of power relations that Weller duly notes at the outset.

Neil Selwyn (2013b) has argued that "open" technologies actually serve the forces of neoliberalism, and that the "open" philosophy is a delusional and elitist ideology. The grounds for Selwyn's objections, however, lack factual basis, methodological rigor, and conceptual coherence. Selwyn claims that open source software mostly offers duplicate versions of proprietary software, and is therefore a waste of effort. This has two critical flaws. First, it reduces the value of software to economics (consistent with a *neoliberal* perspective) by ignoring the value of Free Software alternatives that provide liberty and equitable access for the poor (Stallman, 2016). Second, it fails to provide empirical evidence. Selwyn's basis for the claim is an unsupported statement made in a blog post (Shirky, 1999) – not a study – and an abstract economic model (Johnson, 2002). In fact, there are millions of open source software projects,[121] and he provides no evidence to determine if these are all or mostly "replica" projects. With regards to methodology, Selwyn focuses on anecdotes from which he extrapolates grand conclusions about the entire software ecosystem. For example, to argue open source development is produced by selfish elitists, he selects a single study (Lerner and Tirole, 2002) of four open source projects, as if these four projects stand in for millions of projects and developers, while ignoring that subsequent findings contradict and confound[122] Lerner and Tirole's hypothesis (Hars and Ou, 2002; Hertel, Niedner and Herrmann, 2003; Lakhani and Wolff, 2003; Bitzer, Schrettl and Schröder, 2004; Roberts, Hann and Slaughter, 2006; Jensen and Scacchi, 2007; Coleman, 2006, 2012; Krogh et al., 2012).[123] Selwyn also fails to address a plethora of prominent Free Software projects (e.g. Signal, Wire, Jitsi, F-Droid, Debian, LineageOS, and the Tor Project, to name a few), world-renowned experts who argue Free Software as critical to privacy and empowerment,[124] and the important distinction between the Free Software and "open source" philosophy and community.

Selwyn also makes arguments that lack conceptual coherence. For example, he claims that open source software programmers form a new technocratic elite, but it is not clear why he believes

121 See, for example, projects at Github (https://github.com/search?q=is:public) and users (https://github.com/search?q=type:user&type=Users).

122 The study postulates *theoretical* incentives based on a "preliminary explanation" of open source producers, but does not include actual data on the incentives of open source producers (see Lerner and Tirole, 2002, p. 198). The origins of three of projects mentioned – Linux, Sendmail, and Perl – contradicts Selwyn's point (Bitzer, Schrettl and Schröder, 2004, p. 7). The Linux kernel, for example, was developed by Linus Torvalds "for fun" (with no reasonable prospect of personal profit at the time) *and* for the purpose of providing a Unix-like kernel free of charge (Tozzi, 2017, pp. 125-126). To be sure, Torvalds holds authority over kernel changes, but Linux also features contributions from thousands of individuals across the world, an extensive peer review process, transparency, and the capacity for modification in the advent of malicious behavior, in addition to other features important to freedom and rights (Curtis, 2010, pp. 16-20).

123 Of these, see especially Bitzer, Schrettl and Schröder's (2004) empirical study on developer motivations, Coleman's (2005, 2012) work on the Debian developer community, Jensen and Scacchi's (2007) findings on contributions demonstrating *variation* within software projects, and Krogh et al.'s (2012) comprehensive overview of the literature.

124 See, *inter alia*, the EFF-US (n.d.), Bruce Schneier (1999), Edward Snowden (2016), Eben Moglen (2017) and Julian Assange (LaInfo, 2014). See also perspectives offered by the South African government in Chapter 6.

this has anything to do with open source. If the software were proprietary, there would be even stronger forms of control concentrated into the hands of "elite" programmers in corporate institutions, and the only public "accountability" for their products would be through the market – precisely the neoliberal dynamic Selwyn opposes. If the complaint is that programmers exercise disproportionate power due to the influence of technology, and that the public is dependent on them due to the learning curve needed to directly participate in modifying it, then the issue is the division of labor (and not unique to open source). Nevertheless, with Free Software, society *reduces* dependency and *expands* the opportunity for members of the global public to shape digital technology. Finally, while "open" technology can be (and is) used by the powerful to exploit the public, locking up technology under the exclusionary ownership and control of private owners (usually corporations) makes software *more* (not less) neoliberal. Just as those opposed to neoliberalism would not recommend locking up science as secret knowledge owned by corporations, it is not clear why it we would lock up source code as secret knowledge owned by corporations.

Coming from a different perspective, Audrey Watters (2015c) penned a short essay on "open washing" – the notion that because "open" now enjoys widespread popularity, it has become fashionable to affix the term to technology products. Google, for example, might label Google Android "open" because it includes the Linux kernel, even though they have locked down other parts of the OS through proprietary licenses (e.g. Google Play and Google Maps) and business deals (e.g. the Open Handset Alliance) (Amadeo, 2018). Watters supports Free Software (see "recommended reading" for teachers in Watters, 2015d) and acknowledges the critical importance of technical architecture to education technology and power in the digital society. As she put it, political, economic, technological, and cultural forces "matter at the level of infrastructure, technological infrastructure: who controls the networks, who controls the servers, who controls our personal devices, who controls the software that's installed on them?" (Watters, 2015a). Yet Watters stops short of developing these subjects in her work, and has not yet addressed the possibility of placing Free Software and People's Technologies in the education system. Crucially, the field of education technology generally neglects questions of technological infrastructure, despite common criticisms of Big Data surveillance.

Lack of engagement with the Free Software philosophy is symptomatic of a deeper neglect for the role architectural *design* in shaping social outcomes. Section 3.3 demonstrated that under colonialism, technical architecture – such as railroad networks and panoptic housing compounds – was *designed* for exploitation, and as such, formed part of colonial domination. In the digital era, this analysis applies to the technical architecture of the digital ecosystem, especially with respect to proprietary software, cloud computing, and Big Data. This enables domination and surveillance in education, economy, and society, with implications for e-education policy.

Some may argue this framing constitutes *technological determinism*. However, to the contrary, this position is based on the notion that technology is socially constructed. Along with a long list of prestigious scholars (see Section 1.3.1), it conceptualizes technical architecture "as arrangements of power" that "embed design decisions that shape social and economic structures ranging from individual civil liberties to global innovation policy" (DeNardis, 2014, p. 7).

To unpack this, Madeline Carr (2015), drawing on Vig (1998), offers a useful outline of three perspectives on the relationship of technology to power and society. First, the *instrumental* perspective, holds that technology is value neutral and it is at the point of use that technology becomes political. For example, a gun can be used as a paperweight, or as an instrument to kill people. In this sense, we give political meaning to technology according to its actual use.

Second, *technological determinism* holds that technology is political, arguing that it is imbued with values like power and the profit motive. However, Carr states, this position also argues that technology evolves along a mono-directional path whereby technology influences society, but society does not influence technology. Its impact is also experienced uniformly across societies where it is implemented. Among the deterministic variants, "hard determinists" argue that technology evolves along a logical sequence (e.g. the development of the sail ship and the steam engine lead to the steamboat, and so on). According to Carr, hard determinists do not incorporate the evaluation of *social choice* by in the design of technology. This shortcoming is ill-suited to studies on digital technology (in Carr's case, the Internet) because policy decisions and other social factors are influential on the development of technology. "Soft determinists", by contrast, argue that technology shapes, rather than determines, social change. Technology does not follow an inexorable path, but it does impact upon society in a monocultural fashion.

A third position, *social constructivism*, holds that "technology is neither a neutral instrument for problem solving (as instrumentalists suggest) nor a value-laden force which threatens human autonomy (the determinist view)," but rather, it is "an expression of norms and expectations within society" (Carr, 2016, p. 29). Additionally, she argues, social constructionist theorists "believe that the adoption of technology can also change it. Those who use it, also improve, exploit, adapt and shape technology" (*ibid*, p. 30). This has particular relevance to the study of the Internet, Carr adds.

The Free Software philosophy holds that technologies are not neutral (Stallman, 2016). Rather, their design features (e.g. centralized cloud computing) embed power relations reflecting the values and interests of their designers. Given that the public can also learn how to design and shape technology by developing code and participating in the development process in other ways (e.g. submitting feature requests or bug reports), the Free Software philosophy argues that the public should have the direct ability to shape and design digital technology because it shapes our lives. In this sense, Free Software (contextualized to a more holistic account, as outlined in Section 3.2.3) can be considered a human right similar to freedom of speech (Stallman, 2014). The FSM also engages in political advocacy resisting intellectual property rights and various forms of technological restrictions that public ownership and control of devices (e.g. Digital Rights Management) (Samuelson, 2003). From both a participation perspective and a policy perspective, then, the Free Software philosophy holds that society – from the common person to those with power – shape the development of technology.

This position is akin to a social constructionist position. However, we should acknowledge that because digital technology is not neutral, it *shapes* social outcomes, much the way other technical design principles shape social outcomes. As we have seen, if colonial railways, for instance, are designed to connect ports, military outposts, and mining compounds, while bypassing villages of indigenous peoples, then its design shapes social outcomes (favorable to the interests of the designers). The same is true for panotpic housing compounds arranged to control black labor in the mines (Crush, 1993). Of course, people do not *have* to *use* technology in any single way, but there are clearly *likely* outcomes given the power relations that technology arranges. The regulation of nuclear weapons, the distribution of 3D printed guns, controversies surrounding CCTV surveillance, algorithmic filters on news feeds, and myriad other considerations about technology are all premised on the likely social outcomes that follow from distribution, technological structure, and implementation.

Crucially, the Free Software philosophy does *not* offer a *reductionist* stance on the role of technological design in shaping human outcomes. Many problems in society, such as inequality and poverty, cannot be reduced to the state of technology. When asked if Free Software could help stop "plutocratic domination" and alleviate poverty, Richard Stallman (2015b) responded: "I don't know. There are different ethical" and "political issues in society. There's no reason to think that one specific thing about software is the solution to all of them. That's like the quacks that say, 'here's this wonder-drug that will cure every disease…'" Things like Free Software and Free Hardware only fix *particular* problems, he added. They add to other human rights, Stallman said, but “we still need to fight for all the human rights that we needed to fight for fifty years ago” (*ibid*).

This dissertation addresses a *particular* issue: how *policy choices* about *e-education* contribute to the social construction of the (inherently political) design of technology, as it relates to education, economy, and society. As Klaus Schwab (2018) puts it, “Technologies and society shape each other in a reflexive way – we are the product of our technologies as much as they are the products we create” (p. 46; see also, Carr, 2015, pp. 28-32). A critical question follows: *who* shapes technology? Who owns and controls it? What needs and interests are imbued in its design? Schwab, we have seen, neglects questions about the architecture of technologies like software, the cloud, and Big Data. He also fails to address how technology is being shaped in the context of vast inequalities within the political, economic, and cultural domains. Instead, he focuses on trending technologies without interrogating arrangements of power embedded in technologies like AI, proprietary software, or centralized clouds. We are thus left with a superficial account that fails to problematize these technologies, and assumes they will be part of society in the future. A similar problem afflicts much of “critical data studies”. Scholars like Kate Crawford and danah boyd (2012) acknowledge that technology is not value neutral, but the best they have done to address this is to challenge algorithmic bias. While that is noble work, their assessment, much like Klaus Schwab, leaves various other foundational elements untouched.

The field of education technology is also missing the opportunity to engage with the politics of technical architecture. As we have seen, scholars have addressed topics that acknowledge the importance of software as a “layer” within the education system that, when under the control of third parties like corporations, effectively privatizes parts of education and undermines teacher autonomy. They have also criticized Big Data quite heavily, but their solutions have been either problem-posing with no normative solution (e.g. Williamson, 2017) or framed within an assumption that Big Data is an inexorable development in human society. This has led to proposals for “data agency” of students (Prinsloo and Slade, 2016), without questioning the power relations which inhere in proprietary and cloud-based architecture – or the need for Big Data at all. Furthermore, EdTech critics have artificially narrowed their concerns to education-specific technology, without considering the implications of putting more general software systems (like Microsoft Windows, Google Android, or Apple macOS and iOS) into school systems. Given that there are quality alternatives like GNU/Linux that do not surveil users – an options which has been deployed in Kerala for a decade – both learners and teachers could be provided with software that does not spy on their general use habits. Schools also offer a place to educate people about technology from a critical perspective, including how software works at a rudimentary level ("critical" coding for kids), how surveillance capitalism works, and how to think about the ethics of privacy and autonomy in the digital age.

And finally, scholars should assess the digital technology ecosystem from a global perspective, rather than one strictly dedicated to one's own country or common experience. Providing business to Google, Microsoft, and other Big Tech giants problematically strengthens their power as global entities, much like providing business to fossil fuel corporations helps perpetuate climate change that has disparate impact on the Global South. Intellectuals, technologists, sympathetic policymakers, and the global public can counter technology designed by the ruling class with a re-designed digital ecosystem imbued with libertarian socialist principles of equal, non-exclusive ownership; free and open licensing; decentralization; direct action; the capacity for popular participation; and individual and collective liberty. This dissertation fills takes a different position in the debate over technology in the literature, and helps fill these critical gaps.

## 3.5: Conclusion

This chapter has outlined the theoretical context for the e-education policy analysis for the findings which will be presented in Chapters 5 and 6. It began with an overview of anarchist philosophy, noting how it challenges forms of authority and domination that pervade social life, from government and capitalist economy to race relations, patriarchy, hierarchical organizational forms, and interpersonal relationships. It explained that anarchists seek to replace structures of domination with systems of non-domination based on direct action, prefiguration, decentralization, direct democracy, and radical equality. The chapter then explained the Free Software philosophy of the digital society. According to this perspective, Free Software should provide people the individual and collective freedom to control their computer-mediated experience. To accomplish this task, it is essential that people have Free Software, which allows anyone to use, study, modify, and share the software itself. However, we saw that the focus on software is too limited. In an effort to expand the Free Software conceptualization, Eben Moglen's (2004) framing in "Die Gedanken Sind Frie" provides a more holistic framework for conceptualizing power in the digital ecosystem. In 2010, Moglen, along with colleagues in the Free Software Movement, launched the FreedomBox in an effort to re-decentralize the Internet in an effort to combat centralization in the cloud. The re-decentralization movement has picked up steam, with endorsements from the likes of Tim Berners-Lee and Vint Cerf.

This chapter next compared anarchism with Free Software, noting strong theoretical affinities with respect to liberty, collective control, direct democracy and direct action, and the desirability for decentralization to prevent the concentration of power through domination of the digital ecosystem. The following section proposed a theoretical and conceptual framework for digital colonialism. Informed by anarchism and the Free Software philosophy, this theory postulates five core and related elements of digital colonialism: economic domination, imperial control, global surveillance capitalism, imperial state surveillance, and tech hegemony. It noted how e-education initiatives are marked by corporate domination that feeds into digital colonialism. The final section addressed a series of objections to the theoretical positions taken in this chapter, including objections to anarchism, the practicality of implementing Free Software under neoliberalism, possible objections to the "open technologies", and possible characterizations of the theoretical framework as exhibiting technological determinism. The chapter concluded positing a reassessment of digital studies from a global perspective and calling for a new digital ecosystem based on anarchist principles. This perspective guides the e-education policy analysis in the findings (Chapters 5-7). The next chapter details the research methodology.

# Chapter 4

## Methodology

---

### 4.0: Introduction

The previous chapter outlined the theoretical context that guides the findings for this dissertation. This chapter details the dissertation methodology. First, it outlines the approach to the research paradigm. This includes the ontological and epistemological outlook guiding the thesis. Next, it explains how the research problem was determined. In the following section, it describes the dissertation's form of study, policy analysis, and explains how it is applied in this thesis. The next section describes the research design and methods, which includes semi-structured interviews and document analysis. Following that, the chapter explains how triangulation was deployed to make the research more robust and dependable. The next section reviews the data analysis, including thematic analysis and the use of the theoretical lens, outlined in Chapter 3, to analyze policy. The following section explains how reliability and trustworthiness were established in the thesis. The chapter then outlines the approach to research ethics used in the dissertation.

### 4.1: Research Paradigm

Any approach to research must account for a paradigm through which to view the world. According to Babbie (2014), paradigms provide "logical frameworks within which theories are created" (p. 31). Beliefs leading to different interpretations of the same phenomenon are often implicit, and in the social sciences, there is a moral or "value-laden" approach to research. As Babbie puts it, "The sanctity of the individual is not an objective fact of nature" but is a "point of view, a paradigm. All of us operate within many such paradigms" (*ibid*, p. 33).

*Ontology, Epistemology and Methodology*

In the social sciences, paradigms are not "true or false", but constitute ways of looking at things that inform various theories and kinds of research. That said, there is nuance to ontological questions of truth in the social sciences. The early positivism of August Comte stressed "laws" of human behavior, facts, and knowledge on the model of Newtonian physics. Society, for Comte, should be hierarchically ordered according to laws determined by the rational insights revealed by sociologists and administered by business and government (Feagin and Vera, 2001, pp. 39-41; Babbie, 2014, p. 34). This perspective is not tenable, even on narrow grounds. As the economist Hugh Stretton (2000) notes, even in the domain of economics, human *beliefs* about the economy induce changes to the behavior of the model in unpredictable ways – economists, investors, governments, act according to beliefs and expectations about the economy, which in turn modifies the economy in a feedback loop – so it impossible to reveal laws of the economy (much less broader human knowledge and behavior) on the model of mathematics and physics (pp. 2-64).

In contrast to positivism, postmodernist perspectives emphasize the social construction of knowledge. Postmodernists argue that truth is socially constructed according to context and lacks a universal basis. They generally reject objective knowledge on grounds that there is no such thing as universal truth, but instead "truth" is value-laden and subjective (Best and Kellner, 1991; Grenz, 1996; Harding, 1986). This position prompted the "science wars" in which postmodernists clashed with those in the hard and soft sciences arguing against postmodernists *characterizations* of science and *subjectivist* alternatives (Gross, Levitt and Lewis, 1996; Koertge, 1998; Sokal, 2008). The science side of the Science Wars argues that science is not a philosophy of absolute truth, but holds a commitment to rational skepticism that posits the philosophical impossibility of final, universal, and absolute truth (Popkin, 1997; Chomsky, 2009). That said, their position holds that metaphysical reality – including social (not just physical) reality – is not subjective, in the sense that there is a universal truth that is not our subjective philosophical making – even if this is theory-laden and never 100% certain (Marvasti, 2004, p. 8). Just as the moon cannot be made out of cheese just because someone believes it to be so, patriarchy cannot be ethically justified because one society, or people in that society, believe it to be so. If our *ethics* were infinitely pliable, then slavery could be "just" in some societies and "unjust" in others. Moreover, *explanations* of social reality cannot infinitely vary. Perhaps the President George W. Bush invaded Iraq in order to liberate the Iraqi people. Perhaps he invaded the country in order to bolster the geopolitical power of the ruling class in the United States. Whatever reasons may explain the Iraq War, it cannot be that anything goes. We cannot accept the argument that George W. Bush is an alien from outer space pursuing an agenda of alien conquest (as some conspiracy theorists believe) or was under the mind control of his pet dog. There are better and worse explanations, and there must be some non-arbitrary, objective, universal truth to the matter.

Postmodernists have made a strong case that universalist positions can be dangerous, especially with respect to "scientific" claims about human nature.[125] However, political economists like Samir Amin (2009) seek a better society based on universal principles of equality, and called for a more inclusive, non-Eurocentric universalism (Amin, 2009, pp. 8-9, 205-216).

This dissertation takes an approach to ontology and epistemology called "mitigated skepticism", which rejects certainty in truth in favor of reasoned skepticism (Popkin, 1979, pp. 129-150; Chomsky, 2009). This approach stresses rational, logical, and scientific approaches to social inquiry while at the same time acknowledging the legitimacy of subjective knowledge and its impact on social reality. As Babbie (2014) puts it, "Ultimately, we'll never know whether there is an objective reality that we experience subjectively or whether our concepts of an objective reality are illusory. So desperate is our need to know what is going on," he argues, "that both the positivists and the postmodernists are drawn into the belief that their view is real and true" (p. 42). Following this ontological and epistemological orientation, both objective and subjective elements of reality are recognized metaphysically and as ways of knowing the world.

The "scientific method" that has people formulate a hypothesis, test it, and then analyze the data and draw conclusions, is a loose caricature of scientific methodology. In reality, science is more complex. Some intellectuals, such as the mathematician John Moore, have attempted to formulate a rigorous set of principles that constitute science. According to Moore (1993), scientific methodology includes, among other criteria, requirements that data be collected from a laboratory or field, testing hypotheses, repeated testing of models, universal generalizations within the domain of the particular science, and the steady improvement of the scientific domain under question. Yet others stress that particular fields of study are only scientific if they are universal, feature law-structuredness, and are strictly quantitiative (Mayr, 1997, p. 30). These strictures are too narrow because they are well-catered to disciplines like physics and chemistry, but not to some other scientific disciplines. Evolutionary psychology, for example, has an historical element to it which does not allow for controlled experiments or testing (say, regarding the emergence of various cognitive faculties; see Kinzler, Dupoux and Spelke, 2007; Chomsky, 2007).

125 Social Darwinists, for example, have argued for the inferiority of Africans in the name of scientific objectivity and the laws of nature (Gould, 1996 [1981]). However, this can cut both ways: during the era of Social Darwinism, the scientist and anarchist philosopher Peter Kropotkin argued in Mutual Aid that human nature includes multiple capacities, including both the capacity for hierarchy, inequality, and selfishness and the capacity for sharing and mutual aid, as a normal part of everyday life (Kropotkin, 1972 [1902]). Human nature varies and people can re-design their society to cultivate the better attributes of our nature.

As the eminent biologist, Ernst Mayr (1997), notes, a “physics bias” in methodological rules can be *prescriptive* and bias researchers towards what scientists *should* be doing (pp. 45-63). The field of the philosophy of science, as it developed in the nineteenth and early twentieth centuries, has overemphasized physics as the “ideal science” at the expense of other, younger sciences.[126] The idea that everyone should aspire to the methods of physics constrains the value of inquiry in other domains. Within biology, Mayr observes, various branches include elements that do not follow procedures found in physics: “the rejection of strict determinism and of reliance on universal laws, the acceptance of merely probabalistic prediction and of historical narratives, the acknowledgment of the important role of concepts in theory formation, the recognition of the population concept and the role of unique individuals…” (*ibid*, p. 37). In a manner similar to the field of biology, this dissertation takes a non-deterministic approach to policy analysis which includes historical narratives, without reliance on universal laws or reduction to quantification. This approach is similar to Madeline Carr’s study on the Internet and US power (Carr, 2011, 2015). Before we address specific methods chosen, let us consider the research problem and the policy analysis approach to the study.

## 4.2: Research Problem

As we have seen, digital technology has altered social life in a number of areas. In South Africa, US technology corporations are disrupting the transportation, news, and television industries. Yet despite rapid changes in the global and local community, Wits Vice Chancellor has remarked that little there is little public discourse or debate in South Africa, which could “once again” become “victims of economic forces and processes beyond our control” (Habib, 2017). After several years of intensive research, I found Habib’s concerns to ring true: there is scant research and debate on the politics of power in the digital revolution, and where this is coverage, most commentators laud US technology corporations, models, and narratives.

Scholars have made highly valuable contributions to *aspects* of the digital revolution in South Africa (see Chapter 1). However, their publications often cover fragments of the conversation (such as surveillance of digital communications or social networking) without relating those fragments to the underlying structure of the digital ecosystem. After an extensive review of the academic and news media publications, referenced throughout this dissertation, the South African intellectual community has yet to present a big picture view on the digital revolution. Digital tech is rapidly integrating into

126 Karl Popper, for example, struggled with what defines science due to these prejudices. Early in his career, he did not consider the theory of natural selection a legitimate science, but later backed off this position (Sonleitner, 1986).

the everyday activities, the life blood of business and finance, the affairs of the state, and the international community. It is necessary to view the digital revolution from a broader lens so that decisions which impact a broad array of human rights – such as which software to use in society – can be thought through effectively. My research set out to fills gaps in field of digital studies in South Africa.

The implications of putting computers in schools changes the role of education policy. In previous eras, education departments could limit their content deployment to the narrow concerns of education, such as which textbooks to offer for national curriculum, which benchmarks are appropriate to public schools, and which other measures (such as those reviewed in Section 2.3) can be taken to improve education. In the digital era, however, the deployment of devices adds a layer of complexity to their considerations. A computer is more than just a "textbook behind glass" – it is a device which carries with it a set of complex dynamics. For example, whereas students receiving a math textbook can only use it to perform math, learners can use their digital devices for social networking, research on Wikipedia, downloading music, and accessing adult content. They may also be spied on by governments and corporations, and they are potentially branded and trained on corporate ecosystems like Google, Microsoft, or Apple. There are many new things to consider when using computers in education. Considerations around the politics of technical architecture (e.g. proprietary software, cloud computing, and online anonymity) as they relate to education, socioeconomic development, privacy, and democracy informed the formulation of the research problem.

The decision to study the national e-education agenda came about as it developed after the proposal phase and during the field research phase. In 2013, I discovered that the ANC was considering deploying tablets as a solution to the Limpopo textbook crisis (BusinessTech, 2013). Based on this article, I began looking into technology and education with a focus on Access to Knowledge (A2K) in the digital age.

As I furthered my investigation, I discovered the Information Communication Technology for Rural Education Development (ICT4RED) pilot project in Cofimvaba, Eastern Cape. Located just four hours away from my residence of study, Rhodes University in Grahamstown, the ICT4RED project was geographically well-suited to study. Moreover, ICT4RED was the major e-education pilot project funded by the national government. Given that it was designed for national replication, it offered a valuable case study for a policy analysis. I emailed ICT4RED project members and obtained approval to study their pilot project for my doctoral dissertation.

In 2014, I traveled to Cofimvaba to observe the ICT4RED project. On this trip, I observed meetings about the project, participated in teacher and district official training sessions, and spoke with individuals working for and with ICT4RED, including district officials, subject advisors, ICT Champions, school teachers, and technology workers. Accompanying a group of fellow students and ICT4RED members, I visited several schools, including: Arthur Mfebe Senior Secondary School, Bangilizwe Junior Secondary School, Siyabalala Senior Secondary School, Gudwana Junior Secondary School, St. James Senior Secondary School, and Mtimbini Senior Primary School.

In 2014, I wrote my proposal, *Going Digital: Access to Knowledge and Pro-poor Development in the Cofimvaba, Eastern Cape School System*. The central aim was to discover and explain how concerns about education, economic development, privacy, and equality inform policy choices and perspectives regarding access to learning materials, the development of an information commons, and the ethics of intellectual property in the digital age. Specifically, it sought to identify and analyze policy choices and perspectives for technical architecture in e-education with respect to A2K and its relationship to education, socioeconomic development, and privacy. Secondary aims included:

- To identify the key stakeholders, their policy positions, and their roles, especially as they relate to national policy;
- To examine opportunities and barriers for A2K development;
- To determine why certain policies are being chosen or planned, and not others; and
- In light of policy thinking, determine the possibilities for digital-era freedom in South Africa with respect to the digital ecosystem and A2K for education, economy, and society.

At that point, ICT4RED was the major actor for my field research. Other key stakeholders were listed as well, mostly comprised individuals in government recommended to me by members of the ICT4RED team. In February and March 2015, I returned to Cofimvaba and conducted additional field research on the ICT4RED pilot project. Over the following months, I arranged new interviews with members of government and remaining members of the ICT4RED team in Pretoria. Later in the year, the government published news of Operation Phakisa Education (OPE) and held the OPE lab at the Birchwood Hotel in Johannesburg. Operation Phakisa in Education is, I discovered, a model to fast-track e-education into all public schools.

In October, I made a trip to Pretoria for field research interviews. When speaking with members of the ICT4RED team, I learned that the ICT4RED program was not given serious attention at the OPE Lab. It appeared that ICT4RED would not play a significant role as a model for national replication after all. When I spoke with government, they confirmed their plans for a national rollout across the country through the OPE program. It became clear to me during this time period that a policy analysis was better suited to focus on OPE than on ICT4RED, which seemed more marginal to the national agenda than I had previously been told.

During the October 2015 interviews with government, officials expressed a vision for a technology-driven education system based on Big Data analytics. These included adaptive learning, corporate partnerships for data sharing, and DBE cloud analytics. Once I discovered these details, I realized that the shift towards a corporate-driven surveillance capitalist education system is the most important issue in the e-education system. I dropped the focus on ICT4RED in favor of OPE (on grounds that OPE is relevant and ICT4RED is marginal). Moreover, instead of focusing on how choices about technical architecture impacts A2K in a complex relationship with education, privacy, and pro-poor development, I removed A2K from consideration to narrow the scope of the dissertation. Instead, the new research problem sought to identify the policy choices and perspectives with respect to the national e-education rollout – with a focus on technology choices and technical architecture – and *why* they are being chosen or planned. Secondary aims included:

- To identify the key stakeholders, their policy positions, and their roles, especially as they relate to national policy;
- To determine how key actors envisage the relationship between technology in education to education, economy, and society;
- To determine why certain policies are being chosen or planned, and not others; and
- In light of policy thinking, determine the possibilities for digital-era freedom in South Africa with respect to the digital ecosystem and education, economy, and society.

After the October trip, I conducted more interviews, extending into 2016 and a few in early 2017. These included a few members of government, corporations, and NGOs utilizing e-education. During this time period I delved more deeply into the privacy aspect of e-education and how e-education was being implemented on the ground.  The next section explains the policy analysis approach, followed by the research design and methods for data collection.

## 4.3: Policy Analysis

This study is a policy analysis, which seeks to critically identify and analyze policy goals.  As Kirst-Ashman (2017) notes, a policy analysis provides "a systematic evaluation of how a policy addresses the targeted problem or issue, meets people's needs, and achieves its goals" (p. 196; see also, McMillan and Schumacher, 2014, p. 33).  Accordingly, it can evaluate the ethics of policy, potential alternatives, who benefits from the policy, what an evaluation of potential alternatives can reveal, and provide recommendations for positive changes (*ibid*).

Consistent with this approach, Jimenez et al. (2015) offer a policy analysis framework. According to their approach (*ibid*, p. 25), policy analysis:

1. *Identifies the social problem addressed by the policy*.  Chapter 2 has already addressed this criterion, identifying the crisis in education coupled with the need to close the digital divide;
2. *Determines the policy objectives, value premises, expectations, and target populations* (see Chapter 5);
3. *Evaluates the intended and unintended effects of the policy* (see Chapter 3, which details digital colonialism, and Chapters 6-7, which analyze the policy);
4. *Considers the implications of policy* (see Chapter 3, which details digital colonialism, and Chapters 6-7, which analyze the policy); and
5. *Considers alternatives consistent with social justice* (see Chapter 7).

This dissertation adopts Jimenez et al.'s framework, without empirically testing the *effects*, for several reasons.  First, this thesis argues the policies under consideration have a *macro* effect on South Africa's tech *ecosystem* and cannot be fully tested without large scale deployment.  As we saw in Chapter 3, the dominance of Big Tech corporations is explained by a confluence of factors, including proprietary ownership of software and data, cloud centralization, network effects, economies of scale, resources for research and development, and the dynamics of AI-driven data analytics.  It is argued that US multinationals dominate the digital ecosystem due these structural dynamics, which cannot be overturned without alternative technologies that re-design the ecosystem on anarchist principles of communal ownership, sharing, mutual aid, direct action, and decentralization.  The ability to test that model *for education, economy, and society* cannot happen without getting there first, and getting there cannot happen without constructing the alternative technologies beyond their current state and implementing them at scale (see Barbas, Narula and Zuckerman, 2017).

Second, while some elements of People's Technologies are in place in some schools (see Chapter 5), it requires a separate study to interrogate these initiatives for *effects* (such as cost and sustainability).  It would be useful for follow-up researchers to visit schools implementing People's Technologies to begin to determine best practices during a shift away from infrastructure dominated by Big Tech.  A comparison to India's IT@School project could be a fruitful avenue for further inquiry.

Third, many elements of the policy analysis do not need empirical interrogation because they stand on the basis of the nature of the systems under consideration.  For example, this dissertation argues that placing learners and teachers under the surveillance of corporations by virtue of pre-loading devices with their core infrastructure is ethically problematic given that there are alternative, fully functional technologies available that do not conduct surveillance (see Section 3.3.4).  The Free Software community offers an ecosystem (e.g. GNU/Linux, LineageOS, and their app repositories) that does not spy on users as a feature of its very *design*.  Microsoft, Google, and Apple, by contrast, spy on users *by design*.  One can choose spy-free infrastructure for education instead one which facilitates surveillance capitalism.

Given that OPE is a rather secretive policy which has not been tabled before the public (say, in a government gazette), I spend Chapter 5 detailing what OPE is and how it is being implemented.  This *describes* current national e-education policy with new empirical details.  Chapter 6 is also mostly descriptive.  It *identifies* the policy perspectives with respect to Free Software and privacy.  It describes positions in Free Software policy documents and interview subjects.  Chapter 7 analyzes the implications of the policy choices, as well as the reasons certain polices are being chosen or planned for the e-education rollout.  Chapter 8 concludes the policy analysis with recommendations for alternatives that policymakers and the public can discuss, debate, and implement.  The next section explains the research design and methods for the data collected to address the research problem.

### 4.4.1: Research Design and Methods

In order to effectively analyze e-education policy, this study was designed to incorporate a three sources of data that help explain why certain choices are being made or planned – and not others. These include:

- *Semi-structured interviews drawn from:* Government officials (including policymakers and key e-education officials) and key stakeholders (including corporate actors and NGOs);Experts and innovators external to the policy process. These individuals were consulted for their views on e-education and various aspects of OPE;
- *Primary source documents*: These include policy papers and speeches related to e-education and technology; and
- *Secondary source literature*: This includes scholarship on technology and e-education policy.

For this dissertation, qualitative methods were adopted because they allow me to interrogate national e-education policy, which is principally formulated by key government officials and stakeholders.[127] Quantitative methods stress random samples, surveys, statistical analysis, and theory "detached from the phenomena" and defined at the outset (Leedy and Ormrod, 2015, p. 99). These are valuable methods for projects with sizable groups of participants that do not vary widely in their roles and relevance to the study. This thesis, in contrast, focuses on identifying and analyzing policy choices and perspectives with respect to national e-education policy, which is authored by a small group of government officials with varying roles and influence. It also incorporates input from a small set of key stakeholders involved through partnerships that can influence government policy. While the government regularly discloses plans and solicits input for basic education initiatives, such as reforms to the National Senior Certificate Examination and changes to curriculum, they have not done the same for their e-education agenda, and I was forced to discern the policy through interviews with subjects who are active in determining national policy.

Because the group of government officials working on e-education policy, in addition to key stakeholders working with government, form a relatively small group of individuals who vary with respect to their roles, functions, education, and responsibilities, I opted to conduct an entirely qualitative study, as the variety in background and expertise precludes quantitative sampling (Barriball

127 As we see in Section 7.6, the general public has had little involvement in formulating OPE.

and While, 1994, p. 329). Qualitative research guards against the imposition of researcher values on the respondents that can occur with a pre-selected range of variables typical to quantitative studies (Marvasti, 2004). It also provides the researcher access to an insider view on the topic of study (Bryman, 1988). Moreover, qualitative methods allowed me to obtain the wide range of descriptions, nuanced viewpoints, contextual understandings, and expert insights needed to build a complex, holistic picture of the policy (Creswell, 2007, pp. 36-41, 122). The freedom to vary conversation by the interview subject and explore tangents before covering all the subjects provided the opportunity to probe research topics in great depth (Fylan, 2005, pp. 66-67). By retaining a set of pre-determined questions to ask across interview subjects, I was able to simultaneously draw comparisons and conduct analysis according to roles and relationships. By using purposive sampling and composing detailed descriptions (instead of numerical codes) (Marvasti, 2004, pp. 5-12), I constructed a picture of national e-education policy. Moreover, with a qualitative approach, I was able to attach theory to methods, in the sense that I kept searching for meaning as the research unfolded (*ibid*). This allowed me the flexibility to adapt my study as I discovered new information (Hashemnezhad, 2015; Babbie, 2014, p. 160; McMillan and Schumacher, 2014, p. 20).

### 4.4.2: Semi-structured Interviews

The interviews in this thesis consist of a series of semi-structured interviews. These were selected for three reasons. First, this study is a critical investigation into technology choices in e-education policy that are not well-documented or thoroughly researched in academic, policy, or other publicly available literature (the entire scope of literature is reviewed in this dissertation, and an extensive array of studies on education technology in South Africa that does *not* address technical architecture is reviewed in Chapter 1). Thus, a semi-structured format provided me the flexibility to discover what the national e-education policy *consists of empirically* – i.e. the architectural *choices* being made – and the freedom to question which allowed me to form an *analysis* of the *perspectives* of government officials and key stakeholders. According to Hashmnezhad (2015) unstructured interviews are guided by the responses of the interviewee rather than the agenda of the researcher, whereas structured interviews the interviewer asks the same questions in the same way according to a rigid structure. In contrast to both, semi-structured interviews "involve asset of open-ended questions. He/she has a general idea of where he or she wants the interview to go, and what should come out of it, but does not enter the interview with a set of predetermined questions" (*ibid*, pp. 60-61; see also, Nunan, 1992, pp. 149-150).

Second, the varied backgrounds, education, personal histories, and roles of the sample group precluded the use of a standardized interview schedule (Barriball and White, 1994, p. 329). That said, wherever possible – which was the case with most respondents – the same questions were used as a guide to touch upon the same themes across the interview set (see Appendix A). For most subjects, *additional* questions were asked as interview subjects provided tangential responses, described the *empirical* realities they have experienced with respect to OPE, and provided their *perspectives* on the themes raised (such as Free Software, socioeconomic development, and privacy). Moreover, for some interview subjects, I asked questions catered to their individual roles (e.g. products that companies offer). This provided both empirical insights as to their role in the e-education ecosystem as well as insight into their views on core themes in the semi-structured interview schedule. While the schedule covers the themes of the dissertation, some interview subjects were not asked the *exact* same questions (as is done with structured interviews) because of the semi-conversational tone of the interview and, in some instances, the differences in background and roles between respondents.

The interview questions were formulated after conducting extensive background research to ensure my interviews would ask new and important questions (see Appendix B). The baseline form for the respondents included an opening section asking the interview subject about her role at her respective institution and some questions about the policy process (national policy, funding, contracts, and so on). The next section asked questions about A2K and copyright, with an emphasis on the ethics of copyright as it relates to technology, poverty, and equality. Other topics included openly licensed content, the technological structuring of the power to control information flows (such as digital rights management). The third section asked questions about the openness of technology and the role of software in the e-education program. Questions included plans to teach learners to code, learner ability to control their device software (e.g. install apps or replace their operating system), the role of Free Software, and choices of software and services. The final section addressed privacy. This asked about tracking of data, learner consent, corporate and government surveillance (domestic and foreign), privacy in education services, and privacy protecting software.

In the last two of my three trips (Cofimvaba and Pretoria, respectively) I conducted in-person interviews using the same set of questions for each interview subject. These were starter questions, however. Consistent with a semi-structured format, all of my interviews evolved in conversation. Some questions were posed in the hypothetical if I sensed the interview subject did not know much about the underlying content. For example, if an interview subject had never heard of the Tor browser, I might explain to her what Tor does and then ask her what role Tor might play, if any, for learners in school. This approach allowed me to ask about underlying principles in the absence of specific technological knowledge.

I prepared particular questions for most interview subjects as an addition to the interview schedule. When I interviewed Google South Africa, for example, I incorporated questions about Google Apps for Education posed to Google by US Senator Al Franken and the Electronic Frontier Foundation. When I interviewed experts like Bruce Schneier, Richard Stallman, and Cindy Cohn (EFF-US), I prepared questions specifically catered to their expertise. For instance, I asked Stallman questions about using the command line in education because he is an expert programmer. I did not ask Cohn that question, as our time was limited and her expertise is in privacy law. Nevertheless, as noted above, in almost every instance, the *core* questions and themes were asked to each of the interview respondents.

For some interview subjects, I asked questions that arose from previous interviews. For example, Herman*[128] (DTPS) (2015) told me South African students could feel assured of their data protection from the NSA by virtue of the fact that Google would sign a legal contract with the SA government prohibiting such sharing. The South African government could sue should they violate their contractual obligations, he contended. I then asked Schneier and Cohn about Herman's claim because they are leading experts in the politics, legality (Cohn), and mechanics (Schneier) of NSA spying. The semi-structured interview format was thus an effective approach because it allowed me the flexibility to adapt to new information, as well as the special knowledge and expertise of each respondent.

As noted above, my focus changed from A2K and ICT4RED to OPE. While I usually asked questions about A2K and copyright, once I shifted focus to OPE in October 2015, I placed greater emphasis on questions about implementation, Big Data analytics, and privacy. In some interviews, it was not appropriate to ask the full range of questions to the interview subject. For example, I did not ask the individuals from the MSDF about copyright and A2K because they (and their organization) are far removed from that topic. It was more appropriate to ask them about that which was relevant to their role. If an interview subject allotted a small amount of time, I prioritized that which was most relevant to them and that which was most important to get input about for the purpose of the study. Tefo* of the Gauteng Department of Education (GDE), for example, gave me 25 minutes of time, so I only asked

128 * Indicates a pseudonym.

one question at the very end about A2K. When I asked that person questions about privacy, I could not flesh out a full conversation about NSA capabilities.

For interview subjects deeply involved with deployment on the ground, I spent considerable time on questions of implementation, such as the successes and challenges, anticipated time frames for completion, and so on. Across the set, questions sometimes deviated from the prepared template in the interests of rounding out my knowledge of the general context of the e-education program.

My interviews were selected through purposive and snowball sampling (Atkinson and Flint, 2001; Babbie, 2014, pp. 201-202). For purposive interviews, I sought out interview subjects on the basis of my knowledge of the field. For example, I knew that Google may have a role in South African education given that they offer “Google Apps for Education” (today called “G Suite for Education”) all over the world, and that Google Android was used for tablets in the ICT4RED project. When I learned that Google visited my campus, I reached out to a colleague at Rhodes University, who put me in touch with an individual from Google working on education in South Africa. In the case of Pearson, I was told of their involvement during an ICT4RED interview, and I subsequently searched the Internet to see which individuals from Pearson SA might be available for an interview. I emailed individuals at Pearson SA, who put me in touch with a relevant person to interview for the thesis. For snowball samples, I was suggested names of individuals to contact based on the prior interview. This began with my first interviews arranged with ICT4RED members through email. They in turn recommended relevant government policymakers and stakeholders. I was able to contact some individuals directly through recommendations, and some government officials were provided to me directly through email by the government itself. Some stakeholders also recommended other individuals for me to pursue.

My interview sample faced limitations due to practical circumstances. The highest level policymakers, such as then President Jacob Zuma, Basic Education Minister Angie Motshekga, and others were not accessible for this project. To fill this gap, I drew upon speeches in the public record. Key stakeholders outside of government were also frequently inaccessible. In some instances, such as with Knewton and Top Dog Education, I reached out through the Internet on several occasions, but never received a response in return. Given that there were no phone numbers listed online, I had no other means to solicit an interview. In these instances, I made do with the information I could access on their websites and in news articles.

When members of government or stakeholders did not respond to requests for an interview, I followed up after a couple of weeks or several times spaced over months. Some of the most noteworthy individuals and organizations that did not respond to interview requests include Knewton, Top Dog Education, and Mark Shuttleworth of Canonical. Two experts from South Africa, Geraldine Fraser-Moleketi and Sibusiso Sibisi, initially indicated willingness to conduct the interview when time permitted; Ms. Fraser-Moleketi eventually declined (due to time constraints) and Dr. Sibisi failed to respond to follow-up emails. I also reached out to Jane Duncan, a top expert in privacy and surveillance in South Africa, but she was unable to make time for the interview.

### 4.4.3: Primary and Secondary Source Publications

In addition to field interviews, my dissertation makes considerable use of document analysis (McMillan and Schumacher, 2014, p. 32). There are more primary source policy documents than can be reviewed for this dissertation. At the national level, the basic education sector is guided by many publications extending back to the 1990s, while each of the nine provinces has education departments with their own documents for their own policies. Taken together, there are perhaps hundreds of education sector policy documents running into the tens of thousands of pages. A broad perspective on the digital revolution includes polices for Internet access and regulation, digital monitoring and evaluation, software, privacy legislation, among other subjects. An exhaustive review of e-education *related* documentation was therefore not feasible for the purpose this study. In order to keep the study focused, I selected important primary source documents published by the government, as well as speeches and parliamentary meetings published online. These included the most important national policy documents for the basic education system, the set of publicly available e-education policy documents, and the set of software policy documents. I also included speeches by ex-President Zuma and other government officials. I also made use of primary source documents published by key stakeholders. For example, a assessed websites and white papers made available by corporations and NGOs on the Internet. These enhanced my understanding of the intentions of key stakeholders.

Finally, I made use of secondary source publications. I discovered that there are very few publications about the technologies for use in basic education. As noted in Chapter 1, most studies and publications are concerned with the use of digital technology itself in the classroom, and do not distinguish between various types of products and services. For this reason, I was able to assess most – if not all – of the secondary source literature in the academic system, and a good portion of material published in news outlets like *ITWeb* and *News24*. These sources informed my findings about national e-education with respect to empirical developments like the announcement of the OPE labs in Johannesburg and updated plans for the national rollout.

## 4.5: Triangulation

Triangulation is a process by which the researcher utilizes more than one approach to build confidence in research findings. This study triangulates semi-structured interviews with primary and secondary source document analysis to enhance the robustness of the findings. As McMillan and Schumacher (2014) note, triangulation compares findings drawn from a variety of data sources and collection strategies to find regularities in in the data (p. 407). This study critically explores the statements of government officials and key stakeholders against their official policies. As Babbie (2014) notes, researchers should be wary of the information provided by informants, as they probably provide "a mixture of fact and point of view" (p. 324). They may provided biased information, such viewpoints that are self-serving or catered to the expectations of the interviewee or the interviewee's audience. This study checks each of the sources of data – semi-structured interviews, primary source documents, and secondary source documents – against each other for the purpose of critical analysis.

## 4.6: Data Analysis

According to Bryman (2012), in contrast to quantitative data analysis, "there are few well-established and widely accepted rules for the analysis of qualitative data" (p. 565). Instead, qualitative researchers analyze data according to "broad guidelines, sensitive to specific cases" (Okley, 1994, p. 32). My research findings were interpreted first and foremost for policy analysis according to the theoretical lens outlined in Chapter 3 and the policy analysis guidelines detailed in Section 4.3.

I conducted sixty interviews, of which I transcribed and used thirty (see Appendix C). The interviews selected were the ones deemed most important (for their relevance to the rollout) and informative. Microsoft, for example, plays a major role in South African e-education, and their interviews made the final list, while ICT4RED plays a more marginal role, but provided insider knowledge of OPE and the broad e-education terrain in SA. Several interviews were excluded from the study because they focused on copyright, which was dropped as an area of focus in the thesis (e.g. Via Afrika and an interview with the Recording Industry Association of America). Other interviews were left out because they did not directly bear upon OPE. For example, two interview subjects from IBM discussed participation in African higher education, rather than the basic education sector. Keeping the interview set to 30 interview subjects prevented the analysis across subjects from becoming unwieldy, and were not deemed to add new information that would change the final analysis. The remaining interviews will be combed over for potential use in further publications after the dissertation is published.

While I conducted the interviews, I also took notes on the side to aid analysis at a later date (Whiting, 2008, pp. 36-37). During the data analysis phase, each of these interviews were then re-listened to and transcribed into text. The text was then re-read and color-coded for the major themes of analysis: implementation, education, socioeconomic development, privacy, and democracy, with sub-comments for common sub-themes (e.g. “affordability”, “adaptive learning”, “tech as magic bullet”, or “Big Data advocacy”). The overarching themes of A2K, Free Software, and privacy were defined at the outset. However, the emphasis on privacy increased when I discovered that the government plans to integrate Big Data into the education system. I added handwritten notes from the audio interviews to the color-coded/commentated transcripts.

The highlighted information was then drawn upon for analysis integration into the thesis according to theme in the findings (Chapters 5-7). This approach to organizing the research allowed for thematic analysis, which is well-suited to the semi-structured format for questioning. As noted, the semi-structured format retains an element of structure to allow the researcher to direct the interview. However, it maintains a degree of openness to also enable flexibility according to the interview subjects and the ability to evolve as the research project unfolds. The structured element of the interviews (asking the core questions and about various themes across interview subjects) focuses the study on themes of importance to the e-education system. The open element is also well-suited to thematic analysis because it allows for the emergence of new themes or sub-themes in the event of new and unexpected findings.

Of note, thematic analysis had its limitations due to complex intersectionalities in the digital ecosystem. For example, the question of the value of Free Software to e-education simultaneously touches upon democracy (e.g. the ability to control computer-mediated experiences), privacy (e.g. the ability to remove or avoid surveillance features in software products and services), transparency (e.g. the ability to verify the software does what it claims to do), socioeconomic development (e.g. the ability to prevent vendor lock-in or customize software for local needs), and so on. With respect to data interpretation, anarchism provided a powerful lens because it explains simultaneous problems (e.g. the anti-democratic, anti-privacy, and authoritarian nature of proprietary software) as related to power and authority, both in direct practice and in more general structures of political economy. By linking categories together, I was able to fulfill the goal of connecting patterns and themes in the data (McMillan and Schumacher, 2014, p. 406-408).

E-education policy often involves detailed interpretations around complex subjects, requiring more open forms of data collection and analysis. Qualitative research is well-suited to this dynamic because it is not easy to quantify or categorize information into discrete concepts or units of measurement. The qualitative, semi-structured format assisted the policy analysis in this regard because it allowed subjects to provide “rich narrative descriptions” that “cannot be achieved by reducing pages of narration to numbers” (*ibid*, p. 346). Policy choices and perspectives regarding, say, the deployment or non-deployment of Free Software, or the value of privacy, is often times told most effectively through the nuanced conceptualizations of the interview respondent. The findings chapters weave together texts while making use of quotations in order to complement the interpretive narrative (Denzin and Lincoln, 2018, p. 22) and incorporate the fine-grained distinctions made by interview subjects.

## 4.7: Reliability and Trustworthiness

It is imperative that research findings be of a trustworthy and reliable character. To mitigate bias, researchers must adhere to a number of principles and strategies. At the outset, it must be acknowledged that all research is linked to the perspective of the researcher. As Babbie (2013) puts it, “No one seriously believes we can observe life with no preconceptions; for this reason, scientific observers must be conscious of and explicit about these conceptual starting points” (p. 138). The theoretical starting points for this study are detailed in Chapter 3, which lays forth the theoretical foundation for the policy analysis. The theories which comprise the framework are derived from a wide range of sources, including top scholars of diverse backgrounds and geographic locations across time and space. Data collected was likewise selected with attention to diversity of voices. This approach helped me guard against social theories that express the views of a single sub-section of humanity (e.g. Western white males) (*ibid*, p. 39).

Critical thinking (i.e. logical, reflective, and evidence-based reasoning) is essential to bolster the credibility, accuracy, trustworthiness, and quality of research results (Leedy and Ormrod, 2015, p. 35, 106). Moreover, reflexive thinking actively attempts to identify personal, social, or philosophical biases that can taint data collection and interpretation (*ibid*, p. 278). As a researcher in the liberation sociology tradition (Feagin and Vera, 2001), I aimed to think critically and reflexively about any potential biases that could arise from identity and experience so that I was able to produce as unbiased research as possible.

To establish validity, I triangulated data sources and methods (as noted above), selected quality sources for empirical and analytical support, and spent a prolonged time period (several years) engaged in the study and field research interviews (Lincoln and Guba, 2013, p. 102). I also made use of "thick descriptions" – the description of a situation in "sufficiently rich, 'thick' detail that readers can draw their own conclusions from the data presented" (Leedy and Ormrod, 2015, p. 106). Thick descriptions were collected from the respondents in interviews and through document analyses, and they are provided in the findings chapters to "help the reader determine whether or not the findings are transferable to the reader's context" (Lincoln and Guba, 2013, p. 109). Providing original quotations is crucial to qualitative research as it provides the full context of respondents' statements so that the audience can be sure of their full position and that they aren't being taken out of context.

Taken together, each of these approaches provides the reliability, trustworthiness, credibility, and grounding needed to evaluate transferability (Leedy and Ormrod, 2015; Lincoln and Guba, 2013; Creswell, 2007). There are, of course, limitations to the study. First, the composition of the sample was limited by the availability of interview subjects. As noted, key or influential figures were not available. Second, the scope of e-education policy as a whole is vast, and this dissertation was restricted to *national* e-education policy. A more comprehensive take on e-education policy would cover all nine provinces, including provincial departments, district officials, circuit managers, principals, teachers, learners, parents, and school governing bodies. Other groups, such as unions, university departments, teacher training centers, investors, entrepreneurs, and the general public would ideally be consulted. Given that the diversity and scope of actors, many researchers will be required to cover the contemporary transition to e-education. Third, some data is necessarily incomplete: negotiations, say, between the DBE and Microsoft, are conducted behind closed doors, and the actual data from their meetings, phone calls, and negotiations will often remain off-the-record. Researchers can only do their best with the data they can collect through interviews and documents. Aside from evaluating the data and analysis presented in this thesis, other researchers can conduct their own studies and collect additional data to confirm the research findings.

## 4.8: Research Ethics

It is imperative that researchers conduct their research ethically. They must be sure to uphold scientific principles of honesty and objectivity while treating interview subjects with respect and providing protection from harm (Leedy and Ormrod, 2015, p. 120). The ethical issues and procedures for this study were evaluated and given clearance by my supervisor, the Department of Sociology, and the School of Humanities.

A form for informed consent was provided to each interview subject (see Appendix A). As the research evolved, in interviews, I informed interview subjects of the shift of focus from ICT4RED to Operation Phakisa Education at the beginning of the interview. In-person interview subjects were provided a document proving the authenticity of the research signed by my supervisor on Rhodes University letterhead. All interview subjects were given the option to ask additional questions at the start of the interview, to opt not to be recorded, to withdraw from the interview without providing any reason, and to be quoted as either named or anonymized subjects. In the findings, I ascribed a pseudonym to those who opted for anonymized attribution (Creswell, 2007, p. 141). To ensure confidentiality of those requesting anonymity, I withheld any details that could be used to personally identify respondents, such as specific job titles (Bryman, 2012, p. 142-143; Marvasti, 2004, p. 138). All information, including audio recordings, notes, and emails, were stored and kept confidential in my own personal archives.

## 4.9: Conclusion

This chapter outlined the approach to methodology used in this dissertation. First, it described the research paradigm favored. With respect to ontology, this approach acknowledges the relevance of subjectivity and incorporates both a commitment to universal, objective reality and subject knowledge in its considerations about reality. With respect to epistemology, this approach argues that there are better and worse ways of knowing, and it favors a mitigated skepticism approach consistent with classical Enlightenment commitments to rationality, logic, and evidence-based analysis (also commonly adopted in the anarchist tradition). Next, the chapter described how the research problem evolved to focus on policy choices and perspectives pertaining to technical architecture (with a focus on software, privacy, and democracy). The following section outlined this dissertation's approach to policy analysis, as framed by Jimenez et al. (2015). Next, the chapter detailed the research design and methods, including semi-structured interviews, as well as document analysis drawn from primary and secondary source material.  It then explained how triangulation of those data collection sources and methods made the dissertation more robust.  The section after that explained how analysis of data proceeded according to the theoretical lens established in Chapter 3 as well as thematic analysis.  The next section detailed how the research was conducted to ensure trustworthiness and reliability so that the results can be accepted for use by other researchers.  This included measures to guard against researcher bias, principles of critical thinking, the inclusion of thick descriptions to provide enough detail for others to evaluate, and limitations of the study (including the inaccessibility of key policymakers, the limited ability to cover the full breadth of the basic education sector, and the limited data provided to researchers due to the partially private forms of decision-making made behind closed doors).  The following section explained the ethics guiding this thesis, including the formal review procedure, the process of informed consent, the measures taken to avoid harm, and procedures used to ensure confidentiality.  The next chapter will describe the empirical findings with respect to what Operation Phakisa Education is and how it is being implemented for the national e-education rollout.

# Chapter 5

## Operation Phakisa Education and the Transformation of Basic Education

---

### 5.0: Introduction

The previous chapter outlined the methodology guiding this dissertation. This chapter details empirical findings on the national e-education rollout, Operation Phakisa in Education. First, it outlines a brief history of e-education in South Africa, focusing on the 2004 *White Paper on e-Education* and related policy documents. Next, it explains what OPE is, based on several features that are different from the previous e-education initiative. It begins by outlining the software suites offered by Google and Microsoft. Next, it explains plans for Big Data personalization. The following section details the DBE Cloud, followed by a discussion of tiered surveillance dynamics and plans to conduct longitudinal data analytics about educational development. The final section details teacher surveillance through interfaces like the MSDF DDD Dashboard. This chapter next provides a snapshot of the state of implementation based on field research on the ground and government publications. It discusses how approaches to implementation currently vary by province, and the factors required to make e-education a reality in the public school system. It then reviews how teacher facilitation and development relates to successful implementation. Finally, it turns to considerations of cost, including the budget needed for implementation and the issue of theft.

### 5.1.1: E-Education Policy in South Africa Prior to Operation Phakisa Education

In the 1990s and early 2000s, digital education policies were formulated in South Africa to meet the needs of the rapidly expanding digital society. As noted in Chapter 2, South Africa faces an educational crisis, as well as a severe digital divide, which the government hopes to address through the deployment of computers to schools. This dynamic was recognized early. In 2001, the government established the Presidential National Commission on Information Society and Development and the Presidential Information Advisory Council on Information Society and Development to advise on the implementation of ICTs in national education (Farley et al., 2015, p. 12). By 2004, the then

Department of Education (DoE)[129] published the *White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (ICTs)* (hereafter: *2004 White Paper*). This document formed the initial guiding policy for what the DoE dubbed "[a] global revolution… in education and training" (DoE, p. 8). According to the DoE (2004), e-education aims to revamp the education system using ICTs "as a resource for reorganising schooling, and a tool to assist whole-school development" (*ibid*, p. 14). The document incorporates six strategic objectives: (1) ICT professional development; (2) electronic content resource development and distribution; (3) access to ICT infrastructure; (4) connectivity; (5) community engagement; and (6) research and development. The ultimate goal is to use ICTs to drive a transformation in pedagogy, learning, schools, and administration (*ibid*, p. 4), and to bridge the digital divide between wealthy and poor (see Section 2.7).

While the *2004 White Paper* remains the central guiding document for e-education, a number of policy papers have further outlined the purpose and goals of e-education for basic education. These include *Guidelines for Teacher Training and Professional Development in ICT* (2007), *Guidelines for Schools ICT Hardware Specifications* (2012), *Action Plan to 2014: Towards the Realisation of Schooling 2025* (2011), *Action Plan 2019: Towards the Realisation of Schooling 2030* (2015), and *National Development Plan 2030: Our Future – Make It Work* (2012). While these policy documents collectively comprise current e-education policy, as we will see in Section 5.2, a new, US-oriented approach to e-education has been developed behind the scenes, culminating in a fast-track initiative launched in 2015, Operation Phakisa in Education. Before we detail that development, let us review the e-education policy which led into OPE.

## 5.1.2: In the Classroom: E-Learning and E-Pedagogy

Fundamentally, education is about cultivating the act of learning new things. To help fix the crisis in education, South African policymakers seek to move the structure of the education system away from a traditional, "chalk and talk" model, to an interactive, digitally driven classroom experience. The e-education initiative seeks to overturn the legacy of authoritarian education practiced under apartheid. In the basic education sector, computer-mediated learning is termed "e-learning". The DoE (2004) defines e-learning as:

> … flexible learning using ICT resources, tools and applications, focusing on:

129 The DoE was split into the DBE and Department of Higher Education and Training (DHET) in 2009.

- Accessing information;
- Interaction among teachers, learners, and the online environment;
- Collaborative learning; and
- Production of materials, resources and learning experiences (p. 15).

The central purpose of e-learning, the DoE asserts, is "the use of ICTs to accelerate the achievement of national education goals" (*ibid*, p. 14). To accomplish these goals, new models of learning making use of digital technology will displace traditional pedagogical practices with more participatory and learner-centered models (DBE, 2011, p. 16). E-education, the DoE (2004) asserts, will help facilitate a "shift from teacher-centred, task-oriented, memory-based education (with technology at the periphery), to an inclusive and integrated practice where learners work collaboratively, develop shared practices, engage in meaningful contexts and develop creative thinking and problem-solving skills" (p. 16). The result is the creation of "21st Century learners" who build and share knowledge in collaboration with peers and teachers, for the purpose of empowerment and the "acceleration of national education goals" (*ibid*, p. 14). By displacing the authority of the teacher as a domineering figure in the classroom, the above-listed e-Learning objectives resemble some of the core aims of anarchist pedagogy.

Through the integration of ICTs into the classroom, the DBE aims to improve and diversify learning (DBE, 2015a, p. 17), increase learning opportunities, reduce inequality, improve teaching, and personalize learning experiences (DoE, 2007, p. 1). Knowledge, comprehension, and analytical skills would likewise be improved with ICTs (DoE, 2004, pp. 15, 20).

The DoE similarly holds that *teachers* will benefit from a successful e-education transformation. They stress that "e-Learning will not replace teachers" but will "enhance the quality and reach of their teaching and reduce the time spent on administrative chores" (DoE, 2004, p. 19).[130] The DoE (2004) stresses that e-learning *augments* traditional pedagogy: "In introducing e-Learning, we must make sure that we balance it with other teaching and learning methods. e-Learning should recognise that its value is linked to its suitability to individual learning and teaching styles and strategies" (p. 19).

Education officials seek to integrate ICTs into teaching by integrating "many sets of competencies including, but not exclusively, those in pedagogy and technology" (DoE, 2007, p. 4).

130 A Teacher Laptop Initiative to provide teachers with laptops was created to "enable teachers to prepare lesson material and exam papers when away from the school" (DBE, 2014, p. 12). According to Chloe* (SchoolNet SA), this seems to have fallen by the wayside, with only some laptops delivered (Chloe, 2016).

While blended learning models mix traditional and digital methods of learning into the rhythms of the learning experience, the ANC (2017c) plans to "introduce paperless schools throughout the country" (p. 26). This would imply a strictly digital model (or digital-dominant) model.

### 5.1.3: E-Administration: Management, Administration, and Monitoring & Evaluation

According to the DBE, educational management can be dramatically improved by the power of ICTs to collect, sort, and analyze educational data. As officials put it in 2004, "ICTs are increasingly allowing GET and FET institutions and education systems greater access to timely, relevant and detailed information on many of the functions of schools. More complex information can now be collected, analysed and used at both institutional and system levels" (DoE, 2004, p. 21). With these new tools, e-administration "for institutions and for provincial and district offices" will be improved to a degree "not yet fully appreciate[d]" (*ibid*). The DoE would like educational leaders "at all levels of the system" to be supported so they can "manage the introduction of ICTs and the related change processes" (*ibid*).

The DBE shines a light on the rosier benefits of ICTs for rote teacher tasks. For example, they explain how digital tech offers "a tool that can improve education management in a variety of ways, for instance through the computerisation of routine administrative tasks" (DBE, 2011, p. 92). ICTs, they argue, provide "the capacity to automate processes and save time, thereby freeing managers to focus on instructional leadership" (DoE, 2004, p. 21). The DBE states that principals and other educators will likewise benefit from tools to update their policies, make school management easy, facilitate collective problem-solving, and engage with the community (DBE, 2011, pp. 95-96). Officials also speak of plans to use computers to standardize administrative interfaces and data analytics for government evaluation and improved efficiency (DoE, 2004, p. 21; DBE, 2011, p. 45).

"Assessment reforms" are designed to transform education administration, especially via more thoroughgoing monitoring and evaluation (M&E) at all levels. The DoE states, "Assessment is an important driver in education and, if not well-managed, can become a barrier to innovation. Once ICTs are embedded in learning and teaching reform processes, they can be effectively used, in conjunction with other methods, in assessment" (DoE, 2004, p. 20). Teachers are expected to use a data-driven managerial approach with learners:

> The efficient use of e-Learning methodologies has the potential to enhance the quality and value of assessment. Data analysis techniques can assist teachers to track learner achievements and review teaching strategies according to the insights gained. Teachers will also be able to give learners immediate feedback on progress, identify areas of weakness, and design necessary and appropriate support systems in a timely fashion (*ibid*).

These principles provide an early vision for how management and administration could change with e-education. With the emergence of cloud-based systems, however, this takes on a whole new form. As we will see in Section 5.3, e-administration based on Big Data fits a neoliberal agenda, championed by the Stellenbosch School, which enables technocratic forms of management that subvert the autonomy of schools and teachers to manage their own affairs.

### 5.1.4: Beyond Schooling: Economy and Democracy in the Digital Society

Government policy not only sees in "e-schools" the capacity to transform education, they also see an opportunity to make technology available to the poor black majority (*ibid*, p. 22). As they put it:

> The present situation… cannot be maintained if South Africa is to address the digital divide. Like most parts of the world, the South African education and training system has to respond to the pressures and challenges posed by the information revolution. It is for this reason that Government has expressed a strong commitment to the use of ICTs in education (*ibid*, p. 13).

The NPC (2011) states that the digital "ecosystem of networks, services, applications, content and innovation will support economic growth, development and competitiveness; create decent work, nation-building and social cohesion; and local, national and regional integration" (p. 170). They believe affordable broadband for all "is not simply a social intervention – it is a necessary condition to grow and stabilize the economy…" (*ibid*, p. 172). They conclude that the digital divide "has to be narrowed" and call for "more competitive markets and effective regulation" to address the issue (*ibid*, p. 173).

The subsidization of computers to all school children could offer a means to provide a more equal computing experience for the poor. Given that most of the population cannot afford high-quality digital services, the government "has the responsibility to ensure that the benefits of e-Learning are enjoyed by all" (DoE, 2004, p. 37). By 2011, the DBE (2011) contended that "ICTs present new risks for social cohesion", and so "[e]nsuring that all learners gain access to ICTs as soon as possible, reduces the dangers of an entrenched digital divide in the future" (p. 92; see also, p. 130). Thus "major steps will have to be taken in the coming years if historically disadvantaged learners are not to be left on the wrong side of the digital divide" (*ibid*, p. 94). In 2015, the DBE (2015a) reaffirmed this position (p. 17).

E-education policy promises to bridge the digital divide in order to distribute technology benefits beyond the narrow confines of the education system. Most notably, officials believe that digital technology will enhance socioeconomic development and democratic governance. The DoE (2004) hopes that e-schools will stimulate local development through maintenance, support, and other ICT enterprises (p. 32), and "ensure that all learners will be equipped for full participation in the knowledge society before they leave further education and training (FET) institutions" (p. 13). The New Partnership for Africa's Development (NEPAD) – an African renewal framework – regards ICTs as "central in the struggle to reduce poverty on the continent" and "increase democratic participation of the poor to participate in decisions that have an impact on their lives" (DoE, 2003, p. 2). NEPAD also "recognises the pivotal role of ICTs in the establishment of regional distance learning[131] and health education programmes to improve the situation in the health and education sectors" (*ibid*). To handle these tasks, they argue, "Africa must develop a pool of ICT-proficient youth and students from which the country can draw trainee ICT engineers, programmers and software developers" (*ibid*, p. 9). As with e-education, the DoE claims ICTs will benefit development and governance: "ICTs have increased the effectiveness and reach of development interventions, enhanced good governance, and lowered the cost of delivering basic social services" (*ibid*, p. 8). Policy documents thus envision e-education as a broad program for education, economy, and society. For the government, implementation has been the major stumbling block.

### 5.1.5: Implementation Prior to Operation Phakisa in Education

When the DoE published its *2004 White Paper*, they were hoping to complete the transition to e-education within a decade. By 2013, they declared, "Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to

131 The NPC (2012) maintains this position: "Distance education, aided by advanced information communication technology, will play a greater role in expanding learning opportunities for different groups of learners and promote lifelong learning and continuous professional development" (p. 295).

help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community)" (DoE, 2004, p. 17). Despite resource constraints, they asserted, "the Department of Education will invest in national initiatives to increase access, boost the capacity of managers, teachers and learners, and provide electronic resources of the highest quality" (*ibid*, p. 11).

Goals set out in the *2004 White Paper* were divided into three phases. The first focused on preparing system-wide readiness for the integration of ICTs into learning, teaching, and readiness; the second focused on integration into teaching and learning; and the final phase focused on the seamless integration of ICTs into the entire system of education. The target date for completion was 2013 (DoE, 2004, p. 19, 46). More than a decade later, this has failed to materialize.

Over the years, the DBE has stated that a number of new targets and frameworks are needed to guide policy. This includes a new framework for teacher in-service training (*ibid*, p. 25), a national framework for competencies for educators (*ibid*, p. 33), dates for teacher competency attainment (DoE, 2007, pp. 7-8)[132], and new asset management policy (DBE, 2014, p. 30). While much of the *2004 White Paper* is still said to guide national policy aims, e-education goals were modified in the DBE's *Action Plan to 2014* (2011). With full integration obviously some time off, they revised their ambition. This time, by 2025, they declared, "Much learning happens through the use of computers and, from Grade 3 onwards, all learners are computer literate" (DBE, 2011, p. 46). Crucially, the plan stated that by 2012, "[a] new e-Education strategy, which updates and adds detail to the *2004 White Paper* and includes future targets for ICT access in schools, is released" (*ibid*, p. 97). This update has yet to materialize.

## 5.2: Operation Phakisa Education: A Brief Introduction

Having realized that the dual purpose of the e-education rollout – to fix the crisis in education and bridge the digital divide – has not been met, the national government decided to renew the call to go digital in education through Operation Phakisa Education in 2015 (PMG, 2018). Phakisa, meaning "hurry up" in Sesotho, is a fast-track implementation model that ex-President Jacob Zuma was introduced to during his 2013 visit to Malaysia. Impressed with their "Big Fast Results" model for economy and governance (Siddiquee, 2014), in 2014, Zuma launched Phakisa in Oceans Economy and Health. Each initiative began as a way to fast-track progress in critical development issues. All

132 These dates include competency at the "adaptation level" for all students leaving higher education by the end of 2008 and the same standard for all practicing teachers by 2010 (DoE, 2007, p.8). The targets have not been met.

Phakisa projects feature Delivery Labs which bring together various stakeholders drawn from the public and private sectors, NGOs, and civil society.

By May 2015, then Minister in the Presidency for Planning, Monitoring, and Evaluation, Jeff Radebe, announced the government would be launching Operation Phakisa in Education (Radebe, 2015). As the next step in the process, two problem-solving "labs" were convened to formulate the OPE plan. The first, a one-week "Challenge Scoping Lab" organized by the World Bank, was held from June 22 to July 1, 2015 (Farley et al., 2015). At the scoping lab, the DBE and Operation Phakisa planners worked with the World Bank to scope out the problems, challenges, and solutions for a national e-education roll-out ahead of the main planning lab (*ibid*, p. 5, 8). There were 40 planners, including private sector, unions, and "additional individuals", who clarified the thematic scope and work streams for the main lab (*ibid*, p. 6).

The second was the four-week main lab, held at the Birchwood Hotel in Johannesburg from September 7 to October 2, 2015. The four-week Birchwood lab included 120 participants from schools, facilitators from across the world (brought in by the World Bank), teachers, teachers' unions, labor, financial institutions, corporations (including Microsoft, Intel, Hewlett Packard, Google and Telkom), government (including DBE, DPME, DTPS, DoC**,** DST, DHET, National Treasury, and the nine provincial education departments), nonprofit organizations (including CoZa Cares, Mindset, and SchoolNet South Africa) and academia (DBE, 2016a, p. 11; PMG, 2018). Members of the media were invited to attend the main lab's opening session on September 2, 2015 (SA Gov, 2015a). According to government official at the Department of Science and Technology (DST), Simon* (2015), Deloitte, a top-five international financial consulting firm, was the consultant for the conference, and they managed the process. All attendees were bound by a non-disclosure agreement. The DBE has not released a document detailing these developments to the public (see Section 7.6). The "working streams" of the OPE lab were:

1. Connectivity
2. Devices and Support
3. Teacher Professional Development
4. Digital Content and Distribution
5. E-Administration

Phakisa's aim to fast-track ICTs into education is partially based on the plans reviewed above. According to interview subjects at the DBE, the *2004 White Paper* remains the central document guiding e-education, while the other documents sampled will also continue to guide policy unless they are replaced (e.g. guidelines for teacher training and the most recent "Action Plan" documents). While the content of OPE will be detailed below, it is worth providing a brief overview of how this dissertation regards OPE and a succinct definition of OPE.

According to the government, OPE is simply an *implementation model* to fast-track digital tech in basic education, based on the *2004 White Paper on e-Education* as the foundational document, with the documents noted in Section 5.1 offering additional policy prescriptions and updates. However, this is problematic from the standpoint of e-education policy because the technologies and models for e-education have changed dramatically since 2004. In 2004, the typical e-education program incorporated separate computer labs and, perhaps, a few computers in each classroom, but they did not utilize the kinds of technologies and models the DBE presently envisions. New technologies emerged after 2004 and are driven by new trends in the digital society (e.g. Big Data surveillance and cloud computing) alongside new devices (e.g. smartphones and tablets) and new e-education models (e.g. adaptive learning and one-to-one personalized learning).

Thus, the current e-education system is *qualitatively* different than the 2004 era. For this reason, the fast-tracking of digital technology into schools constitutes a *new policy* which is not reflected in old policy documents and has not been disclosed to the public. In this thesis, OPE is defined as the fast-tracking of *contemporary* (Western) digital education initiatives within South Africa. It includes Big Data surveillance, cloud computing (including corporate and government centralized cloud services), corporate proprietary infrastructure (e.g. operating systems and productivity suites), new e-education models (e.g. blended learning, adaptive learning, flipped classrooms), cloud-based administrative dashboards, and digital content (e.g. digital textbooks and interactive content). Many interview subjects provided details about the latest proposals for OPE. The next section will review the core features of OPE's *education-specific* technologies, as revealed from field interviews: software suites, Big Data personalization, the DBE Cloud, longitudinal analytics, tiered surveillance analytics, and e-administrative dashboard analytics.

### 5.3.1: Operation Phakisa Education: Authoritarian Architecture, Authoritarian Education

This section will review the technologies and models being chosen for Operation Phakisa Education, as well as perspectives offered by government officials and key stakeholders. The core technologies and models must be detailed in order to analyze the significance of OPE to education, economy, and society in Chapters 6 and 7. Each of the five following sections corresponds to a core technological model which defines the services envisioned for the new e-education under Operation Phakisa Education. These models each incorporate products that are rooted in technologies of authoritarian control: proprietary software and cloud-based computing. As a result, control is being centralized into the hands of the state and corporations. The discussion begins with software suites.

### 5.3.2: Authoritarian Software Suites

As explained in Section 3.3.3, “code is law”, and it affords those who control code to control the user through the code. If an education system uses software to drive education, whoever controls the software exercises control over the education experience. For Operation Phakisa Education, Microsoft and Google are two large corporations poised to exercise control over the education process through the planting of their software in South African schools. Microsoft is currently the lead software of choice for operating systems (Microsoft Windows in five of nine provinces), with Google Android the second option of choice (with one unnamed provincial contract a possibility) (see Section 6.1.7). Devices using those operating systems are likely to use the same brand of productivity software suites (e.g. Microsoft Office 365 and Google Apps such as Google Docs), rather than FS options like LibreOffice or Riseup etherpads.

For school adoption, both Microsoft and Google offer educational software suites that integrate well with their operating systems and general productivity software. Microsoft’s major education offering – Microsoft Classroom – provides a cloud-based platform to manage classes and assignments, enable collaboration, and provide feedback to students. Crucially, the system draws upon the traditional Microsoft Office suite, biasing students toward Microsoft’s app ecosystem through a vertical integration model. Google is the other major player in the e-education space. Their educational offering is the Apps for Education suite (as of 2017, called “G Suite for Education”), which is built for tablets and Google Chromebook laptops. The G Suite for Education is free for schools. They can register as many students as they like, use their own Google-provided domain name, and access unlimited Google-hosted data storage in Google's cloud. Many of these features are similar to Microsoft Classroom, including the vertical integration of productivity apps.

The products offered by Microsoft and Google are authoritarian in nature because they use proprietary and corporate cloud-based services (see Section 3.2.3). For both product suites, individuals and communities have no ability to understand and change how they work. Structural power relations at the technical architectural level thus allow Microsoft and Google to exercise partial control over the education process. With control over software, they can impose specific features on education, such as the monitoring of student time spent reading an assignment (e.g. Microsoft Classroom), the hosting of learner email services run through their corporate servers (e.g. requiring a Gmail account), or the vertical integration of services across offerings. For educational activity, then, these two foreign corporations retain the means to influence South African schooling, by virtue of architectural control via proprietary software and cloud computing.

### 5.3.3: Big Data Personalization

As noted in Section 2.5, trending models for education include blended learning, flipped classrooms, adaptive learning, and paperless classrooms, as well as data driven e-administration. Each of these models aim to harness Big Data surveillance to implement "personalized" education for learners and teachers. This section discusses adaptive learning for Big Data personalization in South African classrooms.

Companies like Knewton have partnered with Top Dog Education to provide e-education services for Grades 4-12 in South Africa (Knewton, 2015; Knewton, 2016). Pearson, a major player in South Africa's basic education sector, has recently said they are shifting their business model away from textbooks to "focus more on adaptive, personalized, online assessment in an era of 'fewer, smarter' tests" (Straumsheim, 2016). Knewton has since changed its business model to focus on higher education, and it isn't clear if they are still slated to operate in South Africa. However, the adaptive learning model they helped make popular in the global EdTech space is still popular in the West (Kelly, 2018) and in South Africa: a 2016 DBE slide seeks to "[e]xtend functionality to include adaptive learning" as a "mid term activity" on their timeline (DBE, 2016a, p. 17). I asked Richard* (DBE) if there are any discussions or plans to use personalized, adaptive learning to customize education on the basis of Big Data analytics. He responded:

> Yeah that's where we're going. We are currently developing, we are mostly finished [with] what we call the DBE Cloud. And in there we have a learner management system, we have data analytics, and the reason for that is that should inform us, the state should download by analyzing the data, and the iteration we are able to improve on the [DBE] Cloud, or improve on the services that we offer, or even adapt the curriculum or adapt whatever we are providing to the needs of the users. So yes, we are on that route (Richard, 2016).

When asked about adaptive learning, Ashley* (Pearson SA) (2016) contended that it can improve South African e-education:

> Adaptive learning is definitely where we'd all like to get to, it's one of the true added values that technology can offer. And if you look at the challenges that are facing the South African education system, well there are a couple that adaptive learning would really address. One is, I'm sorry to say, the quality of teaching and evaluation of teachers. Actually a lot of teachers don't know the next thing [they] should do if a learner is struggling… And then [two is], simply the scale of numbers. So if you were in a school where sixty kids were in one class, as a single teacher you simply cannot give that level of personalized understanding and individual learning paths. As one person, how could you manage that? But with the technology you could. So as a means to improving learner outcomes adaptive learning clearly is where we need to get to and Pearson is about the efficacy of learning and improving learner outcomes. That's our kind of mission statement (Ashley, 2016).

Given the shortcomings in digital infrastructure, literacy, investment sources, and the like, Ashley said the cost puts adaptive learning out of reach. In the near future, however, she said the government could get there within five or ten years. She added that "They could jump from 'here' to 'here' overnight. And we will see that if the likes of Penyaza Lesufi come out in nationally or any other province, it's gonna happen overnight, they're going to want it. So it could be quick and we have to be there and ready to go" (*ibid*).

Another Pearson SA interview subject, Steve Vosloo (2016), said that adaptive learning "hasn't really filtered down to South Africa yet but for sure we would like that kind of functionality and that kind of adaptive learning logic to be built into our learning management system". When asked about the status of data analytics and adaptive learning for Pearson SA, Brian Wafawarowa (2016) said, “we clearly talk a lot at different levels and for me that’s really the value of e-learning because I strongly believe that learners fail because… nobody knows where they are” (without data).

When asked about “*collecting data points on students and trying to create learning software to predict their thinking and individualize their education*” – including linking performance to *personal* variables *outside of* education (such as nutritional habits), Meryl Ford (ICT4RED) (2015) said, “I think it’s a huge opportunity. And if it’s done correctly, it’s actually good”. Chloe* (SchoolNet SA) (2016) said adaptive, personalized learning on cloud-based services is “fantastic… where there’s access”. She held that cross-referencing students in a database of millions is “great” and supported the (surveillance-based) analytics of “a child’s reading – what [they are] reading, what pages [they are] reading, how long [they are] reading… within an adaptive learning environment”. In her experience teachers “just wanted marks” and “didn’t want to look at understanding of where the child is learning, or if they are learning, what exactly [they are] learning” (*ibid*). Computer-assisted evaluation may help in this area, she claimed.

When asked how a system like Knewton’s which conducts real-time “*up to the minute monitoring of students*” to create a system that may allow students to learn while a teacher is absent, Laetitia de Jager (iSchoolAfrica) (2016) answered that she “would love to see” it. Sania* (Microsoft SA) (2016) was asked about software looking at “*your conceptual understanding, predicting it*” to deliver personalized content, based on Big Data analytics. She responded, “yes, that is import to us”. This is “not always something we can do ourselves [at Microsoft],” she explained. Microsoft, she said, could eventually offer adaptive learning services, using its Business Intelligence technology: “That’s where we can form the partnerships and I think often the partnership may be around providing Office 365 for a platform for a partner to develop a solution on top. And [we can] leverage a lot of the functionality around the business or Power BI at least to pull through a lot of that analytics and analysis type stuff” (*ibid*).

Herman (DTPS) (2015) said the DTPS and the DBE are developing Big Data analytics for personalized and adaptive-type learning through their systems by monitoring student “tests and assignments”, using analytics to identify “learning gaps”, sending input to the teachers to help them identify the gaps for “specific learner[s]”. He added, “this is what we are basically trying to do in terms of the development of the DBE cloud together with the learner management system… But it is not yet mature, the development process is being done in conjunction with Basic Education plus our side as well" (*ibid*).

Alister Payne (CloudEd) (2016) said "the next thing over the horizon is artificial intelligence – the ability for computers to learn from what we're doing, which now speaks to the realm of adaptive learning." Speaking of a South African higher education service, GetSmarter, Payne said, "They're using analytics to target their students to improve performance and to pick up people who are dropping back. That's an adaptive learning type – certainly automated marking, automated responsing happening in real-time. And it's not a pure form but at least it's analytics being used. To me analytics in education is definitely a hot one – over the hill" (*ibid*). Payne (2016) subscribes to a "collect it all, keep it all" Big Data ideology, similar to Western intelligence agencies:[133]

> So here's my problem – where is the data? The strength is not in structured data. The strength is in unstructured data. So again, come back to my analogy of Google Maps… I didn't know what data I needed until I needed it. And conceptually structured data is, 'I know what data I'm going to use'… That's where Big Data is so useful. How do we know whether a student is struggling or not? How do we know whether they are strong in a particular area or not? Because they write a test? No, that's not helpful. That's only a small, thin wedge.
>
> I want to know things like time on task. I want to know duration. I want to know, what is his engagements? Some sort of feedback. All these standards… There must be some key pillars in education – on the task, engagement with people – that equal a student who is highly motivated in learning because that's the outcome. And to do that, we're probably not there… that's probably two or three years down line. When we get there, what data [are we] gonna troll?
>
> And this is where I think Google is going itself. Because Microsoft is not collecting any data at all at the moment. Everything that is on premises is completely, is horribly out of the responsibility of Microsoft. There is no contest there. And that's why I think Google are going-- Google are already collecting this. Draftback is just an example. You can see from Draftback when a person works, what time they work, how long they work for, what edits they made. If collaboration is the key digital skill going forward, then for me collaboration is communication on steroids. So the art of communication is critical in education (*ibid*).

133 See Greenwald, 2014, pp. 90-169.

Payne downplayed (or missed) that Microsoft is developing Big Data analytics with Office 365 for Education. (Their Big Data products include Power Mix for PowerPoint, Power BI, and MyAnalytics.) Nonetheless, Payne felt as though a data-driven system is the future for education, with Google best positioned to lead the way. His assessment reflects their company's investments (Levy, 2016), including their $40 million investment to become a minority owner of Renaissance Learning, "one of the leading cloud-based K-12 assessment and learning analytics companies" – at a $1 billion valuation (Lardinois, 2014).[134] Renaissance's CEO, John Lynch, Jr., said they are working "to create a 'GPS system' that could identify where students are in their learning path." He added, 'We're doing something fundamental: uncovering what a student knows and what they're ready to learn'" (De la Merced, 2014).

Lin Zhou, Head of Watson Education at IBM, also subscribes to a "collect it all" perspective for the Big Data space. Zhou (2017) spoke of how "data pools" relate to the desire to collect as much data as possible:

> IBM provides data analytics for the owners of the data (e.g. schools and parental guardians). We host or mirror the data in conjunction with the owners. Personally identifiable information – sensitive data that can be used to identify individuals, such as date of birth or social security numbers – is not sharable with third parties without owner consent and complying with appropriate laws and regulations. This procedure ensures the privacy of school participants is protected.
>
> It is desirable for as much relevant data as possible to be available in a *common pool*, where all the other projects consume that data. This is because *the more data that you have* about the individual learner, the better you can predict or analyze the user. Having a partnership in place allows data to be shared, in accordance with rules and regulations. Yet for all participating technology companies, it is beneficial to have some data which is not personally identifiable made available for others to share. We see this with the two large repositories in use for research and development, coming out of Stanford [University] and CMU [Carnegie Mellon University].

134 Lardinois (2014) explains, "Renaissance Learning now hosts data for more than 38,000 schools and reading records for almost 11 million U.S. students. In total, 18 million students now use the company's cloud-based Renaissance Place platform. Together with the 30 million students and teachers on Google's platform, Lynch told me, that's a 'really big reach into K-12'". The company was quickly bought by private equity firm Hellman & Friedman and changed its name to Renaissance (De la Merced, 2014).

> With machine learning, *there is never enough data*. So the more we know of the users, the better you can predict. If a student changes schools, for example, data can be lost, and with it, the ability to personalize their education. If you can combine and share data, you can get *a complete view* of that student when they make the transition.

Microsoft also adopts a "know everything all the time" disposition. When asked if Microsoft is conducting a general shift toward cloud-based services, Greg* (Senior Researcher, Microsoft Research) (2016) responded, "there is definitely a cloud-based technologies push, I would say there's multiple reasons for that. Partly that's because that's where the company sees its money coming from the future". In fact, Microsoft seeks to be the "vanguard" of artificial intelligence revolution. Its CEO, Satya Nadella, explains:

> … every human interaction [with technology] is going to be mediated by the fact that we can create intelligence by reasoning over large amounts of data… [AI is] the thing that is going to be in the internet, it's going to be in every device… Every product we design, and how every user is going to interact with the environment, is going to be 'intelligence first'" (Waters, 2016).[135]

From these accounts, it is clear that surveillance is the centerpiece of current efforts to "personalize" education. Big Tech corporations are developing systems that will harness as much surveillance data as can be collected in order to "adapt" to each individual learner. The DBE is building interfaces for educational analytics via the DBE Cloud, and it is integrating Big Tech corporations that plan on implementing adaptive learning interfaces for education.

### 5.3.4: The DBE Cloud

Government officials and stakeholders are also enthusiastic about data-driven education. Policymakers are fully intent on implementing Big Data surveillance systems to manage the education system – and the broader society. In the previous section, Richard (DBE) (2016) noted the DBE is constructing a DBE Cloud for adaptive and other learning analytics. According to current plans, the DBE Cloud will

135 Microsoft "spent $12bn [in 2015] on R&D, a third more than Google. A large slice of that budget is now being swung behind AI. A third of the work being carried out in Microsoft Research is already spent on AI-related projects" (Waters, 2016; see also, Heath, 2016). Microsoft, Google, Intel, Samsung, and other big tech corporations are buying up and investing in artificial intelligence startups (CB Insights, 2017).

conduct mass surveillance of learners from a young age, in partnership with corporations. When asked about harvesting “vast comprehensive data sets” about learners in a Knewton-like fashion, Herman (DTPS) (2015) said:

> So who's approached us on that basically was Microsoft, part of this thing called Office 365 in the cloud. So what they said also is that they have made a school account. What happened is that if the government departments actually adopt Office 365 basically for education, then access in terms of the database gets passed back to Basic Education.
>
> *Kwet: But does it go through their hands as well?*
>
> It'll go through their cloud because Office 365 is one account for life, which means when a learner becomes a student and basically when he graduates as well, he'll be able to use the same account all through his entire life cycle. So it also acts as a means for Basic Education to check where is a student after you've done school – in a college or a university, you then left there, now you are working, employed. So this will help Basic Education get stats as well. Basically: we've taught “x” amount of kids – kids that have been taught here – which means it will help them in terms of [providing] their stats back to government as well, in terms of impact that it made. I do know it has not yet been adopted, but they have been approached by Microsoft.[136]

I also asked Herman about the privacy of Internet users, and if there is going to be monitoring and storage of student data. He answered:

> So we've got a cloud solution. The cloud solution is linked to an LMS, a learner management system, which means every user will then be able to acquire a login, and with the login profile you can actually monitor and track exactly what these kids are then doing there and seeing as well. So we've got his or her content in the cloud and basically you've got access by the teacher, the school, and the administration (*ibid*).

When asked, “*will the browsing habits be stored permanently?*” Herman responded, “It’s going to be stored, so your cookies[137] will be able to be watched as well” (*ibid*). The DTPS is currently monitoring

136 When told about Herman’s proposal, Bruce Schneier (2016) said it “seems pretty freaky”.
137 Cookies provide a data trail about users in conjunction with their web browsing activity.

data usage at schools, but it is not clear if they are conducting detailed traffic analysis at the moment (Gina and Kubayi, 2016). Richard (DBE) (2016) added that the Department itself will be conducting the data analytics, but may need “some additional human resources” for the iteration, with differentiated privileges granted to responsible parties (*ibid*). He said the LMS was slated for completion the month of the interview (June 2016). The LMS would collect “more complicated” and “detailed information” over time. The scope of data analysis is thus slated to expand and its complexity will advance as the system develops. Given the technical expertise and resources required to handle such an operation, this requires third party involvement – corporations, NGOs, and others contracted to store and/or process data. This means third party surveillance will be conducted in partnership with the state.

When asked about individualized data-driven assessment, Tefo (GDE) (2016), a policymaker at the Gauteng Department of Education involved in the Paperless Classrooms initiative, confirmed that “in terms of integrating assessments, including solutions, that is the next phase that we are working at… We are taking a phased approach”. In response to a question about the status of the DBE Cloud, Tefo responded that “we are finalizing our content configuration” to “benefit from the cloud”. When asked about conducting “*longitudinal data analytics...starting from youth and the...basic education system, continuing into university, and then to the job market where you can...do data analytics*”, Tefo responded:

> That is correct. Remember it is not only in a school environment, there’s a relationship between what we do [in] school scenarios. And most importantly, we are not doing this on our own. There are other government institutions that we are working with, for instance, the [Gauteng] Department of e-Government is one of those, the Department of Social Development… So all of that, of these sources, must contribute towards all the databases of the institution (*ibid*).

### 5.3.5: Tiered Technocratic Surveillance and Longitudinal Analytics

Clearly, policymakers and key stakeholders believe that surveillance will improve educational outcomes via Big Data personalization. However, the new e-education also aims to harness the power of Big Data to centralize managerial power. To this end, the government, in partnership with corporations, plans to record the minutiae of daily activity among individuals, networks, and populations, process the information using ever-increasingly sophisticated data analytics, and provide differentiated and partially tiered surveillance privileges and intelligence to authorities for the behavioral modification of surveillance subjects. This resembles the spirit of authoritarian control exercised under apartheid, but within a neoliberal framework that does not formally discriminate on the basis of race.

Teachers are at the low rung of the managerial surveillance hierarchy. If they use dashboard surveillance software like Impero, they are granted access to some data which third parties may not have, such as the real-time display of their students' screens. Moving up the hierarchy, third parties such as corporations (e.g. Google, Microsoft, Pearson), NGOs offering surveillance dashboards (e.g. MSDF), and government departments (e.g. DBE, provincial departments) obtain access to a more expansive set of information. If corporations like Microsoft provide departments like the DBE data from Office 365 Education, then the DBE will likely have a richer data set than Microsoft alone, given its other sources of data fed into the DBE Cloud. At the top of the hierarchy, US-based intelligence agencies like the NSA have direct access to information held by PRISM partners like Google and Microsoft, as well as the legal power to compel US organizations to provide data on foreign nationals. The portrait of citizens lives are thus revealed in various ways according to tiered access privileges up a hierarchy which houses increasingly complete details about individuals and communities. By extending the type of e-education programs currently planned for education, e-education extends this kind of surveillance into the lives of children.

The widespread reverence for "longitudinal" analytics illustrates the embrace of Big Data surveillance by government officials and stakeholders alike. As we saw in the previous section, Herman (DTPS) and Tefo (GDE) both spoke of plans for longitudinal data analytics. When Rachel* (MSDF) (2016) was asked about "*plans...for integration into other data sets, such as a situation where you have longitudinal studies on school to post-school to job employment or university admissions, etc.*", she responded, "Yeah I mean that's a fabulous vision". Stephen* (MSDF) (2016), who works on the Michael & Susan Dell Foundation Data Driven Districts program, was asked, "*are there any plans for integration into other data analytics, such as longitudinal transition studies on school to post-school to job employment, or university admissions?*". He answered, "there are definitely plans for that… there are people talking about an actual clearinghouse where you can link with school database systems to a post-school system and then you can link that up with various opportunities, and the theory is very simple". When asked about longitudinal data collection, Veronica* (Microsoft SA)

(2017) said she thinks the proposal is "good". Asked if there is a plan or proposal for longitudinal data gather and the DBE Cloud, Sania (Microsoft SA) (2016) said:

> I can't really answer on behalf of the DBE. In terms of how we're integrating our technology and the ability to use our technology as sort of, things within Office 365 like Power BI, which is really our data analytics, it's not there yet. We are working with the DBE-- well the Gauteng Department of Education to look at how all of these things can be leveraged. I know that they've got plans to do that. As far as I am aware it's not something that is off the ground yet. There are a number of organizations like Michael and Susan Dell Foundation that are trying to get into their systems where you are collecting this data so that you've got this ability to analyze what's actually going on in the province. But that has not been done on a broad scale so that either the MEC in Gauteng or the Minister in fact can look at any province at a particular point in time and see exactly what is going on with real-time data. It's not there yet but it certainly is on everybody's agendas and I think it's important.

Stephen (MSDF) (2016) believed it was very doubtful that an elaborate, real-time longitudinal system would be up and running any time soon. He felt that the capacity for government to bring such a system to fruition in the next few years is low, due to the cost of human resources to integrate databases across provinces and sectors, such as the TVET sector, higher education, and so on. However, he said that there is a "clearinghouse" being discussed that would ostensibly address this issue.

Longitudinal data analytics is conceived of as an instrument for managerial intervention and institutional filtering. In the era of Big Data, population studies can reach down to a granular level to predict and assess individual learner trajectories. Universities already screen candidates on the basis of test scores like the senior matric examination. But as Payne (CloudEd) (2016) put it, writing a test provides a "small, thin wedge" of data about a person. Adding in rich data sets collected daily from birth to death would fill the mostly empty data pie with a vast array of details to admissions offices or employers.

These kinds of policies, as with others, are already budding in the Global North. In 2014, the UK government announced a new regulation system for Further Education colleges in the UK, requiring them to "measure and track their students' performance and progress through their education and beyond" (Evans, 2014; Department of Education [UK], 2014). Learner destination tracking campaigns then tie *funding* to the performance of learning institutions. A survey of 60 colleges and learning institutions found "many providers are tracking student outcomes simply to fulfil funding criteria rather than using this data to help shape curriculum planning, business development or to inform marketing campaigns" (Futures, 2015). The UK's system is also supposed to make data transparent. If, for example, websites display "headline measures" which include the "[percentage] of students going on to sustained education, employment, or training at the end of their course" (Department of Education [UK], 2014, p. 6), such numerical ranking could put competitive pressure on learning institutions to align their curriculum more rigidly to the desires of employers. Allegedly, data-driven "accountability" systems will use funding pressure and data transparency to "continuously improve" learner outcomes (Evans, 2014). The UK's system, as described in the press, is not driven by the use of cloud-based surveillance. However, emerging digital systems offer a truly practical capacity to deliver 21st century surveillance solutions. The Michael and Susan Dell Foundation Data Driven Districts (DDD) Dashboard is specifically designed to provide data-driven technocratic management to the DBE and other officials external to the classroom.

### 5.3.6: "Ammunition" for Technocrats: Dashboard Teacher Surveillance

Indeed, Big Data can be used for powerful new forms of teacher monitoring and evaluation in high demand within South Africa. An MSDF promotional video states the South African school system is too large to manage, but society can "fix all the problems" across South Africa's vast educational terrain "by taking a data-driven approach to problem solving where we translate classroom-level data into clear actionable insights so that education officials can make decisions that make a difference" (MSDF, 2015).[138] Stephen (2016) echoed this assessment, explaining part of his portfolio's mission as follows:

> The hypothesis in this portfolio was: in order for any educational outcomes to succeed, there needs to be accountability and transparency and absent this, whatever you doing is practically irrelevant and meaningless because you'll never know if you're having any effect. So we spent several years working with the government to drive accountability and transparency. So data collection, validation, and identifying exactly what's going on in your school system… The question becomes now that you can see where the problem areas are, what do you do about it?

138 Details of the MSDF DDD Dashboard system were explained in Sections 4.9 and 5.9.

> And that's genesis of my portfolio which is what are you going to about it? Can you identify areas for remediation?

In years past, data fed into the system through SA-SAMS was often incomplete or inaccurate. According to Ford (ICT4RED) (2015), the online Dashboard system aims to fix "dirty data" where you have issues like "phantom learners that never existed in schools so that they can get an extra teacher". The MSDF Dashboard attempts to end this problem, and it is maturing at a slow but steady pace. The technology is regularly upgraded and the user base is continuously expanding. Data is fed into the system on a weekly (not daily or momentary) basis by school administrators (Stephen, 2016), and it only includes four of the 12 modules from SA-SAMS (Rachel, 2016). The depth of data analytics that Google, Microsoft, Pearson, and Knewton are conducting on their users is not yet a feature of the MSDF Dashboard because inputs are not streamlined to the cloud through a broadband connection. A Dashboard system connected to the daily use of teacher devices through a simple interface would allow bureaucratic managers to record, watch, and analyze the current spectrum of SA-SAMS – and expand upon it.

As noted above, Sania (Microsoft SA) (2016) stated real-time analytics are planned so that "either the MEC in Gauteng or the Minister can look at any province at a particular point in time and see exactly what is going on with real-time data. It's not there yet but it certainly is on everybody's agendas". Meryl Ford (ICT4RED) (2015) explained there is "a big focus on e-admin… for the schools" and they're "busy totally revamping the e-admin system… doing this big e-admin system at the moment, it was part of the planning in Operation Phakisa. But it's more in terms of managing, making decisions". Sipho* (DBE) (2015) agreed that "ICTs can be used as a tool" for "things like being effective, or being efficient through e-administration instead of working through paper, and different ways of collecting data – if we had one integrated one using ICTs".

Managerial power – especially government officials external to the school – is drastically enhanced with a powerful Dashboard system. For example, the common complaint about absenteeism could be reined in through the Dashboard, district officials believe. As a circuit manager, Monki Gabashane (2016) put it, "this is a project where people want to see real-time attendance". "You can actually zoom into the learner", she explained, "and see which is the learner that is not attending school". District officials can then use the system for "interventions" (*ibid*).

While the MSDF system does not (yet) offer fine-grained collection, bureaucratic officials already fashion data as part of their "ammunition" repertoire. Indeed, the goal to "zoom in" on individuals so officials "know what you are doing" is a serious aim of Operation Phakisa Education. Laetitia de Jager (iSchool Africa) (2016) said she thinks a nationwide system is "the idea behind [the MSDF Dashboard]. And the more they grow and if it works everywhere it would be pretty awesome because we would be able to draw on stats that we don't have at the moment". These could include gender-based violence, rape, pregnancy, and other statistics, she said. "As soon as we have systems in place," De Jager continued, "and they work, and we have different departments that can start drawing on the data, we can't address a lot of issues in this country effectively" (*ibid*). They're doing "a lot of training on" the Dashboard, "so I'm sure we're going to keep building on it… It's a pain for most teachers but it's a good thing", she added (*ibid*).

Ashley (Pearson SA) offered a similar assessment. When asked about analytics to monitor teachers, she said the DBE is "certainly keen on data-driven outcomes for learners… LMSs [are] clearly powerful… So maybe it's a next step to monitor the teachers, you're probably going to capture some of that data in any case" (Ashley, 2016). Moreover, she said, "half the teachers are truant and don't have the skills and knowledge to do [their job]. But you get a sort of high horse point of view that says you can't disrupt the teachers" but "if you don't actually assess, how you can improve the teacher?" (*ibid*).

Similarly, Steve Vosloo (Pearson SA) hinted at the fact of using Pearson's LMS for work in the classroom means that teacher data will be collected. This is obvious from a technology standpoint – both teachers and learners are interacting inside the cloud-based system, so both are being monitored by the system. As Vosloo (2016) put it, "[teachers] use the system to set assignments, to grade students, and eventually they will also be able to load in their own content. So you would also be able to track the learner usage, but [also] the teacher usage". He said for students, "there's two kinds of metrics. The one is the usage, and the other is the actual performance. Whether they took the test or not, that's usage. And then if they took the test, what did they score? That's the performance". The teacher is more nuanced – for now, "it's more just around usage". However, "down the line, if we allow them to add their own content, that's also important to performance, and that's one of the metrics we can use to track teachers". Vosloo predicted monitoring and evaluation of teacher activity will expand within the system. He said the DBE holds that in addition to usage, teacher contributions to the dashboard represent a metric of of success, stating that "how many times you logged on and… how many assignments you set", as well as content contributions, could be "viewed as performance" (*ibid*).

Richard's (DBE) account congeals with this vision. When asked what kind of data will be collected and analyzed, he responded:

> You have resources that are hosted on the cloud. Now you could look at what resources are currently used, in what form they are used. What resources are they looking for but they can't find there? Then… you look at the utilization of resources because the learning management system, how those resources are being used, the demand for the use of resources, and whether you could get feedback from the users, so these are the kinds of things that we are going to be looking at (Richard, 2016).

Richard noted that things get more complicated as the system advances. He explained they differentiate collection for whom and why the data is collected:

> Who are you collecting data on? Individuals? Or are you collecting general data that is not really specific to any one individual or requires that, okay, Henry is downloading Mainly Maths or something. We're not going to be doing that. It's going to be kind of general. How many users are downloading this? Or how are they using it? When do they download it? This information. But when you come to the learning management systems, that's when what you are talking about comes in, for where individuals are actually – different within the educational context of only the school. So within a school context or within a district context, and that information is needed (*ibid*).

In other words, usage and performance data will be collected on teachers and learners in e-administration systems. And they will do the things cloud-based surveillance systems do – record usage data like time stamps, click counts, and downloads, as well as what could be categorized as "performance" – not just learner test scores, but also usage data that can simultaneously be conceived as performance (e.g. teacher uploads of content to the system). It should be evident by now there is an artificial boundary between e-administrative and learner software surveillance systems. The MSDF Dashboard system is an administrative tool largely geared toward surveillance intervention by bureaucrats, including circuit, district, and provincial officials external to the school system. It is especially aimed at educators such as teachers and principals who are responsible for learner outcomes on the ground.

In contrast, personalized and adaptive learning systems are said to benefit learners while simultaneously empowering teachers to increase their efficiency and evaluation capabilities. Cloud-based systems do not simply target learners, however. Even if the MSDF Dashboard were eradicated, teachers would still be under surveillance through the student surveillance conducted by learning software. The data collected about their students would reveal the real-time activity and performance of learners every time they use the software for classroom activities, homework, and the like. Given that teachers may interact with students through the system, and are often held responsible for learner performance, school systems could take an in-depth look at their interactions and "outcomes" in terms of the metrics obtained about students: the frequency of e-education software usage, student activity in the system, curriculum coverage, learner marks, improvement in scores, in-class activity, and so on. From the standpoint of "accountability" preached by neoliberals (see Chapter 2), surveillance of teachers is obtained through the surveillance of learners.

### 5.4.1: Implementation of Operation Phakisa Education

Before proceeding to the findings about policy perspectives on Free Software and privacy – the subject of Chapter 6 – it is important to detail the current state of implementation. The government can declare it wishes to implement technology in schools, but how can we know if it will deliver the goods? After all, service delivery is often abysmal in South Africa, and there is less reason to care about OPE if it replays the failures of implementation experienced over the past decade. The government has not been forthcoming releasing information about the status of implementation within the country, and the remainder of this chapter provides a first look of how implementation is playing out on the ground. What follows demonstrates that there is slow and uneven progress and if the government wants to "hurry up" with technology integration, it will likely need to provide additional funds. This exploration begins by discussing variation in implementation across the country.

### 5.4.2: Variation in Implementation

The Gauteng Department of Education's Classrooms of the Future initiative – also called "paperless classrooms" – delivers the most entrenched version of e-education. The program is headed by Gauteng MEC of Education, Panyaza Lesufi, a vocal proponent of the powers of e-education. In June 2014, Lesufi revealed Gauteng's plan to convert public schools to paperless within a few years (Oxford, 2014b). These would be modeled on Boksburg's former Model C school, Sunward Park High School – the country's first state school to scrap textbooks for paperless classrooms (Oxford, 2013b). In January 2015, Lesufi announced seven Gauteng schools were going paperless in what he called the "#BigSwitchOn" (Shezi, 2015a), with six others slated to join them at a later date (Oxford, 2015). The ultimate plan was to "roll out these 'paperless' classrooms to all [3,000] township and rural schools in the province by the end of 2017/18 financial year" – one laptop per learner, to the cost of R17 billion (Avenant, 2015). The National Treasury did not provide the billions of rand needed to meet these benchmarks, but Lesufi is still pursuing the project, extending delivery from Grades 11 and 12 to Grade 10 for the 2018/2019 financial year (Mzekandaba, 2018).

In 2015, Lesufi mentioned a two-step process for implementation. The first is "a tech-enabled learning model, based on the use of smart boards and digital exercises and lessons in classrooms" (Shezi, 2015b). The second is "a blended learning classroom model, to be introduced in the long-term and involves employing more multimedia in lessons" (*ibid*). According to Lesufi, this involves:

> ...creating a more learner-paced educational environment where the teacher manages multiple groups of learners working on different tasks. By the end of 2019, between 5% and 10% of schools (100-200) are expected to have full blended learning in place. The rest should have tech-enabled learning and be ready to graduate to blended learning (*ibid*).

While the Gauteng province is embarking on its Classrooms of the Future initiative, the Western Cape Education Department (WCED) is developing its e-learning "Game Changer" project. The Western Cape has years of partial implementation behind it with its award-winning Khanya in Technology Project, which succeeded in providing a computer lab to each school (SA Gov, 2006) and taught 27,000 teachers how to use digital tools in education (at a cost of R1 billion) (Alfreds, 2015a; Alfreds, 2015b). In 2015, Western Cape Premier Helen Zille announced a new "smart classrooms" project as a "game changer" for the WC education system (Schreuder, 2016; SA Gov, 2015b; Zille, 2016a; Zille, 2016b).

In July 2017, 16 schools were identified to become e-learning schools as part of a pilot program, while the rolling out of broadband to schools continues apace (Cawe, 2017).

A detailed description of variation by province was provided by Ashley (Pearson SA), who has years of experience implementing for Pearson on the ground. Ashley (2016) described a spectrum of implementation strategies:

> The national level… has a vision… to embed eLearning as part of South African education… So [the DBE has] an eLearning *[2004] White Paper* strategy. Now they completely failed to deliver on that… They said they haven't done it at all, they kind of have to start from scratch. So they've got the vision but they don't have… any sort of standard policy... Phakisa does intend to have more practical actions to implement things, but that's quite recent and isn't really rolled out… yet… The *national* [has] the vision and ideas but not the implementation framework for achieving it.
>
> [At] the provincial level, they're the people that are actually trying to find out, 'okay, what do we do to implement it? I've got this guidance, I've got this direction from national.' They also have their own agendas as to what they want to achieve… and you can see very clearly that the different provinces have taken very different routes. So if you start in Gauteng, Penyaza Lesufi, who is the MEC for education there, he's gone on what we might like to call a "big bang" approach. We were involved in some of that – we provided some content, we provided facilitation… [Lesufi's] basically gone all out, he's tried to put all the infrastructure in place and just kind of run with it, make sure we get something actually up and running. He wants to prove that our schools actually using the paperless solution. And he's been… criticized for the cost of it, he's been criticized for possibly being ill-prepared – I mean there were lots of laptops stolen, for example, they had to recall a lot because they didn't have MDM [Mobile Device Management] software on the tablets to actually track things, there were things that they kind of learned along the way. They've gone out and done something, but without actually knowing all the things they should have thought about…
>
> The other extreme is the Western Cape, who started from a connectivity point of view. So they wanted to make sure everything is in place and then they build up. So they're going from a much more conservative thought for their approach, which is actually much slower, as well… I think those are the two provinces that are probably leading the way in experimenting…

Then you've got provinces sort of in between. And they're provinces we've also been working quite closely with. So that would be KwaZulu-Natal and Free State. KZN and Free State, they're quite actively looking for solutions, but also they don't really have a solution themselves. I think Gauteng [and Western Cape] have an approach that they're quite passionate about… I think in between you've got provinces like KZN and Free State who actually want to try and do something but are looking for people to run pilots and demonstrate things and pick up models that they can then run with rather than leading a policy implementation…

Other provinces like Eastern Cape or North West, they simply don't have the money to be doing this. They're struggling so much just to pay for the teachers… So they're kind of left without any support because there isn't [any]. Unless Phakisa brings out something else from a sort of national implementation point of view, those provinces that can't in fact go ahead and do it themselves are really left with nothing to implement and no finances to do it. I think what we're trying to do at Pearson is to try and find reputable models that work in certain a number in scenarios that we can take into our provinces and try to give them support implement vision that's been driven by national.

At the school level, then, we've got some real hands-on experience about what it means to have successful implementation at the school. And that is… having to do a sort of needs analysis of the school itself, the actual set up and infrastructure, the number of classrooms… what sort of server might [be needed]… The North West… have actually asked for people to come and give them ideas. I actually quite admire that because they know that they don't have the capabilities to do it themselves, they've come and asked for help and that's exactly where Pearson should be positioned to be… We should be able to take in some sort of feasible model that they can work from. Eastern Cape tried to initiate something themselves but they're not really a functioning department and certainly don't have the money to implement this stuff either, so they're not really going anywhere fast. So there's a lot of work that's needed to make sure there is actually realistic understanding of implementation requirements. Even those provinces who think they have a plan, they don't really have any practical experience… so that's really the sort of thing we're trying to help them with.

Sania (Microsoft SA) (2016) offered another take. When asked if the intensity of tech integration varies across provinces, she contrasted the Western Cape, Gauteng, and Limpopo:

> I feel like we work with nine different countries, because they're just so different… I'd have to say that the Western Cape is the most advanced in terms of the fact that they've got quite a strong vision and strategy for getting technology and 21st century teaching and learning in place. And they're sort of aiming towards anywhere anytime learning… I know that they're ultimately aiming at working towards one-to-one, but for now giving device banks of devices to schools. So we're seeing shared computing where the teachers can book access to the devices…
>
> Gauteng is trying to move along the same lines. They're working toward their strategy… Then there are other provinces, Limpopo for example, that really don't have a strategy and they're not really allocating much money at all to sort of technology in any way, shape or form. So in provinces like that we still see a lot of teachers making a plan on their own, and often with their own money to try to integrate technology, and are doing a really great job of it. But it's certainly not something that scales across the province. So I think it really varies across provinces.

In short, from these descriptions, implementation seems most advanced in Gauteng (which takes an aggressive, "big bang" approach) and the Western Cape (which takes a slower, more conservative approach than paperless classrooms). KZN and Free State have something of a plan, while the Eastern Cape, North West, and probably Limpopo lack the resources and experiences to begin implementing to scale. Of course, the Western Cape and Gauteng are the wealthiest provinces, and it should come as no surprise that they have the most advanced e-education programs. It appears that additional resources will be needed to deploy education technology in all public schools.

### 5.4.3: Making E-Education a Reality: Implementation Factors

In order to make e-education a lived reality, certain conditions must be met. The minimal components for a sufficient rollout were described by Richard (DBE) (2016):

> For us to roll out ICTs in schools, I think there are three, four things that are critical that all of them go together, what we call an end-to-end solution. All of them must occur for it to be a

> success. You must have ICT devices, otherwise, what are they going to use? Then… the teachers must have been trained, in ICT skills, in integration of ICTs in teaching and learning. Thirdly, you must have content, otherwise what are the children going to use, because many students, many schools don't have Internet connectivity. So we need to develop content and distribute it offline, but it's available online for those who have good connectivity. So basically it is an issue of hardware, it's an issue of content, digital content, it's an issue of training, and it is an issue of Internet connectivity. So those four things are critical, they go together.

Putting aside teacher training, according to the most recent data provided by the DBE, slow progress is being made on infrastructure delivery: devices, digitization, and connectivity, in addition to core infrastructure. For digital content, Dr. Maboya (2018) has stated that 706 digital content resources consisting of 112 textbook titles and 594 Grade 1-3 readers and e-books have been developed (p. 9). Additionally, the DBE has developed interactive digital content in English, Setswana, and isiZulu, with plans for content translated into Sepedi and siSwati in 2018 (*ibid*). Deputy Minister Enver adds that 60% of content has been digitized (PMG, 2018).

According to the DBE's December 2017 study on Internet connectivity, there are 24,775 schools in their database and as many as[139] 16,102 connected to the Internet (65%). Of those connected, 14,137 schools have low-speed Internet for teaching and learning (mostly 256kbps ADSL), while 1,965 schools (8%) have broadband connectivity (RSA, 2018, p. 7-8; Maboya, 2018, p. 26). The "identified challenges" of the document include funding and the lack of availability of broadband to many locations, especially in rural schools (Parliament, 2018, p. 9). The government plans to expand connection to broadband through the SA Connect policy, which will prioritize rolling out infrastructure to schools, as well as nearby clinics, post offices, police stations, and other government facilities.[140]

On the administrative backend, the SA-SAMS system is "gaining momentum" (Maboya, 2018, p. 11). According to the Data Driven Districts website, the MSDF DDD Dashboard covers 10,506,301

139 "As many as" indicates that some of the data includes schools counted twice. The data thus provides a rough estimate (Maboya, 2018, p. 26).

140 The National Treasury has allocated R1.84 billion for its Medium-term Expenditure Framework, which covers Phase 1 of SA Connect and includes 6,135 facilities in 8 district municipalities. Phase 2 will cost R60 billion, connect 35,211 facilities, and cover 44 district municipalities (Maboya, 2018, pp. 31-33). The Gauteng province aims to have all government buildings, schools, health care facilities, and hospitals connected by 2021 (Guest, 2018).

learners in 20,090 schools across 73 districts.[141] Meanwhile, the DBE Cloud has been built and portions of it are now live at http://www.dbecloud.org.za.

According to Deputy Minister Enver Surty, lack of Internet connectivity is the "key challenge" to the rollout and "Issues of infrastructure would not be as great a problem once there was connectivity" (PMG, 2018). Without Internet connectivity, the new government vision for e-education is not possible. That Internet connectivity has yet to reach many schools may help account for why devices have not been delivered *en masse* to date, although cost may be a significant factor. We turn to cost next, first in terms of teacher development, and then in terms of budget and theft.

### 5.4.4: Teachers: Facilitation, Training, and Professional Development

In order to ensure e-education actually gets implemented, proper teacher training was the greatest concern among South African stakeholders. De Jager (iSchoolAfrica) (2016) said there are two elements for successful implementation. The first is having the "right package" of infrastructure in place – devices, connectivity, content, and the like (discussed above). The second, however, relates to teacher development:

> The other element that often gets missed out is the training and facilitation. Now I specifically use two words there…. Training is… something that people latch on to. *Training* for me is specific learning outcomes delivered in a formal environment. It might be an afternoon session or week's training on something, it's kind of discrete. *Facilitation*, on the other hand, is that on-site 'I'm working with you and we're learning as we go' kind of model. And that facilitation is critical. It's the one thing I think that has the biggest factor of success in anything that we've seen for varying reasons. First of all every school site is slightly different – they might have a number of different classrooms, they might be set up in a slightly different way; there's absolutely going to be different levels of digital literacy, and cultural experience, within the school. So delivering a one-size-fits-all training approach, even if it's modular at different levels, which we all supervise… is not enough.

141 This data dates to August 25, 2018. For an archived version, see https://web.archive.org/web/20180825200725/http://www.datadrivendistricts.co.za

Moreover, in the "typical scenario", De Jager said, teachers are worried that the kids know more than they do and therefore don't want to lose control in the classroom" (*ibid*). This power element is more pronounced in the one-to-one rollout scenario, she said, because:

> It really decentralizes control in the classroom – you're going from classrooms which are almost exclusively 'chalk and talk' setup – rows of desks facing a chalkboard, or a white board in some cases – to suddenly group work happening, or individuals may have to explore their own content, and that's very unsettling for the vast majority of schools here. It's not the sort of environment that they're used to, even the more highly resourced independent schools, that's kind of not their operating model that they're used to. So it's very unsettling for teachers. So they either then don't want to do it at all or are absolutely flummoxed and don't know where to go. But if you've got people on hand who can model things, and also troubleshoot the kind of issues we just had – 'oh the Internet's dropped, what do we do?' – you can keep going. Those kinds of things are really important. We think-- we provided facilitation in Gauteng, we developed facilitation through KZN, and we now have formal facilitators in the schools we're working in the Free State. And they are there.

De Jager recommended spending six months upskilling teachers in the schools so they are "actually getting knowledge and experience in how it's delivered and working this way. Because it's not just about… learning the technologies, it's actually about changing the pedagogical approach in many ways. And we've seen that having the biggest effect" (*ibid*). She added that facilitation is "the thing that the provinces don't see – they're just worried about who the device provider and the connectivity provider is" (*ibid*).

Alister Payne (CloudEd) (2016) made similar remarks, stating, "training is essentially, 'how do I use something?' And professional development is, 'how do I use this thing to change teaching and learning? How do I use this thing to change my profession?'". Likewise, Chloe (SchoolNet SA) (2016) said "the change in practice doesn't happen overnight"; it cannot happen in "just five days". The need for teacher professional development – rather than training – is far and away the strongest point of emphasis among South African e-education advocates interviewed. Teachers must simultaneously learn how to use their computers *and* use them effectively in the classroom. If either is missing, e-education is never actually implemented.

Teacher professional development requirements are quite extensive. Teachers require a needs analysis,[142] new pedagogical and tech literacy skills to match the tech-driven models being offered to (or forced on) them, and on-going support as they learn the ropes. Chloe (2016) stated that development includes a broad array of actors in the education sector – not just teachers. This includes district officials, provincial officials, coordinators, the senior management team, school governing board members, even education faculties at universities – "whomever is involved in the schooling sector". Effective teacher professional development is thus quite costly. This is especially the case when considering the amount of learning many teachers, students, and communities require. Given the low or non-existent ICT skills base of many teachers (Alfreds, 2016), many teacher professional development programs start at a zero base level. They begin by learning how to turn devices on and off, what an application is, on so on. It takes time and resources to cultivate teacher expertise in e-education.

## 5.4.5: Price Tag – The Cost of Making E-Education Successful

The price of e-education, then, constrains or enables the types of solutions available. If teachers need a lot of help provided through an ongoing facilitation process, it will be more expensive than dropping low-priced devices off at schools and then leaving after a training session or two. Like so many other development challenges in South Africa, cost matters.

The total cost of an e-education includes tech infrastructure (hardware, software, connectivity), content (e.g., e-books and paper/backups), teacher/educator professional development[143], management (initiative, operations, stakeholder, change), community engagement, hardware, technology and educator support and maintenance, monitoring and evaluation, broad policy and implementation coordination, on-going research (to support evidence-based policy), extra security, supportive building infrastructure, continuous electricity, as well as any unexpected costs.[144]

Some government officials have claimed that savings from textbooks will make funds available for other e-education costs (Oxford, 2013b). In 2018, Deputy Minister of Basic Education, Evner

142 This is an analysis of their needs made by the trainers or facilitators so that they know what kinds of support might be required. Interview subjects implementing e-education on the ground suggested the best method is for trainers/facilitators to work *with* teachers alongside them on the basis of mutual input, in an adaptable way.

143 Michael Goodman, the group content manager for Via Afrika (a leading content provider), told the press that "[Via Afrika's] courses are structured in both face to face and online sessions and teachers are incentivised to complete them. Face to face courses of 36 sessions cost R500 per two hour session and online sessions cost R400" (Alfreds, 2015b).

144 For an in-depth explanation of possible components which must be costed, see Herselman and Botha, 2014, pp. 35, 48-49, 56-65, 215-246.

Surty, told Parliament that South Africa "will not be saving millions, but billions of rands for education" with digitized content. Surty said that whereas one of the DBE's textbooks would have cost R320, in digital format, the DBE could reproduce it for R20. In response to this kind of claim, Mario Marais (ICT4RED) (2015) said that there are other costs that offset the savings, such as security to guard against theft.

When speaking about e-education issues in South Africa, the issue of theft is commonly mentioned, and it has received considerable press attention (Shezi, 2016a; Gedye, 2016). However, some of the press reports may exaggerate the matter. On De Jager's (iSchool Africa) (2016) account, theft is "a major issue" but not one which would overtake a national rollout. She said that in the 61 schools where they operated over three years, they had issues in just four schools. However, De Jager added that proper protection is more expensive than one might guess. She said that schools need to procure safes or a strongroom before the deployment occurs. In two schools, thieves "used anvil grinders to to completely dig through a chub safe door and stole everything [the school] had" (*ibid*), which is a lengthy and risky procedure. She said the Gauteng classrooms which experienced theft did not have strongrooms or safes, and the tech "was just delivered because government had to tick those boxes". Thus, for her, the issue is that groundwork needs to be done to ensure proper means of protection are installed at each site.

Fiona Wallace (CoZa Cares) (2015) said the fixed infrastructure cost is not the main expense. Rather, "the biggest expense… is ongoing maintenance and then the broadband. It's huge… the cost of broadband to schools… So it's the maintenance and the upkeep and the sustainability of whatever infrastructure they have got". Addressing cost concerns, Herman (DTPS) (2015) explained that:

> Because the provincial budgets are so small they are unable to cater for the ICT needs for the entire province… So that is basically seen as a massive barrier. This is why also Operation Phakisa was then formed as well – to see basically how alternative funding models can be directed to their respective provinces and the country as a whole, to then solicit funding, to ensure that ICTs in schools – from a device perspective, from a content perspective, from a teacher professional development perspective, including also connectivity.

Herman would not disclose further details about the discussions held. Marais's account was a bit different from Herman's. He said:

> We were part of the stream that does the costing team, from Treasury. And that's the trick then-- you've got this initiative, but how the heck does it fit with your existing budget structure? So you [have a] zero sum game. Treasury's saying, 'you can have the grandest plans in the world, but there's no way we can put more money – there's no more money in the bank to give to schools.' So you need to innovate, and re-purpose money, and be more effective in terms of using the funds to achieve better educational outcomes (Marais, 2015).

De Jager (2016) added:

> [Some of] the budget that comes from treasury-- it is sort of ring-fenced to be spent on certain items. Of course the provinces often don't keep to those ring-fences and that's why they get into trouble (such as Limpopo [which is in administration by national at the moment]).
>
> But to the best of my knowledge there is no specific ring-fence for e-products. Most of the opportunities that we have been… through… to actually get revenue, has been through tender or what we call special projects, you get special project funding. A lot [of] special projects is often around math and sciences, that's a key area. And some of that comes into e-learning solutions. And I think we talked a little about-- around training budgets as well. About how they're kind of increasing and changing in light of e-learning. There's definitely a drive to make more budget available for that. These seem to be some one-off initiatives rather than a consistent pool of money from national to specifically spend on e-learning. They tend to be individual initiative projects.

Ashley (Pearson SA) (2016) contrasted her on-the-ground observations against what she sees from government. For her, facilitation is a major cost not being covered properly. She said that the type of training being implemented is short-term, "'we're going to run a bunch of sessions until we get it' kind of approach," which she doesn't see as being effective. Ashley said that is "not wasted", but *facilitation* is needed, and the provinces aren't really "buying into" that yet. She added, "that's a much longer term, probably more expensive requirement than training budgets".

Thus, if interview subjects outside of government policy circles are correct, without sufficient funding for the necessary elements, the project will fail, or will fall very short of its goals. Can the government justify the cost of OPE in a country where basic needs have yet to be met? Deputy Minister Surty was asked this question in February 2018. He responded that "concurrent" development is needed; "If the DBE first had to sort out basic challenges such as building toilets, the digitisation process would occur in only five years' time, and the rural child would not have the benefit of access to ICT, no digitised content that he or she could download, not only on a computer but even on an ordinary phone" (PMG, 2018). South Africa has to prepare for the Fourth Industrial Revolution, he added, and cannot afford to be left behind.

## 5.5: Conclusion

This chapter detailed South African e-education policy. In South Africa, education technology initiatives were proposed in 2001, and an official policy was set in 2004. This policy, the *White Paper on e-Education*, set some of the core goals for e-education in the country, including a shift from a traditional, brick-and-mortar "chalk and talk" education system to a collaborative, personalized one making extensive use of digital technology. By 2013, every learner was supposed to become computer literate, but the plan never got off the ground. In 2015, recognizing the failure of the 2004 initiative and anxious about the growing influence of digital technology on society, the Presidency launched Operation Phakisa in Education, a plan to fast-track digital technology into all public schools. The government plan for e-education, however, is different from the one envisioned in 2004. This time around, the government plans to make use of new technologies (e.g. Big Data, cloud computing, and administrative dashboards) as well as new e-education models (e.g. adaptive learning and flipped classrooms). (The "new e-education" will be outlined and analyzed in the next chapter.)

The chapter next described what OPE is. The first section described the software suites offered by Google and Microsoft, noting that they empower those corporations to shape norms and behaviors in the classroom without direct democratic participation or accountability offered on the Free Software model. Next, it described plans for Big Data personalization, with a focus on plans for adaptive learning (and enthusiastic backing from respondents sampled). After that, it described the DBE Cloud, as well as plans for longitudinal "cradle-to-grave" analytics in partnership with Big Tech corporations. Finally, it presented the plans for the MSDF DDD Dashboard e-administration system, including future plans for real-time surveillance.

The final section of this chapter detailed the implementation of OPE. Making heavy use of semi-structured interviews, it found that variation in approaches exist according to province. It then outlined the core implementation factors needed to make e-education a reality in schools: the provision of digital infrastructure, digitization, and the facilitation and development of teachers. It provided empirical details about each of these issues, and then turned attention to cost, budget, and theft. It found that funding OPE is a challenge, and that the cost of infrastructure and facilitation may be amount to more than the government has budgeted for. By explaining conditions on the ground, as well as the evaluations provided by interview subjects and press accounts, it is evident that the initiative is not simply repeating the non-progress of the past. However, implementation is slow, and it will take some years to build a full e-education system.

Clearly, a great deal of thinking has gone into how to successfully implement e-education in the classroom. However, there is insufficient dialogue with policymakers, e-education implementers, school participants, and the society about how to define implementation “success”. Is it merely the use of digital technology in schools? Is it improving learner outcomes, and if so, is success improving metrics synonymous with standardized test scores? Is it preparation for the “knowledge economy” and the “Fourth Industrial Revolution”, as envisioned by the World Economic Forum? How broadly conceived is “education”? Do the products offered by Google and Microsoft empower learners and enhance democracy? What about the power of Big Tech corporations, who stand to gain by placing their products in schools? Will privacy be lost? These and other questions will be answered in the next chapter.

# Chapter 6

## Policy Perspectives on Free Software and Privacy

---

### 6.0: Introduction

The last chapter reviewed South Africa's e-education policy by detailing its history, a brief introduction to Operation Phakisa in Education, and how it is being implemented throughout the country. It identifies the policy choices and perspectives being made at the national level with respect to Free Software and privacy for e-education. The first section reviews Free and Open Source Software policy in South Africa, including the documents leading into the 2007 *FOSS policy preference*. The policy papers establish that government policy, and the thinking behind it, is inspired by and matches up with the essence of the Free Software philosophy articulated by Richard Stallman, Eben Moglen, and the Free Software Movement detailed in Chapter 3. The *FOSS policy preference*, in combination with the philosophy articulated in Chapter 3, sets the stage for consideration of perspectives held by interview subjects with respect to Free Software for education, economy, and society. The second section details opinions on privacy and surveillance critical to OPE policy.

### 6.1.1: Digital Technology and E-Education

In Section 1.2, we saw that the overwhelming majority of critical e-education scholars focus on issues of *education* technology – technologies that are specifically designed to perform educational tasks. Yet, as noted in Section 5.1, devices given to children are more than just "textbooks behind glass". If computers do social networking, then schools are providing learners with social networking. If they offer video games, then schools are giving learners video games. Computers are complex machines, and the range of elements that are included within each device constitutes the range of considerations policymakers must consider (Schneier, 2018b). The DBE tacitly accepts this argument when it states the dual purpose of e-education is to transform education *and* to close the digital divide. Providing learners the digital experience (i.e. bridging the digital divide) forms the second major part of OPE, and so more general digital experience must be critically assessed when making policy decisions for device implementation. This section is particularly concerned with this component, with inquiry into the software policy component of the technical architectural choices that government policymakers how the power to determine in basic education (e.g. operating systems, not net neutrality policy) and how they relate to education, economy, and society. As reviewed below, the South African government has a software policy which mandates a preference for Free and Open Source Software for use in the public sector. We begin our discussion with the history of Free Software policy in SA, and then move on to the sociological implications of Free Software for power, privacy, and socioeconomic development.

### 6.1.2: FOSS Policy Preference in SA: A Brief History

South African policymakers awoke to the problems of digital colonialism in the early 2000s. South Africa was the first and leading advocate of Free Software for use in the public sector on the African continent (Savant, 2007). Early policy studies highlighted the threat of proprietary software to local interests, with Microsoft at the center of attention. The collection of documents advocating the use of FS in the public sector spoke to the complex political, social, and educational implications of technology choices in the public sector.

After several years of deliberation, in February 2007, the South African Cabinet approved "a strategy and policy for Free and Open Source (FOSS) in government" (Tectonic, 2007). This stipulates that the government is to choose, migrate to, develop, implement, and promote FS in government and public institutions. Free Software is to be given preference over proprietary software unless proprietary software "is demonstrated to be significantly superior" (DPSA, 2006a). Moreover, the policy states, "Whenever the advantages of FOSS and proprietary are comparable FOSS will be implemented when choosing a software solution for a new project. Whenever FOSS is not implemented, then reasons must be provided in order to justify the implementation of proprietary software" (*ibid*).

The history of FS in South Africa goes back to the conceptual foundations of education in the anti-apartheid resistance movement. Nhalhnhla Mabaso (Armscor; Wikimedia Foundation) (2016), a key figure in the FS policy process, told me the foundations of Free Software policy extends back to the Freedom Charter, which states, "the doors of learning and of culture shall be opened" and that "All the cultural treasures of mankind shall be open to all, by free exchange of books, ideas and contact with other lands" (*ibid*; Freedom Charter, 2003 [1955]). While in 1955 "people were not really thinking about software," Mabaso (2016) observed, "that kind of thinking [in the Freedom Charter] has come through the years" and has influenced South African government policies. During the Mandela years, "a huge nation building project" was constructed "looking at a range of policies which helped make

South Africa a functional state". One of the departments was commissioned for what became the 1998 *Report of the Presidential Review Commission on the Reform and Transformation of the Public Service* – a policy geared toward making "the state much more useful and relevant". Mabaso called this:

> Mandela's gift to technology in South Africa, ICTs… [The report] made a number of recommendations saying our systems, our technologies are currently based on linking paradigms and modes from the past – we need to move in… a certain line with a new type of government that is transparent and accountable, and we need to see a change of technology systems in line with that. We need to be safety-conscious, participatory, and all of those other good things (*ibid*).

During the Thabo Mbeki presidency, several documents were published which today form the basis for the FOSS policy preference passed in 2007. These documents include the 2002 National Advisory Council on Innovation (NACI) report, *Open Software & Open Standards in South Africa: A Critical Issue for Addressing the Digital Divide*; the 2003 Government Information Technology Officers' Council (GITOC) report, *Using Open Source Software in the South African Government*, the 2004 NACI report, *Free/Libre & Open Source Software and Open Standards in South Africa*, and the the Presidential National Commission (PNC) report, *Open Source Software and the Information Society: Policy and strategy recommendations to the Presidential National Commission of the Republic of South Africa*, which became "the major software document for the current Open Software policy" (Mabaso, 2016). By 2006, the Department of Public Service and Administration (DPSA) published a series of statements on FOSS, including a strong policy preference for government. In February 2007, the South African Cabinet formally approved the *FOSS policy preference*, based on the DPSA's 2006 *FOSS policy preference* documents approved by the Cabinet in 2007. The policy was informed by the above-listed documents published before it[145] (Mabaso, 2016).

145 These were: DPSA, 2002; NACI, 2002; GITOC, 2003; NACI, 2004; and PNC, 2004. The PNC (2004) document was especially influential; the DPSA (2002) document pertained to Open Standards and not so much to software licenses. The final policy documents comprising the FOSS policy preference are: DPSA, 2006a, 2006b, 2006c, 2006d, 2006e.

## 6.1.3: Free Software: General Benefits

The aforementioned documents express the thinking that guides *FOSS policy preference* binding on software deployment in the public sector, including basic education. The benefits of Free Software outlined in policy documents coalesce around a number of related themes. At the most general level, Free Software is endorsed for the liberty it provides the people to control their computing experiences. Echoing Stallman (2010a) and the Free Software philosophy, GITOC (2003), for example, endorses FS because it "offers users the choice to probe, modify, learn from and customise the software, harnessing the power of many small contributions from a large network of individuals to suit their needs" (p. 8), including "local needs" such as "support for local languages" (NACI, 2002, p. 13).[146] The NACI (2002), in turn, expresses an anarchistic view on software and intellectual property, arguing that with FS, those in the public sector (such as students) can use the software as they please, learn from it, and modify it, and they recommend against licensing software under exclusionary, proprietary licenses (p. 7). Beyond the concern of broad-based freedoms at a higher level of abstraction, policy documents argue that FS is beneficial to the domains of education, security, and local development. Let us consider each in turn.

## 6.1.4: Free Software in Education

Education is only given casual consideration in software policy documents, usually in reference to socioeconomic development. As with the 2004 *White Paper on e-Education*, the relationship between software choices and *pedagogy* is not given any consideration. Nevertheless, policy documents extend the FS policy preference to public institutions, and there are some policy guidelines for the education sector.

Writing before e-education policy was published, the NACI (2002) spoke in general terms about FS education for Training and Support, emphasizing the educational benefit of open (rather than proprietary) knowledge (p. 21). They also urge schools to produce Free Software instead of proprietary software in the interests of "freedom" and the public interest (pp. 7-8). The PNC (2004) holds that education is in need of an "open source software element" more than any other domain considered (pp. 33-35; see also, pp. 70, 80).[147] They explicitly recommend Free Software for use in education: Open

146 See Dalvit, Terzoli, and Wolff (2008) for a discussion of how Free Software enables local language customization in South Africa.

147 These are: Programming languages; Operating systems, Databases; Applications, components and interoperable systems; Generic software tools; Societal: OS community; Legal, IP and governance; Information interoperability standards; and Content structure standards. The table states each of these elements should be emphasized for people to

Source Software [OSS]"should be both a medium for education, and the subject of education, especially at tertiary institutions.  This touches on the whole area of ICT education in general" (p. 86). Universities and public sector R&D, the PNC adds, "should use OSS as the 'default exploration route'" so that "institutions… enjoy the benefits of OSS, but also critically build the skills base, and ensure that every degree-qualified ICT professional is fluent in the OSS environment" (*ibid*).

The NACI's second (2004) publication also endorses FS for education.  They make the crucial point that "Newcomers to computers, particularly students and youth, are likely to be more receptive to a different, open model" (NACI, 2004, p. 28).  The DPSA (2006b), by contrast, does not go into detail about FS for education, but it argues that there are "developmental benefits of FOSS/OS" such as "innovation, local solutions, and learning" as well as "local content creation and consumption" (p. 9). Software policy documents thus stress the benefits of Free Software to education, economy, and society.

### 6.1.5: Free Software and Security

Software security is another category given considerable attention, beginning with GITOC (2003). While it is not uncommon to find misinformed or biased commentators holding the view that Free Software is less secure than proprietary software (Vermeulen, 2017), all policy documents make clear that security is a reason to favor Free Software.  GITOC (2003) argues that Free Software "[r]educe[s] security risks due to extensive review and access to source code" (p. 9).  With FS, they reason, code can be analyzed to determine if the software is performing any operations that may pose a risk to the user and compromise the security of the organization (*ibid*, p. 19).  GITOC concludes that with FS, "it may be possible to safeguard information to a greater extent than when using proprietary software due to the inherent security benefits of the OSS model" (*ibid*, p. 23).

The security benefit of FS is premised on the theory that "Given enough eyeballs, all bugs are shallow" (Raymond, 1998).  Opening the source code to the public provides a wider opportunity for peer than "security by obscurity", where only the developers can view the code.  On the Free Software side of the security debate, world-renowned cybersecurity expert, Bruce Schneier (1999) remarks, "In the cryptography world, we consider open source necessary for good security; we have for decades. Public security is always more secure than proprietary security.  It's true for cryptographic algorithms,

use, modify, enhance and create the software (PNC, 2004, p. 34).

security protocols, and security source code. For us, open source isn't just a business model; it's smart engineering practice”.

Among the broad community of security experts, however, there is no definitive consensus over whether open source offers a clear security advantage over proprietary software, *if* the definition of security is restricted to *flaws* in code that create vulnerabilities for exploitation by an attacker (Boulanger, 2005; Schryen, 2011).[148] However, as Richard Stallman (2016) notes, Free Software provides the user security from the *developers*. As we saw in Section 3.3.4, corporate software developers have been shown to place spyware and other “unfavorable” features in software. For example, Microsoft instituted an upgrade to Skype which allowed the NSA to monitor Skype calls. They also added an Outlook.com backdoor for US spies, and provided the NSA the means to access user storage on SkyDrive (Greenwald et al., 2013; Thomson, 2013). Back in 2004, even prior to disclosures provided by NSA whistle-blowers, the PNC (2004) registered concerns about this kind of “foul play” in relation to software freedom, explaining that:

> Governments have expressed direct concern over other government involvements in proprietary software developments, and because the source is not available in proprietary software, there are opportunities for foul play. By using OSS, one has a view of the source of the software and hence the ability to identify any particular concerns. Thus OSS provides sovereignty and direct control over systems developments (p. 48).

Additionally, they characterize Microsoft’s affiliation with the United States government as problematic:

> The fear that proprietary software is not as secure as OSS as the source code is not available for perusal has driven many countries to consider OSS. This is also driven by the belief that the United States government is affiliated with Microsoft and the recent spate of virus attacks that targeted Microsoft operating systems.
>
> Hence security is stated as one of the most important rationales for OSS policy implementation. The foundation of this issue is that in order for the state to perform its

148 The process of auditing code by reputable organizations and the need for actual peer review help make software more secure and trustworthy. Organizations like the Electronic Frontier Foundation include audits and open source among their criteria for best security practices (EFF-US, n.d.-a).

> obligations it must store and process information related to its citizens. The state has an obligation to protect the privacy and integrity of the data and many governments believe that OSS can provide these solutions through OSS enabling the user to inspect the mechanisms used in processing the data. These reasons have been especially prevalent in countries like China, South Korea and Japan (*ibid*, p. 68).

NACI (2004) echoes these arguments, holding that "transparency enhances FLOSS security because peer review roots out 'backdoors' and bugs from the code" (p. 7). The DPSA (2006e) likewise holds a preference for FS in the domain of security, on similar grounds while noting its economic benefits. They conclude FS will allow the country to "exert greater national control. And the more we are able to develop our FOSS security skills base the more we will be able to reap these security benefits of FOSS. This should be seen as an enormous opportunity and national priority rather than a barrier to adoption" (*ibid*). Government policy documents thus endorse the choice to use Free Software in the interests of national security and protection against foreign government surveillance – a position consistent with the Free Software philosophy and anarchist conceptions of technological resistance to digital colonialism.

### 6.1.6: Free Software and Economy

While freedom, customization, security, sustainability, and education are discussed throughout South African FS policy documents, economic issues take center stage. The principal considerations are cost, socioeconomic development, and vendor lock-in. As the NACI notes, FS is "the cheapest way of generating software suited to the country's needs" (NACI, 2002, p. 2). Moreover, it is "an ideal jumpstart for entering the development arena" (*ibid*). Success in the knowledge economy is prioritized by the NACI. Free Software, they argue:

> … is an especially useful tool to allow developing countries to leapfrog into the information age. It encourages novel development models that have been demonstrated to be particularly well suited to take advantage of the work of developers collaborating across the Internet. In general, it also has a positive impact as an enabler for the creation of new markets and business opportunities (*ibid*).

Major economic benefits include:

- Reduced cost and dependency on foreign imports and skills;
- Affordable software for individuals, enterprise, and government;
- Lowered barriers to entry for software businesses;
- Participation in global software development networks;
- A cost-effective transfer of knowledge across national borders; and
- The stimulation of an indigenous software industry based on FS (*ibid*, pp. 3, 19).

South Africa, they contend, will save money and boost its economy by avoiding acquisition and upgrade costs while simultaneously utilizing its local skills base for training and maintenance (p. 17). The "return on investment… in software has to be an enhanced national skills base for software development, training and maintenance", "while reducing the country's dependence on imported software" (*ibid*). Free Software is thus "the logical way forward" (*ibid*).

Local economic benefits are said to accrue to small and medium sized enterprises, especially those focused on Free Software . With FS, the NACI (2004) states, "Africa could develop indigenous ICT industries which primarily address their own development needs… but which subsequently could emerge as leaders in the next phase of the global information economy" (p. 38). Proprietary ICT vendors would not "seriously consider many, if any, of the innovative ideas from this under-developed, seemingly unattractive market". With Free Software, by contrast, "the local entrepreneurs and champions are immediately empowered to pilot their ideas themselves, with very low start-up costs. They do not have to reinvent wheels, but can adapt and build on what is already freely available from the global FLOSS community" (*ibid*).[149] This congeals with anarchist conceptions of decentralized, autonomous control based on direct action – the ability for anyone in Africa to edit and control code.

The NACI (2002) seeks to avoid vendor lock-in through the use of FS combined with open standards. Proprietary document formats (for example, those part of the Microsoft Office suite) prevent use across software platforms.[150] This locks users into perpetual reliance upon Microsoft software. Writing at a time when Microsoft was unusually dominant in markets across the world, the

149 Eben Moglen (2015b) backs this position, arguing that FS helps small businesses compete by providing them read-to-go tools they can use, customize, and improve themselves in collaboration with the creative commons. For other scholars on the political economy of FS, see Benkler and Nissenbaum, 2006; Benkler, 2006.

150 Today, there is some ability to use Microsoft Office files across software platforms, but files often fail to format properly in other office suites or across versions. Based on this line of reasoning, the NACI (2004) states "the use of… freely available formats for document exchange...is a fundamental recommendation of this document" (p. 28).

NACI (2002) stated, “Proprietary software does not create the same opportunities” as Free Software (p. 15). Rather, “[a] large fraction of the market is sewn up by a small number of companies based in North America. Most of them already have their development operations set in a specific pattern and are not looking for new help, but simply to resell support via a small number of approved distributors” (*ibid*). The NACI’s end conclusion is that proprietary software favors foreign corporations at the expense of the local economy.

All subsequent FS policy documents affirm this position. GITOC (2003) emphasizes how FS reduces costs and dependency on foreign imports, facilitates collaboration, “lead[s] to better export potential”, and “contribute[s] significantly to human resource development, especially in the area of ICT” (p. 10). Examples of successful businesses investing in Free Software include IBM, SAP, Intel, and Silicon Graphics (*ibid*, p. 16). GITOC envisions a local software industry based on FS development, stimulated by public service usage of Free Software applications and solutions (*ibid*, p. 22).

The NACI, by contrast, emphasizes African technology development for Africans. They note that African countries “tend to be consumers… rather than producers to any significant degree” (NACI, 2004, p. 34). “Africa, led by South Africa,” they note, “has been importing developed world ICTs and employing them in a variety of ways for more than two decades, but with negligible impact on the inclusion and poverty alleviation for the vast majority of its people” (*ibid*, p. 36). The “corridor between Johannesburg and Pretoria” has an “ICT cluster, centered on Midrand” but “very few ICT products are South African in origin” (*ibid*, p. 37). Rather, they depict a situation akin to digital colonialism:

> The local ICT industry is made up of outposts (satellites, or fully dependent subsidiaries) of mostly multinational companies who find Midrand the best environment to sell on their products, developed in the USA or Europe, primarily into the developed component of the South African market, but also into other African markets.
>
> In the rest of Africa, much of the money used to purchase and maintain large ICT applications stems from donor funds. Hence, donor funds, which superficially appear to be ‘invested’ in Africa, are often used to buy developed world applications for installation in African government premises. The foreign reserves immediately flow back to the developed world, without circulating in the African economy, and the potential impact of the ICT

> 'solution' compromised, because it is a solution developed for a different problem, involving different people with different organisational circumstances and culture (*ibid*).[151]

The PNC (2004) focuses on jobs, local development, and independence. They likewise seek to resist digital colonization with Free Software, which "supports ICT spending with local companies, keeping that money onshore and thereby encouraging a valued, employable skills base to flourish domestically, which in turn keeps educated and skilled workers at home and encourages other educated and skilled workers to immigrate" thereby "drawing in talent" (p. 6). Moreover, Free Software, by "recognizing participation in software development at the level of the individual and not the corporation, and by shifting the value capture within the ICT industries from proprietary software" to "customisation and integration of existing Open Source Software… furthers the success of small, medium and micro-enterprises (SMMEs)" which can "drive job creation" and "grassroots empowerment" (*ibid*). The NACI (2004) expresses an anti-colonial perspective:

> … if the software is closed it leads to public sector dependence on particular vendors and the potential for externally imposed upgrades with associated additional licensing, training, and hardware costs. This also creates a problem in terms of innovation. Other organisations are unable to develop improved products, complementarities and add-ons when proprietary software and closed standards predominate. Particularly as software is often a complex technology, this is likely to hinder innovation in the long run (p. 27).

The PNC (2004) adds that foreign corporate domination based on the profit model is particularly threatening:

> Dependence upon imported ICTs can also increase reliance on foreign skills, creating incentives for skilled workers to emigrate and disincentives for workers to develop the skills for which there is less of a domestic market. Because of the profit potential and in order to support a global customer base, the corporations providing ICT products are motivated to become ever larger, and with their size comes additional political and economic clout, which is typically used

151 Moreover, the capabilities of multinationals "tend to be vendor specific and limited in scope" (NACI, 2004, p. 42).

to further their own advantages as they enter new markets and also used to suppress new competitors (p. 26).

In this context (2004), Microsoft is singled out for its monopolistic power: “The current environment shows a monopoly.  Regulate software procurement in all government organisations to ensure that any proprietary software, especially Microsoft, is not favoured without proper motivation and justification” (p. 8).  Critically, they note that Free Software is the major competitor to the Microsoft monopoly: “In South Africa particularly, we must take into account that Microsoft dominates software for computing and Internet access, and the strongest competitor to its dominance is not commercial software but is a collection of free software tools and operating systems collectively defined as OSS” (*ibid*, p. 115).  Government-driven usage of Free Software “correlates with innovation in ICTs” and is “a critical requirement to breaking the well-entrenched Microsoft monopoly”, the PNC adds (*ibid*, p. 125).

Writing in 2004, the PNC noted with concern a colonial dynamic: that South Africa’s ICT industry “is currently dominated by the provision of services, with very little original development taking place. Most companies are effectively franchised resellers of applications owned by overseas corporations and developed elsewhere” (*ibid*, p. 87; see also, NACI, 2004, p. 10).  On the PNC’s account, the open nature of FS and the encouragement of collaborative, communal, and team-oriented product production is “particularly well suited for the products highly valued in a Knowledge Economy, and proven across a range of sectors” (PNC, 2004, p. 6).  These benefits combine to combat a “psychology of dependence on foreign countries”, as well as preventing vendor lock-in, which “[reduces] market competitiveness as well as economic transformation” (*ibid*, p. 7).

Vendor lock-in, the PNC states, is not *automatically* avoided by using FS.[152]  However it “enables vendor independence as its inherent principle.  Proprietary software – by definition – requires proprietary support, maintenance and enhancement”.  They assert that “Research shows… the only advantages of proprietary software are those realised by the companies that develop proprietary software” (p. 116).  The PNC did not find a difference in skills difficulty for FS versus proprietary software, and was optimistic that the market was already adjusting towards FS skill sets (p. 118).

152 This is a critical point.  While the PNC was writing before end-users made frequent use of cloud services, it is quite relevant today.  Google uses the FS Linux kernel for its operating system, yet it locks its users into its Google Android ecosystem through tactics like the Open Handset Alliance, which mandates vendors use Google’s Android to feature a set of proprietary Google Apps (Amadeo, 2018).  Google also makes extensive use of FS in its cloud products, which are built to interoperate as a platform, making it most convenient to use Google’s ecosystem for one’s general computer experience.  This is a form of vendor lock-in despite the use of Free Software.

According to PNC's inquiry, FS will cost less than proprietary software in the long-run.  If there is an initial cost to customize software and train support staff, it will eventually be offset by savings on licensing fees.  Moreover, "the private sector will rapidly re-align its skill base and product/service offerings to meet Government requirements and demand, resulting in a normalisation of cost" (*ibid*, p. 41).  The NACI (2004) notes that "the funds covering [solutions associated with the time and skills of local ICT technicians] flow into and circulate within the local economy, whereas most of the licensing fees leave the country" (p. 20).  Government policy documents thus stressed local development and independence from foreign owners, who seek to impose dependency and control on South Africa's digital economy.

### 6.1.7: Free Software Policy Implementation

Despite well-reasoned policy perspectives advocating the use of Free Software in the public sector, the DBE is not following the DPSA's advice.  In South Africa's short history of e-education implementation, nonfree software products have been favored for schools.  In 2003, Microsoft signed a five-year $250 million Microsoft Partners and Learning contract with the national government to offer Microsoft software and services to all public schools.  During this time period, Microsoft trained 17,000 teachers to use Microsoft software.  The PNC (2004) audit found that the "number and impact of currents projects" using Free Software across all components of government is "insignificant in the broader context of software used or developed" (p. 118).  Free Software was slated for use in ten pilot schools in the Western Cape through a sub-project of the Khanya project.  However, schools did not pursue it "given the perceived lack of available Open Source Software expertise" (*ibid*, p. 107).  According to researchers writing years later, Free Software was never substantially used in the Western Cape.  Instead, Microsoft dominated where computers were implemented (Johnston, Begg and Tanner, 2013).  Free Software was likewise "snubbed" in the teacher laptop rollout of 2010 (Tectonic, 2010).[153]

In 2008, the national government renewed their contract with Microsoft for three years (Masemolo, 2008).  By 2011, the national contract fell away, and some individual provinces signed new school agreements with vendors.  As of 2018, Microsoft software remains the leading choice with agreements signed in five of nine provinces.  According to interview subjects speaking off-the-record, one province in is talks to go with Google.  Interview subjects said the remaining three provinces may

153 This initiative partially subsidized the purchase of laptops by teachers.  The initiative "fell dead in the water", according to Chloe (2016).

have no overarching contract for e-education software, and therefore may be making use of many types of software. This likely includes Free Software. On Richard's (DBE) (2016) account:

> Three provinces have not entered into an agreement, and I know that the province of Northern Cape is actually using open source software in… their schools, in terms of operating systems. So it's not a blanket thing, and some provinces, such as the Northern Cape, and perhaps Limpopo and KwaZulu-Natal, have no Microsoft agreement and as such they are using open source software.

Limpopo is currently using Free Software in basic education (Sekoati, 2017), while Microsoft recently renewed a license for schools in the Gauteng province (MyBroadband, 2016). As of April 2017, the Microsoft Partners in Learning website lists contacts at Western Cape, Free State, Northern Cape, North West, and Eastern Cape for "access to the school agreement software" (Microsoft, n.d.-c). It is not certain that these provinces have a Microsoft School Agreement. Veronica (Microsoft SA) (2017) felt it was "inappropriate" to disclose to me which provinces have signed a Microsoft School Agreement. A lack of transparency about provincial contracts underscores the anti-democratic nature of South Africa's e-education policy. Such a neoliberal orientation places market actors – private corporations – in a position to exert influence in public schools at the expense of school participants and the broader public.

### 6.1.8: Recap of Free Software Policy

To recap, the software policy documents just reviewed – NACI (2002), GITOC (2003), NACI (2004), PNC (2004), and the collection published by the DPSA in 2006 – express a relatively enlightened policy which comports with the theoretical position taken in this dissertation – an anarchist articulation of the Free Software philosophy, with a concern for resisting digital colonialism. While the government does not use the term anarchism, they often take an anarchistic position. First and foremost, they recognize that FS empowers individuals and communities to use, study, and modify the software as they see fit, empowering them to control their own computer-mediated destinies as individuals and collectively. In the domain of education, they promote open source for the purpose of learning how software works, including for the cultivation of coding skills for the eventual development of an local technology ecosystem built for Africans and South Africans, not foreign interests. They make clear that foreign corporations, especially those based in the United States, threaten local development and aim to dominate their technology ecosystem, especially through vendor lock-in and other forms of dependency. This expresses an anti-colonial perspective which criticizes the forced underdevelopment and perpetuation of dependency on colonial powers (Rodney, 1981 [1972]; Slater, 1975; Nwanosike and Onyije, 2011, pp. 41-47). Predating the NSA revelations reviewed in Section 3.3.4, the FS policy documents point out the dangers of state-corporate surveillance buried in proprietary code. To counter foreign domination (i.e. digital colonialism), they recommend software that the people can control and the government can support, even if immediate implementation is cumbersome or costly in terms of support and maintenance. Thus, they take a long term view on policy implementation.

The documents guide South African software policy for use in the public sector (including education) were formulated in the early 2000s, before critical changes were made. These include the increase of mobile phone ownership, the rise of cloud computing, and the expansion of dominance by US multinationals in the tech ecosystem. If written today, the software policy papers would have to accommodate those developments, including surveillance capitalism. While they do not speak much of freedom and liberty, the principles expressed in the documents are largely consistent with the Free Software movement. Given their statements of principle about control, education, and local development, we can reasonably state that the original intent of the documents express antipathy towards cloud centralization.

There is some nuance the policy documents worth noting. In particular, GITOC (2003) takes a more "open source" kind of philosophy towards than a Free Software approach. Recalling Section 3.2.2, this means that they see reasons to adopt Free Software in more utilitarian terms (i.e. it produces better software) than in anarchistic terms of liberty, power, freedom, and democracy (GITOC, 2003, p. 3). Additionally, each of the policy documents place heavy emphasis on cost, as expressed by the amount of times and order in which they discuss the reasons the public sector should adopt. While this might be understandable for a country struggling to alleviate mass poverty, as demonstrated in Chapter 3, the strong moral commitments to freedom expressed by Stallman (2010a) and Moglen (2004, 2017) are needed to foster pro-poor development and resist digital colonialism and the new age of surveillance capitalism.

As a final point, while the policy is endorsed by the Cabinet and binding on the entire government, as we will see, implementation has not occurred and even when principles of "free and open source" and privacy are ascribed value in rhetoric, there is no action being taken to actually implement FS and protect privacy. Nevertheless, the government's software policy provides a basis for pressuring the government to implement Free Software instead of proprietary and other nonfree (e.g. cloud-based) systems in education.

### 6.2.1: Free Software

In Chapters 1-3, we saw how technologies deployed in public schools are not neutral, and the choices made for schooling impact South African education, economy, and society. We also saw that free vs nonfree software choices shape social, political, educational, and economic power in society. Making technology choices that empower South Africans, these chapters argued, is critical to the society's digital future.

Interview subjects held different opinions of Free Software in accordance with conceptualizations of technology and human rights, as well as according to occupation. On the one hand, digital rights experts took a strong position in favor of the use of Free Software in schools. On the other hand, government officials and stakeholders took a weak stance on Free Software – one which is friendly to proprietary software – and frequently showed little thoughtfulness about the subject. The following two sections will first consider government and stakeholder opinions, and then turn to digital rights experts.

### 6.2.2: Government and Stakeholder Positions on Free Software

Officials interviewed at the DBE, GDE, DTPS, and DST were clear there is no substantive discussion in government about Free Software for OPE. This was expressed by their preference for Microsoft and a secondary preference for Google, as well as in interview responses to questions about FS. This sections reviews their interview responses. When asked about FS for education, Simon (DST) (2015) said:

> There is a preference from the IT sector to make use of Open Source Software because it's just obviously cheaper and then also proprietary software has license fees, annual license fees, that can become quite a high figure. So yes, government has made the decision some years ago to go for Open Source, I'm not sure if that is still being driven. I think DST was part of the experimental phase of it, as well as CSIR. CSIR… are using Open Source Software quite a lot,

and they prefer it.  DST is still making use of Microsoft for various reasons – Microsoft equipment, Microsoft software.  So I'm not sure if open source is really actively motivated currently by government.

I would imagine that it will be cheaper to get the software.  If you get free software yes, it's fine.  I'm not sure if the support is available… and there often you pay more for the support then you would've paid for the software with the support included.  So I think that is still not taken to its final steps.  I know that Gauteng Education Department-- sorry, DBE[154] has earlier this year, procured Microsoft software.  They said that they prefer Microsoft software.  I think they got a lot of criticism for that.  And again I'm not up to date on what was the outcome of that talks.

For Simon, *price*, rather than freedom, is the issue.  His statements about support contradict government policy, which clearly states that even if costs for support increase in the short term, the government should implement Free Software to drive the shift to FS for the long run.  The DST does not put much effort into developing FS, he said, because the Department of Trade and Industry (DTI) handles the issue and the DST can only provide support.  This does not preclude the DST from moving into that area in the future, he added.  At the moment, ICT and education is handled by the DBE:

> To focus on education and education enhancement is the [responsibility of] Department of [Basic] Education.  They need to do that.  They can ask us to help on particular aspects like ICT and education and how to implement that and how to develop that, what problems do they need – so we can do some research on that to enhance that.  But primary school education is not our main focus.  That may change of course but at the moment it's not (*ibid*).

Software development is thus disconnected from the DST's central task "to create innovation in various fields" (*ibid*).  When asked about FS for 21st century development – including "*local adaptability and production for local needs rather than import[ation] from companies that are looking out for their own interest*" – Simon (2015) provided an indirect answer.  The DST, he said, "is focusing on software but more to mobile development or app development".  This suggests that the DST is not concerned with digital colonialism, as government documents articulated earlier.

154 Simon must mean Gauteng Department of Education, as software agreements are made at the provincial level.

When asked about Free Software implementation, Herman (DTPS), who deals with network and security issues, did not address the pros or cons of FS. He said said a Free Software migration is the responsibility of SITA and ultimately, government departments:

> There has to be a migration period in terms of them moving away from proprietary over to FOSS. However, it then basically remains the responsibility of DPSA, together with SITA, to change the mindset of respective government departments to then change over. There's no mandated policy to say, 'you will use FOSS' or 'you will use proprietary software'. I do know that there are some government departments that were piloting FOSS. However, there were proprietary issues when it came to integration. So that process basically was then stopped (Herman, 2015).

This again contradicts government policy which endorses FS for security purposes (including security against the developer) and advocates moving forward with implementation despite short-term costs with migration to FS. Sipho (DBE) (2015) said that “there’s no obligation to” use Free Software, but that “the state would love to” and “where possible, we use open source”. This contradicts the implementation record, reviewed in the previous section, as well as comments by Simon and Herman, who suggested that FS implementation and development is a low priority and not occurring to scale. When asked about “*the kind of freedoms that come along with Free and Open Source versus proprietary*” software, Sipho said:

> We don't even let ourselves get into that debate because you are talking to the Department of Education here – what matters to us is education. And… there will still be some advantages and disadvantages on both sides. That is why for us what matters is the educational need. There is no way you can just have one [option] catering for all educational needs. So if open source helps you do what you want to do, because that is what matters, then you use it. If on the contrary, the other [proprietary option] offered it, you use it. So there is no restriction as to what one needs to be using because what matters to us is the educational need. Simple. And that again is a debate on its own when you are thinking in terms of coding and so forth – we are not into that space (*ibid*).

Sipho's comments suggest that e-education technology is neutral, and that the politics of technical architecture have no bearing on education, economy, and society, as stated in policy documents. He expresses a passive perspective on software which contradicts government policy and relegates its conceptualization, development, and design principles to foreign corporations. When asked how the discussion of Free Software is being conducted in 2016, Tefo (GDE) (2016), responded:

> The policy states you will give first preference to the use of open software but where it is not feasible then you can look at proprietary software. Now most organizations or most government organizations are actually using Microsoft instead of using open source software. And the excuse they give is of course there is support behind the software – I mean can you imagine if something went wrong and your whole department went down because of software?
>
> But if you have a specific company that is responsible for providing software updates, for making sure that they provide the correct support… We have to make sure that everything is perfect, we have to make sure that they take it to another level. So yeah, I think most of government… they look at… what… is running in terms of using open software vis-a-vis proprietary software. And the same maybe for the sake of stability, for the sake of being sure that I won't get issues, or I won't get problems, or I won't get challenges – they will go for proprietary software… The policy… [is] if it's not possible, then you use the proprietary, and most of them are going for proprietary.

This position contradicts government policy, which praises Free Software for its *strength* in the domain of security. It also suggests a lack of awareness about how software works, as there is no reason to believe departments will "go down" due to the use of Free Software instead of proprietary software. The position taken by Judith Bishop (Microsoft) was similar to Tefo's. When asked about the liberty that FS provides individuals and communities, she remarked:

> But you know what the flip side of the coin is, don't you? … Which is that you've got to have sysadmins there who can do that for you. I mean not everybody is going to be able to fix it if you just give them all this Free Software. I mean that's why Microsoft and/or any other major company sends you periodic updates. It's because there's an army of people here checking on the security etc. etc. of the software, and then they distribute it for free out to people. And if

> you just take on something free, and then rely on everybody in your organization, knowing what they've got to do any one or other time, that's a huge responsibility. You would need to set up your own army in the schools. And pay for those people. You're not going to get everybody to be tech-savvy. It really is two sides to the coin. And Richard [Stallman] I think understands that, but he's tech-savvy! I don't know how this works in a developing country to be honest (Bishop, 2016).

Bishop's position on security is not empirically supported – Free Software builds are updated and patched on a regular basis,[155] and Microsoft often fails to patch known security vulnerabilities.[156] Moreover, her recommendation (using Microsoft software) calls for the perpetual dependency on a vendor (Microsoft) that the government explicitly rejects as a matter of policy.

Richard (DBE) (2016) offered negative opinions of FS. He argued that a proprietary model helps ensure quality production. When asked if copyright is beneficial to the poor, who cannot afford to purchase information goods, he said that free and open publications and software have lower quality because they are not being built for profit (i.e. copyright "encourage[s] people to produce quality stuff because they own it"). He also claimed "there is no support behind it". These comments contradict the FS policy documents, which hold that the Free Software development model has erroneously been deemed inferior to proprietary software, and that the proprietary/profit motive in software is problematic to South African interests. Richard also said FS offers a tool for creativity (consistent with policy documents), but contended (without offering any evidence) that poverty limits its applicability to South African schools (contradicting policy).

In contrast to government officials, some stakeholders took a sympathetic view to Free Software. Alister Payne (Cloud Ed) (2016) said he is "a Linux guy". He remarked, "What is the role of Free Software [in education]? Not big enough". Payne also endorsed GNU/Linux for servers, stating that, "If I run a server, and I run one Windows server because I do legacy stuff, all my other servers are Linux servers, because they're just simple, easy, effective. No concerns on licensing, they get the job done better, faster" (*ibid*). Payne echoed the Free Software philosophy, expressed in policy, when he stated that the FS model is grounded in sound scientific principles:

155 Schyren (2009), for example, found no statistically significant differences in patching behavior between commonly used open source and closed source software vendors.
156 See, for example, Washkuch, 2007; Keizer, 2010; Warren, 2013; Fox-Brewster, 2015; Osborne, 2015.

> I’m hugely in support of any of that open source, not just software. Conceptually it’s built on good academic principles of peer review and the only people that normally get this are academics themselves because sharing of knowledge doesn’t seem to be a big thing in academia. The idea of peer review and sharing [and democratization] of knowledge is fundamentally what… academia is about and what open source is about (*ibid*).

However, Payne’s company, CloudEd, chooses to exclusively service Google, which includes proprietary software for critical parts of its ecosystem (Amadeo, 2018) and frequently makes use of cloud-based services that nullify the freedoms granted by FS. Thus, while Payne endorses open source principles, much of what Google does contravenes the principles of Free Software.

Some South African policymakers have made vague statements about the need to shape and customize digital technology. For example, a presenter at the DTPS’s ICT Policy White Paper Symposium noted that digital technology is changing nearly every aspect of society. It thus “behooves black people” to “get involved in creating value” so they can “direct the vision and be able to find opportunities in the communities that you have” (ICT Policy White Paper Symposium, 2016). DTPS Minister Siyabonga Cwele said South Africa needs to build “Information Society Highway that will enable us to be active participants in the global Information Society” (SA Gov, 2015c). Yet government officials have a passive outlook on technology development, and Microsoft remains dominant. When asked about South Africa’s capacity to shape the evolving digital ecosystem, Ashley (Pearson SA) (2016) said that “Microsoft is winning the battle here in Africa. They’re absolutely the whole stack as far as software and rollouts are concerned… I think software like Google has changed people’s usage of software rather than them [the people] trying to change the software themselves”. She added that a small percentage of users (maybe 2%) actively shape software while the remaining 98% use it passively on the back of those who develop it, which nevertheless moves things forward (*ibid*). Unlike policymakers, Ashley thus recognized that South Africans can harness Free Software to advance technology, even when a small percentage of the population is developing it.

The DST could be one place the government can assist the production and distribution of FS of the public interest. Yet Simon (DST) (2015) said that the DST does not “prescribe to a research team what software they need to use”, be it Android, Microsoft Windows, or Apple iOS. He did not mention GNU/Linux, suggesting a lack of consideration for use in DST projects he had in mind. Simon concluded that “in the future we may see that government will be more open towards various forms of software development" (*ibid*). This suggests government's preference is currently for proprietary and foreign corporate options, a position which contradicts the position calling for government to prefer and implement Free Software options.

The ongoing preference for proprietary and foreign corporate software locks South Africa into foreign corporate products and models. Key interview subjects noted that Google and Microsoft are primarily motivated by profit, which bleeds over into the issues of surveillance capitalism and its monopolistic character. Google does not profit much from its Apps for Education suite – the service is free for schools to use while their company provides free limited support through Internet-based troubleshooting.[157] Given that Google is a for-profit corporation and is not generating revenue directly from G Suite for Education, one might wonder: what is their motivation? When asked this question, Jill* (Google SA) (2016) provided an answer, but asked to keep it off-the-record. Alister Payne (2016) stated that Google's incentive is to dominate the market by pulling children into the Google ecosystem:

> The model that Google has for education in the States, and why that's done so incredibly well, is although Google Apps is for free, they've done incredibly well on devices. So the Chromebook has gone from zero two years ago to 51% of all American sales.[158] So there are a couple of sides to that. (1) One could say that Google wants to do good in education because it's part of Stanford University and I think that's part of it, I don't believe that's the overwhelming part of it. I think [it's because] they're a business. I think (2) they want to dominate the market, in a market that was heavily dominated by Apple in the education space in particular, and in lesser degrees Microsoft. And they needed to get a stronger hold in there, and they needed to do something really radical. And I think that they had a bigger plan. They were going to make money more out of things that were going to be of service and value, and that's what they've done with Chrome devices.
>
> They also have the Android Play Store which they making huge amounts of money on, an Apple-esque type of environment. So although they're directly not making money they're bringing people into their environment and they're making money indirectly off that. But that's always been their model.

157 According to Jill (2016), schools can purchase extra support at $30 (~R400) per Chromebook.
158 Jill (2016) said Google does not earn money from Chromebook sales (see also Bort, 2014).

In other words, Google aims to capture the emerging market by funneling learners into their other products – a process of digital colonization via surveillance capitalism. They do this in part through vertical integration to lock users into their Google ecosystem. For example, Google's "free lessons" for teachers include things like how to search the web – using *Google* Search. From an education standpoint, there are a variety of web search engines available, from Microsoft Bing to DuckDuckGo – the latter of which does not collect data about and profile its users. These web search engines provide different search outcomes, and a comparison of each would provide *education* to learners about how the function "search" works on the Internet. A truly educational plan would expose learners to the different search engines, how they work, including the surveillance practices of each, and its ramifications for society, including issues like racism and algorithmic bias (Noble, 2018). Yet Google only includes a sanitized, depoliticized version of its own search feature, even though the task is to learn about *searching the Internet*, not *Google* Search.

Google also uses a Google-only approach across its "free" lessons about how to use computers. Under its country-specific "Africa" section, Google provides slides for how to use "web browsers" (Google Chrome), "language tools" (Google Translate), "brainstorming tools" (Google Wonder Wheel), "believe it or not" (Google Search to determine "what is credible") (Russell, Bergson-Michelson and Maverick, 2011a, 2011b, 2011c, 2011d), and so on (Google, n.d.). In other words, Google is teaching educators and learners to become Google product users. Google will then profit by data mining the lifelong habits of South Africans that become hooked on their products. Placing Google in schools spreads Google's surveillance capitalism agenda.

By contrast, Microsoft's primary source of revenue comes from proprietary (and increasingly surveillance-based) software goods and services. If South Africans continually use Microsoft products, they will have to continually purchase Microsoft software for personal use and in the office. This poses a major ethical problem for e-education policymakers. More than half the population lives on less than $3 (R44) or less per day. What happens when learners leave school and have to pay to access Microsoft software?

When asked about the poor majority, Judith Bishop (Microsoft) (2016), a white, wealthy individual from South Africa, responded that "you buy beer, you buy cigarettes, you buy all sorts of things. You can't really say you mustn't buy software these days". She remarked that *her* friends, families and colleagues "wouldn't live without Microsoft Office" (*ibid*), implying that poor South Africans can do the same. Sania (Microsoft SA) (2016) said that Microsoft 365 is available online for free, but she did not mention that you need an online connection, and it is "crippleware" (i.e., most features are not available without purchasing the software).[159] A free version of Microsoft Windows or Microsoft Office is not in the cards any time soon (*ibid*). As Payne put it, Windows 10 was given away for free, and there will only be subscription-based Windows going into the future. I.e. "They shifted from a licensing model to a subscription model. So all those people that are now on Windows 10, they're going to come back to them and say, we're going to start charging you" (Payne, 2016). This scenario is not conducive to poverty.

Simon (DST) addressed affordability in response to a general question about how copyright prevents the poor from obtaining access to knowledge when they cannot afford to pay. The population, he remarked, has an *entitlement mindset* derived from the anti-apartheid era:

> I think we have a problem in the country in terms of ethical behavior, or ethical perception. In the sense, we want electricity for free, we want water for free. And that was even offered by politicians some time ago. Even in the previous, pre-free South Africa, apartheid South Africa, I think one of the ANC's strategies was to promote civil disobedience – of course, to bring down the existing government, but I think that perception has taken hold of the people. They feel, 'well, if I don't like something, I don't have to pay for it.'
>
> In terms of software, I think the same thing applies… Bill Gates is a billionaire, Microsoft has lots of money, Google is running the world – so they feel, 'those rich guys, why do I have to pay them?' So that may be a perception that the local guy [has] that is little-informed of software (Simon, 2015).

This position contradicts policy documents, which state that savings on licensing fees are an important reason to adopt Free Software. Moreover, Simon expresses a view sympathetic to Big Tech dominance in South Africa, a symptom of digital colonialism explicitly rejected by government policy. The government is supposed to use Free Software to cut costs and develop African technology for South Africans. He also does not seem to empathize with the position of the poor, who are stuck in severe poverty as a result of historical injustice (see Section 1.1).

Much like Google, Microsoft aims to entrench its product in the market by spreading it to schools. Microsoft Advantage allows educators and learners to use Microsoft products purchased

159 As Sieber (2017) put it, "[i]t'll work for simple tasks, like writing a letter, but that's about it".

through the provincial Agreement for free on up to five home devices. South Africans receive subsidized access to Microsoft software (which biases them towards Microsoft products) but will then have to pay out of pocket to keep using it. This “free sample” tactic potentially subverts the uptake of Free Software, as free copies of Microsoft products prevent the spread of FS alternatives such as GNU/Linux (Gramstad, 2016; Andy, 2014). As a result, Microsoft perpetuates lock-in effect by creating dependency on their technology for use and development. When addressing Microsoft deployment in schools, Alister Payne backed this point, (2016) stating:

> The examination in matric is on Microsoft Word and Excel. Not on spreadsheeting and word processing – what it should be – it’s Microsoft Word, Microsoft Excel, Microsoft Access. Again, who in industry uses Microsoft Access? No one. Databasing? Yes. And again, the example is here, we don’t have to teach our kids how to use Microsoft Outlook. No. We teach them how to use emailing and etiquette by emailing and how to respond professionally. And writing and word processing should have concepts behind them. It shouldn’t be written in Microsoft Word, but the exam is written in Microsoft Word. And there’s been a huge bone point about that. I know guys in the Eastern Cape have tried to put in Open Office and have been quietly accepted but I think that’s being bunted out again.
>
> So I don’t believe that the decisions that are made on the ground, practically, as I look at them, have taken [up] open source and are moving towards open source at all. In fact I think it’s contrary. I see them being held captive – exactly what they were trying to miss, they are now locked in and captivated by Microsoft, who is pulling about 20 million Rand licensing for every single-- six different provinces per year. You know, that’s 120 million Rand if we do an averaging out. That’s a big contract for Microsoft.

Echoing FS policy documents, Payne highlighted the vendor lock-in strategy, its adverse impact upon the budget, and, most importantly, that the *educational* approach to technology should emphasize learning the various technologies themselves, not particular branded versions. Taking a more utilitarian approach, when asked about the use of the Ubuntu operating system, Marlien Herselman (ICT4RED) (2015) said that they opted for Microsoft Word because that is what teachers like to use. In reference to Free Software, she explained:

> The idea wasn't to give them Open Source Software to do their daily activities. The idea was to use the tablet to supplement them for their current activities, and teaching and learning. If those activities focus on Word and Microsoft stuff, then that is what they are familiar with then. We can't introduce new things because it's going to create a huge confusion, that's not the idea. It has to be a smooth transition. It's already a terrible, it's already a lot of information for them to digest with the training modules. So you can't also put on top Ubuntu and Linux.

It is not clear why LibreOffice or GNU/Linux would be more difficult to use, given that they are easy to use and include only subtle differences in features for word processing, spreadsheeting, and other basic tasks. Moreover, considerations of autonomy, long-term cost, privacy, and broader digital ecosystem issues were not factored into the choice to go with Microsoft, in contrast to government policy. The more teachers use Microsoft products, the more Microsoft entrenches its dominance in the education system.

Microsoft has amassed a small army of teacher trainers in South Africa, whereas Google does not have a substantial teacher training presence in SA (or if they do, it is not publicly visible). Both corporations are devoting resources to training programmers. Surely they understand "Skilled programmers are the key to success in [the software] market" (MarketLine, p. 15). As we saw in Section 3.3.6, developing programs for various brands of software biases development toward their own corporation's ecosystem. As a consequence, alternatives, such as skills development for community-based GNU/Linux operating systems and FS repositories, remain marginal.

Microsoft thus further deepens their dominance in schools and society by training IT personnel. Cloud-based technology may change this dynamic, but not necessarily in a way that supports Free Software. Alister Payne said that broadband-connected schools are turning to cloud-based software services like Microsoft Classroom and Google Classroom. Local service-level agreements are drying up because they are going directly to the cloud platform provider, Microsoft and Google. Cloud providers then absorb support services into their cloud platforms (Payne 2016). Given that Microsoft and Google exercise complete control over their cloud services, they can (and do) use it to generate revenue through rent via their lock-in platforms (see Section 3.3.2).

The profit motive, coupled with foreign control, secures the dominance of product development for US multinationals. Greg (Microsoft) (2016) made this clear when asked about access to Microsoft for the poor once school subsidies disappear:

The simple truth is that most of what Microsoft pays attention to right now is places that are going to be profitable or places where they see growing market in the future, and they're not in the business of just providing software for the sake of software if they don't see potential market for it.  And I think that’s going to be true for any corporate, any multinational that you talk to.  So Google will provide tools in accessing free services to the degree that they believe it's going to be recruiting more users for services that they can provide advertising to.  And there's little interest in just providing services if there's no avenue for expanding further use of Google services.  The same is going to be true for Microsoft… I would say in the education space, there’s not a great deal of actual software that Microsoft provides in that space.

This vindicates policy documents which oppose the deployment of foreign corporate products on grounds that production is for Global North, rather than South African, contexts.  In this case, Microsoft and Google have tacked e-education products onto their software offerings so they may channel the youth into their profit-oriented models for products catered to people in wealthy societies. Their strategy is to lock users and developers into their own ecosystem to capture market share and ensure perpetual dependency on their own products.  The real or perceived time, training, change management and other costs to switch software benefits powerful incumbents (MarketLine, 2015, p. 17).  The more deeply incumbents can root their products into society, the more money they make – and the harder it becomes to root them out.  This builds in path dependency (Starr, 2004, p. 2) that makes the initial choices for education all the more important.

In short, the government is making technology choices that benefit foreigners at the expense of South African education, economy, and society.  Silicon Valley corporations have captivated the hearts and minds of government officials, whose views are at odds with official policy designed to resist colonization.  The value of Free Software to public education was viewed differently by experts consulted for this study.  We turn to those voices next.

### 6.2.3: Digital Rights Experts on Free Software in Education

In the previous section, it was demonstrated that e-education officials hold perspectives that contradict the policy documents outlined in Section 6.1.1.  In contrast to these officials, this section will show that experts on digital rights held Free Software is essential to education and society.  Moreover, in Chapter 3, it was shown that software code and digital infrastructure provides those who design the technology the power to usurp legal, institutional, and social norms impacting the political, economic, and cultural domains of society. This is as true in education as it is in other domains for which this insight has been applied (copyright, free speech, torts, and so on). The chapter also illustrated how the Free Software Movement has outlined conditions necessary to socialize digital infrastructure (including software, hardware, and network connectivity) to bring it under the direct control of the public. The FSM expresses an anarchist perspective on power which emphasizes individual and communal liberty, communal ownership of property, direct action, self-governance, and decentralization. These insights are important for education technology because the loss of individual and community control over technology in a technology-mediated education system provides control *over* the technology users – learners and teachers – by the owners of the technology. By contrast, with Free Software and other People's Technologies, communities are empowered to own and control their own computer-mediated experience. This position was emphasized in my interview with MIT Media Lab's Walter Bender, former President of Software and Content for the non-profit One Laptop per Child Program, the largest education technology initiative in history. Bender is founder of Sugar Labs, which maintains Sugar, a community-run Free Software desktop environment and learning platform. His responses help set the frame for the Free Software position on education technology.

In an interview, when asked whether or not he believes Free Software is ideal for education and ICT literacy, Bender (2015) told me, "I think not only is it ideal, I think it's absolutely necessary. I don't see it working any other way". Free Software is "*the* critical question" for education technology, he said. For Bender, "technology is a tool, technology is a culture, and technology is a community". Only Free Software can "engage these kids" with each of these three things.

Elaborating on this point, Bender reasoned that schools are often about "extrinsic motivation" – the "carrot and the stick" – but that has "nothing to do with what really motivates people". Instead, he argued, "we really need to motivate people around what they are passionate about", and in order to do this, "they need to have autonomy, they need to have a sense that they can actually master something, and they need to have a sense of purpose". Without Free Software, you lose autonomy and put "a very low ceiling on what they can actually master. And you're basically saying you're going to give them a sense of purpose as opposed to let them find their own sense of purpose". If "what you want to do is raise a bunch of obedient kids," Bender continued, "then forget everything I just said. But if you want to generate a generation of kids that can solve problems, innovate, and bring the country to the next level, then you want them to take intellectual risks, as students", and you want them to challenge themselves, and ideas. “Not only is that enabled by Free Software”, he explained, “it’s tied to the culture of Free Software. Learning is not something that’s done to you, it’s something you do”.

Thus, Bender stressed that Free Software is ideal to motivate kids, on constructionist grounds (Papert, 1980).[160] But if that sounds abstract, “it actually boils down to very tangible things as well”. Bender provides a concrete example in a TEDxKids talk given in 2011. In this case, he had written an abacus program for the Sugar (Free Software) interface students were using in Caacupé, Paraguay. His version was the Chinese abacus, but there are many possible variations. In Sugar, a small gear icon is used to modify the program. Not only can learners use the graphical interface to change the abacus – how many rows, the base number, and so on – but they can “view source”, which allows them to see the source code running the program. They can then make their own copy of the code and modify it. Utilizing the freedoms to study and modify the software, teachers in Caacupé invented an abacus with fractions for use in their class.

Bender draws on examples like these to show how in the Free Software community, there is a culture of invention, sharing, and critique. Using Sugar, students don’t use PowerPoint, they invent (a basic version of) PowerPoint (Bender, 2011).[161] In the example from Paraguay, the students were “learning they can solve problems, that the world isn’t complete, that problems aren’t solved, but they can solve them themselves, and become part of the process of ideas, ideation, making things and doing things”. For Bender, this exemplifies Alan Kay’s quip, “technology is anything invented after you were born”. He added a statement from Seymour Papert saying, “the context of human development is always a culture and never just a technology” (*ibid*). Because Free Software provides users the freedom to use, learn, share, and modify the technology, the corresponding culture encourages constructive engagement.

The Turtle Block computer program provides a case in point. Key members of Sugar Labs forked[162] the Free Software education program Turtle Art after receiving requests from a Uruguayan teacher to modify features of the program. Turtle Art is based on a FS license which allows end-user modification, but it was difficult to facilitate end-user modifications. The new version made it easy for end-users to produce and share modifications. As Bender, Solomon and Urrea (2013) explain, “We

160 South African-born Papert was an early pioneer of artificial intelligence and constructionist education, co-inventor of the Logo programming language, and a co-founder of the MIT Media Lab. Bender (2015) said he became interested in technology and education “by hanging out with Papert in the late 1970s, early 1980s.”

161 Bender is not claiming that learners build software to rival Microsoft PowerPoint. Rather, the learners can create PowerPoint-type slideshows on software they build through manageable coding and construction processes available to them through software built for that purpose.

162 Forking is a software practice where a FS project already in existence is modified to become a different program. It is a “fork” because the original program remains. For an in-depth explanation of forking, see Mako Hill, 2005.

forked Turtle Art and began a series of refactoring it to make it easier to add new blocks: first through inline extensions and ultimately through a plug-in mechanism… By giving our users not just the license but also the means to make modifications, they have taken responsibility for shaping their own learning environments” (p. 3).

In contrast to Free Software, commercial software like Google Android is poorly suited for education, Bender argued, in part because it was not designed for the end user. Instead Apple iOS and Google Android were “designed for the… phone company model of consuming services as opposed to the computer model of making, creating, being expressive, being independent thinking”.

For Bender, software itself does not rigidly determine outcomes. Free Software alone, for example, will not *guarantee* active construction of software environments. He endorsed Free Software because it provides the *opportunity* to for learners to get actively involved in designing systems. In his case example, half the patches in Sugar had recently come from learners themselves. Bender (2015) argued that kids each have different interests, they want to “climb different mountains”. However, “the mountains have to be there… you need to have the mountains [there] for the kids to climb”. With the mountains in place, you still need to give the kids the resources, such as encouragement or instruction in an extracurricular program.

Much like Walter Bender, Cindy Cohn, distinguished lawyer and Executive Director of one of the world’s leading electronic civil liberties organizations, the Electronic Frontier Foundation (EFF-US), offered a strong endorsement of Free Software for education. In response to a question about school use of corporate services (like Google Android or Microsoft Office 365) versus FS (like Ubuntu without spyware), Cohn (2015) stated:

> The ability for a tool to be changed and adapted and for kids to feel like they can have control over what’s going on is just much easier in an open source environment than it is in a closed environment. And I think that’s a value that the schools ought to reinforce where they can. That these tools, I mean this is a second level from the pedagogical – what tool you’re using to teach them [with], but I think you know free and open source software comes with it the idea that you have control, that you can build it, and if you don’t like the way this works, you can build it [yourself], you can do the next thing that moves you from being a passive recipient to an active participant in the development of things. And I think that’s a really important value.

I suspect the school district has to look at the whole range of things, right? What is the functionality, how hard it is, how much does it cost. Usually open source tools are cheaper in the long run than the closed source ones because you've got a wider range of people who come in and fix it. You've got a wider range of ability to manipulate it, you're not stuck in a service contract with just one [company where] you only get the updates that the company wants you to get, you can't go find some independent person who's done something interesting and feed that into your system. So I think the free and open source community is actually a better model in a lot of ways for an educational context.

Alfredo Terzoli (Rhodes University) (2016) took a similar stance to Cohn. When asked about the relevance of Free Software to SA schools, Terzoli made two points. First, he said, "software is the codification of human knowledge… so it should have a special status" because you can't "lock down" the source code and human knowledge it embodies. Second, he said Free and Open Source software is "the engine that brought out the big innovation, if you like, in the field of ICT" (*ibid*). It proves that you don't need patents, and "the great majority" of tech innovations "that have been built have been built on this type of software, and the big players… have been riding on that, and are still riding it" (*ibid*). Crucially, he added, "From a South African perspective, it beats me completely why you would want to create dependencies on software that can be built only in other places because they have the source, you don't have it, when you could actually start building on things that are as much yours as they are everybody else. So in a sense, why do we want to be re-colonized?" (*ibid*).

For Terzoli, software that should be used should be "open source" and "completely controllable" (i.e. excluding centralized cloud services) (*ibid*). Stressing the anarchistic and anti-colonial values of self-determination, cost, and independence, Terzoli and Cohn's outlook is consistent with government policy in SA, in contradistionction to e-education officials. Eben Moglen concurred with her assessment. According to Moglen, Free Software is about growing knowledge, autonomy, and freedom, with ties to the political economy. In an interview, when asked if policymakers might have a consumer's-eye-view of technology, where the difference between software amounts to little more than where the "start button" is located (that is, a trivial detail which misses important differences between FS and nonfree software), Moglen (2015a) responded:

> That's right. And what you want to say to [South Africa policymakers] is, 'if you keep having a consumer's-eye-view of this technology, then your population is consumers in the 21st century and they're poorer than other people's consumers'. So what you want is for your consumers to be producers in the 21st century and the difference between them is they have a start button and we [the Free Software Movement] start programmers. They have a thing that enables you to Netflix your way to passivity on the couch, we have a thing that tells a 14-year old that he can own any part of the Internet he wants, what does he want to do today? Not 'where do you want to go', but 'what do you want to *do*?'
>
> Across the way Mr. Modi wants to figure out how to make a digital India with 1.1 billion people in it. If he succeeds we're a very small country [South Africa]. But our position ought to be we're the biggest country we can be and the way we do that is we make these brains bigger. The technology comes so if you eat from one side of the mushroom you get smaller and if you eat from the other side of the mushroom you get bigger. There's always a guy peddling you the technology that makes your children smaller because he wants it that way.
>
> You guys, you guys ever read the thing called *The Communist Manifesto*? You ever read the thing anything about colonialism? … You know what this is about.[163] If they want to make you smaller the technology they send you will do that. Let's make it here [in South Africa].

Drawing on an anarchist perspective, Moglen compared proprietary software to a colonial product destined to create dependency and domination of Big Tech corporations. This position is consistent with aims and objectives of FS policy documents (reviewed in Section 6.1), including the capacity to shape and produce technology with independence from foreign corporations. Nhlanlha Mabaso (Armscor; Wikimedia Foundation) (2016) offered a similar perspective, stressing a local development and anti-colonial perspective:

---

163 Moglen was iterating that socialist political economy resistant to capitalist colonization is part of the long-standing anti-apartheid resistance tradition. As he put it elsewhere in the interview: "Years and years and years ago, so long ago that Nelson Mandela was still in prison, Albie Sachs said to me, 'you know,' he said, 'my parents joined the South African Communist Party and the ANC in the 1920s.' He said, 'I joined the Party. So I have no idea whether the struggle is going to succeed in my lifetime and it doesn't really matter. And the interesting question is what happens if it does succeed in my lifetime.'

And part of the question is: whatever happened to the South African Communist Party? Joe Slovo is really really dead, right? If the ANC still has the South African Communist Party in it somewhere – and it does – this should not be a completely impossible discussion at least to have. These are not untraditional positions. For most of the last hundred years, these were the positions of these people, right? I mean we're not, we're not telling them anything they haven't heard before. None if this is unknown. It's just forgotten" (Moglen, 2015).

> South Africa should have been leading not just in the policy space but as far as skills, etc. So Android should really have come out of South Africa to have developed that kind of environment where people can innovate locally and create new technologies for these things and using Free Software… making it possible for them to move into a mobile platform. These were some of the benefits that were expected to come from the country taking advantage of this new wave and heeding. But that didn't happen.

Bruce Schneier (Harvard Berkman Center for Internet and Society) (2016), a leading expert on cryptography and computer security who helped journalist Glenn Greenwald with the Edward Snowden NSA documents, told me that open source software offers important benefits, on similar grounds:

> The devil's in the details but the Open Source is a plus in its favor. Right, it can't be the only criteria by which you make the decision, but it is a benefit. And it's a big benefit. Especially if you're living in a low-trust environment. But then you need to have the software that's doing the actual work Open also. Having an Open Source operating system and then having proprietary stuff on top of it isn't going to help you.

"Microsoft's idea", he remarked, is "we're gonna give away our software in the developing world because when those people get jobs they'll buy it". For example, he said that "years ago it was Brazil that was thinking of doing Open Source as a national standard… and Microsoft came in and promised them the moon because they knew if they lost Brazil they'd never get them back". "US businesses", he added, "have, [what] the economists call 'lock-in.' Because you're used to it, switching is hard. And companies take advantage of that… companies try to increase their lock-in" (*ibid*). In the appendix sections, NACI (2004) publishes the Peruvian government's exchange with Microsoft in which Congressman Édgar Núñez of Peru endorses Free Software in opposition to Microsoft, on grounds of freedom, independence, and stimulus to local development (pp. 51-58).

While corporations try to hook populations into their products, much of the South African population has been too poor to afford access to computers. Many have yet to become habituated to any particular software. In an interview, Richard Stallman (2015a) told me developing countries like South Africa "have a precious resource. They have millions of people who never learned to use proprietary software. In other words, it's just as easy for them to learn to use Free Software and it would be better not to ruin that resource by teaching those people proprietary software". Stallman recommended that schools only use Free Software.[164] By offering nonfree software, there is a "danger of getting people trapped in nonfree software" (*ibid*). "If you're accustomed to nonfree software", he said, or, "if the device won't work without your having an account with some giant company or even even a small local company, it's an injustice. And if you can't replace and change all the software in the device it's changed to subjugate you. So the school system must, for various reasons, teach exclusively the use of free software (*ibid*).[165]

Stallman (2017) argues that Free Software "can save schools money, but this is a secondary benefit". The primary reason to choose FS is ethical: schools have a "social mission" to "teach students to be citizens of a strong, capable, independent, cooperating and free society" (*ibid*). "By teaching students free software", Stallman asserts, "they can graduate citizens ready to live in a free digital society. This will help society as a whole escape from being dominated by megacorporations. In contrast, to teach a nonfree program is implanting dependence, which goes counter to the schools' social mission. Schools should never do this" (*ibid*). Proprietary software vendors offer schools free (as in price) use of their software to "implant dependence" on their products "like tobacco companies distributing gratis cigarettes to school children", he added (*ibid*). In the future, those children will be forced to use and pay for their proprietary products.

For Stallman, Free Software "permits students to learn how software works", and the Free Software community "rejects the 'priesthood of technology', which keeps the general public in ignorance of how technology works". Proprietary software, by contrast, makes learning about their software "forbidden" (*ibid*). People learn to program by reading and understanding real code. "Only free software permits this" (*ibid*).

Most importantly, Stallman contended, Free Software should be used "for moral education": "… The most fundamental task of schools is to teach good citizenship, including the habit of helping others… Teaching the students to use free software, and to participate in the free software community, is a hands-on civics lesson. It also teaches students the role model of public service rather than that of tycoons. All levels of school should use free software" (*ibid*).

164 Stallman prefers Trisquel, which is similar to Ubuntu GNU/Linux, but does not have any proprietary components whatsoever (see Stallman, 2018a).

165 Stallman (2017) added, "you can see writings about this in the gnu.org/education/edu-schools.en.html".

### 6.2.4: Brief Evaluation of Perspectives on Free Software

The previous section found that digital rights respondents took a position consistent with South African government policy, while government officials and stakeholders did not. While there may appear to be nuanced differences of opinions between various officials and stakeholders, they are superficial. Across the board, government respondents had given little thought to the importance of selecting technologies that comport with the Free Software philosophy, which is also explicit government policy. Their responses contradict the policy thinking explained at length in policy documents (see Section 6.1), but wasn't addressed or being applied or planned for implementation. Free Software positions were provided by experts, however, which demonstrates the difference in thinking.

Moreover, e-education officials did not find it problematic to select proprietary software like Microsoft software or Google Android (recall that the Google version of Android has a proprietary layer on top of the Linux kernel), as well as cloud-based systems that deprive users of ownership and control. Non-corporate stakeholders had at times given more thought (e.g. members of ICT4RED), but were at best apathetic to the deployment of nonfree software and at worst completely willing to partake in it, even if they were not members of the Big Tech companies themselves (e.g. SchoolNet, iSchoolAfrica, and CloudEd). The end result is that there is no Free Software being implemented or seriously contemplated by any government or stakeholder respondents with respect to core software like operating systems or productivity suites. Moreover, officials and stakeholders did not raise strong objections to the practices of Google, Microsoft, or Apple. The nuances where, say, Alister Payne (CloudEd) favored free software instead of open source are less meaningful than one might think, because Payne exclusively services Google, and is looking to have the education system use Google's nonfree (often proprietary and cloud-based) software instead of Microsoft software.

Thus what these officials and stakeholders did *not* say (e.g. the inventory of points about why Free Software is important to education, economy, and society, identified in Chapter 3 and Section 6.1) and what they are doing in action (i.e. implement nonfree corporate software) sheds light on their positions. Moreover, what the experts said (and would have the government and stakeholder organizations do) also helps inform government policy perspectives, because the experts provided answers that are consistent with human rights and FOSS policy documents, and that the government and stakeholders *could* have taken, but did not.

E-education officials and those who would place proprietary software into schools might argue that the *FOSS policy preference* is only a *preference* for FS, and that the proprietary software being used is “substantially superior” to FS options like GNU/Linux, LibreOffice, and the like, as well as for security. According to this perspective, the use of proprietary software would accord with government policy. Given that what constitutes “substantially superior” software is somewhat subjective, one could argue the FOSS policy preference is too weakly worded to ensure the adoption of FS. However, one would be hard-pressed to maintain this case. Comments from e-education officials expressed indefensible notions that deploying FS would result in entire departments shutting down, or that FS is of inferior quality because software without a proprietary license fails to incentivize the production of a quality product. As we saw in Section 6.1.1, these positions are explicitly rejected by government policy. It should also be added that at this stage of the digital era, proprietary and cloud-based software is empirically linked to surveillance, whereas Free Software operating systems (like GNU/Linux and LineageOS) and software repositories (like F-Droid) are empirically free of (and often actively resisting) surveillance and other undesirable features (see Section 3.3.4). As we saw in Section 5.2, privacy and surveillance in the form of Big Data is a foundational element of OPE. The next section discusses the issue of privacy.

### 6.3.1: Privacy and Surveillance

In Sections 3.3.4 and 3.3.5, we saw that surveillance has broadened its scope of influence and taken on new forms with the rapid expansion of digital technology in the past two decades. In particular, we saw that Big Data serves the ends of digital colonialism through data extraction, rent, domination of services, and global surveillance capitalism. Moreover, we saw that the West’s vision of how to construct a digital society constitutes *tech hegemony* where the interests of those with power – concentrated in the United States, as well as local elites outside of the US – are attempting to naturalize the notion of being under constant surveillance. This conceptual domination serves the interests of the state-corporate ruling class articulated by anarchists (see Section 3.1), who carry out the surveillance to get people to do what they want them to do.

This section details the opinions about privacy held by the interview subjects sampled for this thesis. It found that subjects held different opinions of privacy and surveillance in accordance with conceptualizations of technology and human rights, as well as according to occupation. On the one hand, digital rights experts took a strong position against privacy violations. On the other, government officials and stakeholders took a weak stance on privacy – one which is friendly to Big Data surveillance – and frequently showed little thoughtfulness about the subject. The following two sections will first consider expert opinions, and then turn to officials and stakeholders.

### 6.3.2: Digital Rights Experts on Privacy and Surveillance

When asked about Big Data in education, Walter Bender (2015), former President for Software for the One Laptop per Child program – told me it "does worry me… there's almost no reason why you ever need to gather data about kids. And there's almost no reason why you need to have kids be accessing websites that are going to be gathering data about them". Bender said kids do not need to collaborate "out there" (through the cloud), but could instead collaborate on intranetworks and systems that do not collect data about them. He added that Big Data for education has "very little demonstrated value higher level thinking. And so the question is, if it's got so little value, or so little demonstrated value, why are we doing it at all, and why are we risking, why are we opening this door?" (*ibid*). When asked about logging learners' data from the time they are young, he responded, "I think we need to be looking out for these kids. Because I think that we don't. And I think a lot of adults don't think about it for themselves, either, but they're adults, and these are kids… And I think that regardless of the long-term commercial implications or anything like that, I think that we need to protect these kids" (*ibid*).

When asked about how to address network connectivity and privacy/surveillance, Eben Moglen (2015a) responded that we seem to be heading towards disaster:

> I want people to have good technology that doesn't hurt them. I want them to have technology that doesn't alienate them or control them. That's not the contemporary smartphone, it just isn't. That doesn't mean that mobile devices can't be the right objects. It doesn't mean that the electromagnetic spectrum we all own in common isn't what we should use – it is. But we have to take a serious step back in order to take a serious step forward. We have gone so far down the line of the proprietary network and the devices connected to it that every government, every listener, every thief, every platform, every data miner has freer access to the human mind than we have to any minds other than our own. That's disaster coming.

His latter point was aimed at mobile network providers, but just as well applies to the e-education movement. Alfredo Terzoli (Rhodes University) (2016) echoed this sentiment, stating that the Big Tech corporations are "colonizing the Internet" and the "amount of data they are collecting is scary", and worth worrying about. When asked about handling student data, Cohn (EFF-US) (2015) remarked that "there's no reason to centralize [student] information". She said "I don't think think you should keep cookies on what kids do. Granular collection on student's browsing activities is "a horrible idea", she added (*ibid*). When asked about collecting data on students, Cohn (2015) offered criticism along this line:

> People need private space to access information and if they feel like they're being tracked all the time, and watched all the time, you will limit their intellectual curiosity, you'll limit their ability to feel like they can act on their intellectual curiosity. And so if we build an education system for kids and they feel like they're being watched every single moment about what they're looking at and how long they're looking at it – the every keystroke model – I think that's really counter-productive for the idea that we're trying to educate people to have a mind of their own. It's a way to build a system where people are afraid to get too far outside the line, and so I think that would be a horrible loss for an educational system, if you think that an educational system is supposed to teach people how to think for themselves. If you're tracking everything they look at I think you're working against that idea.

For Cohn, privacy is important because information could be misused, at the very least, "to harm kids later" in life; Big Data is unlikely to be as effective as promised by its advocates;[166] and the loss of privacy will have a negative effect on intellectual curiosity. Cohn asserted the level of granular analysis Jose Ferreira promises, such as how "what you eat for breakfast" factors into learner performance, is "not proven at all" (*ibid*). Separating out factors like what you ate for breakfast, distractions from noises outside, and so on "seems very unrealistic in terms of real science", she said (*ibid*).

Bruce Schneier held that data tracking could have an adverse impact on education. When asked about the possible effects of being tracked in Knewton's system, he remarked:

> I think that's… a consideration – the feedback, the self-censorship, the feeling that you're under constant surveillance. We know that is a negative. Again that's cultural but sure – that is definitely a negative. I mean, how does someone feel? I have no idea. I grew up when

166 Cohn (2015) felt that "data analytics is a pretty unhelpful tool for education compared to other places that you could spend your money" – such as reducing classroom sizes.

> textbooks were on paper.  Now that they are online, how do students feel that their every reading is being tracked? (Schneier, 2016)

Schneier also said that cloud-based data storage raises security issues.  As he put it:

> Is this data going to be a liability for [the responsible party], if a criminal gets their hands on it? You remember the [US Office of Personnel Management] breach?  People who worked for the government 20 years ago got a letter saying ‘sorry, the Chinese have your data.’  What?  So that's a very real concern.  You wait 20 years, an entire cohort of graduating students gets a letter saying, ‘you know, somebody stole your data, we don't know who.  But it's highly personal data, and we're sorry.’  That would suck (*ibid*).[167]

Schneier also argued that “open source” is beneficial to privacy and security because it “gives you a level of transparency that you don't have otherwise – so it's a good thing” (*ibid*).  He said “closed source doesn't magically mean the system's bad”, but the transparency of Free Software is valuable for voting systems, algorithmic calculations, and the like (*ibid*).  Nhlanhla Mabaso  (Armscor; Wikimedia Foundation) (2016) also connected Free Software to privacy, stating that privacy:

> … requires that individuals and organizations and even nation states be much more savvy about how they protect their information, how they enhance their privacy of themselves as organizations or as individuals and the tools for doing that.  It’s no wonder then that you have something like Signal, which I told you is Free Software, finding its way into the social media environment, as well as being used to encrypt WhatsApp environment now.  As to WhatsApp is a whole another story.  But the point I’m making is that the idea of people are into protecting their privacy is becoming more and more prominent.

Richard Stallman (2015a) said that proprietary software (and other nonfree ways to control computer experiences) tempts developers to abuse their power for activities like surveillance:

167 When asked if data centralization in the cloud is a risk, Schneier (2016), responded, “I think there’s huge threats in that, and that it’s single-point shopping for attackers.  So China, instead of breaking into the computers of this person, that person, they try to break into Google, which gives them everybody.  So yes I mean the consolidation is a security risk”.

> In proprietary software, it's common because they all have this temptation, and they all have taught themselves to have very low ethical standards, so they will do it and get away with it. They expect to get away with it. They expect not to even to get much pushback because users of proprietary software don't believe they're entitled to be treated decently. They say, 'please sir, could you not do this to me?' and they don't believe they're entitled to make a demand.
>
> When they learn they're entitled to make a demand they're likely to cease being proprietary software users. But if the schools force it on children, the children won't be able to change and it would require a lot of mental strength for them to say this is wrong, 'I reject this'. That's what they have to do.

Stallman was deeply opposed to data collection in schools. When told "*local school authorities, governments, and corporations… want to monitor… their Internet traffic, maybe what they do on their computers*", he remarked, "that sounds tyrannical" (Stallman, 2015a). Stallman called for strong privacy protections:

> Giving the company any information about the student, even the student's name and what school the student goes to is a violation of privacy. If the school makes an account with that student's name in the server of that company, it has already violated the student's privacy. [They] must not.
>
> *Kwet: Including Google?*
>
> Of course, it doesn't matter which company. It may be somewhat worse if it's a foreign company that's not even regulatable by the state. But even if it's a domestic company that only operates in that country it's still wrong. Getting the company to make some kind of promise about how it will use the data is worthless. First of all, they have clever ways of convincing themselves that the commitment doesn't mean what it appears to mean or that no one will ever find out. So why shouldn't they? Or they make a promise to anonymize it and they do and they sell it to another company who figures out who the student is. Facebook does this.[168] Or the company goes bankrupt and all the data gets sold to some other… creditor that never made a commitment about how to use it. The only acceptable privacy policy is don't ask, don't tell. We won't ask for any data about you and you won't give us any, including your name (*ibid*).

168 See, for example, Epic (n.d.).

Thus it is clear that experts held strong opposition to the kinds of granular data collection planned for schools.  Walter Bender and Richard Stallman didn't see any value in collecting more than the bare minimum required, while Eben Moglen saw a general disaster coming.  Cindy Cohn rejected the need for granular collection, while Bruce Schneier worried about the security problems posed by cloud storage.  Nhlanhla Mabaso did not comment on the privacy of learners in particular, but he linked privacy concerns to Free Software like Signal.  As we see next, e-education officials and stakeholders took a very different stance.

### 6.3.3: Government and Stakeholder Opinions of Privacy and Surveillance

In contrast to the privacy experts sampled above, government officials and stakeholders were more willing to sacrifice privacy in the interests of using surveillance for various features said to improve education, economy, and society.  They stated that privacy is a very important issue, or that the issue needs to be discussed more often.  However, much like state surveillance agencies in the fight against terrorism or crime, they justify the erosion of privacy on a "pragmatic" pros and cons perspective – do the pros (improving learner outcomes) outweigh the cons (the loss of privacy)?  Some believe legal regulation can protect users, while others believe "anonymization" or "de-identification" can protect privacy.  Some believe the loss of privacy is inevitable in the digital era.  Crucially, interview subjects revealed that little or no discussion is being conducted around privacy in the South African e-education space.

Meryl Ford's (ICT4RED) responses hit on many themes, and provides a good starting point for considering policymaker and stakeholder perspectives on privacy.  She was asked: how much discussion is there about privacy, including the fact that "*you're giving [a comprehensive data set] to a company*" and foreign intelligence with US-based corporate services like Google Android?  Ford responded, "there's no discussions… well, there's discussions at Meraka that are kind of different amongst people who know what's happening" (Ford, 2015).  In Ford's view, typical people do not care:

> I honestly think the man in the street doesn't care really.  With the whole NSA thing there wasn't the uproar I thought there should have been.  So I actually think the man in the street doesn't care.  But it's, I don't know… I mean Facebook does it as well… If you're using the Internet that's what happens, no matter where that's a Google ID, or a Yahoo ID, or a Microsoft, you know, Facebook, Twitter, all of the social media sites.  So I'm not sure there's much we can

do about it. Yes, I don't like the idea. And I went through a phase in Facebook not liking anything because it builds up your profile and stuff like that. But that's a personal point of view. I don't think the man in the street, [he] doesn't care.

*Kwet: In terms of policymakers, they're not discussing that?*

I doubt it (*ibid*).

Ford saw in Big Data analytics "a huge opportunity" to improve education. With respect to privacy, she said, "as long as you anonymize the data, it shouldn't be a problem… You need to look at ways to make it truly anonymous, and there must be good techniques of doing that. And you kind of take it from there". She added that these Big Data systems are not an issue if "we're sure that [the data] is anonymized, and if it's aggregated data, then I don't see what the problem actually is, if you're looking at software. And it's going to help them, or help other people like them" (*ibid*).

The prospect of anonymization Ford would like to protect technology users is unsupported by empirical evidence. A plethora of studies have shown that large datasets of the kind proposed for e-education can be re-identified with relative ease (Narayanan and Shmatikov, 2008a, 2008b; Narayanan and Felton, 2014; Montjoye et al., 2013; Montjoye et al., 2015; Le and Safavi-Naini, 2018). This position was explicitly affirmed by the *President's Council of Advisors on Science and Technology* report on Big Data and privacy to the President of the United States. The Council held that because it is quite feasible to "re-identify" data, claims of "anonymization" give a "false expectation of privacy", including for contexts like education (PCAST, 2014, p. 39). Yet granular data linked to a persistent unique identifier is *necessary* for personalized and adaptive learning. A staple method of Big Data personalization is to collect a rich data set about that individual and cross-reference that person against others to identify what they are thinking and assess how to customize their development. Thus it cannot be both ways – if computers have even *modestly* detailed records about individuals revealing things data miners want to know about them which are important, such their thoughts, their likes, their age, their race, their location, their friends, their medical conditions, their future behavior, etc., then those records are identifiable with minimum cross-referencing against other data sets which also feature some of those attributes (Eckersley, 2010).[169] Current data in the MSDF Dashboard, for

169 Consider this example: UK-based Moorefields Eye Hospital NHS Foundation Trust is researching a set of one million anonymized eye scans in collaboration with Google's DeepMind Research. They anonymized the eye scans to avoid repeating the NHS-Google privacy debacle in April 2016. As Toby Clarke, interim head of Moorefields, said, "[t]he real value will come from using non-anonymised data… If you have a large repository of information, and you can add big data from demographics, you can start to take make predictions about patient healthcare. You could potentially say when people should be coming in for tests in terms of early warnings'" (Samuels, 2017). This type of "Big Data"

example, includes race, language, date of birth, sex/gender, school, particular days absent from school, and more.  Three attributes – school, date of birth, and sex/gender – already narrows the individual down to a highly accurate guess.  The MSDF plans to expand their data set, and currently has *much* less data than Google, Microsoft, and other parties have access to.  The government wants to aggregate data from NGOs, corporate partners, and more.

In South Africa, this is a significant, tangible concern because a dataset containing variables like name, race, sex, income, housing location, and identity number were found accessible online.  Given that the database covered almost the entire population, including children, anyone who gets access to it will have the means to cross-reference datasets and re-identify anonymized individuals (Woolven, 2017).  Data anonymization for this kind of personalization is therefore misleading.  However it is a useful claim which allows people to rationalize mass surveillance.  When asked, "*what if the data cannot be anonymized?*" Ford (2015) responded:

> Pragmatically you have to look at the pros and cons.  Is it worth actually letting a child struggle with a problem and perhaps not passing a particular subject, not getting their matric, and messing up their whole future?  Versus, knowing a lot about that particular individual and actually being able to adapt to help that individual.  Versus not doing it.  You see what I'm saying.
>
> So there are pros and cons and you need to weigh up the pros and cons.  And it could be that at this country in this time it's actually better to understand exactly what the issues are in education and what kids are struggling with and using data in order to solve that particular issue or support various interventions to solve the issue.  Versus not doing it and our education system continues to dwindle into nothing because we're not solving the right problems.  We think we know what the problem is.  So I would say in South Africa's context, it's better to know, even though you could lose some freedom and there's a potential for misuse of the data, I think the positive things far outweigh that.  And I'm speaking, I was shocked by the whole NSA thing, so maybe I'm a bit naive, but [laughs].

Ford added that "some people shouldn't be able to be anonymous" because they conduct "nefarious activities".  She believed there is a *middle ground* for Big Data: "you've got to aim for the middle of

---

surveillance is precisely what e-education advocates are seeking to "add value" for personalization, adaptivity, and bureaucratic administration.

the road, so you kind of don't assume the worst, but you don't assume the best either. And you make provision for both of them". If tracking and collection is forced on students – say, their devices have GPS tracking, their operating systems conduct surveillance, and their homework and tests conduct pervasive analytics – she said, you have an option to opt-in or opt-out. But if it's towards a learning goal, then if you don't respond to this questionnaire which is actually a test then you're going to get a zero for the test (i.e. you fail). So "it's tough". The right to privacy, if demanded by parents or learners, is up to the parent to decide, or a learner if they are over 18 years of age, she said (*ibid*).

When asked about the potential for chilling effects among informed school members – and if any discussions are held about that – Ford said, "no, I think, as I said, our problem is to get to that problem. I mean, I would imagine that's exactly what would happen" (*ibid*). She added, "I haven't done any deep thinking about this – our first challenge is to get the technology into the kids' hands. If we start having this problem, then hallelujah, that means people are starting to think more a bit more deeply about the effects of technology and privacy and stuff like that" (*ibid*).

Ford thus expressed a contradictory position. On the one hand, she held that Big Data could improve education and with education progress will come better livelihoods. On the other hand, she recognized that the outstanding degree of Big Data surveillance in schooling entails a loss of freedom that will almost certainly produce a chilling effect in education and society. She attempted to resolve this tension with a "middle of the road" approach – the right to privacy and associated freedoms are traded away for the *possibility* to improve learning outcomes – a stance typical of Big Data moderates (e.g. body and Crawford, 2012; Zook et al., 2017; Packin and Lev-Aretz, 2018).

Ashley (Pearson SA) (2016) said privacy issues surrounding fine-grained data analytics is "not a national conversation I am aware of at all, it's obviously a conversation that we have continually internally as we're developing our LMSs, something we have to be aware of", including "being aware of things like POPI[170] and those sort of legal requirements". Ashley holds that (surveillance-based) adaptive learning is "where we'd like to get to, it's one of the true added values technology can offer". She wondered whether it's "technically possible to make systems" to "look at the aggregated data rather than worrying about the granular level". When asked about sharing data with the DBE Cloud, she said, "we have no conversations on that at all, there's no answer to your question… The LMS that we are developing has nothing to do with the DBE". She added, "there may be interest that they have

170 POPI (now abbreviated as "POPIA") is the Protection of Personal Information Act which is not yet in effect in South Africa.

in having… that data and that would be an interesting conversation to to have, but it's not one that's started at all" (*ibid*).

Steve Vosloo (Pearson SA) (2016) said that adaptive learning provides the kind of functionality Pearson would like to offer in education. He felt that longitudinal studies present major privacy issues. When asked about longitudinal analytics "for the life cycle of the user," he gave a neutral opinion:

> It's totally conceivable that that's what the government is thinking. It actually makes a lot of sense, it's the same kind of argument about having sharable medical records so it doesn't really matter which hospital you go to or which doctor you go to, you build up a profile of a patient and so why shouldn't one build a profile of a student? Obviously there are privacy, and big privacy issues to consider, and those would have to be engaged with in a very meaningful way. But on a conceptually, I think it makes a lot of sense. And the fact that you could take a portfolio beyond where you've studied so it becomes your lifelong portfolio (*ibid*).

He added that a chilling effect on free speech is "certainly possible". Privacy, he said, is "probably one of the biggest issues facing the human race in the years to come. It's frightening and extremely challenging, who knows what the answers are right now?" (*ibid*).

As detailed in Section 5.3, many interview respondents are supportive of Big Data surveillance plans and projects. Chloe (SchoolNet SA) said adaptive, personalized learning on cloud-based services are "fantastic", while Latitia de Jager (iSchoolAfrica) (2016) stated she would "love to see" Knewton-style adaptive learning systems. Brian Wafawarowa (Pearson SA) (2016) said that he would like data analytics and adaptive learning because without data, teachers don't understand where learners are, and so they fail. Lin Zhou (IBM) (2017) offered a "collect it all" mindset, stating that, "the more data you have about the individual learner, the better you can predict and analyze the user… With machine learning, there is never enough data". Alister Payne (CloudEd) (2016) expressed a similar outlook, stating that "a small, thin wedge" of student data (such as written test scores) is "not helpful", and more data "is where I think Google is going itself". On the teacher surveillance side of analytics, Rachel (MSDF) (2016) said longitudinal data analyitics would be "fabulous", while Stephen (MSDF) (2016) said, The hypothesis in this portfolio was in order for any educational outcomes to succeed, there needs to be accountability and transparency and absent this whatever you doing is practically irrelevant and meaningless because you’ll never know if you’re having any effect. So we spent several years working with the government to drive accountability and transparency”.

Sania (Microsoft SA) (2016) said that privacy “is something that Microsoft takes extremely seriously and everything in terms of our cloud solutions has been designed around safety and security and privacy”. She also stated privacy “shouldn’t be underestimated. I think we probably don’t understand how much of a concern that may be in the future” (*ibid*). In contrast to Sania, Judith Bishop (Microsoft SA) (2016) expressed little concern for privacy. She believes Google’s profit model monetizing surveillance with ads is “fantastic”. When asked about comments from former Microsoft Chief Privacy Advocate, Casper Bowden,[171] detailing Microsoft’s collaboration with the NSA, Bishop said:

> Well I think he might’ve been a little bit off-beam because if you look at the latest statements from Microsoft that have been reported, Microsoft is steadfast that government has no place in our software. And all of the [Silicon Valley] companies… have stood shoulder-to-shoulder on that. Our software has nothing that the government can get its fingers in… So I’m not quite sure actually why government interference is there or why it’s important for your study, actually, because you’re dealing with tablets in the Eastern Cape (*ibid*).

In response to the notion that surveillance-induced chilling effects could adversely impact education, Bishop stated, “if that’s the case then nobody would use Facebook. Facebook is watching every single thing you do. You know that. And people still do it, because they love it” (*ibid*). Both Sania and Bishop’s comments fail to address the Snowden revelations which detailed Microsoft’s collaboration with the NSA (Greenwald et al., 2013; Osborne, 2013b), the plethora of evidence demonstrating that digital surveillance induces chilling effects on users (including Facebook, see Section 3.3.6), as well as the company’s plans to integrate surveillance-based AI into across its entire product line (see Section 5.3.2).

The conversation about privacy with Jill (Google SA) was brief, as she did not know much of Google’s privacy policy off-hand and recommended sending me their privacy policy web links. She said that learner data “is their data completely and Google isn’t trying to look at it” (Jill, 2016). She was unsure if Google makes fine-grained data available to teachers:

171 Bowden passed away in 2016. He was honored across the tech press for his defense of online privacy (Moody, 2015; Doctorow, 2015b).

> Within a school's admin panel there's an analytics tool that exists in there already so the school can actually see how much usage is happening within the school. And they can actually go down to the individual, if I remember correctly, but that's within the school domain. So yeah, data collection by Google, I'd have to find out how that works (*ibid*).

Jill was also unable to answer questions that have been posed by the Electronic Frontier Foundation (EFF-US, 2015a) and Senator Al Franken (2016) in the United States, such as whether or not Google collects data on individuals.[172]

Alister Payne (CloudEd) restricted his considerations about data collection privacy issues to selling to third parties for advertising services and the right of teachers to discipline students. Payne (2016) was seemingly uniformed about protecting student data:

> If you are bringing kids and giving them digital presence in your school-owned domain, there is an argument that that's not personal information. You're in a professional space. A company – who owns the email? The company does. You sign it and it's set for use as part of your, contract. And kids should be signing an AUP [Acceptable Use Policy] as they come into the school that says anything that's done in the school environment can and will be used against you in the court of law. Can be used against you, can be trolled, can be looked at, this is not a private account. So therefore those kinds of privacy things don't exist.
>
> Sure, I can't take your data and show it to somebody else. Absolutely. Privacy needs to be adhered to there. But if 'Kid A' says something to 'Kid B' that's hugely inappropriate, I should be able to go in their account and look at their account like I can in a business and pull it out for disciplinary reasons. Absolutely. So I think there are some good laws in place, I don't think they're as structured as in the US and the UK.

Payne's assessment misses that learners are not workers, and adult legal guardians (such as parents) must provide legal consent on behalf of minors. Simon (DST) (2015) said "there is a big need" to "bring [privacy issues] to the front" and they are "busy in talks and discussions around policy and

172 Jill put me in contact with Google SA partner, who asked me to send in questions. I sent them in and asked about consultation fees; they never responded to multiple follow-up emails. For Google's response to Franken, see Google, 2016.

implementation advice”. However, it is questionable as to what kind of content is being addressed in those sessions. When asked about private-public partnerships in surveillance, such as the Google-NSA partnership, Simon responded with a non-answer, stating that “South Africans in general are aware that it’s not safe on the Internet” and proceeded to speak about the need for anti-virus software and to “keep money safe” when making purchases online (*ibid*).

Regarding the collection of student data, Sipho (DBE) (2015) said, “there [are] a lot of contentious problems because it’s very much linked to privacy, the right to privacy and so forth”. When asked if he has any thoughts (or if there are any discussions) about Google collecting data about South Africa’s children from the time that they’re very young, as well as the sharing of data with the United States government, Sipho said, “no, we haven’t engaged into such discussion”. When Richard (DBE) (2016) was asked if students and parents would be aware of data collection, he answered, “yes they will know, maybe they will know that the data is being collected and that the data is being collected for their own benefit”. He said that:

> You have to watch them. You have to watch, otherwise, they’ll end up viewing pornography, or videos, or social media – where they’re not supposed to be. So you need to keep a watch on, you need to guide that, you need to make sure that they go to the appropriate sites or the appropriate spaces. Yes you can do that by educating them, you open up but you educate them, that would be the best, the ideal situation, when you allow them to have cell phones at school, you educate them on how to use the device or the technology responsibly. That is responsible use of the technology (*ibid*).

If that is not working, Richard reasoned, “then you have to do what you have to do. And I feel that’s what most cases is being done to make sure they don’t spend time and data on the use of things other than what” they are supposed to be doing in school. When asked about the conundrum of using privacy tools such as Tor which screen out both corporate and government surveillance *and* local area network surveillance, Richard said, “I hear your question. You’re far ahead, but you know, I don’t know what I’d do, because, I mean, we haven’t even got there… I think we need to deal with… the basic stuff and then you get to the more complicated stuff” (*ibid*). Tefo (GDE) (2016) was asked about the Snowden revelations, to which he said “those are areas that we are grappling with and we have not yet established, you know, norms to a point here we can become comfortable where we have a controlled environment".

Herman (DTPS) (2015), who handles networking and cloud-based systems, was asked about state-corporate data sharing. For example, how does the government handle sharing data like GPS coordinates with corporations? He responded, "so what we do is that if any private sector comes to us with such things, we sign a mandatory non-disclosure agreement… between government and the respective party, prohibiting them from sharing such information". When asked about the Snowden revelations, which revealed Big Tech data sharing with the NSA, he said:

> What would happen there, before any private sector [party] would release any information, for security purposes or anything else, the private sector organization would come back and seek permission, based upon the [non-disclosure agreement] that has been signed… [Our] government has a right to sue the private sector for making such information privy to anyone else. Such content would then be basically contained in here as well.

Two of the world's most respected experts in NSA spying, Cindy Cohn (EFF-US) and Bruce Schneier, flatly rejected Herman's contention. Cohn (2015), a lawyer currently involved in litigation against the NSA, said a US-based company such as Google "can't promise that… That's not the way it works, right, you don't get to contract yourself around a statutory mandate that the information be handed over". She added that South Africans would not "know if it was violated given the secrecy that goes on here [in the US]". "In the United States" she remarked, "if the data is in the hands of anybody, the US government believes it has the right to come get it, so you have to make a threshold determination about whether you are going to create that dataset or not with that in mind" (*ibid*).

Schneier offered the same conclusion: Herman's assurance that a non-disclosure agreement can protect South Africans is not supportable. He said with regards to the interception of foreigners' (non-US) communications, "you basically have no rights" (Schneier, 2016). When told about Herman's non-disclosure agreement proposition for SA schools, he responded: "They can't… They[173] have to share with the [US] government. Of course" (*ibid*).

Schneier said that most people are more afraid of their own government's surveillance because of the power it exercises inside their country. A South African is "more at risk from South Africans

173 "They" refers to US-based corporations.

spying on South Africans" because "all the things that the South African authorities could do with the data – all the ways they could discriminate, they can unjustly, basically unjustly treat citizens in a way a foreign government doesn't really have the capability of doing. It's kind of a weird truism". In other words, the US "is all the way over there" and the "NSA can't do much to a South African" in this sense (*ibid*).

However, given the colonial context – the capacity of the United States to affect trade laws or government policies not favoring foreign power – Schneier conceded this "*could...be a greater threat in a context for, say, South Africa*". As he put it:

> It may be, right, but this is the scariness of today's world, that all of this data could be used against people, could be a threat, and as I say, sloshes around. If the NSA, the US government favors whoever's in power in South Africa, they might share the data. Just like right now US government shares data with Israel. And with the UK, and Germany, and France, and all those… Five Eyes… the Eight Eyes,[174] all those surveillance agreements. So yes, I mean that is a worry. Because the US saves data for quite a long time.

When asked what to do if surveillance curbs speech, inquiry, democracy, and dissent "*if you know that there is someone watching what you're doing*," Herman (2015) remarked:

> The thing is, because you are in a school environment, you basically need to be controlled. Nothing stops you from leaving the school environment and researching online and such things. As government, our responsibility is to ensure, for example, to deliver the proper tools for teaching and learning. And we will do that in a school environment. Nothing stops dissent – students and learners – to do it after hours at home or anything else (*ibid*).

In other words, in Herman's view, schools are not places for dissent. That children need to be controlled with surveillance is a major concern among contemporary scholars challenging the prevalence of surveillance in education (see Section 3.3.6).

174 Schneier meant to refer to the Nine Eyes; the Five Eyes is a decades-old intelligence alliance between the United States, the United Kingdom, Canada, Australia, and New Zealand. Other partners include Israel, Denmark, France, the Netherlands, Norway, Germany, Belgium, Italy, Spain, Sweden, India, and Saudi Arabia (Schneier, 2015a, p. 76). See also, Schneier, 2015b.

### 6.3.4 Brief Evaluation of Perspectives on Privacy and Free Software

The previous section and last chapter established that all e-education officials and stakeholders commenting on e-education technology embrace Big Data surveillance. Respondents typically acknowledged the importance of privacy, but for them, collecting the minutiae of day-to-day education activity for the purpose of longitudinal analytics or adaptive learning falls within the scope of acceptable practice. The digital rights experts disagreed, arguing that surveillance is problematic for society, and that strong privacy protections are needed. Bender and Stallman in particular were adamant that almost no data should be collected about children.

More generally, e-education officials have adopted the ideology of the tech industry, as well as Big Data moderates in academia (see Section 1.3.2), for their vision of the tech ecosystem. They are ambivalent about Free Software and enthusiastic about Big Data, and they seem to have given very little thought to either. This dissertation sampled the entire range of major policy documents for the basic education sector, including for general education and e-education, and did not find any substantive discussion of Free Software, Big Data, or privacy and surveillance.

Most stakeholders were likewise enamored of Big Data and had weak or no commitment to Free Software. Some (e.g. members of ICT4RED; Alister Payne) viewed Free Software positively, but they did not speak of it in terms of freedom, as Bender, Stallman, Moglen, and Cohn did. Interestingly, the documents guiding the *FOSS policy preference* spoke of Free Software to security and privacy. Although their writings pre-dated the rise of surveillance capitalism, their distrust about Microsoft partnerships with the US government is consistent with the Free Software community in the post-NSA whistleblower era, and one could argue the spirit of the policy documents harmonize well with the FS community's antipathy towards Big Data surveillance.

As with Section 6.2, the variation in government and stakeholder responses to questions about privacy differ, but from a superficial perspective. All respondents were accepting of Big Data practices (see also Section 5.3, including government materials sampled). The acceptance of Big Data surveillance, as well as nonfree software in education, poses a grave threat to South African education, economy, and society. The implications, and reasons why these choices are being made, are analyzed in the next chapter.

## 6.4: Conclusion

This chapter analyzed Operation Phakisa Education as a policy for the national rollout in public schools.  In particular, it assessed the choices and perspectives about technologies to place on devices according to how they can be expected to impact education, economy, and society.  The first section reviewed Free Software policy in South Africa, finding a progressive, enlightened Free Software philosophy across several policy documents which form the basis for the 2007 *FOSS policy preference*. The policy was written during the 2000s, however, and should be updated to assess cloud computing, Big Data, new devices, and other developments that have taken place since 2007.  There has been little implementation of Free Software in the public sector, including education, according to the research available.

Next, this chapter assessed the policy positions for Free Software among e-education officials, stakeholders, and digital rights experts.  It found that e-education officials favored or accepted proprietary software and showed little thought or concern for the power relations that surround Free Software.  Stakeholders like Alister Payne and members of ICT4RED were more favorable to Free Software, but were nevertheless utilitarian about pragmatic use (rather than liberty).  Digital rights experts took the strongest position endorsing Free Software for education, economy, and society.

The following section evaluated policy positions on privacy and surveillance.  It found that e-education officials sometimes acknowledged the importance of privacy, but they gave little thought to the subject.  Stakeholders had given more thought.  Some company stakeholders, such as Judith Bishop and Alister Payne, embraced corporate surveillance, whereas others (including Steve Vosloo or Sania) were more concerned.  All government officials and stakeholders embraced Big Data, however.  Digital rights experts were the only ones to take a strong stance calling for very minimum data collection.

The next chapter provides an analysis of OPE policy choices and perspectives in the context of digital colonialism.

# Chapter 7

## Operation Phakisa Education: Policy Formulation in the Shadow of Silicon Valley

### 7.0: Introduction

The earlier chapters in this dissertation have set the stage for the analysis of policy choices being implemented or considered for Operation Phakisa Education. Chapter 2 detailed the neoliberal perspective on brick-and-mortar education leading to the transition to OPE, while Chapter 3 explained the theoretical framework for understanding e-education for the digital society in South Africa. That chapter helped explain problems with proprietary software, cloud-based, and other forms of digital power at the technical architectural level, and how they undermine education and lead to digital colonialism. Chapter 5 outlined what OPE is, and how it is currently being implemented on the ground. This gave the reader a grasp of the program and why it should not be dismissed out of hand as a mere paper promise that will never materialize. Chapter 6 detailed policy perspectives on Free Software and Privacy, finding that the *FOSS policy preference* is not being applied in the basic education sector, and that officials and stakeholders held positions at odds with the Free Software philosophy and government policy. They also embraced surveillance and held weak views on privacy and surveillance. The perspectives on FS and privacy set the frame for the two core components of OPE technology choices evaluated in this dissertation: software and Big Data analytics.

Thus by now, this study has identified and established what is wrong with the technical architectural choices being considered or chosen from implementation in basic education, as well as the policy perspectives giving rise to them. This chapter will provide an in-depth analysis of OPE. The first three sections analyze OPE's neoliberal character and explain its implications for education, economy, and society. They explain how progressive rhetoric is used to mask OPE's neoliberal authoritarianism, evaluate how OPE can be used to undermine teacher autonomy and impose policies resisted by teacher's unions, and assess the corporate colonization of the public through product placement in classrooms. The following four sections analyze *why* policymakers are adopting a Global North e-education policy. They consider corporate influence and policy mobility, examine problems of policymaker competencies and interests, scrutinize the lack of democratic procedures and accountability, and conclude by explaining OPE as a form of digital colonialism.

## 7.1: Authoritarianism and the Hidden Curriculum of E-Education

In Chapter 5, we saw that Operation Phakisa Education fast-tracks nonfree education technologies and Big Data surveillance into the education system for learning, teaching, and administration. In Chapters 5 and 6, we saw that when discussing these programs, government officials and key stakeholders praise Northern corporate solutions and models, including surveillance analytics, that they are piloting and pushing into the education system. We have also seen that these same officials and stakeholders subscribe to progressive views about education transformation. These sentiments, while positive, contradict the specific technology choices and perspectives they are implementing and planning for the basic education sector.

According to anarchist and critical scholars in the socialist tradition, education for liberation requires major changes. New curriculum should provide a more honest account of history and equip learners to think and develop critical thinking skills (Aronowitz, 2000, pp. 176-193; Loewen, 1996; Mkhize, 2016; Masola, 2016). Beyond this, education should be reshaped to include democratic participation, both because it is intrinsically just *and* to prepare children to live in an anarchist society based on direct democracy (Goldman, 1910; Smith, 1983; Avrich, 2014).

These principles transpose to the domain of e-education. The disdain for authoritarian education technology at the technical architectural level – technology that, in Walter Bender's (2015) words, gives the children their purpose, rather than allowing them the freedom to determine it individually and collectively – resonates with anarchist conceptions of independently directed education and schooling (Spring, 1975, 1983; Bakunin, 1971, 1970 [1882]) . Just as Walter Bender would like to institutionalize core principles of freedom and science into the *software layer* that mediates schooling, anarchists also previously attempted to institutionalize schooling as a whole on similar, anarchist principles (Smith, 1983; Avrich, 2014). A century after anarchists theorized education for liberation on holistic, anti-authoritarian principles, a new generation of education scholars would (re)discover in schooling a "hidden curriculum" where, as Stanley Aronowitz (1992 [1973]) put it, "The child learns the teacher is the authoritative person in the classroom, but that she is subordinate to a principal. Thus the structure of society can be learned through understanding the hierarchy of power within the structure of school" (p. 75; see also, Dreeben, 1967; Giroux and Penna, 1979).

Richard Stallman (2017a) echoes these sentiments, arguing that the delivery of nonfree software to schools normalizes submission to the authoritarian dictates of proprietary software vendors ("megacorporations"), products, and services. In a surveillance context, Joseph Turrow (2017) utilizes the concept "hidden curriculum" for the erosion of privacy, arguing commercial activities "that dismay privacy advocates are already beginning to become everyday habits", teaching people to give up their privacy "in order to get along in the twenty-first century" (p. 13). While Turrow has retail in mind, this equally applies to education (Hope, 2009).

Free Software, on the account of Free Software advocates, is also well catered to building education environments. As Bender noted, it provides the individual and community the ability to study and experiment with one's learning environment (software), as well as the independence to define it (rather than obey the dictates of the systems controlled by proprietary owners and service providers). Stallman (2015a) summarized this position in anti-authoritarian terms consistent with aims familiar to socialists: "Free software encourages everyone to learn. The free software community rejects the 'priesthood of technology', which keeps the general public in ignorance of how technology works; we encourage students of any age and situation to read the source code and learn as much as they want to know". Critically, Free Software advocates distance themselves from tech reductionism and tech solutionism, both in general and in education. Walter Bender (2015), for example, stated that "no one in the history of technology and education has ever demonstrated that kids can learn how to use a computer *for learning*" (rather than how to use a computer itself). Thus, from Bender's point of view, computers are not a magic bullet that can fix education, and he is skeptical that computers can transform it. He recommended having the students use the computers for five minutes at the end of every class to write a reflection on what they just learned (*ibid*). "You could even do that on an Android tablet", he adds, but argues against it, for reasons just discussed. Yet, if computers are going to be used, Bender argued, they should provide the users the freedom to control the software, so they are not controlled by the authoritarianism of software owners.

In South Africa, some scholars and communities have challenged the traditional, authoritarian structure of schools. Harber and Mncube (2011) find that most South African schools exhibit "continuing authoritarianism" based on "traditional, teacher-centred methods of monologue and rote learning" (p. 240). They state that SA schools have two faces: one that can improve individuals and the wider society, and another which reproduces inequality and fosters authoritarianism and violence. In their view, structural changes are needed to change education: "Essentially, the dominant or hegemonic model of schooling globally, with some exceptions, is authoritarian rather than democratic. What is taught and learned, as well as how, where, and when, in addition to the learning environment, "is not in the hands of the learners". Formal mass schooling was established "in order to produce citizens and workers who were conformist, passive and politically docile", a model which, they contend, dominates "the real world of schooling" (p. 242). The authors conclude that a "struggle… continues" to materialize democratic education for the people.

As noted in Section 1.3.1, the deployment of technology in public schools constitutes an element of privatization. The kinds of reforms called for by the Stellenbosch School and other prominent voices in the South African media – envisioned for collaboration schools – is achieved through the use of technologies designed by private corporations. While the public may see placing private sector tech products into schools as a means of "upgrading" education for 21st century life, the notion of placing Google, Microsoft, Pearson, Impero, Knewton, or other educational products into schools serves a hidden agenda for private sector influence.

Furthermore, the use of AI and other standardizing technologies may help to hide and present as "objective" educational policies and preferences that are in reality not so objective. For example, IBM's proposal to assess students at an early age as to which paths they are suited towards future study and employment – mechanic, biologist, etc. – could easily "track" students into paths based on the input they feed students along the way. Under the guise of education for the Fourth Industrial Revolution, the ANC seeks to equip individuals with skills for future jobs and "[ensure] that the education system as a whole responds" to this "challenge" to "produce skills that are required at the correct time and in correct numbers" (ANC, 2017, p. 17). The neoliberal imperative to treat students as "human capital" and educate them for pre-existing markets suggests the need to build systems which will track students into various jobs not on the basis of their capabilities, but on the basis of supply and demand. A computer system which ranks students mathematically according to quantifiable metrics – while "nudging" them towards feasible career paths along the way – will extend the logic of summative examinations to every moment of the educational experience, while providing the veneer of objectivity with respect to career outcomes.[175]

The integration of technology into the classroom could further entrench the faux meritocracy of algorithmic education in the minds of the public. The deployment of digital technology in schools is frequently seen as a means to keep with the times and provide the means to compete in the digital

175 For commentary on how summative examinations in schools perpetuate inequality and "cool out" popular desires for fair job outcomes, see Schmidt (2001, pp. 197-201).

economy.  Those seeking a better life for their children may intensify their desire for corporate products in school for employment opportunities.  Lose your job?  Don't organize – learn to code, or drive for Uber.

Activists and parents are taking up this struggle against authoritarian digital education, including on a model similar to free schools and the anarchist modern school.   For example, the Democratic Education SA portal provides information about democratic and self-led learning environments in South Africa.[176]  Drawing on educators like Neville Alexander, Ivan Illich, and Paulo Freire, Je'Anna Clements (n.d.) criticizes the "imposed schooling", based on the "banking model", as a "Western mainstream norm" that is, in the democratic era, "a leftover from the days of our colonial oppression".  The Riverstone Village in Johannesburg is one concrete place offering education based on direct democratic procedures.  At Riverstone, Terry Bell (2018), a seasoned veteran of the anti-apartheid struggle, likewise argues that "the existing school system[s]" – both elite and private – "aim to bring about conformity to the existing political and economic order" and that "child-centred, democratic education of any kind has always attracted hostile reactions from establishment sources".

On the surface, government officials and key stakeholders seem to share progressive ideals expressed by Bender, Stallman, anarchist thinkers, and self-directed education advocates in SA.  Ex-President Zuma (2015) would like learners to use ICTs "confidently and creatively" to "transform learning and teaching through ICTs and to produce ICT capable learners".  Sipho (DBE) (2015) stated that the government aims to produce ICT capable learners which have "21st century skills" that will fulfill progressive ideals.  Sania (Microsoft SA) (2016) defined 21st century skills as putting learning "in the hands of the learners", based on a "move away from a chalk and talk approach, a teacher standing and delivering content, to a scenario where learners are given a framework, and scaffolding, to start doing their own research".  "Collaboration and being able to communicate in a skilled way" are additional criteria, as well as problem-solving and self-regulation (e.g. giving learners time to work over a few lessons).  Alister Payne (2016) emphasized a movement away from "chalk and talk" to collaboration stimulates "higher-level thinking".  The same set of values is endorsed by the ICT4RED project, which aims to transform "traditional pedagogy" to "emerging pedagogy for the information age" based on the "21st Century Classroom" (Herselman and Botha, 2014, p. 31).  Drawing on Voogt (2008), Herselman and Botha (2014) contrast traditional pedagogy against the "information age" by stressing, among other things, learner (instead of teacher) determination, teamwork (instead of

176 See http://www.democraticeducation.co.za

individual work), productive (instead of reproductive) learning, integrated (instead of alienated) learning, and student-directed (instead of teacher-directed) learning (p. 73).

However, despite progressive rhetoric, the plans proposed by OPE *reduce* democratic self-governance by *transferring* authoritarianism from the teacher to the technology. As we have seen, proprietary and centralized cloud-based systems are authoritarian in structure, as is the Big Data surveillance which those systems are designed to conduct. Je'Anna Clements (2018) summarizes this point upon learning about OPE through Kwet (2017c): "Children who spend 12 years being digitally profiled and manipulated will likely experience digital puppeteering of their activities as normal. Those who are continually subjected to digital profiling and direction, could learn to be steered and controlled by technology". The DBE, she worries, may be "embracing partnerships with Big Data for profit and powerful tools to indoctrinate learners and control political dissent", adding that "children must either 'learn to program or be programmed'" (*ibid*). Endorsing my point on People's Technologies for People's Education, Clements concludes that "it's perfectly viable to use the best of ICT in South African education without abuse of privacy or appropriation of personal data" (*ibid*). Her position is in line with Seymour Papert's (1980) comments that, under the new "computer-aided instruction… One might say the *computer is being used to program* the child" (p. 5, emphasis in original). Instead, in Papert's view, it should be that "*the child programs the computer*" to become empowered and knowledgeable computer users (*ibid*, emphasis in original).

Lin Zhou (IBM) (2017) expressed how adaptive learning intends to "program the child" with his description of "personalized pathways". According to Zhou, adaptive learning enables personalization through "three components". The first combines human and machine intelligence, where adaptive systems "augment or assist" the teacher. The "best" teachers still outperform any machine, but the combination of the two "is ideal". Second, the adaptive learning system collects data on what the best learners and teachers "have been doing in the past" to "advance the adaptive learning system" and "predict remediation pathways". The system must also be "supervised" (trained by the professor or teacher), and the more it is used, the better it becomes. Third, IBM's "design thinking process… defines the hills in an initial workshop, begins a prototype, and uses feedback to drive development. Guidance then comes from users and teachers to improve development" (*ibid*). In other words, the machine (IBM's adaptive learning system) harnesses surveillance to "define the hills" for the child. The teachers to then "guide" them along. The adaptive learning model contrasts sharply against Walter Bender's (2015) comment that with nonfree systems, "you're going to give them a sense of purpose as opposed to let them find their own sense of purpose". The computer is clearly built to "program the child", just as Papert feared.

Human rights advocates like Walter Bender and Je'anna Clements argue that children be given the opportunity to control their computer environments with Free Software. While one might question the need for every child to *master* code (Torvalds, 2014; Miltner, 2017), learning some basics gives inclined learners the groundwork to move forward, while providing the others knowledge to think critically about the digital society (Williamson, 2017). Certainly, with state-corporate proprietary and cloud-based systems, individuals and communities lose authority to control their educational environments, as Harber and Mncube attest. And with Big Data surveillance – an architectural design feature – authoritarianism intensifies, as learners grapple with a system of "never ending, and often reductive and punitive, 'audit cultures'" (Swalwell and Apple, 2011, p. 369), based on the pervasive, all-seeing judgments of Big Data systems.

The authoritarianism of e-education officials and stakeholders, then, is the "real world of schooling", rather than the progressive one described by policy papers, e-education officials, and stakeholders. The progressive language can be explained as an extension of the *Waiting for "Superman"* approach to narrative construction. In *WfS*, the dominant groups behind the film "listen carefully to the language and issues that come from below. They then creatively appropriate the language and issues in such a way that very real problems expressed by multiple movements are reinterpreted through the use of powerful groups' understandings of the social world and of how we are to solve 'our' problems" (*ibid*, pp. 369-370). In the case of e-education, the authoritarian "factory model" of education, long emphasized by the left – from anarchist interpretations (Goldman, 1910, p. 24; Berkman, 2005 [1992], p. 271; Armaline and Armaline, pp. 182-185) to socialists and other critics of later generations (Bowles and Gintis, 2011 [1976], p. 170; Nasaw, 1979) – has been appropriated by e-education advocates to attack "traditional" education and replace it with state-corporate authoritarian technologies.[177] These new systems, we will see next, are aimed at teachers as much as they are learners.

177 See comments, from industry and educators in the US to journalists and academics in South Africa (Lapowski, 2015; Education Reimagined, 2015, p. 4; The Economist, 2016; Huawei, 2016, p. 31; Phillip, 2018; Morkel, 2016; Fourie, 2016).

## 7.2: Teacher Autonomy and E-Education

Just as Big Data surveillance threatens learner freedoms, it also threatens teacher autonomy. In Chapter 5, we saw that OPE plans to use e-administrative software to surveil classroom activity in real-time, and that there is an artificial boundary between learner and teacher surveillance analytics. These measures threaten teacher privacy and autonomy (Zeide, 2017; Kwet, 2017c).

Michael Apple (2005) has labeled a recent global wave educational reforms "conservative modernisation", whereby "neoliberal commitments to the market" place "emphas[is] on stronger control over curricula and values, and 'new managerial proposals' to install rigorous forms of accountability at all levels" (p. 11). Over the last several years, the government, along with journalists in various media outlets, have called for a conservative modernization reforms that would intensify auditing, surveillance, and quantifiable managerial procedures. These include annual standardized tests (called the Annual National Assessment, or ANAs), biometric fingerprinting to track teacher attendance, performance-linked pay ("merit pay"),[178] teacher competency examinations, and the re-introduction of external inspectors (Anthony, 2013; Govender, 2016c; Masondo, 2015; Masondo, 2016b; News24, 2013c; Reddy et al., 2010, p. xi, 88). Each of these measures have been successfully resisted by the five major teacher's unions.

The reforms proposed by neoliberal voices in the university and press are nothing new (see Chapter 2). For decades, Linda Chisholm (1999) has written about how apartheid-era controls are "being reorganized within the context of a neo-liberal global hegemony" (p. 113). Chisholm provides examples of tactics used to control teachers' work in black schools under apartheid. In one instance, a deputy principal in a Soweto girls' school explained, "Like in the past we used to have a record, a logbook. If a teacher doesn't go to class, we'll record that teacher didn't go to class. If we record the teacher three times, we refer the matter to the inspector". Control of black teachers, enforced through surveillance, was "direct and linked to official concerns with social control and departmental demands for loyalty and subservience" (p. 115). According to Chisholm:

> The main concern with procedures for evaluation was monitoring and surveillance. These were performed on the basis of checklists which evaluated teachers in terms of four components: curricular efficacy, extra-curricular efficacy, personality and character traits, and professional disposition and attitude. In the context of growing resistance by teachers to apartheid

178 In its 2011 policy document, the DBE (2011) holds that performance-linked pay should be kept low (p. 112).

education, the latter were increasingly used to assess and measure loyalty to the department controlling African education (p. 116).

Chisholm adds that despite the 1980s teacher challenges to “top-down, bureaucratic and authoritarian controls over teachers’ work”, at the moment of transition to democracy, “new forms of control over teachers’ work were finding their way into education policies of developing countries, including South Africa” (*ibid*). At the center is “new discourses on marketing and management… to ensure the restructuring of controls over teachers” (*ibid*, p. 119). During the past decade, the government has been pushing to bring back “surprise school inspectors” to address teacher absenteeism and monitor curriculum coverage (Anthony, 2013; Masondo, 2016b).

With OPE, the “monitoring and surveillance” of teachers prevalent under apartheid and proposed in the neoliberal era would be easy to implement at the flip of a switch. As we saw in Section 5.3.3, surveillance LMSs are already being implemented and are expected to increase in complexity (Richard, 2016). Moreover, they plan to implement surveillance “on a broad scale so that either the MEC in Gauteng or the Minister in fact can look at any province at a particular point in time and see exactly what is going on in real-time” (Sania, 2016). Rachel (MSDF) (2016) has added their DDD “is a project where people want to see real-time attendance”, a position backed by circuit manager Monki Gabashane (2015). Performance-linked pay also becomes easier with cloud-based systems: in a DBE brochure advertising the DDD Dashboard from the MSDF website, Nardus Vosser, Principal at Laerskool Bysonderheid, said, “I can look at the Dashboard and see the performance of each teacher and that can help to inform salary increases and other important decisions. It’s a brilliant system, gives concrete evidence rather than a teacher self-evaluating” (DBE, 2016b, p. 8). While Vosser says he seeks to “focus on supporting rather than accusing teachers of underperformance”, his statements clearly suggest the system is used to implement merit pay (*ibid*).

With computers and high-speed Internet in the hands of teachers and learners, the *infrastructure* used to to implement neoliberal reforms becomes more powerful and easier to implement. Fingerprint readers are no longer essential because laptop activity can be individualized and monitored in real-time through clouds. In-person inspectors are no longer required because the clouds inspect everyone all of the time. Summative standardized tests are no longer needed because students are being monitored and tested throughout the day, everyday. Teacher competency examinations now become a click away: it will be easy to demand teachers log into a teacher LMS system and perform an examination for education authorities. The power relations are shifted towards centralized bureaucrats and corporations due to *design features* in the technical architecture of the digital ecosystem. The OPE technologies being developed and implemented illustrate that "arrangements of technical architecture… embody specific forms of power and authority" (DeNardis, 2014, p. 7) and constitute "politics by other means" (Starr, 2004, p. 6). Without alternative systems in place, teachers face the reintroduction of apartheid-era and neoliberal reward-and-punishment schemes, based on computer-driven quantification and surveillance and justified through the language of "monitoring and evaluation" and "accountability".

## 7.3: Big Tech Colonization in South Africa

If the technical architecture is "politics by other means", it is of concern that "megacorporations" – rather than the public – are in control. Corporations, Noam Chomsky (1994) notes, are "absolutist organizations" that place power "in the hands of owners and managers" with a strict top-down authority structure and no means for participation from outsiders (the general public) (p. 239). They engage in the "pathological pursuit of money and power" as an institutional form which extends back to colonialism in countries like South Africa (see Chapter 3; Bakan, 2004). When foreign corporations are dominant in the Global South, democratic control becomes even more remote, as foreign states lack the means to regulate their behavior.

In South Africa, US multinationals are aggressively pursuing their interests for education, economy, and society. For some Big Tech corporations, such as Google and Microsoft, schools provide a powerful means to capture emerging markets. As Alister Payne (2016) noted in Section 6.1.2, Google's profit strategy is to use education to bring children into the Google ecosystem: "although they're directly not making money they're bringing people into their environment and they're making money indirectly off that. But that's always been their model." This is a notable comment coming from Payne, who (by choice) exclusively services Google for education in SA for his company, CloudEd. It also confirms the assessment of Lindh and Nolan (2016), who, speaking from a critical lens, found that with Google educational products are problematic for schools: "Google can disguise the presence of a business model for online marketing and, at the same time, simulate the practices and ethics of a free public service institution. This makes it problematic for Swedish schools to implement Google Apps for Education" (p. 1).

Microsoft also pursues "politics by other means" through its educational offerings. As noted in Section 3.3.6, Microsoft has a history of attempting to undermine GNU/Linux in Africa. Ostensibly, Microsoft recognized the importance of capturing the youth experience to perpetuate their dominance in emerging markets, where many users are beginning their digital journeys from scratch. Starting on GNU/Linux or Google Android instead of Microsoft Windows will likely influence long-term adoption rates in the country. In Section 6.1.1, we saw that Microsoft is still the top choice for e-education in SA. While this could change – Google rapidly captured market share in the US within a short period of time (Henderson, 2018) – Microsoft remains dominant force.

To this effect, Microsoft has embarked upon an aggressive campaign to entrench its products in SA through schooling and even adult education. With respect to the latter, in July 2016, the City of Johannesburg announced an R200 million, five year deal with Microsoft "to empower the poor" (City of Johannesburg, 2016a). Then Mayor Parks Tau notified the public that "800 000 youths aged between 18 and 34 and 200 000 residents aged 35 or older would be provided with free training to equip them with computer skills needed for entry-level jobs" (*ibid*).[179] Computer skills include training on Microsoft Office and are available without charge to the participants.

In September 2016, the Tshimologong Precinct, "Johannesburg's own Silicon Valley in Braamfontein", opened for business, with Microsoft one of its partners (City of Johannesburg, 2016b). The R40 million tech hub "is aimed at rejuvenating Braamfontein through the incubation of hi-tech start-ups and the commercialisation of research and development of high-level skills for students, working professionals and unemployed youth". The City of Joburg describes it as "the brainchild of the City of Johannesburg, Wits University's Joburg Centre for Software Engineering and Gauteng Province e-Government" (*ibid*). Through this initiative, Microsoft sponsors Microsoft software for the Tshimologong Precinct (Schofield, 2016, pp. 15-16). With the creation of this Johannesburg-based hub, a leading founder, Professor Barry Dwolatzky[180], aims to make the Precinct "home to a digital revolution" (Dwolatzky, 2015; see also, Dwolatzky, n.d.).

Microsoft is a founding partner of the Wits-based Joburg Centre for Software Engineering (JCSE) (2016, p. 15). One of its initiatives, called the App Factory, offers a paid internship program to develop Windows apps for the South African market (Shezi, 2014). Collaborations with Microsoft are "aimed at instilling business principles" in students and developing innovation for business (City of

179 According to one report, Tau stated, "the investments on the overall project come from the City of Johannesburg and Microsoft" (SA Gov News, 2016). Other reports said Microsoft "injected" R200 million into the project (Diphoko, 2016); it is not clear what Tau meant when he said "investments" were made by each of the partners.

180 Professor Dwolatzky was appointed as full-time Director of the JCSE in 2007 and is the Chairman of the Tshimologong Precinct. Dwolatzky and Mteto Nyati, Managing Director of Microsoft South Africa, were named the joint South African IT Personality of the Year at the President's Awards of the Institute of Information Technology Professionals (JCSE, 2015, pp. 22-23).

Johannesburg, 2009). Partnerships between government, academia, and business form the foundation of the JCSE. First National Bank, a JCSE founding member, says that "[a] contributing factor to the success of our enduring partnership includes our shared undertaking of the JCSE's values, vision and goals" (JCSE, 2015, p. 23). This leads one to ask: what constitutes their "values, visions and goals"? Do they include freedom, human rights and local autonomy? The replacement of an overly financialized economy (Bond, 2013) that disproportionately burdens blacks (Southall, 2016, pp. 163-196; Khunou, 2015) with production for the real economy? Privacy measures to prevent invasive Big Data surveillance used for manipulative advertising, employee monitoring, and technocratic management?

Ben Williamson (2017b) asks these kinds of questions in his popular essay, "Coding for What?" Williamson emphasizes the need for coding education that teaches about the social effects of coding practices, such as "the social power of algorithms". From an anarchist perspective, we can add to this critical consciousness about the digital ecosystem and the politics of digital architecture, including property relations and software licenses. In Tshimologong, Free Software is not given attention in documents, on websites, or in web search results querying these initiatives – despite official government policy mandating a preference for FS use in the public sector. In fact, it is hard to find mention at all. One cannot find engagement with the values, visions, and goals central to human rights in the digital age. Instead, big business, predominantly drawn from US-based corporations, and local academics are directing the process. They are seemingly enthused to funnel students into any type of business venture, no matter the consequences for society, in part by setting curriculum aims and content to the needs of dominant corporations.[181] The JCSE Skills Academy (2016), for example, focuses on "the administration of the various skills initiatives, business development, training and consultancy, and customer relationship management" (p. 25). The Academy "has identified a need within its immediate environment to present training courses in programmes in the Microsoft suite such as Office and SharePoint to the JCSE's partner institutions and staff at Wits University, as a starting point" (*ibid*, p. 30). Oracle and Cisco certifications are also offered at the Skills Academy (*ibid*).

Other corporations are involved in the newly launched Tshimologong Precinct. IBM opened its Research Lab in the Precinct (one of two IBM Labs in Africa and its 13th in the world) with a $70 million investment, catalyzing co-investments by other corporate partners like MMI Holdings and Telkom (*ibid*, p. 31). Accenture, Microsoft's 2016 "alliance partner of the year", provided financial

181 At this time of writing, regular classes scheduled at the JCSE include "developing solutions for Google Cloud Platform" and classes for Big Data and machine learning for the Google Cloud Platform (JCSE, n.d.).

support to train 6,000 youths for the Precinct's Accenture Coding School, launched in 2015 (Accenture, 2016; Schofield, 2016, p. 28).[182] According to Jill (Google SA) (2016), Google South Africa Education is "short-staffed" and spends its resources in other African countries. While Google has partaken in efforts to provide white space Internet connectivity in Cape Town (Oxford, 2013), its activity in South Africa has been small by comparison to Microsoft. In March 2017, Google announced it reached its goal to train one million young people in digital skills across Africa, but only 70,000 were trained in South Africa, compared to 450,000 in Nigeria and 400,000 in Kenya. Google said the low number in SA "is due to the lack of buy-in from government and universities" (Rawlins, 2017). Disappointed with the figures, the head of policy and government for Google SA, Fortune Mgwili-Sibanda, said, "[w]e are no longer going to knock at the door, we are going to bang" (Ventkess, 2017). If true, additional resources will likely be poured into Google South Africa.

While Microsoft South Africa plays a prominent role in Johannesburg's tech hub, it is also signing deals elsewhere in the education sector. Universities like Wits, the University of Cape Town, and the University of Venda have Microsoft Agreements which allow staff and postdoctoral fellows to load Microsoft Windows on computers purchased through the university, for free. Staff and students can install Office 365 on up to five devices (15 for staff), also free of charge (UCT, n.d.; Wits, n.d.). The University of Venda partnered with Microsoft to provide every student with a Microsoft tablet (Microsoft, n.d.-a), while the University of Limpopo partnered with Microsoft, the DST, the CSIR, and Multisource to pilot Microsoft's TV White Spaces (Internet connectivity) project in several Limpopo primary and secondary schools (Oxford, 2014d).

Microsoft also entrenches its products in South Africa via teacher training programs. Through its Microsoft Partners in Learning program, Microsoft notes: "we have trained over 31 000 teachers and school leaders on ICT integration to enhance teaching and learning, having an impact on nearly 4 million learners" (Microsoft, n.d.-b). This includes "[o]ver 800 trainers from the Department of Education and [Microsoft's] education partners" who "have been trained to roll out, scale, and sustain the Partners in Learning programme in support of… the White Paper on e-education" (*ibid*).

In each of these initiatives, Microsoft offers a poor country resources and "donations" that serve the long-term interests of the Microsoft ecosystem. Herman (DTPS) (2015) explained that the

182 Accenture is part of an effort to have government in Munich, Germany replace the use of LiMux, a custom version of Ubuntu desktop operating system, with the use Microsoft Windows. Microsoft had recently moved its Germany headquarters to Munich, which has a strong local Free Software community; the recently elected pro-Microsoft mayor of Munich, Dieter Reiter, chose Accenture (located in the same building as Microsoft) as a consultant to make recommendations to the Munich government (see Bhartiya, 2017; Vaughan-Nichols, 2017; Heath, 2017a; Heath, 2017b; Schießle, 2017).

government's budget is limited by competing priorities, so they "basically seek to get partnerships with the private sector to see how the private sector is able to invest in government, especially from an education perspective". Initiatives could include teacher training and user-requirements (e.g. trends in future specifications). Herman stated that sometimes "the private sector comes to the party to… say, 'we as the private sector will invest in the government along these lines, and we don't want anything back from you'". For example, he said Intel has provided "responsibility-free training for all teachers. To date, there is about 17,000 teachers that have been training without government being able to invest anything towards it". Corporations also offer corporate social investment (CSI) to provide computer labs, devices, and 3G connectivity. Because provincial education budgets for e-education are "small", the Operation Phakisa Education lab attempted to establish "how alternative funding models" to "solicit funding" for infrastructure, devices, content, teacher training and professional development, and connectivity (*ibid*). It is not surprising that many corporations were present.

Product placement by US multinational corporations in South African schools makes perfect sense when considering the value of children to the market. As Juliet Schor (2005) notes, "students are as close to a captive audience as advertisers are ever likely to get" (p. 85). Exceptions notwithstanding (Kasinathan, 2018), most education technology scholars have missed this point, in part because they are not considering People's Technologies as an option for schools. As Ha-Joon Chang (2008) notes, wealthy countries have developed from poor to rich economies by utilizing selective industrial policies like trade tariffs for "infant industry protection". South Africa can partially protect its infant industries from US multinationals by keeping IBM, Microsoft, and Google from building infrastructure and flooding the market with their products in the public sector. They can likewise attempt to protect infant digital industries by adopting People's Technologies like Free Software and raising consciousness about digital colonialism and technological power relations. Alfredo Terzoli (2016) recognized the consequences of disregarding the 2007 *FOSS policy preference*, stating that "the big problems now" are corporations like "Google and Facebook", in addition to Microsoft, which is operating in South Africa "because there is the possibility of a little extra market there". Policymakers seem to take Big Tech products for granted, which constrains choices to behemoths like Google, Microsoft and Apple, without considering that freedom-respecting options are available for end-user devices. The following four sections will address *why* the DBE is opting for foreign corporate products instead of the Free Software options endorsed by the Cabinet in 2007.

## 7.4: Corporate Influence and Policy Mobility

This dissertation makes clear that Northern technologies, models, and ideologies have overtaken the e-education agenda in South Africa. The choice to implement Northern solutions to Global South problems is consistent with the history of policy development in the post-apartheid era (Marais, 2011; Bond, 2014; Madlingozi, 2007, 2014; Terreblanche, 2002, 2012). As famed education scholar Jonathan Jansen (2002) noted in 2002, South African policy has “striking resemblances” to “England and the United States”, including “the emergence of dominant discourses about markets and competitiveness” that “co-exist with increased surveillance and regulation of schools and universities” (p. 42). While “it is clear that education policies and ideologies cross national borders with roughly similar promises, perils and procedures as economic markets” he added, “It is also clear that in the case of the third world state, these movements can no longer be declared a consequence of the dependency of such states on powerful first world nations” (*ibid*). Rather, “the South African state draws liberally and loosely from policies and policy ideologies in the West”, without strong forms of coercion (*ibid*, p. 44). The National Qualifications Framework, for example, was essentially a New Zealand policy, while Outcomes Based Education was based on the work of the US educator, William Spady (who consulted for South African policymakers) (Fiske and Ladd, 2004, pp. 157-158). The policies were thus “borrowed” from elsewhere and emulated locally (Dale, 1999, pp. 9-10).

Policy scholars have long studied how policy travels through networks across the world (*ibid*; Ozga and Jones, 2006; Peck and Theodore, 2010; Ball, 2016). In South Africa, the policies chosen and rhetoric deployed clearly emulate the Global North. However, it is not fully apparent *how* policy is transmitted from the North to SA. In their work, *Edu.net*, Ball, Junemann, and Santori (2017) devote a chapter to e-education policy mobility in South Africa, but this is limited to Curro schools, which, as we saw in Section 1.3.1, have no substantive presence in South African schooling. Curro schools were not mentioned a single time by interview subjects or in policy documents. Thus there is no evidence Curro schools exert any influence upon OPE, the South African state, or any education outside of their tiny network. Aside from *Edu.net*, there are no other works even attempting to analyze the sociology of contemporary e-education policy in South Africa, possibly due to the fact that OPE has been highly secretive (Kwet, 2017c) and its details have not been disclosed to the public.

Many South African interview subjects spoke of corporate influence on e-education policy. Yet much like the OPE lab itself, state sector relationships with the private sector remain quite opaque. DBE interview subjects said the private sector approaches the government about doing business in some cases, while the government approaches the private sector in others. For example, Herman (2015) was asked to present on education at a CSI breakfast with about 50 companies in attendance. In addition to CSI events, there are periodic "e-education" conferences often supported by state and corporate sponsors. Examples include EduWeek, EduTECH Africa, The African Innovator Education Innovation Summit, ICT South Africa, The Digital Education Show Africa, and EdTechTeam Summit (a Google event).[183] Speakers are typically drawn from the public and private sector; some of the conferences offer pre-scheduled ministerial meetings to partners and delegates. When asked about EdTech conferences, Chloe (SchoolNet SA) (2016) said:

> For me, EduWeek, for example – everybody is on the education cash cow. And I think maybe people realize there is a lot of money in education in terms of schooling, wanting to have devices, and [they] unfortunately just prey on unsuspecting people, in my opinion. But you have many of these conferences all like, 'we are the leading whatevers in terms of ICTs in education', and they have a couple of keynote speakers. But at the end of the day it's a marketing spiel, these people are selling their software, or selling their hardware. Particularly if you look at Platinum and Gold and all these kinds of sponsors.[184]
>
> Not to say that all conferences are useless. The thing is where people get to be aware of their sort of trending technologies. But unsuspecting people are then hoodwinked into thinking, 'that's the solution.' Particularly if you don't have any sort of prior experience of-- and a lack of awareness of the world in terms of ICTs at large. You'll find that many of these things are basically people selling their stuff. And the educational value is a game, sort of sidelined because it is, 'look at this fantastic new trending hardware or software that's in these first world countries. You should have it, too.' Without understanding what its purpose is, what its use could be. So yes, I agree, there's quite a lot of these education conferences and some of them cost an astronomical fee and again, it's education. So a teacher being able to afford to go to a conference that is going to cost an arm and a leg is just not right.

In other words, the conferences are places for corporations to pitch their products, with mixed utility, a possibility of "hoodwinking" target audiences, and cost barriers to participation from actors like school

183 For an example of content discussed, see presentations for EduWeek 2018 at: https://web.archive.org/web/20180917013100/http://www.educationweek.co.za/ewprogramme

184 Many of the conferences offer sponsorships whereby corporations can purchase advertising for their products according to tiers like "platinum" or "gold" – the more they pay, the more prominently their products are advertised.

teachers. It is not a format conducive to anarchist and progressive ideals which prize community self-determination in education (see Section 7.6). Nevertheless, the DBE is aware that EdTech vendors are out to make money. In *Action Plan to 2019*, the DBE (2015a) acknowledges there is "'hype' generated around ICTs, much of it by vendors" selling the impression that their products will "automatically lead to" improved learner performance (p. 18). Nevertheless, it is quite plausible that business relationships are facilitated at these conferences, especially considering that multiple conferences are held each year, sometimes with the same individuals at each one.

When asked about the EdTech conferences, Alister Payne (CloudEd) (2016) said "there is a bit of revolt happening from the inside out". At EduWeek, he remarked, "we had several of our partners that put up stalls there and said, 'we stood along with the weeds.' There was nothing going on. There were no educators and it was basically a waste of time" (*ibid*). He said non-profits "at the coalface" of e-education implementation are "starting to become more Google-centric" despite preferences at higher levels for the likes of Microsoft (*ibid*). Payne concluded, "almost internally from the middle out you can see a little bit of revolt nationally where those top-down decisions are [now] going to be started to be implemented by educators and NPOs that are starting to make decisions there" (*ibid*).

In light of respondents' comments, as well as information gathered from conference websites, it is difficult to assess the role of e-education conferences and similar gatherings, such as Herman's CSI breakfast. Payne suggested that the conferences are overhyped, while Chloe suggested that product "peddling" might "hoodwink" attendees. Peering in from the outside, one cannot be sure how much influence these events have on policy without directly observing the policymaking process. However, the fact that several of these conferences are held each year suggests that they help facilitate or establish state-corporate policy networks (Ball, 2016).

A similar opaque dynamic characterizes the tendering process.[185] Payne did not believe that tenders are actually put out for provincial-wide software agreements. He remarked:

> I may be absolutely open to correction here – it currently sits at a provincial level. The way it was explained to us is that does not go to tender [but that] the provinces get around that by allocating to resources. So the paper and pens that were going to schools unfortunately are now

185 The DBE is guided by the procurement procedures in the Public Finance Management Act (Sipho, 2015). The "five pillars" of government procurement in the Act are: (1) Value for Money; (2) Open and Effective Competition; (3) Ethics and Fair Dealing; (4) Accountability and Reporting; and (5) Equity (Government of the Republic of South Africa, n.d.).

> being pushed to Microsoft licensing. And that's been an historical contract that's been in place (*ibid*).

However, there is a tendering process for components of the e-education initiative. It may be the case that tenders go out for most things, such as learner devices in particular initiative or support services in a particular pilot project – but not the provincial software agreements. Chloe (2016) said that hardware "generally goes with software". Telkom, for example, "has a relationship with Microsoft and they would load Microsoft Office product onto the devices and then send it out to schools". The Universal Service Obligations project has tablets and tend to be coupled with Android devices (*ibid*). Ashley (Pearson SA) also described the tendering process for transparency and funds. She remarked, "once you go through a tender process, you get a few people winning those tenders and so a few people are actually implementing" (Ashley, 2016). She believes in the long run, "a lot of this is going to come down to big tender opportunities," and "you will find big players delivering in bulk in many ways when it's fully established" (*ibid*). That is to say, she expects e-education to be dominated by a few big corporations.

Business interests are linked to the underlying technologies in ways not apparent to the average person. Microsoft Windows runs natively on x86 processors (which Intel dominates) and is used by the majority of laptops and desktops. ARM processors, by contrast, are used by the majority of smartphones and tablets. Google Android runs natively on ARM, but not x86, so Google Android is used in most smartphones and tablets. Microsoft and Intel thus have a mutual interest in x86 devices (despite some forays by Microsoft into the ARM world).[186] When schools decide to go with ARM tablets, it comes at the expense of Microsoft and Intel – two powerful corporations that have, through investments and partnerships, integrated themselves into the South African e-education landscape for over a decade.[187] Thus, e-education policymakers and stakeholders have to account for these economic linkages into order to critically evaluate the interests of different actors. Intel vendors may suggest Microsoft products or laptops simply because they make more money from those products. (The competency of e-education policymakers to grapple with complex economic questions such as these is addressed in the following section.)

Non-profit e-education participants are usually partnered with several corporations. SchoolNet SA, a Section 21 non-profit, has partnerships which include Microsoft, Intel, Google, Adobe, Vodacom

186 For additional background, see (Shah, 2017).
187 For example, Intel (along with SABC) sponsored EduWeek 2016.

Foundation, The Telkom Foundation, DG Murray Trust, Eskom, CSIR and ICT4RED, DBE, DTPS, and the Eastern Cape Department of Rural Development and Agrarian Reform. Its two main teacher development programs are supported by Intel (Intel Teach) and Microsoft (Partners in Learning). iSchoolAfrica is an education initiative supported by Core Group, the "sole distributors for Apple in Sub-Saharan Africa" (Core Group, n.d.). iSchoolAfrica has a variety of government and corporate partnerships, including the United Nations Children's Fund (UNICEF), DRDLR, CSIR, Telkom, Sasol, and iStore South Africa. While Laetitia de Jager (iSchoolAfrica) (2016) maintained that iSchoolAfrica is "device agnostic" (meaning they will deploy their services for any device or software), they clearly favor Apple devices.

With funds coming from corporations and government, NGOs are wise to align their ideologies and services to corporate and government interests and educational ideologies. De Jager described the process of appeasing funders a "dance you dance" on a "tight rope" (*ibid*). Funders, she said, want to be sure they receive a return on investment. As a logical corollary, if her organization's approach to e-education was antagonistic to their funders' interests, they would risk losing money. Incumbents like Microsoft, Google, and Apple will withdraw funds for projects if technology chosen subverts their profit agenda (e.g. vendor lock-in and surveillance capitalism), and new sources of funds will have to be obtained. If NGOs rely on particular vendors, such as Big Tech corporations, they may feel pressured to internalize their ideologies and interests.

De Jager added that sometimes funders expect NGOs deploying technology will reverse poor performance overnight. To safeguard against this unrealistic expectation, she primes their expectations towards the long-term at the outset of each project proposal. Funders should not expect a 15% increase in learner grades, for example, because there are too many variables to consider. Instead, iSchoolAfrica will construct surveys with very specific questions (such as how teachers use the technology, what kind of changes they see, whether or not disciplinary issues arose when they started using the technology, and so on) and give the results to the funders. In some instances, they conduct a before-and-after test (say, in numeracy performance). But they are careful to add in "soft issues" that do not show up in a spreadsheet, such as the typical drop in grades during exam-intensive terms, or the added enthusiasm for students making their own movies with the devices (*ibid*).

Mario Marais (ICT4RED) provided an example of how "setting the specs", much like De Jager describes, can go wrong. On his account, Apple sets its own standards to deceive government officials. As he put it:

> ...you've always got Core, which is the Apple Distributor, and you've got iSchoolAfrica which is your education arm, which is supposed to be the front end of Apple in education. But they've got a very direct linkage, the money comes from the business side, so it's very directed by the business side… What I've seen… it's very directed… in terms of the results they want… They've got this push on, they've got their own… numeracy and literacy tests designed by Apple. And they would then come in with a baseline measurement and they would say, 'look, our target for our team is 15% improvement, so after six months, as a business, as a corporate, we'd like to see 15% because of the use of iPads plus its software ecology, plus our teacher training.' But then they define their own targets, and they go and sell that results to the powers that be… So it's evidence-based but defined in their terms using their software, using their approach, using their measurements, telling them, 'look, this is how iPad will change teaching.' So that's, I think that's their primary route.
>
> The other route is to create publicity. So, in the project we did with them, they actually took a group of kids to parliament, and the kids did, as a project they did a video of Parliament and they did a photograph together with the Minister, Deputy of Rural Development and Land Reform, funded by iSchools project. And the Deputy Minister. So they're all surrounded by smiling kids and then they do videos of that and then they market the hell out of it. And you can find that on YouTube and so on. So Apple is good at marketing. If you were to ask the actual impact on the schools and the sustainability of it, and how many people do they put on the project, and I've told them, it's too little. The resources they're putting in is just-- it's small compared to the publicity they get out of it. They've got very good people. They've got people with their hearts in the right place, but they're in the context of a corporate environment that wants to see a return on investment (Marais, 2015).

Thus, when negotiating funding for NGOs and tenders with government, big corporations are using their resources to place their products, inculcate their perspectives, and propagate their marketing materials. As we see in the next section, policymakers and e-education officials likely lack the competencies needed to critically evaluate technology choices for the education system, and are vulnerable to the ideology and biases of Big Tech corporations. Rather, it seems that the private sector is being called upon to counsel advice to government. Ashley (2016), for example, said that Pearson works with local and national government to "help them find ways to implement the e-learning strategies they are looking for". The national government has "no real framework, or means to do that", so the provinces are left to themselves "to work out what that means" (*ibid*). The North West province, for example, "asked for people to come in and give them ideas" (*ibid*). Pearson then steps in to provide a workable model. Ashley said that other players, such as Samsung, Lenovo, and Microsoft offer individual products like hardware and software, "but nobody seems to have the full picture. So we [at Pearson] were trying to put ourselves in the position to have that full picture so we can actually have a meaningful end-to-end solution. Otherwise people have to keep re-inventing the wheel" (*ibid*).

One interview subject from South Africa, who wished not to be named for this quote, stated that the decision to mandate Microsoft software for programs like Computer Applications Technology (CAT) curriculum was "clearly given to [the DBE] by Microsoft as a push and it takes little to push these guys. It's enough to have a workshop in Kruger Park, it's not that you have to pull out a big wallet – just be nice to them, take them out to lunch a couple of times, that's enough." This respondent said there is no neutrality regarding software in the DBE because "compared to the open source suite, Microsoft has people that know how to push the business in the way that is the best" (*ibid*).

Alister Payne (CloudEd) (2016) believes that government wants industry to give them guidance and direction about where e-education is going – a strategic vision – and that industry will not provide "an education line". In other words, policymakers want industry to suggest what products to implement *and* how they should conceptualize their overarching e-education agenda. Payne believes the government may be "hiding behind [non-disclosure agreements]" at events like the Operation Phakisa Education lab "because they don't have a clear idea" on the overall direction "and the answers are not there yet" (*ibid*).

While the relationship between industry and government is opaque, there is little doubt that the Global North, led by US multinationals, exert enormous influence on e-education policy. Big Tech products, funding for various projects and institutions, longstanding integration into the e-education system, and general market dominance in South Africa puts US corporations in a position to muscle their way into schools. The policy process is different than, say, the New York state model outlined by Joel Spring (2014), in which a "shadow elite" of former Bit Tech corporate executives obtain jobs inside government and press for corporate e-education technologies. Nevertheless, the elite domination by the North seems apparent. While we cannot observe private transactions between policymakers and government directly, we can certainly discern that their agendas are dominant in the basic and higher education sector, as well as in adult education and training – a clear manifestation of digital colonialism.

## 7.5: Policymaker Competencies and Self-Interest

While OPE continues the pattern of Northern policy mobility to South Africa, there is no reason to think this *must* be the case. As Theda Skocpol (1985) has noted, states are often "potent and autonomous organizational actors" (p. 6, 9), and there is no reason to doubt a *degree* of independence can be exercised on behalf of state policymakers (Jansen, 2002, p. 42). We have seen that corporate influence is apparent, but it does not *dictate* government choices. While pressures to conform with the wishes of corporate funders may exert *some* influence on the policy preference, South Africa is not facing coercive military or economic threats to conform to Northern e-education policies that effect digital colonialism. We must ask, then, "what other reasons might have led to government policy preferences for foreign corporate products and models?" "Why aren't education policymakers following government policy and implementing Free Software in education?"

A deficiency of knowledge among education policymakers[188] could help explain the issue. Perspectives on Moglen's (2004) pillars of digital freedom are central to an e-education program. This is especially true for software and hardware, where education policymakers can choose which technologies to deploy.[189] In making these decisions, they must evaluate the relationship between software licensing and education,[190] or hardware ownership and the use of services running off the cloud. If e-education policymakers are not educated about these critical parts of the digital technology landscape, then they will fail to grasp the implications of their choices.[191]

As noted in Chapters 1, 3, and 6, many digital rights experts hold that software licensing critically impacts education and society. South African e-education policymakers, by contrast, seem to miss this point. As we saw in Section 6.2, interview subjects take an "anything goes" attitude to software for education and society – a "consumer's eye view" narrowly circumscribed to what they perceive as the latest and greatest tech available on the market for the goal at hand: improving

188 This is as opposed to other policymakers, such as those who pushed for the Free Software policy in the early 2000s on the basis of a richly detailed analysis of software and intellectual policy (see Section 6.1).

189 School systems cannot affect Moglen's third pillar: equitable access to neutral Internet connectivity. However, they can educate the population about the importance of broadband decentralization and net neutrality to human rights; at the more advanced levels, they can work with students on creative solutions to these problems.

190 See Bender and Ulibarri, 2016, p. 10.

191 This is not unique to South Africa; for comments on tech illiteracy in the United States Senate, see Greenberg, 2016; for comments on the US Supreme Court, see Timm, 2014.

education. The human rights and development benefits derived from the freedoms granted by strengthening the pillars of technological freedom does not factor into their assessment.

It seems likely that many e-education policymakers lack the requisite knowledge about power relations in the technology ecosystem to effectively promote the well-being of South Africa, as it relates to the digital revolution. For example, in late 2016, the Minister of the Department of Telecommunications and Postal Services (DTPS), Siyabonga Cwele, who is in charge of South African Internet policy, told an audience at a technology conference, “I am excited to be amongst you, so many techies, and people who know a lot about technology. I am just a villager, I don’t know much about technology” (Cwele, 2016).[192] It is not clear that e-education policymakers have much more relevant knowledge than Cwele does. An e-education policymaker should *demonstrate* critical understanding of how power, e-education technology, and the broader digital ecosystem intersect so they can assess choices for education. This should be reflected in policy *documents* and public *speeches*. We see recently, for example, Indian policymakers speaking of digital “colonization” in public (Goel, 2018). It is not clear why South African policymakers are not speaking to these issues.

Policymaker interview responses and feedback from other interview subjects suggest a deficiency of knowledge. When asked what choices of technology will be put on devices – and in particular, which operating systems – Sipho (DBE) (2015) said that “The device or the software – whether it is an open source or not – if you check our specs you will not find any specification to any device that is a well-thought decision because what matters for us is not the device, it is what can one do with the device”.

This raises two points. First, Sipho perceived no relationship between software licensing and education and society, a point which has been well established in previous chapters. Second, the use of the phrase “open source”, especially in this context, is unimpressive from a human rights standpoint. (This is typical across South African interview subjects.) As noted in Section 3.2.2, the difference between the use of the phrase “open source” and “Free Software” (or “Free and Open Source Software”) is carefully selected amongst those who have investigated software politics. The use of the term “open source” is typically used by camps which do not care to emphasize freedom and liberty, yet a commitment to freedom and liberty is what we would expect coming out of the anti-apartheid liberation movement. The distinction is made explicit in the software policy documents leading into

192 Likewise, the new ministers appointed in Zuma’s 2017 cabinet re-shuffle, Ayanda Dlodlo (Minister, Communications) and Thandi Mahambehlala (Deputy Minister, Communications) have no background or experience in ICT or telecommunications (Mamabolo, 2017).

the 2007 *FOSS policy preference*. Nevertheless, Sipho did not speak to the intersection of Free Software, education, and society when asked about technology choices. He did not see a relationship between software freedom and freedom in society. Instead, Sipho (2015) approached the topic with a consumer's eye view:

> In my view, what I keep on saying – I'm refusing education to play in that space. Because, listening to [your questions], that is what has been happening. That the education needs, it's like, we are being led by software developers with devices that are in the market [and] then we [in] education have to follow suit. Which is, in my view, supposed to be the other way around: I determine my need and go out there and look for what is going to serve my need, instead of the other way around.

This approach trades in the constructionist role of local software development which can be cultivated by the education system for a neoliberal market-based approach which has multinational corporations develop the product line from which the education system can pick. More (slightly) technical questions were given responses that suggest unfamiliarity with issues where technology, education, and politics intersect. For example, consider questions about digital rights management (called "digital restrictions management" by critics).[193] DRM, recall, places restrictions on the use and sharing of information (such as an ebook or film) with proprietary software or cloud-based authentication (see Section 3.2.2). DRM technological controls create controversy in the field of education. Electronic rights organizations such as the Electronic Frontier Foundation (EFF-US) are challenging DRM in the US courts for adversely impacting speech, access to knowledge (including use for education, see EFF-US, 2016, pp. 7-11; Higgens, 2016), and computer security (Doctorow, 2015). While DRM's status is unclear in South Africa (Koornhof, 2015), it is certainly an important issue for access to knowledge in public schools.

When asked about DRM, Sipho was unable to offer an opinion, and recommended asking Richard (DBE). I subsequently interviewed Richard (2016), who was also unfamiliar with the subject, stating that "They are using software to make sure that copyrights are protected. Yeah. I don't know if they use exactly what you are saying, but I know that they use something to make sure that copyrights are protected." DRM is a very basic part of the discussion of digital politics. That Sipho and Richard

193 See Samuleson, 2003, p. 2; Stallman, 2017b.

had no opinion on (and, perhaps, familiarity with) the subject speaks to a lack of competency to address such an important topic for the national basic education sector.

On questions of privacy, responses were often uninformed at an elementary level. For example, when asked about software controls on devices, Sipho (2015) said, “how do you envisage having a policy that is related to learners downloading their apps or not? How would that even work? Because they are doing it anyway”. In this response, a question about basic software controls to limit the apps *installed* on a device was met with a response about *downloading* the apps. When I added that there are ways to restrict user access controls and privileges (that could block the user installation of apps), Sipho responded, “I thought we are talking education here” (*ibid*).

When asked about the use of privacy protecting software such as Tor and other privacy tools, Richard (2016) said that “you’re too far ahead” and “I don’t know whether any of the aspects that you are talking about” will be covered in the draft guidelines about e-theft and cybersecurity currently being formulated.[194] The purpose of using Tor is not to guard against e-theft or enhance cybersecurity, but to protect privacy online. Richard’s response does not address the simple question at hand, one which would be familiar to those with a basic understanding of online privacy protection.

Tefo (GDE) (2016), an e-education official at the Gauteng Department of Education, offered another worrying comment. When asked is a discussion about Free Software is being conducted in policy circles, he responded that most governments opt for Microsoft because of the support. He said, “can you imagine if something went wrong and your whole department went down because of software?” As noted in Section 6.2.2, the notion that an entire department would “go down” because of Free Software is not supportable.

Herman (DTPS) provided knowledgeable responses to all questions about privacy and privacy software. He spoke of network security systems (such as firewalls) and access control on user devices (such as root user privileges). Yet part of Herman’s job is to *implement* technology. Not surprisingly, he stands as the sole authority among multiple interviews with e-education officials. Most importantly, there are no other comments made elsewhere – including in policy documents – indicating familiarity with many popular debates where technology and human rights intersect.[195]

---

194 Simon (DST) also indicated lack of familiarity with contemporary discussions about privacy and software. When asked about government and corporate surveillance, such Google data mining, and its partnership with the NSA, Simon (2015) responded with a non-answer, stating that “South Africans are quite aware that it’s not safe on the Internet”. He then spoke of theft from sources like “mobile banking” and “scam messages”, and suggested students install anti-virus software (*ibid*).

195 Stakeholders generally came across as more knowledgeable than policymakers in government.

Some non-policymaker interview subjects were questioned about the knowledge competency of e-education policymakers. When asked why SA policymakers are not thinking about critical themes, such as free versus nonfree software, and if that speaks to a lack of awareness or understanding, one interview subject from South Africa (requesting to remain anonymous for this response) answered, "yeah it's a lack of skills, lack of understanding, lack of awareness, and it's arrogance as well. It's being afraid of being shown up that you actually don't know what you're talking about". He continued, stating, "Unfortunately you very often have people who have positions of power that are all of those things. And often things just don't get past them. Yet you get pushed to them because ICTs people within the department feel insecure, so they push you to certain people, and those people are incompetent, basically, a lot of them" (*ibid*).

Chloe (SchoolNet SA) (2016) added that because "the officials may or may not be fully versed in [Free Software]" they opted for Microsoft Office in CAT and IT subjects. Chloe suggested that policymakers may lack "any sort of prior experience of, and a lack of awareness of, the world in terms of ICTs at large" (*ibid*). Ashley (Pearson SA) (2016) said that "the national [government] has no real framework" for eLearning strategies, "so the provinces are left to themselves without any real practical experience". She observed that some policymakers are placing smartboards into schools with the expectation that classrooms will harness the powers of digital technology, prompting her to remark: "I fear that there is a bit of an assumption that the same assets can be delivered [as] in the front-to-class scenario" and therefore "it'll have the same effect as if we use the tablet. There really isn't a thought process around actually how you engage in the pedagogy with those tools". She noted in this example, policymakers "really haven't thought through what [they're] asking for" (*ibid*).

In the absence of knowledge about technology, policymakers seem to be "dumping" Western solutions into South Africa, without thinking critically about the implications. Questions about what software to use, control of the technology ecosystem, the dual role of digital technology in education and society, as well privacy are simply not on their radar. Marlien Herselman (ICT4RED) (2015) expressed this position when, in response to questions about copyright (such as DRM), openness of technology (such as Free Software), and privacy (such as tracking of student data or secure, private email), she said: "I think you want to come with American things to South Africa. It's a completely different country – you know, the things of privacy, copyright, and all of that, it's the last thing that we're worried about".[196] Eben Moglen (2015a), in response to this comment, remarked, "what does she think are South African questions, if those are American?"

Fiona Wallace (CoZa Cares) (2015) said that questions about software, privacy, and the like are just starting to be asked in South Africa. She juxtaposed them against other, more pressing needs:

> I think you are asking questions this country is not even considering at this point. We have such a disparate and divided schooling system. You could ask the best kinds of questions at a well-resourced private school, and they probably are just thinking it through. They probably are. And there's some really interesting things happening at some of the private schools. So they have almost the leisure to discuss these, it's not a matter of survival from day-to-day.

When asked about Free Software versus open source, she said it is thought of in terms of price, rather than liberty, political, and economic power: "I don't even think those are issues for us, I really don't. Even the difference in philosophical outlook is not there. It's actually pragmatic, we don't have money." When I asked, "s*o usually it's pragmatic, it's price?*" Wallace responded, "Yeah, we don't have money, let's find the simplest way to do it, make it the best we can under the situation. So it's not a political choice that everybody [is concerned with], even in Free and Open Source Software" camps (*ibid*).

Why might DBE policymakers ignore Free Software and other People's Technologies, despite the *FOSS policy preference* and the political power issues for education, economy, and society? One explanation could be that policymakers are concerned with picking the "latest and greatest" tech on the market in order to boost their popularity with the public. Unorthodox choices (such as GNU/Linux) could subject officials to scrutiny, whereas mainstream technology deployment presents politicians with an opportunity for fashionable press releases. The Gauteng paperless classrooms project, for example, receives considerable *positive* media attention, which could boost MEC Panyaza Lesufi's image, even as the school systems continue to fail.[197] As one SA interview subject requesting anonymity put it with respect to politicians:

196 It should be noted that in further conversation following our interview, Herselman remarked that there is indeed a lot to think about (regarding the kinds of questions asked in this dissertation).

197 The first results of the paperless classrooms project has too been a failure, although it is early.

> ...you've also got the really serious aspect where people sit around the table and go, 'okay, we only have funds available, so many million over three years, how many schools can we get into?' But unfortunately for government, those guys are politicians. They look at numbers because they've got to tick boxes, they're not educationalists, they don't got and say, 'okay fine, let's rather spend the money on better training and less schools over three years and make sure it works.' They need to make sure they are re-elected again, and they will go with numbers. So they can say, 'okay fine. We spent money and we gave the whole of Gauteng 40 tablets [in each school].' They don't come back and say, 'okay fine, we took it all back [in a recall]. But that's what they say. So it's about numbers and ticking boxes in the end.[198]

South Africans may be vulnerable to these political tactics, given the common belief that educational and technological mastery offer pathways to wealth. Marais (ICT4RED) (2015) asserted that politicians and vendors stand to benefit from e-education rollouts in ways that are problematic for education:

> Ultimately your problem is they go more for the flashier rollouts… So there's a publicity stunt which says, 'there will be no more chalk in schools', so you can look at the statements from the MEC [Lesufi on] paperless [classrooms]. But to do paperless they just focus as politicians on the tablets. They've got no idea the support system required plus the training required to make that tablet educationally relevant and educationally effective in the hands of the teacher.
>
> So there's grandstanding. But the other influence is the vendor push. Vendors… directly push products by-- I said Apple route is to show impact and results. So you'd say, 'we put pressure on you, why don't you deploy Apple because look at the results we're achieving. You're getting hounded by the public and by your bosses because you're not achieving educationally.' So this vendor promise that educational outcomes will improve if you're using their technology, even though that's bullshit because you need… enabled teachers.

Popular opinion – especially in sectors of higher education and the media – may also exert pressure to conform from the perspective of a policymaker. In the tech world, there is a famous industry

198 See also press releases showcasing Gauteng's R100 million Mokone Maruping Primary School (Leepile, 2017; BusinessTech, 2017b) and the R106 million Moses Kotane Primary School (Mzekandaba, 2017), both launched in 2017. Lesufi, along with other prominent politicians, have promoted the paperless classrooms project through launches promising dramatic results for African children and their families (City of Johannesburg, 2015).

catchphrase: “nobody ever got fired for buying IBM”. When asked about the problems with relying on Google for support with Android, Walter Bender (2015) used this phrase:

> You have no control over it whatsoever. It’s just such the wrong choice, and it’s the choice that everybody’s making. So you’ll be among the ranks of lots of people making that wrong choice. But they’re all making it because it’s an easy-- there used to be an expression, ‘nobody ever got fired for buying IBM.’ And then it was, ‘nobody ever got fired for buying Microsoft.’ And now it’s, ‘nobody gets fired for [Google Android].’[199]

For government policymakers, selecting Microsoft or Google probably is unlikely to get them fired, but picking Ubuntu for schools might be considered a risk because it is an unusual choice. If a project fails, nobody will blame Windows or Android. But deviation from the *de facto* standard usually invites criticism when things turn out worse than promised. Politicians may be susceptible to fear, uncertainty, and doubt (FUD) about GNU/Linux. They may be poorly positioned to understand the value, stability, and user-friendliness of Free Software if they and their colleagues have never used GNU/Linux themselves and do not know much about the technology in the first place. Added to this, Alfredo Terzoli (Rhodes University) (2016) noted that the corporations have the resources to market their products: “Microsoft, being a commercial company, has a better capacity to push its products than the open source community”. The forces, taken together, likely overwhelm the initiative to implement Free Software and other People’s Technologies in education.

In short, none of the DOE/DBE policy documents address implications of digital technology for education and society raised in previous chapters. The relationship between pedagogy and software tools, digital technology choices and broader societal and developmental processes, as well as privacy, are nowhere to be found, despite their critical importance. This is all the more troubling when considering that surveillance capitalism, driven by products developed by US multinationals, is being fast-tracked into the education sector without democratic consultation. We turn to this subject next.

199 Moglen (2015a) and Marais (ICT4RED) (2015) also invoked the phrase “nobody got fired for buying IBM” when explaining South African policymaker choices for schools.

## 7.6: OPE's Secretive Process: A Violation of Democratic Principles

While corporate influence, knowledge deficiencies, and political self-interest may help explain why South Africa is embracing Northern technology without critical engagement, the decision to transform the system without public consultation violates basic democratic procedures, as well as official policy. In an anarchist framework, transparency is core to democratic participation. Yet Operation Phakisa Education, we saw in Section 5.2, was formulated by around 120 individuals silenced by non-disclosure agreements. Since then, the government has proceeded with minimal public disclosure. This violates the spirit of democracy and the Phakisa model itself, and is inconsistent with other democratic procedures observed by the SA government.

The Phakisa *process* is based on Malaysia's "Big Fast Results" methodology, according to an eight-step sequence:

1. Strategic Direction: determine the strategic direction required
2. Labs: determine what needs to be done
3. *Open Days: share the Lab findings with the population and incorporate their feedback*
4. *Roadmap: inform citizens of plan of action*
5. Key Performance Indicators (KPIs) and Targets: determine KPIs to measure progress
6. Implementation of plan of action in communities, regional, and national level
7. External validation of results achieved
8. Annual reporting and information sharing with population on achievements (Van Wyk, 2016, pp. 15-16, emphasis added)

Steps three and four were implemented for the Operation Phakisa projects which preceded education – Oceans Economy and Health. Consistent with Phakisa prescriptions, those two projects issued reports each exceeding one hundred pages (RSA, 2014, 2015). For Operation Phakisa Education, however, steps three and four were wholly skipped, and the government has gone about implementing the their plan of action without democratic participation.[200] To make matters worse, the government knew it was *supposed* to issue a report to the public from the outset. I spoke with Simon (DST) (2015) just after the OPE conference ended. He said:

200 In the 2017 SONA, Zuma merely mentioned that "All [Phakisa] projects are proceeding well" (Zuma, 2017b). Zuma did not mention OPE in his response to the SONA debate (Zuma, 2017b). In the most recent statement to date (September 2018), Minister Angie Motshekga (2018) reaffirmed progress on OPE implementation.

> Yes, I spent some time there and [there was] a lot of...focusing on various focus areas involving schools. The outcome is still not yet known. So all the inputs we've taken, we have given, has been taken into a system and they are working on it in consultation with their consultant, I think it's Deloitte. So the result will only be available in the next two weeks. The final report.

When asked when that would be made public, Simon remarked:

> I'm not sure I can't talk for the DBE. It is their project, their decision, so they need to decide when to make that public... The President launched it on Friday, the project, the lab on Friday. So indicating that the next two weeks will be the finalization of the report. So within the next two weeks, maybe they need longer time, maybe the next four weeks, but in the near future, surely a report will come out (*ibid*).

Finally, Simon said:

> I think they may be reluctant to give any visions now because of this Phakisa process. So I think once that has been published and the outcome is known then they may have a different vision on that… Maybe in January [2016] they may have a better vision of the Phakisa outcome, where they want to go and what they want to do. Whether the current policies are enforced or whether they should change totally. So that may take some time for them, too (*ibid*).

Asked when a new document will be released about OPE, Richard (DBE) (2016) responded, "it hasn't been released to the public yet". A timeline for release, he said, "depends on the President, the President will have to release it, and you can't tell the President when to release something" (*ibid*).

Sipho (DBE) (2015) said there will be an Operation Phakisa Education report coming out, but he has "no idea" when. The DBE (2015a) explicitly acknowledges the shortcoming of extant policy due to technological changes over the years in its *Action Plan to 2019: Towards the Realisation of Schooling 2030*, where they state:

> The DBE will, during 2015, release a draft national strategy on e-education for the schooling sector for consideration by the large range of e-education stakeholders in the country. Whilst the 2004 *White Paper* remains a key guiding document, there remain important gaps, partly because ICTs evolve rapidly over time (p. 18).

Richard contradicted this position, stating that OPE is merely an implementation of the *White Paper on e-Education*. As he put it, "we developed a plan through which we are going to [roll out ICTs in schools]. A comprehensive plan. And that's the basis of developing that plan, and the implementation of that plan is what we call Operation Phakisa Education" (Richard, 2016). The plan "is about speeding up" the "pace" of e-education delivery outlined in the White Paper. He explained:

> We are not changing the policy, we are not doing any other white paper, we are just implementing the [2004] *White Paper.* It's just a matter of speeding up the paper that which--remember the *White Paper* is 2004, and as far as… government is concerned, we've been moving at a very slow pace… The [2004] policy is still very relevant – the output and the goals is to educate kids and the process is very relevant… Maybe some things were not there, things like the tablets, that kind of thing, but that's not a big development, things you can't accommodate in your plan. But in terms of the policy, the objective is fine (*ibid*).

Thus, "speeding up" implementation of OPE which, we saw in Chapter 5, is very different than the e-education envisioned, amounts to the fast-tracking of a new *transformational* education policy. This violates the democratic component of the Phakisa model, which requires the government to "share the Lab findings" and "inform citizens of plan of action". Moreover, the behavior of the government violates the spirit of the eight Batho Pele (Sotho for "People First") principles, endorsed by the DBE (2011, p. 45), which would require them to make changes to education with democratic participation. Batho Pele principles include "consultation" (consulting citizens about services offered) and "information" (providing citizens "full and accurate information about the public services they are to receive") (DPSA, 1997). (One might also interpret OPE to violate the rest of the Batho Pele principles because the sufficient details needed to interpret OPE has not been provided to the public.)

The choice to proceed on OPE without broad public input also violates the normal consultative practices of the DBE. The government routinely releases white papers *prior* to the implementation of important policy changes.  For example, the 2004 *White Paper on e-Education* was preceded by a 2003 draft, issued to the public, "in the spirit of *Trisano*" – i.e. working together "with a spirit of democracy" (Waghid, 2010, p. 118) where "the pubic and private sectors will have to join hands" (DoE, 2003, "Foreword").  Many other policies, such as the 2016 National Integrated ICT Policy White Paper, have undergone extensive drafting and reworking after consultation with the public and stakeholders alike. Moreover, the DBE, we have seen, lists "calls for written submissions from stakeholder bodies and members of the public" for a range of topics, such as the National Senior Certificate Examination, Guidelines on Inclusive Education, and changes to the National Qualifications Framework.[201] In just one example, Deputy Minister Enver Surty noted that the DBE received "hundreds of submissions" regarding the Basic Education Laws Amendment Bill, much of which related to the power of SGBs. The DBE, Surty said, "was looking at all the submissions and analysing the data as a whole.  Where there was a need to refine the bill, the DBE would do so" before sending the mandate to the Cabinet for approval, and then sent to Parliament.  "Parliament would go through the same public participation process, for public comment on the Bill. This process would take no less than 90 days before it came to Parliament" (PMG, 2018).  The DBE has completely eschewed this democratic process for OPE, the one policy that will, in their words, *transform* the education system.

South African stakeholders offered comments on the OPE lab and the new e-education policy process.  Chloe (SchoolNet SA) (2016) remarked, "I think the DBE have been talking about a revision, let's say, because the wording is quite dated in terms of the policy… Operation Phakisa, when and if it gets implemented is then the new operational plan for ICTs in education".  Chloe also stated that "we've got to have a consolidated plan as a national strategy.  And I think that is in place, it's now looking at ways in which we can fund those national strategies in terms of making sure that our kids benefit in the end" (*ibid*).  Ashley (Pearson SA) (2016) added, "There certainly needs to be policy change, even if it's just at the school level."  Many interview subjects were tight-lipped due to the non-disclosure agreement.  Jill (Google SA) (2016) kept to secrecy, stating, "Operation Phakisa's supposed to be closed and we're not supposed to talk about it".  Several interview subjects asked to place certain Phakisa-related comments off-the-record.

Veronica (Microsoft SA) (2017) refused to give any information on the number of teacher trainers, the nature of contracts (how long, with which provinces, etc.), plans to partner with the DTPS for longitudinal data analytics, and their partnership with Knewton (which at the time listed Microsoft

201 See https://web.archive.org/web/20180909031333/https://www.greengazette.co.za/departments/education-basic/20180904.

as a partner on its website), she stated that "it's not appropriate… to divulge details on Microsoft's business". Multi-billion rand contracts are thus not part of the public's right to know, even though such information ought to be a staple feature of democracy. When asked if the public needs to be informed so they can decide 1) if they want e-education in the first place, and 2) the ramifications of different technology choices, she responded, suggested school participants should not exercise consent: "Well that's all well and good, but if we want to obtain learner's consent for curriculum, we're getting now into an area that's a bit of a minefield. I mean every school cannot be a Summerhill school,[202] can they?" Consent, for Veronica, is "the political system" – representative democracy – upon which people vote to enact policies. She said "they make those policies well aware before they line up to vote for them", as in Gauteng, where they said they "are putting devices into the hand of every child." This presupposes the options for those devices are otherwise meaningless. When asked about Big Data, she added that you "could argue" that people should know if they are going to be data mined, but that public consultations for these kinds of matters are expensive, and would take away from money spent on education itself. Thus, in her view, it is not worthwhile to spend money to inform the people about the policies detailed in this dissertation.

OPE has been so thoroughly off-the-record that in 2017, a member of Parliament, Ms Delisile Ngwenya (EFF-SA), "asked for clarity about what was called 'The Lab' - who were the stakeholders and what was happening there? She further asked which decision makers attended and what 'The Lab' was supposed to contribute to the educational system" (PMG, 2017). Thus even members of Parliament are in the dark about "The Lab" and the new e-education agenda. This is all the more troubling when considering that implementation was described by respondents working on the ground as working best when there is community buy-in. Chole (2016) said that participation of school principals "bring[s] the community in", while parental involvement helps support the kids in learning. De Jager (2016) added that, "you've got to be very sensitive towards teachers and what they need". "People" on the outside, she said, tend to think "we know best" and attempt to impose what they want the schools to do, "and it doesn't work in rural areas". She added that explained that implementer have to first cultivate relationships of trust, and then the "people are open to learn and they want to learn". Imposing the technology without allowing them to decide if they want it, she said, "creates negativity", resentment, and sabotage which ultimately undermines the project. Ashley (2016) said you cannot "presuppose… what was most needed through implementation", and that the most important part "is

202 Summerhill schools are famous for following a democratic method of schooling that delegates democratic control to learners, similar to free schools and modern schools.

the buy-in. These things don't work unless there's actual buy-in from the people doing it." Some parts may not have any community participation whatsoever. For example, when asked if communities, teachers, and parents are involved in the Dell DDD Dashboard system, Stephen (MSDF) (2016) responded, "I'm not aware of any". The lack of broad public disclosure is all the more problematic when considering that in March 2018, President Cyril Ramphosa released ANC (2017c) plans stating that the goal is to roll out paperless classrooms "throughout the country" (p. 26).

The decision to implement OPE without public consultation is not only authoritarian (Kwet, 2017c) and in violation of government's own principles (the Phakisa methodology and Batho Pele), it violates all conceptions of democracy. In their study of what defines democracy, Coppedge et al. (2011) state that "Democracy, understood in a very general way, means rule by the people" (p. 248). They delineate six conceptions of democracy (electoral, liberal, majoritarian, participatory, deliberative, and egalitarian), each of which requires an *informed public* for "rule by the people" (pp. 253-255). Of course, anarchist conceptions of a democratic society call for direct participation and self-governance. In education, they advocate practices based on local control and self-determination (Kennedy, 2017, pp. 560-561). Apple and Beane (1995), when discussing democratic schools, offer a similar perspective, arguing that "professional educators as well as parents, community activists, and other citizens have a right to fully informed and critical participation in creating school policies and programs for themselves and young people" (p. 3). From the basic conception of democracy to more direct and participatory models, the move to transform Operation Phakisa Education violates principles of democracy. This is deeply problematic. The project is not only authoritarian, but it is deepens the forces of digital colonialism for education, economy, and society. We turn to this subject next to conclude our analysis of Operation Phakisa Education.

## 7.7: Operation Phakisa Education as Digital Colonialism

Thirty-one years ago, Zwelakhe Sisulu (1987) warned against anti-democratic and foreign interests in South African education:

> We are not prepared to accept any 'alternative' to Bantu Education which is imposed from above. This includes American or any other imperialist alternatives designed to safeguard their selfish interests in the country, by promoting elitist and divisive ideas and values which will ensure foreign monopoly exploitation continues (p. 26).

Operation Phakisa Education is ushering in the kinds of "imperialist alternatives" Sisulu described. We saw in Chapter 3 that digital colonialism, as conceptualized in this dissertation, is marked by five key elements: economic domination, imperial control, global surveillance capitalism, imperial state surveillance, and tech hegemony. Operation Phakisa education embodies all five features.

With respect to economy and society, OPE entrenches the monopoly power of Microsoft and Google, as well as many other American/Northern corporate services, such as Facebook or Twitter. While these services cannot be blocked wholesale, there are freedom-respecting alternatives for each that could be pre-loaded onto learner and teacher devices. With respect to education, corporations like Microsoft and Google, Pearson, and the neoliberal non-profit MSDF, are arranging to service the national public education system, while others, such as IBM, have their eyes set on African education (e.g. IBM, 2017). This entrenches their stranglehold over digital South Africa, which has little capacity to compete given the dominance of large corporations due to network effects, the physical resources to store and exploit Big Data, the types of data dominated by large actors, habituation to branded software as *de facto* standards, and economies of scale. With such power, major corporations design the digital architecture to ensure their own dominance over critical functions in the digital ecosystem. This allows them to accumulate profits from revenues derived from rent (in the form of intellectual property or access to infrastructure) and surveillance (in the form of Big Data). Placing Microsoft, Google, and other corporate services on devices simply deepens dependency on Norther corporations, ensuring, as Sisulu put it, "foreign monopoly exploitation continues".

Big Tech's monopoly power is then used for *imperial control*, where corporations shape the flow of information (such as the distribution of news and streaming services), social activities (like social networking and cultural exchange), and a plethora of other political, social, economic, and military functions mediated by their technologies. As Lessig (2006) famously argued, "code is law", and the "code" being chosen for OPE – as well as the rest of the critical technical architecture forming the digital ecosystem for education, economy, and society – is owned and designed by the North. This gives imperial control to the Americans, whose technological systems are, in Sisulu's words, "designed to safeguard their selfish interests".

With design features set by US multinationals, they are poised to impose *surveillance capitalism* on South Africa. In previous epochs, colonial railroads were designed to service the colonists, helping them extract raw materials produced by exploited labor for shipment back to the mother country for processing and, in some cases, the export of surplus goods, which decimated the prospect of local development and created strategic underdevelopment (Rodney, 1981 [1972], p. 241). In the digital era, tech giants like Microsoft, Google, Facebook, and others are set to repeat the extraction/dependency process. This time, surveillance data is extracted and processed by US multinationals, who provide the data "services" back to the dependent colonial subjects. Meanwhile, US intelligence agencies piggyback off of their own corporations to access and collect surveillance data. By placing Microsoft, Google, and other US multinationals into South African classrooms, the US expands its power over South Africa's digital society.

All of this is underpinned by technical architecture and the design of the digital ecosystem. As we saw in Section 1.3.1, digital studies scholars have frequently professed the non-neutral, politicized nature of technical architecture. Yet far too few of these scholars have considered the centrality of Free Software, Free Hardware, and free network connectivity, understood intersectionally, as proposed by Eben Moglen. Moglen's framework provides unique insight into how power is designed at the technical architectural level in the digital society, and he provides a vision for how technology could be re-designed to respect freedom. Of course, many other political, economic, and cultural dynamics are at play, as partially addressed when theorizing digital colonialism. Yet while power cannot be reduced to technical architecture, it remains the case that it plays a structural role in the digital society, and the digital ecosystem must be redesigned in order to redistribute power and wealth within the digital ecosystem and without. Just as colonial railroads were designed for labor exploitation and panoptic housing compounds were designed for surveillance, so too are proprietary software, centralized clouds, and other technologies designed to deprive individuals and communities of direct control over their computing experiences. Operation Phakisa Education cannot influence all aspects of the digital ecosystem through *choices* of which technologies to deploy in schools, but policymakers can have a powerful impact on education by choosing technologies like Free Software, protecting privacy, eschewing services based on centralized clouds, and educating the population in digital literacy and the politics of technological design. Countries like India have recently publicly challenged "colonization by tech giants", and are taking steps towards concrete policies that would "crimp the power – and profits – of American tech companies" (Goel, 2018). This conversation is nowhere to be found in South Africa. Instead, we see the enthusiastic adoption of US-based Big Tech products, which deepens dependency on the US, violates the *FOSS policy preference*, and sets South Africa on the path to digital colonialism.

These choices can be explained in terms of the fifth component of digital colonialism, *tech hegemony*, whereby US multinationals have "not only a preponderance of power but the ability to set the agenda and shape the preferences of others" (Carr, 2015, p. 118). In this regard, the neoliberal World Economic Forum agenda to build a "Fourth Industrial Revolution" (4IR) has been absorbed by policymakers and intellectuals in South Africa, based on commitments to adopting technologies of imperial control: Big Data, centralized clouds, intellectual property, automation, and concomitant technologies of surveillance (e.g. smart cities and Internet of Things). Ultimately, the ANC (2017b) is preparing South Africa to "restructur[e] the economy" for the North's vision of digital capitalism. As they put it:

> Research by the World Economic Forum (entitled 'The Future of jobs and Skills') predicts a decline in employment levels associated with office and administration, manufacturing and production, construction and extraction, arts, design, entertainment, legal, installation and maintenance. The same report concludes that there will be positive job growth in business and financial operations, management, computer work, architecture and engineering, sales and related fields, education and training.
>
> The challenge therefore is to make society as a whole aware of these changes so as to equip individuals with the necessary decision-making powers and skills so they can take up future job possibilities. *The second aspect to the challenge is ensuring that the education system as a whole responds to the challenge and produces skills that are required at the correct time and in correct numbers* (*ibid*, p. 17, emphasis added).

Indeed, Big Tech corporations are seeking to fill this administrative task, in part through education. In our interview, Lin Zhou (IBM) (2017) put education technology into the context of bureaucratic sorting for the division of labor in society. IBM is building "personalization" curriculum for this task:

> High costs and poor outcomes trouble the education system. Many schools have low retention rates, while graduates often lack desired skills in demand for jobs. Without personalized education, one cannot maximize learning outcomes, motivate students, and build the right skill set so they can find the job that interests them, do it well, and it get paid well in the process.

> When you have a student, you have to ask the question, 'what is the objective of the education'? Many – but not all – students will make college as their primary goal. Some will be happy to become a plumber, or a fireman, and serve the community. The society is tasked to create the necessary skills within the education system, and deliver on it. The student who wants to go to college may need different education than the student who wants to become a farmer. This is where personalized learning comes in. In the US, we assess jobs in the market. There are several large categories of jobs (e.g., hospitality or public service), each with corresponding skill sets. By determining the skill set required you can define the education that you need. Once you know your set of skills, and once you know the education you need to receive, you can build that into education system and say, 'for this student, these are the set of skills and education she needs to pick.' That's how personalized career pathway can improve student preparation for future careers (*ibid*).

Longitudinal analytics centralized in the DBE Cloud, coupled with adaptive learning, would carry out this emerging vision of digital capitalism. The tech economy on which it is based also happens to be dominated by US multinationals (see Section 3.3). For Terzoli (2016), deploying these corporate products might be "appealing in the beginning, but cannot have a happy end." "What [a happy ending] would mean," he explained, "is that we finally built a good corporation. And I have not seen a single [good corporation over] the long run… I think we [South Africans] are going to be very sorry some time down the line."

The ANC has adopted Northern ideologies and is encouraging the development of a future based on surveillance capitalism where Big Data and information services command and control everyday life. The education sector will play a central role administering this 21st century colonial system. Much like the previous colonial era (Nwanosike and Onyije, 2011, pp. 41-47), schools and training programs will assimilate South Africans into the ideology, technologies, models, and jobs of the expanding Silicon Valley empire.

Richard Stallman (2015a), provided a principled and pragmatic counter to this colonial process. When told that the primary concern is training teachers and getting them to use the technology effectively, he responded, "they don't understand how this could be bad… Nobody is so poor that she doesn't need freedom and nobody is so rich that she doesn't need freedom". Stallman elaborated:

> Getting people to use digital technology can be good or bad. If the digital technology respects their freedom, then it's good. If it's convenient but is under someone else's control, it subjugates them in a way they may not immediately recognize. Because they can see how they can do things with it that they couldn't do before, it looks like a step forward and you have to think about it to recognize that it's subjugating you to the power of some entity that controls the software in the device. And then because people are taught that this is normal, they have to break out of the mental trap to think that this is wrong. It's the state's duty to move the country towards freedom. The state must never cooperate with the teaching or use of nonfree software in a classroom (*ibid*).

When asked if South Africa needs to band together with other Global South countries to counter Northern hegemony, he responded that “South Africa is enough. South Africa doesn't need anyone else's help… you don't need that shouldn't hold back, waiting for another countries”. He added that, “They should stop talking about open because open is an excuse to adopt a weak criterion. Instead they should talk about free/libre, or perhaps take a good word from some local language” (*ibid*).

Indeed, as we have seen, the focus on freedom is essential to the struggle against 21st century imperialism. The completion of OPE, Deputy Minister Surty has said, “would be the first of its kind in the world” (PMG, 2018). Clearly, doing something novel is within the range of policy considerations, and that could instead by the adoption of Free Software and other People's Technologies. However, the concern with power has not been engaged, and conformity to Northern thinking is in place. Imperial forces are poised to dominate South Africa once again through the process of digital colonialism.

## 7.8: Conclusion

This chapter situated OPE within the context of digital colonialism. It found that progressive rhetoric masks the neoliberal character of OPE, which trades in the authoritarianism of the “chalk and talk” model for increased surveillance and authoritarianism at the software level. This position is inconsistent with anarchist and progressive stances on education reform. Next, this chapter found that e-education threatens teacher autonomy by transferring power and authority to the software layer. It also found that e-education can be used to undermine the teacher unions' resistance to biometric surveillance, teacher inspectors, merit pay, teacher testing, and the standardization of curriculum. The following section found that corporations find in education an opportunity to profit. This is especially true for Google and Microsoft, who are looking to place their products in schools and adult education programs to hook the population into their corporate ecosystems. The section after that discussed how corporations might be influencing policy, at e-education conferences and through investments in physical infrastructure, as well through programs to give learners and teachers devices and access to their software. It also assessed the prospect of policy mobility from the Global North. The next section evaluated e-education officials' competencies, finding in a number of statements indicators that they lack the critical knowledge essential to power relations and policy choices for the nation. This assessment was backed by several interview respondents. It also fund that officials may be motivated by self-interest in picking the mainstream choice rather than something less common like GNU/Linux for devices. The following section found that OPE is anti-democratic, as it fails to provide the necessary criterion for all forms of democracy (an informed citizenry), violates government procedures (Batho Pele, the Phakisa methodology), and is inconsistent with public consultation processes for other educational policies. Finally, the chapter concluded with a discussion of digital colonialism, finding that OPE meets the five criteria outlined in Chapter 3: economic domination, imperial control, global surveillance capitalism, imperial state surveillance, and tech hegemony. The next and final chapter will provide a summary of this dissertation and recommendations for government policy.

# Chapter 8

## Summary and Recommendations

---

### 8.0: Introduction

The objective of this study was to identify the choices, plans, and perspectives for technology deployment in South Africa's national e-education rollout, and to explain why various choices and plans are being made and not others. This chapter summarizes the findings I set out to answer in the dissertation. I focus on the empirical and theoretical contributions made to the literature, identify areas for further research, and offer a set of practical recommendations for e-education policy.

While previous studies in the field of e-education (e.g. Williamson, 2017a; Spring, 2012; Ball, Junemann and Santori, 2017) on e-education policy have focused on the corporate-driven digitization of education, including the move towards Big Data analytics in education, the field as a whole has downplayed or ignored the significance of power relations at the technical architectural level. As a whole, critical education technology scholars have been primarily concerned with *education-specific* products (e.g. Knewton's adaptive learning engine) and technologies catered to education (e.g. data-driven learning management systems). As such, the field has missed that technology choices for education impact *both* education-specific products and educational applications *as well as* more general products (e.g. Microsoft Windows) and applications (e.g. the type of digital ecosystem constructed by society). As a result, they have missed that different *forms* of education technology products and technologies chosen for education (e.g. Free Software or proprietary software) has a *dual* role in society, impacting upon both education and the broader spectrum of society. Critical education technology scholars thus fail to address how technology choices for education impact education, economy, and society and play a "constitutive" role in constructing the digital society. While they often criticize Big Data, they make no links to the structure of power and control at the technical architectural level, thereby severing outcomes from their structural foundations. Their position, consistent with the broader field of critical digital studies (reviewed in Chapter 1), constitutes a tacit technological determinism by assuming proprietary software, centralized cloud computing, and Big Data analytics are an inevitable part of the technology landscape, without ever asking why they are appropriate to society in the first place.

Moreover, in missing the broad implications of technological choices for education, the field of critical digital studies, including critical EdTech studies, fails to address the consequences of placing these technologies into school systems in the Global South. As this dissertation has argued, digital colonialism, which is hardly recognized and under-theorized in the global academic community, is a deep problem that is entrenched and exacerbated by the deployment of Global North products and models in South African public schools.

By merging an anarchist theoretical lens with the Free Software philosophy, and by framing the issue for South African within a world-first theoretical and conceptual framework for digital colonialism developed in Chapter 3, this study is the first to fill the above-listed gaps in the literature. To the best of my knowledge, it constitutes the first long-form study on digital colonialism, and the first in-depth study to apply an anarchist lens to the Free Software philosophy and movement. This dissertation provides an answer to the problems of Big Data in education identified by critics concerned with surveillance and privacy in education (e.g. Williamson, 2017a; Watters, 2016; Prinsloo and Slade, 2016). By proposing the implementation of Free Software in schools as a critical site of struggle towards the construction of a digital ecosystem consistent with anarchist principles of ownership, authority, and prefiguration, it also offers a practical means to resist the colonial power of Big Tech and re-design the digital society in the interests of human rights, pro-poor development, and equality. Additionally, this study provides a partial solution to Richard Stallman's (2018b) suggestion that society build and *scale up* systems that, by their very nature, protect people's privacy and resist state-corporate surveillance. It thus provides a practical means to resist surveillance capitalism.

This thesis focused on policy choices at the national Department of Basic Education, which sets the guidelines for implementation in public schools. The issue of Free Software and privacy were given special attention. The former was deemed to have special significance to power relations at the technical architectural level which shape and influence outcomes in education, socioeconomic development, privacy, democratic process, and equality. The latter has heightened significance due to the rise of surveillance capitalism and the neoliberal movement to deploy Big Data analytics in education. As noted in Chapter 4, to obtain an understanding of the subject matter, I used qualitative methods which allowed me to obtain rich and detailed descriptions of policy choices and perspectives (Leedy and Ormrod, 2015, p. 106) while providing me the flexibility to adapt the study as I discovered new information (Hashemnezhad, 2015; Babbie, 2014, p. 160; McMillan and Schumacher, 2014, p. 20). The study was concerned with the central question:

What technology choices are being considered or selected for the national e-education policy, and why?

It also addressed the following sub-questions, to fulfill the broad research objective:

- How do government officials, key stakeholders, and experts envisage the relationship between technology in education to education, economy, and society?

- What is the potential impact of e-education on education, economy, and society?

- Why are certain policies being chosen or planned, and not others?

- What are the best digital technology choices for the South African education system?

To generate empirical answers to these questions, this dissertation triangulated semi-structured interview data (drawn from government officials, key stakeholders, and digital rights experts and innovators) with primary source documentation (policy documents, speeches, and press releases) and secondary source materials (scholarship and press accounts of technology and e-education policy) (McMillan and Schumacher, 2014, p. 407; Babbie, 2014, p. 324). As noted in Chapter 4, I deployed mitigated skepticism with respect to my ontological and epistemological lens (Popkin, 1979, pp. 129-150; Chomsky, 2009), reflexive thinking to maintain reliability and trustworthiness in interpretation (Leedy and Ormrod, 2015, p. 35), and thick descriptions to allow audiences to determine whether or not the findings are transferable to the reader's context" (Lincoln and Guba, 2013, p. 109).

### 8.1.1: Empirical Contributions: Operation Phakisa Education and the National Rollout

This dissertation addressed policymakers' technological choices and perspectives for the national e-education rollout. It used an anarchist lens in order to make sense of why certain choices were made by state policymakers and not others, as well as which choices *should* be made. Anarchist philosophy emphasizes direct democracy, anti-authoritarianism, prefigurative and direct action, decentralized and federated modes of organization, libertarian socialism, communal ownership, and egalitarian forms of social relations. This dovetails with the Free Software philosophy (Stallman, 2010a; Moglen, 2004), which stresses non-exclusive and communal forms of software ownership, individual and communal liberty to control technological experiences, decentralized and federated computer networking, the ability to take direct action to change how one's own computer works, and resistance to authoritarian, proprietary, and other forms of nonfree software. Merging these two perspectives provided this study with a theoretical framework well-suited to assess government policy with respect to technology choices for basic education, as anarchism provides a broad sociological outlook on education, economy, and society, including government policy and corporate power, whereas the Free Software policy provides a sociological outlook specifically catered to the digital arena. Recognizing the postcolonial position of South Africa vis-a-vis the United States in the global digital economy, this thesis also formulated a theoretical and conceptual framework for an emerging concept and phenomenon, digital colonialism, that helped make sense of policy in South Africa. (A summary of the theoretical contributions is further detailed in Section 8.2).

This dissertation began with an investigation into the proposed use of tablets for schools announced in 2013 (BusinessTech, 2013) , which led me to the ICT4RED pilot project in Cofimvaba in 2014. To my knowledge, ICT4RED was the only government-funded e-education pilot project, and it was initially designed for national replication. However, I discovered in 2015 that the government decided that year that they would embark on "Operation Phakisa in Education", a plan to fast-track digital technology to all public schools in the basic education sector. Interview subjects told me that the government was not considering ICT4RED as a model for national replication, and I shifted focus from ICT4RED to OPE. While attendees of the OPE lab held in Johannesburg were on non-disclosure agreements, members of government and key stakeholders were willing to discuss on record some of the details of OPE. From these accounts, I learned about the technology choices and plans for the national e-education rollout. The two core empirical findings related to the technology choices and plans, on the one hand, and the policy perspectives, on the other. Let us consider each in turn.

### 8.1.2: Choices and Plans for the National E-Education Rollout

With respect to choices and plans, I discovered that Operation Phakisa Education aims to "transform" the basic education system using technologies and models developed by corporations and intellectuals in the Global North. While OPE is said to comprise a mere fast-track model for *implementation*, with policy based on the 2004 *White Paper on e-Education*, the e-education system envisioned for OPE is based on new technologies and models fundamentally different than the e-education system envisioned in 2004. OPE thereby simultaneously comprises a new e-education policy for basic education. This dissertation identified seven substantive elements to OPE: 1) general software, 2) e-education suites, 3) Big Data personalization, 4) the DBE Cloud, 5) tiered and technocratic surveillance, 6) longitudinal analytics, and 7) teacher surveillance through e-administrative dashboard systems. Each of these components is problematic to the education system.

The general software being considered for devices currently consists of Microsoft and Google software. Microsoft has a contract with at least five of nine provinces (Western Cape, Free State, Northern Cape, North West, and Eastern Cape ) which will provide schools with free access to Microsoft Windows and Microsoft Office products. One interview subject also claimed that Google is in talks for a contract with one of the provinces, although details are not public. Three of the provinces do not presently have contracts for device software (Limpopo, Northern Cape, and KwaZulu-Natal). Crucially, GNU/Linux is not being taken seriously by the national DBE, who, as we saw in Chapter 6, does not see the choice of software as relevant to education beyond the narrow consideration of immediate functionality, and they impute no significance to its constitutive role in shaping the digital ecosystem and broader digital society.

If schools deploy Microsoft Windows or Google Android, the e-education suites available will be Microsoft Classroom and Google G Suite for Education, respectively. These systems will be used to manage classes and assignments, enable collaboration, and provide feedback to students with vertically integrated nonfree software applications. Other features include monitoring student time spent reading an assignment (e.g. Microsoft Classroom) and running learner email services run through corporate servers (e.g. requiring a Gmail account). These choices deepen school integration with US multinationals, providing them power over education, economy, and society.

This study also found that Big Data personalization is a core part of OPE. In particular, the DBE plans to integrate adaptive learning to “personalize” the education experience (DBE, 2016a, p. 17). Adaptive learning, we saw in Chapters 2 and 4, extends Big Data surveillance to education (Ferreira, 2012, 2013; Zhou, 2015). Chapter 5 details DBE plans for Big Data personalization, including plans for integration of data collected in the DBE Cloud with a learner management system, as well as plans by stakeholders to deploy their own corporate surveillance capitalism systems. Details behind the DBE Cloud also form part of the dissertation findings. Herman (DTPS) (2015) described the DBE Cloud as a place to gather data in conjunction with corporate partners. Microsoft, he said, approached the government with a proposal to feed learner data gathered from Office 365 into the DBE cloud, from an early age into adulthood. The government also intends to collect personal data from learners, such as web cookies, for the purpose of data analytics.

Tiered technocratic surveillance is also a feature of the OPE program. While this isn't a formal part of the DBE's plan, it emerges when considering the range of surveillance analytics being conducted. Big Data for OPE is not a uniform centralized process, but rather, a fragmented system with tiered access according to one's role in the power hierarchy. US multinationals and, ostensibly, their intelligence agencies (such as the NSA) have access to the full set of user data which comes in through surveillance features build into their operating systems (e.g. Microsoft Windows and Google Android), applications (e.g. Google Play and Office 365), and other features (e.g. Google's ad network and Pearson MyLab). Homegrown corporations like Vodacom or Siyavula are also poised to capture part of the data pie. The South African government will gather data directly and from corporate partners in their DBE Cloud. Lower down the hierarchy, e-administrative bureaucrats will have access to teacher and learner data through systems like the MSDF DDD Dashboard. At the bottom of the hierarchy, teachers and principals will obtain access to learner data through corporate dashboards provided by Google, Microsoft, MSDF, and other corporate or state digital surveillance systems.
In addition to tiered technocratic surveillance, the DBE plans to use e-education to conduct longitudinal analytics on the population. This would consist of data that maps out school, post-school, and employment histories across a longitudinal timeline to see which educational practices "work" and which ones fail. The final element of OPE consists of surveillance for technocratic management. The MSDF foundation, as noted above and in Chapters 2 and 5, has built a dashboard system that monitors classroom performance for learners and teachers. This provides administrators with "ammunition" (Gabashane, 2016) to discipline teacher behavior with reward and punishment based on surveillance analytics.

Together, these seven elements comprise the new e-education vision for the national education system. The ANC (2017c) plans to deploy "paperless" classrooms throughout the country, but they have not commented publicly on the specific components of the OPE program, especially with respect to Free Software and privacy. The next section identifies their perspectives on Free Software and privacy, as expressed in policy documents, and by government officials, stakeholders, and experts in field research interviews.

### 8.1.3: Perspectives on Choices and Plans for the National E-Education Rollout

The second core empirical contribution of this dissertation presented findings on the *perspectives* on Free Software and privacy for e-education held in software policy documents and by government officials, stakeholders, and experts according to responses in semi-structured interviews. This part of the dissertation found three major positions. The first position expressed a strong commitment to the Free Software philosophy for education, economy, and society, as well as privacy. This position was found in the interview responses of experts in digital rights and innovation sampled in this dissertation. Additionally, the *principles* of the Free Software philosophy were endorsed in policy documents reviewed in Section 6.1. As Chapter 6 noted, those documents were created in the early 2000s, before the expansion of multiple Big Tech corporations into trillion or near-trillion dollar corporations (e.g. Google and Apple), and before the rise of Big Data, centralized cloud computing, and the shift towards surveillance capitalism as a business model for the tech industry. While the documents did not address those topics, they endorsed the underlying principles of the Free Software philosophy that evolved to address these subjects (see Chapter 3) and hinted at a desire to resist state-corporate surveillance (PNC, 2004, p. 68).

The second position ascribed little significance to Free Software and privacy. This position was held by e-education officials and stakeholders, who gave little thought to Free Software and privacy and saw little relevance of FS and privacy to education *or* did not value them enough to consider what they were implementing as problematic. With respect to the question of FS, all government officials in the interview sample found it acceptable to install nonfree (proprietary and third party cloud-based) software in the schools, without concern or thought for the array of problems detailed in Chapter 3 and and Section 6.1. Stakeholders expressed more varied opinions. Those from ICT4RED (Ford, Marais, Herselman and Wallace), CloudEd (Payne), and SchoolNet (De Jager) found value in Free Software, but not enough to consider it problematic to place nonfree software in the schools. With respect to privacy, all e-education officials (except Herman) and stakeholders found value in privacy, but again, not enough to consider surveillance technologies like adaptive learning, longitudinal analytics, or even general software like Microsoft Windows and Google Android problematic for schools.

In contrast to e-education officials and stakeholders, digital rights and innovation experts found Free Software necessary or highly desirable for schools. Walter Bender, who, was president of Software and Innovation for the largest e-education program to date, the One Laptop per Child program, gave the most detailed responses, finding that Free Software is essential to freedom in education.  Others, such as Stallman, Moglen, Terzoli, Schneier, and Mabaso found FS critical to education, economy, and society, especially in resistance to the encroachment of Big Tech corporations. Cindy Cohn and Bruce Schneier strongly endorsed Free Software for education, but found it acceptable to implement some proprietary software along the way.

With respect to privacy, most e-education officials and stakeholders found value in privacy, *in principle* (that is, on paper),[203] but were enthusiastic about surveillance-based e-education technologies and did not find problematic more general software that drives the surveillance economy.  When speaking of the value of privacy, Steve Vosloo (Pearson SA) (2016) said that privacy is "probably one of the biggest issues facing the human race in the years to come," but he also said longitudinal analytics in school "makes a lot of sense".  Sania (Microsoft SA) and Meryl Ford (ICT4RED) also acknowledged the value of privacy, but they also want to harness Big Data surveillance for education. Ford (2015) expressed the most detailed reasoning when she stated that, "pragmatically you have to look at the pros and cons".  As we saw in Chapter 1, this position is typical in "critical digital studies", which seeks make "ethical" use of Big Data surveillance (boyd and Crawford, 2012; Zook et al., 2017).

Experts, by contrast, took a strong pro-privacy stance.  Walter Bender and Richard Stallman, for example, did not believe the government should be collecting any detailed data about children, while Cindy Cohn suggested random samples rather than granular and pervasive surveillance.  Bruce Schneier took a pro-privacy stance, stating that constant surveillance of an adaptive learning system like Knewton is "definitely a negative" if it leads to self-censorship and the feeling of being watched. He adds that people should be worried to the extent that they trust those doing the surveillance.

The responses by all interview subjects correspond to positions that will, at the very least, fail to contradict their organization's business model.  For example, one would not expect Sania, a Microsoft employee, to take a strong position against proprietary software when Microsoft relies upon proprietary software for its revenues.  Likewise, one would not expect Alister Payne, founder of CloudEd (which chooses to service Google) *not* to reject centralized cloud computing given that his business relies upon e-education in the cloud.  Similarly, SchoolNet takes money from Microsoft, Google, and the government (which partners with Microsoft for training and software licensing), and it would be unwise to refuse to service Microsoft or Google devices.  Experts interviewed do not have ties to Big Tech funders (with the exception of Bruce Schneier)[204] and they were free to criticize both corporations

203 The major exception was Herman (DTPS) (2015), who registered no value in privacy and believed learners must be "controlled" and under surveillance, and that they can "dissent at home".

204 Schneier is Chief Technology Officer of IBM Resilient.  However, while Schneier is arguably the friendliest towards Big Tech among the group of experts interviewed, his book (2015a) *Data and Goliath* is quite critical of Big Tech, and

and the government. Interestingly, the DBE did not find relevance in Free Software or strong privacy protections, even though government documents make clear that Free Software is essential to South African education, economy, and society. The DBE is supposed to follow those documents, which guide the *FOSS policy preference*, but they are instead opting for mainstream nonfree services as well as more recently developed surveillance-based products and models.

### 8.1.4: Implications and Explanations of Policy Choices and Perspectives

This dissertation provided an analysis of policy choices, plans, and perspectives on the basis of the theoretical lens developed in Chapter 3. This approach merged an anarchist theoretical lens with the Free Software philosophy, and formulated a theoretical and conceptual framework of digital colonialism to conceptualize the digitization of South African education and society. (We will return to this contribution to the literature in the next section). From this viewpoint, the implications of OPE on South African education, economy, and society were explained in three sections, and the next four sections explained the reasons *why* South African government policy is opting for policies that effectively colonize their digital society. Let us consider each in turn.

The implications of OPE on South African education, economy, and society were found to result in the neoliberalization of the education system, the undermining of teacher autonomy, and the corporate colonization of the broader digital society. With respect to neoliberalism, it found that e-education officials and stakeholders appropriate the rhetoric of anarchist and progressive values (Swalwell and Apple, 2011) to criticize the traditional "factory model" of e-education (Goldman, 1910; Berkman, Berkman, 2005 [1992], p. 271; Armaline and Armaline, pp. 182-185; Bowles and Gintis, 2011 [1976], p. 170; Nasaw, 1979). However, in reality, they are *transferring* the authoritarianism of the master/pupil "chalk and talk" model to software, which now shapes the education process through code (Lessig, 2006) and Big Data analytics (Williamson, 2017a). This fails to comport with anarchist and progressive educational theories which emphasize human rights and democracy for education, economy, and society.

This thesis also found that OPE can be seen to threaten teacher autonomy. District officials like Monki Gabashane (2016) have stated that the MSDF DDD Dashboard system provides surveillance-based "ammunition" for outside "interventions" into the school system. Teacher's unions have been successfully resisting the imposition of annual standardized tests, biometric fingerprinting to track

he penned an essay criticizing IBM for its vague assurances about government access to its data in the wake of the Snowden revelations (Schneier, 2014).

teacher attendance, performance-linked pay ("merit pay"),[205] teacher competency examinations, and the re-introduction of external inspectors.  With e-education based on Big Data, all of these features can be implemented with the flip of a switch (see Section 7.2).  While education technology studies tend to focus on the implications of Big Data for learners and do not focus as intensively on the adverse impacts upon education participants, this study affirms findings that Big Data poses a threat to teacher autonomy (Zeide, 2017; Saltman, 2016, p. 113; see also, Kwet, 2017c).

The third major finding with respect to the implications of OPE was that Big Tech is colonizing South African education, economy, and society through the technical architectural level.  Corporations like Microsoft and Google design their school products to ensure vendor lock-in so they can capture educational markets and the more general market for their products and services.  This has received very little attention in scholarship (some pursuit can be found in Saltman, 2016; Lindh and Nolin, 2016) with, to the best of my knowledge, little in the way of extended analysis.  This dissertation faces the issues squarely and provides extended focus to the topic.

This study found that Microsoft has a history of attempting to impose its software in African education initiatives where governments are subsidizing devices to schools.  This has included attempts to persuade Nigerian and Namibian officials to replace GNU/Linux with Microsoft Windows on OLPCs (Stecklow, 2008).  In South Africa, Thabo Mbeki accepted Microsoft's offer to "donate" its software to cover around six thousand South African schools in 2004.  In the past decade, Microsoft has trained thousands of teachers to use Microsoft software through its Microsoft Partners in Learning program, contributed funds to the Tshimologong Precinct (where it is a founding partner), launched a Microsoft Apps Factory at the Johannesburg Centre for Software Engineering (where it is a founding partner), offered Microsoft Bizspark for budding entrepreneurs, contracted with the City of Johannesburg to train one million people to use Microsoft Office 365, and "donated" software to multiple universities.

Other corporations, by contrast, have a smaller but growing presence in the education space. IBM is shifting attention towards African education (IBM, 2017) and opened a $70 million facility in the Tshimologong Precinct.  Meanwhile, the Head of Public Policy and Government Relations for Google SA said Google will "bang" at the government's door (Ventkess, 2017).  While uptake for Google is low at the moment, their fortune changed quickly in the US education market, and they can quickly capture market share once affordable high-speed broadband reaches most public schools.

205 In its 2011 policy document, the DBE (2011) holds that performance-linked pay should be kept low (p. 112).

Other corporations, such as Accenture and Pearson, are promoting their own products and services as well.

The vast resources of the Big Tech corporations provide them the means to place their products and services in the education system and through it, spread their products to the greater society. Alister Payne (CloudEd) (2016) acknowledged this much, stating that Google's ability to monetize Apps for Education comes through the planting of the Google product line into school devices. Profits are not generated from the education services themselves, but rather, from pulling learners into the vertically integrated Google ecosystem. This confirms Lindh and Nolin's contention that Google disguises its profit agenda through free public education services, making it "problematic" for schools (p. 1). The same could be said of Microsoft Windows, IBM products (currently being negotiated for use in South African higher education), as well as any other corporate product lines that might be under negotiation for South African schools. As Juliet Schor (2005) notes, children are captive audiences for corporate products and services.

While some of the implications of OPE included tech-driven neoliberalization based on authoritarianism, the loss of teacher autonomy, and the corporate colonization of education, economy, and society, this dissertation also found that corporate influence and policy mobility, policymaker competencies and self-interest, and the violation of democratic process help explain why OPE takes on its current neoliberal form. Let us consider each in turn.

The likelihood of corporate influence on OPE is very strong, especially when considering the history of policy formation in South Africa. As scholars have noted (Marais, 2011; Bond, 2014; Madlingozi, 2007, 2014; Terreblanche, 2002, 2012), South African policymakers have embraced neoliberal ideologies formulated by the Global North, including especially those promoted by the United States. During the transition from apartheid to democracy, the ANC embraced the Washington Consensus strategies to liberalize financial markets and attract investment through export-oriented growth. Neoliberal policies have exacerbated economic inequality, leading some scholars to begin labeling South Africa a "neo-apartheid" state (Madlingozi, 2017; Ray, 2016; Jagarnath, 2018). Similarly, in the domain of education, Jonathan Jansen (2002) notes, "the South African state draws liberally and loosely from policies and policy ideologies in the West", even in the absence of strong forms of coercion (p. 44). The adoption of the National Qualifications Framework was imported from New Zealand, while Outcomes Based education was based on the work of US educator William Spady ( Fiske and Ladd, 2004, pp. 157-158).

Operation Phakisa Education clearly illustrates that yet again, South African makers are borrowing policy from elsewhere (Dale, 1999, pp. 9-10) to apply at home. Scholars have demonstrated that policy travels through networks across the world (*ibid*; Ozga and Jones, 2006; Peck and Theodore, 2010; Ball, 2016), but *how* this is occurring in South African e-education has not been established in prior research. Ball, Junemann, and Santori (2017) produce scholarship on the subject for Curro schools in South Africa, but these are a tiny minority of independent schools, and there is no evidence to suggest they have an impact on public schooling.

This dissertation found that there are several reasons to believe corporations may influence e-education policy. First, there are several e-education conferences held every year, sponsored by major corporate vendors. Their programs, posted online, feature guest speakers drawn from government and the corporate sector. Some of the same speakers present at multiple conferences, suggesting that there is the opportunity to build ongoing relationships with officials through recurring conversations. Examples include EduWeek, EduTECH Africa, The African Innovator Education Innovation Summit, ICT South Africa, The Digital Education Show Africa, and EdTechTeam Summit (a Google event). These events discuss technologies like adaptive learning, models like personalization and blended learning, and integration with the "Fourth Industrial Revolution".

However, this study found some mixed comments about the show suggesting caution when interpreting the impact of these conferences on policy. Chloe (SchoolNet SA) (2016), for example, found that the shows are a "cash cow" for product vendors who push products on "unsuspecting people", especially those who "don't have any prior experience" or "lack awareness of the world in terms of ICT at large". The DBE (2015a) acknowledges "hype" around EdTech products that will "automatically lead to to" improved learner performance. Alister Payne (2016) said the EduWeek conference he attended had "nothing going on," "there were no educators", and it was "a waste of time". In light of these comments, it seems wise to suggest that policy mobility and networking may occur at these conferences, but the extent of influence is an open question without more concrete empirical evidence or direct observation of business transactions.

A similar opaque dynamic characterizes the tendering process. Payne (2016) was under the impression that tenders for provincial-wide software contracts do not go through a tendering process, and that "provinces get around that by allocating to resources". Chloe (2016) said that hardware generally goes with software, while Ashley (Pearson SA) (2016) added that many tenders go to big corporations delivering in bulk. One might imagine NGOs to play an impartial role, but they are also subjected to the influence of corporate resources. Laetitia de Jager (iSchoolAfrica) (2016) said iSchoolAfrica is “device agnostic”, but they clearly favor Apple devices. Mario Marais (ICT4RED) (2015) added that corporations like Apple “set the specs” to favor their implementation results, and they also orchestrate elaborate photo shoots to market their products. Meanwhile, one interview subject, who wished not to be named for this comment, said that the government is persuaded by developing friendly relations with corporate partners, as well as trips to places like Kruger National Park. Interview subjects (Payne and Ashley) added that the government does not understand what it wants to do, and looks to the private sector to provide them with a strategy.

In short, findings suggest corporate influence through policy networks and tendering processes. However, there was no evidence that Global North models, such as the “shadow elite” network proposed by Spring (2012) in New York State, are in operation in South Africa. This dissertation found two additional possibilities: policymaker incompetency and policymaker self-interest.

With respect to the former, there were comments from e-education officials, as well as widespread commentary from interview subjects, suggesting e-education officials lack critical understanding about power relations in the digital society, which leaves them susceptible to the power and influence of Big Tech corporations. Sipho (DBE) (2015), for example, saw little relevance to technical architecture and the power relations inherent in Free Software vs nonfree software for education, economy, and society, indicating a lack of exposure to arguments about how Free Software provides societies the ability to build their own solutions and control their own environments. Sipho also had no opinion about DRM software, and referred me to Richard (DBE), who also had no opinion on the subject. Richard also had no direct response to a simple question about Tor and privacy, while Tefo (GDE) (2016) worried that an entire department would “go down” due to the implementation of Free Software (due to its alleged inferior support services by comparison to proprietary vendors).

When asked about the competencies of DBE policymakers, several respondents stated that they lack critical awareness. One South African interview subject, who asked not to be named for the quote, when asked about policymaker competency, suggested that the people in power making the decisions are incompetent. Chloe (2016) said policymakers may lack “any sort of prior experience of, and a lack of awareness of, the world in terms of ICTs at large”, while Ashley (2016) said the national DBE has “no real framework”, treat smartboards as if they will have the same effect as tablets, and “really haven’t thought through what [they’re] asking for”. Many interview subjects, including government officials, had remarked that they aren't thinking deeply about or debating topics like Free Software and privacy.

This study found a further reason explaining choices for OPE could have to do with policymaker self-interest. For example, one South African interview subject requesting anonymity for the statement, said "it's all about numbers," "ticking boxes", and "getting re-elected", rather than sound polices. Marais (2015) said that they go for "flashier" rollouts and focus on the tablets in the interests of "grandstanding". Eben Moglen and Marais independently invoked the phrase "nobody got fired for buying IBM" when explaining South African policymaker choices for schools. Thus, there is a distinct possibility that policymakers face pressure to conform to mainstream expectations because it is safe and easy to select mainstream choices for the education system.

As a last finding explaining why OPE takes its present form, this thesis found that OPE violates democratic procedures. By failing to involve the public in the decision-making process, OPE has insulated the government against public opinion. As noted in Chapter 5, the OPE lab was formulated in secret by 120 members on non-disclosure agreements. The government has not released documentation on the Lab, nor has it disclosed its vision for a new education system based on the components outlined in Section 5.3. This violates steps three and four of the Phakisa procedure, which requires the government to "share the Lab findings with the population and incorporate their feedback" (step 3) and "inform citizens of a plan of action" (step 4) (Van Wyk, 2016, p. 16). Of note, Phakisa in Health and Oceans Economy have followed these steps (RSA 2014, 2015), suggesting that the government has failed to follow through in the domain of education. The non-disclosure agreement also violates the Batho Pele principles which the DBE (2011) endorses (p. 45). It also fails to conform to the normal workings of the DBE, which posts gazettes proposals to the public on an almost monthly basis, and the spirit of "Trisano" that animated the previous formulation of e-education policy (DoE, 2003, "Foreword"). In their study of what defines democracy, Coppedge et al. (2011) delineated the spectrum democratic forms, from authoritarian and representative democracy to participatory and egalitarian (pp. 253-255), and argued that what united all forms of democracy is "rule by the people" (pp. 248), which necessarily requires an informed public. Anarchists have stressed local control and self-determination (Kennedy, 2017), while progressive scholars, such as Apple and Beane (1995), have argued that "democratic schools" require a right to fully informed and critical participation in creating school policies and programs for themselves and young people" (p. 3).

The lack of democratic procedure and transparency characterizing OPE can help account for the form it has taken. South Africa has faced extreme forms of surveillance and corporate colonization in times past, and full disclosure about what the Big Data component of the program may provoke backlash from teachers, parents, and the general public. Je'anna Clements (2018), for example, wrote a very critical article for the *Saturday Star* upon discovering details from this dissertation published at the *Mail & Guardian* and in the journal *First Monday.* Some, like Alister Payne, suggested that government officials may simply not know exactly which path they would like to pursue. The failure to engage and inform the public, however, can only be viewed as elitist, and suggests the government wishes to impose a transformation of the education system on the public without opening their plan up to the public for input, scrutiny, and participation.

The study concluded finding that Operation Phakisa Education constitutes a form of digital colonialism (see next section). The five related components of digital colonialism outlined in Chapter 3 are all present in the OPE project. For economic domination, US multinationals (Google, Microsoft, etc.) and the neoliberal non-profit MSDF are set to establish economic domination through the implementation of their technologies in the education sector. For Google and Microsoft in particular, OPE offers an entry point through which to capture more general market share in South Africa's digital society. By exercising control over technical architecture, these corporations are set to exercise control over education and other critical information services (such as search engines) and applications (such as app repositories). With design features set by US multinationals, they are positioned to impose surveillance capitalism on the country, dominating their data ecosystem while placing the population under commercial surveillance and with it, imperial state control through the surveillance of US intelligence agencies such as the NSA. The fifth component, tech hegemony, can be witnessed by the enthusiastic embrace of the Fourth Industrial Revolution fashioned by Klaus Schwab, founder and executive chairman of the World Economic Forum. The ANC (2017a, 2017b, 2017c) has embraced the doctrine as a model for tech integration, and expresses a desire to integrate data-driven technocratic management into the education system (2017b, p. 17).

This dissertation found the government's own FS policy documents, as well as people like Richard Stallman, Eben Moglen, and others espousing an anarchist or anarchistic philosophy offer pragmatic and principled recommendations for creating a digital society that benefits South Africans and *counter* the Fourth Industrial Revolution. Yet it is looking to be an uphill battle, as the forces of imperialism are presently the dominant force in the society.

## 8.2: Theoretical Contributions

This dissertation has made significant theoretical contributions to the literature. First and foremost, it has merged an anarchist theoretical perspective with the Free Software philosophy to provide the first, in-depth study of digital technology from an anarchist perspective. This provides a look at how an anarchist position conceptualizes the Free Software philosophy and movement, including how it relates to policy, and it provides an example of how the Free Software philosophy and movement fits into anarchist traditions and theory.

Anarchism is a theory of non-domination (Kinna and Prichard, 2018) that seeks to challenge and abolish forms of authority and power that cannot be justified (Chomsky, 2013). It seeks to materialize radical forms of equality in institutional, organizational, political, economic, social, and interpersonal relationships, based on direct democracy and non-hierarchical institutions. In the domain of governance, anarchists favor decentralized federation of delegates, mutual aid, debate, popular ownership of the means of coercion and administration, and civil rights and liberties for all. Anarchists also reject capitalism, based on the rule of private property, production for profit, class divisions, and the concentration of wealth in favor of a classless, socialist economy based on collective ownership of private property, participatory planning and decision-making, production for use, and decentralized federation of workers' assemblies, councils, and unions (Shannon, Nocella II and Asimakopoulos, 2012; Kinna, 2005). Crucially, anarchists insist on "direct action", the "insistence, when faced with structures of unjust authority, on acting as if one is already free", without the intermediation of authorities (Graeber, 2009, p. 203), as well as "prefiguration", which holds the construction of relations people would like to see in the future society must be implemented in the here and now (*ibid*; Franks, 2003). In Lucien van der Walt's (2013a) words, for anarchists, the ends do not justify the means, because the means shape them (p. 197).

The Free Software philosophy is, in crucial respects, based on anarchist principles. It advocates computer technologies that all people can directly control through direct action, rather than through third parties like corporations and governments. It also stresses individual and collective control over the technology ecosystem, including principles of non-exclusionary ownership (or communal property). Making software "free" (as in freedom) was the initial means towards this end, for it allows anyone to use, study, modify, and share the program (Tozzi, 2017). However, it was formulated during the 1980s, at a time when most end user experiences took place on personal desktop computers with limited or no Internet connection, and no World Wide Web. As the digital ecosystem evolved, it became apparent that other sources of control at the technical architectural level also threatened individual and community freedoms. In 2004, Eben Moglen reformulated power relations in the digital society, arguing that humanity needs Free Software, Free Hardware, Free Spectrum (network connectivity), and Free Culture (see Moglen, 2003; Chapter 3). Since that time, Moglen (2010) and his colleagues have launched the FreedomBox project to re-decentralized the Internet and services like social networking. This project also dovetails with anarchist philosophy, which stresses decentralization and federation.

While scholars like Eben Moglen (1999), Yochai Benkler (2013) , and Gabriella Coleman (2017) have touched upon anarchism in their writings about Free Software, and while anarchist scholars have hinted at an interest in Free Software in their writings about the digital society (Gordon, 2009; Curran, 2007; Williams and Shantz, 2014, pp. 184-185; Shantz and Tomblin, 2014), they haven't developed the analysis. This dissertation is the first to theorize precisely how the two theories line up, and merge them into one for an analysis of software policy.

Anarchist and Free Software approaches offer complementary theoretical approaches to education. Anarchist theories of education emphasize the liberty and empowerment of the student to direct their individual interests in tandem with a community of learners and teachers who work together democratically, both as a just means of development and in preparation for a directly democratic society (Bakunin, 1970 [1882], p. 41; Graeber, 2009, p. 203; Smith, 1983). Anarchists have long rejected authoritarian school roles and relationships (Berkman, 2005, p. 288; Goldman, 1910; Avrich, 2014) in favor of democratic norms. A century later, a new generation of scholars (re)discovered a "hidden curriculum" of authoritarian behavior in schools where the child learns subordination to authority figures and a hierarchical organizational structure of authority (Aronowitz, 1992 [1973]; Dreeben, 1967; Giroux and Penna, 1979).

Similarly, one can say that one finds in software a "hidden curriculum" of authoritarian subordination to the software owners. Joseph Turrow (2017) utilized this theory in relation to commercial surveillance, and EdTech scholars have tacitly hinted at this position in their writings on education (Papert, 1980; Hope, 2009; Williamson, 2017, p. 66). This dissertation merges the anarchist perspective on education with the Free Software philosophy on e-education. It argues that the authoritarian hidden curriculum is shifting from the teacher in the "brick-and-mortar" classroom to those in control of the software layer.

The anarchist/Free Software perspective provides a lens to evaluate government policy while also offering a normative account on what should be done to modify policy and facilitate social justice. The former (critical) approach emphasizes how the learners stand to lose their capacity for democratic participation over understanding and shaping their digital environments as they develop their knowledge, as well as their privacy rights; how teachers are losing autonomy to the software layer of the education system; how US-based corporations are colonizing the market; and how democratic process is being neglected in favor of a transition to the new e-education determined by elites from above, rather than in consultation with the people below. The latter offers an alternative scenario where digital environments make use of Free Software and strive towards re-wiring the digital ecosystem based on People's Technologies.

This dissertation also offers a unique take on digital colonialism. As noted in Chapter 1, most literature has treated digital colonialism to describe singular instances, such as the imposition of Free Basics in India, rather than a systematic phenomenon with a structural basis. This dissertation formulated digital colonialism as a structural phenomenon rooted in proprietary software, centralization, and domination at the technical architectural level in 2015 and 2016, including in its early drafts. Similar insights were theorized independently in a short essay by Andres Guadamuz (2017). Renata Avila (2018a, 2018b) has made some similar points in her work on digital colonialism as well.

This dissertation offers a first theoretical and conceptual framework for digital colonialism as a structural phenomenon. The theoretical framework pieces together theories about Free Software (from the Free Software movement), anarchism (with an emphasis on Internet decentralization, communal ownership of published information, direct democracy, and direct action), theories of network effects and economic factors leading to Big Tech centralization, theories of power and control at the technical architectural level, as well as a unique theory which ascribes a central role to Big Data as a centerpiece of both surveillance capitalism and digital colonialism.

Within the given conceptual framework, the United States exercises imperial control at the architecture level of the digital ecosystem: software, hardware, and network connectivity. This gives rise to five related forms of domination. First, the monopoly power of US multinational is used for resource extraction through rent and surveillance, constituting a new form of *economic domination*. Second, by controlling the digital ecosystem, Big Tech corporations control computer-mediated experiences, giving them direct power over political, economic, and cultural domains of life – a new form of *imperial control*. Third, the centerpiece of surveillance capitalism, Big Data, violates the sanctity of privacy and concentrates economic power into the hands of US corporations – a system of *global surveillance capitalism*. Fourth, as a feature of surveillance capitalism, Global North intelligence agencies partner with their own corporations to conduct mass and targeted surveillance in the Global South. This intensifies *imperial state surveillance*. And fifth, US elites have persuaded most people that society must proceed according to its own ruling class conceptions of the digital world, setting the foundation for *tech hegemony.*

These five features, the dissertation argues, demonstrate that digital colonialism is both structural and conceptual, and the international community needs to create a fundamentally different tech ecosystem that decentralizes technological by placing control directly into the hands of the people. For this task, *People's Technology for People's Power* – combined with education, grassroots movements, and creative legislation – provide practical solutions to counter the rapidly advancing frontier of digital empire.

Chapters 3 and 5-7 provide empirical support for how digital colonialism works, especially with respect to Free Software the role education technology in the Global South. While the theoretical and conceptual framework is not intended to cover all elements of the digital colonialism phenomenon (see Limitations, below), it does cover the core structural elements of the phenomenon as a technical architectural form of domination which, unless they are changed, will continue to perpetuate forms of domination and concentrations of political, social, and economic power into the hands of countries like the United States, and their corporate behemoths.

This theoretical approach, as noted in Chapter 1, fills gaps in the literature. Because the Internet is a global system with global reach, the expansion of it to the poor majority in the Global South presents major problems for human rights. We are just beginning to see Big Tech corporations reinventing colonial relationships in countries like South Africa, and current approaches to corporate and state practices which have global reach must account for their global nature. Digital studies in not currently addressing this problem adequately: the problem of, say, of the power of Google is not simply something for US people to address. Google's power is a global problem. Unless scholars believe corporations like Google, Facebook, Microsoft, and Twitter should exercise power over other countries through *their* code, own, surveil, and process *their* data, and extract revenue from *their* services, they have to address how to allow other countries to exercise self-determination and local development. This dissertation makes that this cannot be done with the current technological structures in place because they both centralize power by their very nature *and* they are global systems. Like colonial railroads and panoptic housing compounds, they are systems *designed* for authoritarian control, centralization, and domination.

A paradigm shift is thus needed in digital studies to think globally about the (primarily) US-based domination of the digital ecosystem. This extends to the field of education technology which, we have seen, focuses on *education-specific* technologies (like adaptive learning). It also extends beyond that academic circuit to the whole of digital studies which, including EdTech scholars, has not problematized the non-neutrality of proprietary software, centralized cloud computing, and Big Data analytics (see Chapter 1). These forms of technology must be challenged for their legitimacy so that the problems of digital colonialism, technocratic authoritarianism, and surveillance capitalism can be overcome.

## 8.3: Limitations to the Study and Areas for Further Research

This dissertation covered a vast topic with many facets which could not be covered in full. For example, it covered policy at the *national* level, without interrogating provincial level policies. Moreover, it selected e-education officials, corporate stakeholders, NGOs, and digital rights and innovation experts for interview samples. It would be fruitful to conduct further research covering each of the nine provinces, as well as representatives from teachers' unions, administrators, teachers, parents, and learners. It would also be productive to investigate the role of universities involved in teacher training for e-education.

Whilst this study focused on South Africa, future studies could incorporate comparisons across countries with potentially similar characteristics. The Kerala province in India could provide an interesting case study for comparison, as could, perhaps, countries from Latin America like Paraguay, (which implemented OLPC devices over a few years in 2009; see Ames, n.d.) or Brazil (which has a history of Free Software implementation; see Oram, 2016; Avila, 2018b).

Another important study could more fully interrogate the estimated costs of implementing e-education in schools. This would include software licensing costs, cost of content, hardware costs, support and maintenance services, broadband connectivity, teacher training, and cloud services. It could evaluate the full extent of corporate partnerships (including tenders), identify alternative partners (such as Canonical) that support Free Software and could service sufficient quantities of schools, and identify full costs according to various types of schools (rural, those in need of supporting infrastructure such as electricity, and so on). This would provide the academic community and public the means to evaluate the economic cost of the emerging e-education system.

This study did not address all aspects of digital colonialism. There were components and complexities that could not be covered in such a small space (e.g. open standards, blockchain, Internet governance, and labor exploitation producing hardware). Other issues should be explored, including South-South imperialism, especially in light of tech giants in Asia (e.g. Tencent, Alibaba, and Huawei), as well as labor exploitation along the material commodity chain. Circumstances will vary by place and time, and it will take many minds to grapple with this complex and understudied subject.

## 8.4: Recommendations

Fighting off the problems of digital colonialism will likely require a popular movement demanding an end to software patents and copyrights, the re-decentralization of the Internet, and the rollback of Big Data surveillance in favor of privacy and a non-data mined, non-surveilled society. The DBE, the South African government, education, and the broad South African society have much to lose if they continue to implement Big Tech products and services, in line with the Fourth Industrial Revolution agenda heartily endorsed by the ANC and the DA. As Alfredo Terzoli (2016) put it when discussing Big Tech, "I think we [South Africans] are going to be very sorry some time down the line."

The warning signs have already emerged (see Chapter 3), but all is not lost. As Richard Stallman (2015a) noted, South Africans have an *advantage* in that the majority have not yet become dependent upon – and accustomed to – nonfree software. The South African government already has a richly detailed government policy which outlines all of the reasons why the society should shift to Free Software (see Section 6.1). Yet the policy was formulated in the early 2000s. Since then, the tech ecosystem has changed. Multiple Big Tech corporations have swelled to trillion or near-trillion dollar giants, smartphones and tablets have become ubiquitous, centralized cloud computing has become dominant, and surveillance capitalism has become the dominant model for the digital ecosystem. The South African government should draft a new software policy that updates and builds upon the previous documents. It should re-affirm the value of Free Software, while also including proposals to begin integrating tools like FreedomBox for Internet re-decentralization, as well as a strong affirmation of net neutrality. Policymakers should also take a world-first strong stance against Big Data, and declare that South Africa will not emulate the surveillance society unfolding in the Global North and places like Asia, and it will actively *resist* foreign attempts to colonize and surveil its inhabitants by both states and corporations.

In the basic education sector, the government should consider laws that make it illegal to install systems that conduct Big Data surveillance on learners and teachers. They should also make laws that prevent the pre-installation of software on devices that conduct commercial forms of surveillance on learners and teachers, even if that data is not being used for advertising purposes (as in, say, Google G Suite of Education). This would include, for example, Google Android and Microsoft Windows 10. Those corporations would then have the choice to modify their software to stop spying on the population if they want to be installed in South African schools. Free Software like GNU/Linux, LineageOS, F-Droid, and LibreOffice should be pre-installed on devices deployed in the public sector. Policy documents make clear that these kinds of software are to be preferred over proprietary alternatives. The language of the *FOSS policy preference* stresses "preference" for FS when proprietary options are not demonstrated to provide superior choices. This is, of course, a vague and subjective clause, and policymakers should amend or revise the policy to strengthen the enforcement of FS for use in the public sector. Other software, such as Jitsi, Tor, Signal and Wire should be used in schools. Search engines like DuckDuckGo should be made default, while privacy-respecting email services like ProtonMail should be considered for use in schools. The government should consider new legislation to build in requirements for privacy services in school devices.

The government should devote resources to the development of Free Software. If advanced surveillance systems like Cmore can be created at the CSIR, there is no reason why custom distributions of GNU/Linux for schools, work on decentralization technologies like FreedomBox, or myriad other human rights software cannot be developed. Subsidies could be offered in the university system, where students, researchers, and professors could be paid to work together on Free Software projects that advance human rights and socioeconomic development in the country.

Education is critical to any cause, and digital technology is no exception. Schools should teach critical consciousness about technology politics, including the problematic power and practices of Big Tech corporations, the Snowden revelations and the problem of US and other government surveillance initiatives, and the value of People's Technologies for People's Power to South African society. Students should learn how to become empowered users of software like GNU/Linux, and some of the foundations of how computers, data analytics, and coding works, without expectations that everyone will become coders and computer scientists.

Finally, experts from abroad (e.g. Walter Bender, Eben Moglen, and Richard Stallman) as well as experts from South Africa (e.g. Alfredo Terzoli and Nhlanhla Mabaso) should be consulted about a way forward. Richard Stallman has some familiarity with South Africa, was warmly endorsed by Archbishop Desmond Tutu, and has advised the Bolivian government on Free Software implementation as recent as 2013 (Avila, 2018b). Others are surely available to the task.

The DBE should train and hire any support needed to ensure its policymakers are equipped to handle the complexities of the digital era, including how to guard against digital colonialism. The government may consider reaching out to the government of Kerala, which has the longest and largest Free Software in education program in human history, covering around 6 million students and 200,000 teachers (half the size of South Africa).

The government should release a report on OPE and open up the conversation about their plans for e-education to the general public. They should give honest and straightforward accounts about the technologies they are and plan to implement, including the surveillance elements, the contracts in place or in discussion, and the relationship between current choices the *FOSS policy preference* which is official government policy.

Lastly, civil society, parents, and activists should get involved in the conversation. This will require building critical consciousness about the need to resist Big Tech and move the society towards a digital ecosystem built for human rights and equality. They could demand People's Technologies for People's Power, as well as laws that promote liberty and equality. Placing children under mass surveillance through Big Data systems is highly controversial and should be widely debated. Furthermore, Big Tech should be understood as a colonial threat. The Western model of digital technology development should be rejected, and a new model for the digital society should be constructed in its place. This should be based on People's Technologies (socialized architecture), the freedom to share information, laws supportive of privacy and digital equality, and the pursuit of a digital society that integrates into other struggles for equality and liberation.

South Africa has a rich history of resistance to repression in the education sector, and a powerful history of resisting intellectual property rights, in the form of patents, through the Treatment Action Campaign. The digital society, and digital education, is going to be another site of power and resistance. If the common people are the ones tasked to shape society for the better, then they will ultimately have to push the government to develop the society they want for themselves.

# Appendix A: Consent Form

**Project Title**
*Going Digital: Access to Knowledge and Pro-Poor Development in the Cofimvaba, Eastern Cape School System, South Africa*

**Project Description**
This study examines the South African government's policy initiative for a roll-out of tablet computers in the national public school system. The post-apartheid educational system faces a number of pressing challenges, including an innovation deficit, problems in the national educational system, and a substantial digital divide. As a proposed solution, the government plans to deploy tablets nationwide so that each child may have abundant and equal access to knowledge – as well as the means to construct and share knowledge – in every public school. Focusing on a major actor, the Information and Communications Technology for Rural Educational Development (ICT4RED) pilot project in the Chris Hani District Municipality, I identify and examine the policy choices and perspectives that inform decisions about which forms of digital technology are under consideration for the national tablet program. I address questions about the core pillars underpinning knowledge production and distribution in the digital ecosystem. The findings have implications for the course of educational development and the newly emerging digital information economy in South Africa.

**Name, Position, and Contact Address of Researcher**
Michael Kwet
PhD Candidate, Rhodes University, Sociology
Grahamstown, South Africa

Signature __________________________ Date ___________________

**For Interview Participant**

1. I confirm that I have read the description of the above study and have had the opportunity to ask questions. _____
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. _____
3. I agree to take part in the above study as an interview participant. _____
4. I agree to the interview consultation being audio recorded. _____
5. Circle one: I agree to the use of *anonymised* / *attributed* quotes in publications. _____

__________________________ __________________ ______________________________
Name of Participant Date Signature

# Appendix B: Interview Questions

*[Note: The interviews were semi-structured in format. Questions often varied by organization and the responses of individuals; below is a sample catered to ICT4RED]*

*Basic background questions*

1. Central Aim: What is the ultimate aim the project? Fill me in.
   What seem to be major themes and concerns about the program? For example, how is it decided on which technologies to use?
2. National policy: Is there to be a national roll-out? Is there a goal date for that?
   1. Will ICT4RED play a role in drafting a national policy, and how will that policy be drafted? Will they be part of a committee?
3. Policy process: How does the policy process work?
   1. Do officials (and from which organizations) have regular meetings to determine which tablets are purchased, and what goes on them?
   2. How do the different tiers of government fit into the national rollout?
   3. Are there competing versions of the pilot project?
   4. Is the private sector involved in this project?

Funding:

1. How will it be funded?
2. Is the private sector involved?
   1. Which companies? Hardware and software?
3. What happens if a laptop gets misplaced or breaks?

**Copyright**

- Will there be copyright on the information in the tablets? What are your views on copyright?

  - (Potential follow-up:) Some people say that since technology has made information cheap, it has changed the ethics of copyright law. Is copyright ethical given that the technology has created an abundance of information.

- A lot of people can't afford textbooks. Maybe a case should be made that people should be given free stuff. What do you think?

- Can a case be made for poorer countries to have a different copyright regime?
  - Are you looking into this?

- What about open content?
  - Do you think the government should consider commissioning Open Content textbooks free for SA school children?
  - Are there discussions about Open textbooks, or commissioning them?

- Will the tablets have DRM?
  - What are your thoughts on digital rights management for content on the devices?
  - Are there any discussions or concerns about DRM?

**Openness of Technology**

- (Statement on FOSS) Free and Open Source Software allows individuals and communities to modify, share, and re-distribute software, by granting all users freedom to use the program, read, study, and change the source code, and share it with friends. Proprietary software, by contrast, closes the code from study, modification, copying, and sharing with other computer users.
    - Do you have any thoughts about FOSS?
    - Are there any discussions about FOSS?

- What operating system is running, and are there concrete plans for the future software running on the tablets?

- There is a lot of information available on the Internet. Is anything being done to control the kinds of information and technologies like software applications students can use on the tablets?

    - Eg, practical limitations like installing games – and how is this prevented? If the strategy is keeping them offline, is there any discussion or worries about how things would change when students eventually get Internet access?

    - Eg, adult and illegal content, such as pornography, violent media, and copyrighted downloads.

- Are there any discussions about how to develop computer programming or other computer skills?

**Privacy**

- Is there going to be tracking of student data?
    - Will they be aware of this?
    - Might this affect what they look up? Eg, depression, personal issues, unpopular ideas?
    - (If so:) Do you think that's an issue?

- Do you know if there will be software that tracks their data, or are there discussions about that issue amongst your colleagues?
    - Would you allow students to have Facebook or Twitter accounts?
    - Would they have to have a Google account?
        - Are there any concerns about students uploading their personal information in order to get an account? For example, many email services require a mobile phone number to register a new account.

- Are there any plans to educate students about how to protect their privacy on computers?

- Would students be allowed to use privacy protecting software even if it obscured what they were doing, surfing, or storing on their computers?

# Appendix C: Interview Subjects

## *Policymakers*

** indicates a pseudonym.*
*Policymakers listed occupy high-level positions in their departments.*

**Simon* (Department of Science and Technology)**

*Interview date: October 5, 2015*

Simon works on issues related to ICTs at the National DST.

**Herman* (Department of Telecommunications and Postal Services)**

*Interview date: October 9, 2015*

Herman works on issues related to devices and network connectivity for education at the National DTPS.

**Sipho* (Department of Basic Education)**

*Interview date: October 8, 2015*

Sipho works on e-education at the National DBE.

**Richard* (Department of Basic Education)**

*Interview date: June 14, 2016*

David works on e-education at the National DBE.

**Tefo* (Gauteng Department of Education)**

*Interview date: September 28, 2016*

Tefo works on e-education at the GDE.

## *Experts*

**Richard Stallman (MIT, FSF)**

*Interview date: July 29, 2015a*

Richard Stallman spearheaded the Free Software Movement. Stallman pioneered the concept of copyleft and is the main author of the GNU General Public License, the most widely used Free Software license, which implements copyleft. He developed the GNU Compiler Collection and GNU Emacs and founded the Free Software Foundation. Stallman has received numerous awards and honorary doctorates and professorships.

**Eben Moglen (Columbia, SFLC, ex-FSF)**

*Interview date: June 23, 2015a*

Eben Moglen is the founder, President, and Director of the Software Freedom Law Center and the former general counsel to the Free Software Foundation. Moglen was a Law Clerk to Justice Thurgood Marshall, United States Supreme Court. He was part of the defense team for Philip Zimmermann, who was investigated by the US government for the export of the public key encryption system, Pretty Good Privacy (PGP). Moglen was heavily involved in the drafting of the GPLv3. He is the creator of the Freedom Box Foundation. Moglen is recipient of the Electronic Frontier Foundation Pioneer Award (2003) and frequently works with Mishi Choudhary (SFLC, Legal Director) on FS issues in India and elsewhere. Professor Moglen teaches law and legal history at Columbia University.

**Walter Bender (MIT, Sugar Labs, ex-OLPC)**

*Interview date: July 28, 2015*

Walter Bender is the co-founder and former President of Software and Content for MIT's One Laptop per Child (OLPC) program. The One Laptop per Child is the largest e-education project in history. Bender is also the founder of Sugar Labs, a nonprofit that develops the Sugar Free Software desktop environment.

**Cindy Cohn (Electronic Frontier Foundation)**

*Interview date: November 10, 2015*

Cindy Cohn is the Executive Director of the Electronic Frontier Foundation and a civil liberties attorney specializing in digital technology law. From 2000-2015, she was Legal Director and General

Counsel at the EFF. Cohn serves as counsel in cases challenging NSA surveillance; she has worked on many high-profile cases. She is a member of the Board of Directors for the Tor Project. Cohn is has been named as one of the most influential lawyers in the United States, and is the recipient of numerous awards.

**Bruce Schneier (Harvard Berkman Center, Tor, IBM)**

*Interview date: January 18, 2016*

Bruce Schneier is a world-class expert on cryptography and computer security, privacy specialist, and popular author. Schneier wrote a classic work for engineers in the field of cryptography. He helped journalist Glenn Greenwald review Edward Snowden's NSA documents, and was asked to brief members of the US Congress about NSA activities. Schneier has previously worked for the government (Department of Defense) and private industry (he currently works for IBM). He is a fellow at the Berkman Center for Internet & Society at Harvard Law School, a Program Fellow at the New America Foundation's Open Technology Institute, a member of the Board of Directors of the Tor Project, and a board member at the Electronic Frontier Foundation.

**Mabaso, Nhlanhla (Armscor, Wikimedia Foundation)**

*Interview date: May 12, 2016*

Nhlanhla Mabaso is the Chief Information Officer (CIO) at Armscor and a Member of the Advisory Board of the Wikimedia Foundation. Mabaso played a substantial role in the formation of South Africa's Free Software initiative in government. He was the CIO the Department of Public Service and Administration and later the Department of Home Affairs. Mabaso ran the Open Source Initiative at the Meraka Institute of the CSIR and served as coordinator of the Free and Open Source Foundation for Africa (FOSSFA). He is trained as a software engineer and systems analyst. Mabaso also serves on the boards of the .ZA Domain Name Authority, Free to Innovate South Africa, and The African Commons Project.

**Alfredo Terzoli (Rhodes University)**

*Interview date: September 20, 2016*

Alfredo Terzoli is Head of Computer Science at Rhodes University and Head of the Telkom Centre of Excellence in Distributed Multimedia at Rhodes University. Professor Terzoli works on issues of ICT for development, and has been involved in the Siyakhula Living Lab initiative that introduced ICT skills and technology to seventeen Eastern Cape schools. In 2012, Terzoli won the Department of Trade and Industry award in human resource development for his contributions to technology development and innovation in South Africa.

## *Stakeholders (South Africa)*

**Meryl Ford (Meraka Institute, CSIR; ICT4RED)**

*Interview date: October 12, 2015*

Meryl Ford is the Manager of Education and Mobile Learning at the Meraka Institute. She was the Programme Manager and Initiator for ICT4RED (2012-2017), the largest and most comprehensive research, development, innovation and implementation project of its kind in South Africa. Mertyl's current interest is in the use of emerging technologies such as blockchain, AI and the Internet of Things, combined with promising new business models (e.g. the token economy) in stimulating and supporting technology innovation in the developing world. She received her Bsc in Information Processing, Computer Science from Rhodes University.

**Mario Marais (Meraka Institute, CSIR; ICT4RED)**

*Interview date: October 6, 2015*

Mario Marais is a principal researcher at the CSIR's Meraka Institute. He handles monitoring and evaluation, sustainability, and modeling for ICT4RED. Recent evaluation work includes an ICT for Education project in 26 rural schools (http://www.ict4red.co.za), the use of iPads in schools and the establishment of ICT-hubs for service delivery to rural communities. In the past seven years, projects included managing the monitoring and evaluation of the Digital Doorway initiative (180+ sites – http://www.digitaldoorway.org.za), assessment of a horizon scanning project, and business modelling of an entrepreneurial model for local technical support for a project that provided Internet connectivity to 176 schools and communities in a rural area using wireless mesh technology. He holds Master's degrees in physical chemistry and theology, and has completed a PhD in informatics on the role of social capital in supporting entrepreneurs supplying ICT-based services in rural communities.

**Marlien Herselman (ICT4RED)**

*Interview date: May 12, 2015*

Marlien Herselman is a Chief Researcher and a Living Lab research group leader at the CSIR's Meraka Institute. She isa member of the ICT4RED team, and has written extensively about e-education and mHealth. Herselman co-authored a book on the ICT4RED pilot project in 2014. She received her PhD in Computer Games from the University of Pretoria.

**Fiona Wallace (CoZa Cares; ICT4RED)**

*Interview date: October 8, 2015*

Fiona Wallace was CEO of the CoZa Cares Foundation during the time of our interview. She handled Content for ICT4RED. Fiona specializes in Open Educational Resources, Quality Assurance of e-learning materials, ICT environments in schools, e-Learning, teacher training, and digital content curation. She is currently an associate at the Ithaka Creative Studio. Wallace received her BA Sp Hons in Philosophy and Religious Studies from the University of Zimbabwe, her BA Hons in English from the University of South Africa, and her BA HDE in English, Religious Studies from the University of Cape Town.

**Jill* (Google SA)**

*Interview date: March 7, 2016*

Jill works on e-education for Google South Africa. At the time of our interview, Jill said Google for Education has a tiny staff in South Africa.

**Alister Payne (CloudEd, Google Partner)**

*Interview date: July 28, 2016*

Alister Payne is an eduprenuer, EdTech specialist, and Information Systems researcher. He was born and raised in Cape Town, and spent 18 years teaching. Payne is the CEO of CloudEd, a Google for Education Partner. CloudEd exclusively services Google and is, according to Payne, the first stop for those interested in deploying Google for e-education in South African schools. His interests and experience include: E-Learning; Cloud Migration; Corporate Social Investment; and Behavioural Information Security, in particular adolescent online behaviour (Cyberbullying).

**Laetitia de Jager (iSchoolAfrica)**

*Interview date: July 29, 2016*

Laetitia de Jager is the iSchoolAfrica Facilitation Manager at Think Ahead Education Solutions. She works on e-education implementation at iSchoolAfrica, an education initiative developed by Core Group, the sole distributors for Apple in Sub-Saharan Africa. iSchoolAfrica partners include the United Nations Children's Fund (UNICEF), the Department of Rural Development and Land Reform (DRDLR), the CSIR, iStore (Apple), Telkom, Sasol, Media24, and General Motors. De Jager received her BSc in Education from the University of Johannesburg.

**Chloe* (SchoolNet SA)**

*Interview date: August 5, 2016*

Chloe works on e-education for SchoolNet South Africa, a national, Section 21 non-profit organization. SchoolNet SA delivers training to teachers and education managers, provides content development, tutor training, and technical service and support, among other services. SchoolNet is partnered to corporations like Intel, Microsoft, Adobe, Oracle, and Google Education; the National Department of Basic Education, the Department of Telecommunications and Postal Service, the Eastern Cape Department of Rural Development and Agrarian Reform, provincial education departments in the Western Cape and Free State; and local SA corporations and institutions like Vodacom, CSIR and ICT4RED, Telkom, Sun International, Anglo Platinum, and DG Murray Trust. SchoolNet SA works on e-education for public schools, and it works with some higher education institutions.

**Ashley* (Pearson SA)**

*Interview date: August 11, 2016*

Ashley works on e-education implementation for Pearson South Africa.

**Brian Wafawarowa (Pearson SA)**

*Interview date: August 22, 2016*

Brian Wafawarowa was the Executive Director of Learning Resources at Pearson South Africa (2013-2017). His portfolio includes print and digital learner and teacher materials, teacher training, and assessments and solutions. Wafawarowa is also the Chair of the Publishers' Association of South Africa and serves on the board of the International Publishers Association (IPA). Wafawarowa has represented the publishing industry to UNESCO, WIPO, WTO, The World Bank, the European Chamber of Commerce and the African Union. He also chaired the ministerial committee that developed the draft South African book policy. Wafawarowa has a broad interest in the broad publishing industry and its policy environment. He received his Honours in English, Literature, language and film from the University of Zimbabwe, his Master of Literature, African Literature in English from Wits, and his Executive Masters in Business Administration from the University of Cape Town.

**Steve Vosloo (Pearson SA)**

*Interview date: May 20, 2016*

Steve Vosloo was Head of Mobileat Pearson SA. His specialties include mobiles for development (M4D), mobile learning in Africa, youth and digital media, digital games, participatory culture, user interface consulting, and ICT for development (ICT4D). Vosloo previously worked for the United Nations Educational, Scientific and Cultural Organization, mLab South Africa, and the Shuttleworth Foundation. He is presently Senior Project Officer at UNESCO, Paris, managing a partnership with Pearson to examine and highlight how inclusive digital solutions can help people with low skills and low literacy use technology in a way that supports skills development and, ultimately, improves livelihoods. For three years he held a Shuttleworth Foundation fellowship for 21st century learning and before that was a fellow of the Reuters Digital Vision Program at Stanford University. Vosloo received his National Diploma in Education Technology from Nelson Mandela Metropolitan University, his Postgraduate Diploma in Information Systems from UCT, his Bachelor of Commerce Honours in Information Systems from UCT, as well as his Masters in Information Systems from UCT.

**Sania* (Microsoft SA)**

*Interview date: September 16, 2016*

Sania works on e-education implementation for Microsoft South Africa.

**Veronica* (Microsoft SA)**

*Interview date: February 2, 2017*

Veronica works on e-education for Microsoft South Africa.

**Stephen* (Michael & Susan Dell Foundation)**

*Interview date: September 30, 2016*

Stephen works on K-12 education and innovation, as well as post-secondary youth employment, for the MSDF Data Driven Districts project.

**Rachel* (Michael & Susan Dell Foundation)**

*Interview date: October 7, 2016*

Rachel works on the MSDF Data Driven Districts education portfolio, the largest program of the Data Driven Districts project.

## *Corporates (United States)*

**Lin Zhou (IBM)**

*Interview dates: March 31, 2017 and April 28, 2017*

Lin Zhou leads IBM's Smart Education Initiative. As Program Director of IBM Watson Education, he is responsible for Watson Education. Zhou's program drives R&D across global research labs and divisions, develops artificial intelligence based education solutions, innovates machine learning and cognitive capabilities, and curates data through deep analytics. Zhou has numerous patents and publications. Zhou has a specialty in IBM Watson Virtual Tutor. IBM honored Lin Zhou as a Master Inventor – the recognition for the most innovative IBMers.

**Judith Bishop (Microsoft)**

*Interview date: August 12, 2016*

Judith Bishop was Director of Computer Science at Microsoft Research in Redmond, Seattle, WA, USA, from 2009-2016. At Microsoft, Bishop was Leader of Open Source for Academics. Bishop was born and raised in South Africa. She attended Rhodes University, the University of KwaZulu-Natal, and the University of Southampton. Bishop was a Head of Department at the University of Witwatersrand and a Professor of Computer Science at the University of Pretoria. She has been a leading figure in Computer Science in South Africa, authored many books, and received numerous awards. She is now an Extraordinary Professor at the University of Stellenbosch.

**Greg* (Microsoft)**

*Interview date: July 20, 2016*

Greg is a senior researcher at Microsoft Research, Redmond, Seattle, WA, USA, and has worked on initiatives involving developing countries.

# BIBLIOGRAPHY

Note: All links were accessible as of September 30, 2018.

## Books

Albert, M. (2003). *Parecon: Life After Capitalism*. London: Verso.

Albert, M., Cagan, L., Chomsky, N., Hahnel, R., King, M., Sargent, L. and Sklar, H. (1986). *Liberating Theory*. Cambridge, MA: South End Press.

Alpaydin, E. (2016). *Machine Learning: The New AI*. Cambridge, MA: The MIT Press.

Allais, S. (2014). *Selling Out Education: National Qualifications Frameworks and the Neglect of Knowledge*. Rotterdam: SensePublishers.

Amin, S. (2009). *Eurocentrism: Modernity, Religion, and Democracy – A Critique of Eurocentrism and Culturalism.* (2nd ed.). New York, NY: Monthly Review Press.

Andrews, L. (2012). *I Know Who You Are and I Saw What You Did: Social Networks and the Death of Privacy*. New York: Free Press.

Apple, M. and Beane, J.A. (1995). *Democratic Schools*. Alexandria, VA: Association for Supervision and Curriculum Development.

Aronowitz, S. (1992 [1973]). *False Promises: The Shaping of the American Working Class Consciousness*. Durham, NC: Duke University Press.

Aronowitz, S. (2000). *The Knowledge Factory: Dismantling the Corporate University and Creating True Higher Learning*. Boston, MA: Beacon Press.

Avrich, P. (2006 [1980]). *The Modern School Movement: Anarchism and Education in the United States*. Oakland, CA: AK Press.

Babbie, E. (2014). *The Basic of Social Research*. Canada: Wadsworth Cengage Learning.

Bakan, J. (2004). *The Corporation: The Pathological Pursuit of Profit and Power*. New York, NY: Free Press.

Bakunin, M. (1970 [1882]). *God and the State*. New York, NY: Dover Publications, Inc.

Bakunin, M. (1971). *Bakunin on Anarchy: Selected Works by the Activist-Founder of World Anarchism*. Edited and translated by S. Dolgoff. New York, NY: Vintage Books.

Baldwin, P. (2014). *The Copyright Wars: Three Centuries of Trans-Atlantic Battle*. Princeton: Princeton University Press.

Ball, K., Haggerty, K. and Lyon, D. (Eds.). (2012). *Routledge Handbook of Surveillance Studies*. New York, NY: Routledge.

Ball, S., Junemann, C. and Santori, D. (2017). *Edu.net: Globalisation and Education Policy Mobility*. New York, NY: Routledge.

Benkler, Y. (2006). *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. New Haven: Yale University Press.

Berkman, A. (1929). *What Is Communist Anarchism?* Available at: https://theanarchistlibrary.org/library/alexander-berkman-what-is-communist-anarchism.pdf

Berkman, A. (2005). *Life of an Anarchist: The Alexander Berkman Reader*. Edited by G. Feller. New York, NY: Seven Stories Press.

Best, S. and Kellner, D. (1997). *The Postmodern Turn.* New York, NY: The Guilford Press.

Biko, H. (2013). *The Great African Society: A Plan for a Nation Gone Astray*. Johannesburg: Jonathan Ball Publishers.

Blum, W. (2014). *Killing Hope: US Military and CIA Interventions since World War II.* (Updated ed.). London: Zed Books.

Bond, P. (2014). *The Elite Transition: From Apartheid to Neoliberalism in South Africa: Revised & Expanded Edition*. London: Pluto Press.

Bookchin, M. (1986). *Post-Scarcity Anarchism*. (2nd ed.). Montreal: Black Rose Books.

Bookchin, M. (2004). *The Third Revolution: Popular Movements in the Revolutionary Era (Vol. 3)*. London: Continuum International Publishing Group.

Booyse, J.J., Le Roux, C.S., Seroto, J. and Wolhuter , C.C. (Eds.). (2011). *A History of Schooling in South Africa: Method and Context*. Pretoria: Van Schaik.

Bowles, S. and Gintis, H. (2011 [1976]). *Schooling in Capitalist America: Educational Reform and the Contradictions of Economic Life.* Chicago, IL: Haymarket Books.

Breckenridge, K. (2014). *Biometric State: The Global Politics of Identification and Surveillance in South Africa, 1850 to the Present*. Cambridge: Cambridge University Press.

Bricmont, J. (2006). *Humanitarian Imperialism: Using Human Rights to Sell War*. New York, NY: Monthly Review Press.

Brown, I. and Marsden, C.T. (2013). *Regulating Code: Good Governance and Better Regulation in the Information Age*. Cambridge, MA: The MIT Press.

Brown, S. (2015). *Dark Matters: On the Surveillance of Blackness*. Durham: Duke University Press.

Bygrave, L. and Bing, J. (2009). *Internet Governance: Infrastructure and Institutions*. Oxford: Oxford University Press.

Bryman, A. (1988). *Quantity and Quality in Social Research*. London: Unwin Hyman.

Bryman, A. and Burgess, R.G. (Eds.). (1994). *Analyzing Qualitative Data*, London: Routledge.

Carr, M. (2016). *US Power and the Internet in International Relations: The Irony of the Information Age*. New York, NY: Palgrave Macmillan.

Castells, M. (2009). *Communications Power*. Oxford: Oxford University Press.

Castells, M. (2010). *The Rise of the Network Society, Volume 1 (Second edition: With a new preface)*. Oxford: Blackwell Publishers Ltd.

Castells, M. (2012). *Networks of Outrage and Hope: Social Movements in the Internet Age*. Malden: Polity Press.

Castells, M. and Himanen, P. (Eds.). (2014). *Reconceptualizing Development in the Global Information Age*. Oxford: Oxford University Press.

Chang, H. (2008). *Bad Samaritans: The Myth of Free Trade and the Secret History of Capitalism*. New York: Bloomsbury Press.

Chang, H. (2014). *Economics: The User's Guide*. New York: Bloomsbury Press.

Chomsky, N. (1970/2005). *Government in the Future*. New York, NY: Seven Stories Press.

Chomsky, N. (1999). *Profit Over People: Neoliberalism and Global Order*. London: Seven Stories Press.

Chomsky, N. (2003). *Chomsky on Democracy & Education*. Edited by C.P. Otero. New York, NY: Routledge.

Coleman, E.G. (2012). *Coding Freedom: The Ethics and Aesthetics of Hacking*. Princeton, NJ: Princeton University Press.

Cresswell, J.W. (2007). *Qualitative Inquiry & Research Design: Choosing Among Five Approaches*. (2nd ed.). London: Sage Publications, Inc.

Curran, G. (2007). *21st Century Dissent: Anarchism, Anti-Globalization and Environmentalism*. New York, NY: Palgrave Macmillan.

Curtis, K. (2010). *After the Software Wars.* Available at: http://keithcu.com/wordpress/?page_id=407

DeNardis, L. (2014). *The Global War for Internet Governance*. New Haven: Yale University Press.

Denzin, N.K. and Licoln, Y.S. (Eds.). (2018). *The SAGE Handbook of Qualitative Research*. (5th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Dirlik, A. (1991). *Anarchism in the Chinese Revolution*. Los Angeles, CA: University of California Press.

Doctorow, C. (2015). *Information Doesn't Want to Be Free: Laws for the Internet Age*. San Francisco: McSweeney's.

Dolgoff, S. (1990[1970]). *The Anarchist Collectives: Workers' Self-Management in the Spanish Revolution, 1936-1939*. Montreal: Black Rose Books.

Duncan, J. (2014a). *The Rise of the Securocrats: The case of South Africa*. Sunnyside: Jacana Media (Pty) Ltd.

Edwards, L. and Waelde, C. (2009). *Law and the Internet*. 3rd ed. Oxford: Hart.

Evans, P., Rueschemeyer, D. and Skocpol, T. (Eds.). (1985). *Bringing the State Back In*, Cambridge, MA: Cambridge University Press

Eubanks, V. (2018). *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*. New York, NY: St. Martin's Press.

Ewen, S. and Ewen, E. (2008). *Typecasting: On the Arts and Sciences of Human Inequality*. New York, NY: Seven Stories Press.

Fanon, F. (1963 [1961]). *The Wretched of the Earth*. Translated by C. Farrington. New York, NY: Grove Press.

Feagin, J. and Vera, H. (2001). *Liberation Sociology*. Boulder, CO: Westview Press.

Feller, J., Fitzgerald, B., Hissam, S.A. and Lakhani, K. (2005). *Perspectives on Free and Open Source Software*. Cambridge, MA: The MIT Press.

Fiske, E. and Ladd, H. (2004). *Elusive equity: Education Reform in Post-Apartheid South Africa (1st ed.)*. Washington, D.C.: Brookings Institution Press.

Freire, P. (2005 [1970]). *Pedagogy of the Oppressed*. Translated by M.B. Ramos. New York, NY: The Continuum International Publishing Group Inc.

Goldman, E. (1910). *Anarchism and Other Essays*. New York, NY: Mother Earth Publishing Association.

Goldsmith, J. and Crawford, S. (2014). *The Responsive City: Engaging Communities Through Data-Smart Governance*. San Francisco, CA: Jossey-Bass.

Goldsmith, J. and Wu, T. (2006). *Who Controls the Internet? Illusions of a Borderless World*. Cambridge, MA: Oxford University Press.

Gould, S.J. (1996 [1981]). *The Mismeasure of Man*. (Revised and Expanded ed.). New York, NY: W.W. Norton & Company, Inc.

Graeber, D. (2004). *Fragments of an Anarchist Anthropology*. Chicago, IL: Prickly Paradigm Press.

Graeber, D. (2009). *Direct Action: An Ethnography*. Oakland, CA: AK Press.

Graham, R. (Ed.). (2005). *Anarchism: A Documentary History of Libertarian Ideas (Volume One: From Anarchy to Anarchism [300CE to 1939])* . Montreal: Black Rose Books.

Graham, R. (2015). *We Do Not Fear Anarchy, We Invoke It: The First International and the Origins of the Anarchist Movement*. Oakland, CA: AK Press.

Granick, J.S. (2017). *American Spies: Modern Surveillance, Why You Should Care, and What To Do About It*. New York: Cambridge University Press.

Gross, P., Levitt, N. and Lewis, M. (Eds.). (1996). *The Flight from Science and Reason*. New York, NY: The New York Academy of Sciences.

Greenhow, C., Sonnevend, J. and Agur, C. (Eds.). (2016). *Education and Social Media: Toward a Digital Future*. Cambridge, MA: The MIT Press.

Greenwald, G. (2014). *No Place to Hide: Edward Snowden, the NSA, and the U.S. Surveillance State*. New York: Metropolitan Books.

Grenz, S. (1996). *A Primer on Postmodernism*. Grand Rapids, MI: William B. Eerdmans Publishing Company.

Guadamuz, A. (2010). *Tech Transfer, Open Licensing and Developing Countries: Open Source Software and Open Science as Tools for Development*. Saarbrücken: LAP Lambert Academic Publishing.

Haggerty, K.D. and Ericson, R.V. (Eds.). (2006). *The New Politics of Surveillance and Visibility*. Toronto: University of Toronto Press Incorporated.

Hahnel, R. (2002). *The ABCs of Political Economy: A Modern Approach*. London: Pluto Press.

Harding, S. (1986). *The Science Question in Feminism*. Ithaca, NY: Cornell University Press.

Hartzog, W. (2018). *Privacy's Blueprint: The Battle to Control the Design of New Technologies*. Cambridge, MA: Harvard University Press.

Harvey, D. (2005). *A Brief History of Neoliberalism*. New York: Oxford.

Herselman, M. and Botha, A. (2014). *Designing and implementing an Information Communication Technology for Rural Educational Development (ICT4RED) initiative in a resource constrained environment: Cofimvaba school district, Eastern Cape, South Africa*. Pretoria: CSIR Meraka.

Hirsch, S. and Van der Walt, L. (Eds.). (2010). *Anarchism and Syndicalism in the Colonial and Postcolonial World, 1870-1940*. Boston, MA: Brill.

Isaacson, W. (2014). *The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution*. New York: Simon & Schuster.

Jimenez, J., Pasztor, E.M., Chambers, R.M. and Fujii, C.P. (2015). *Social Policy and Social Change: Toward the Creation of Social and Economic Justice*. (2nd ed.). Los Angeles, CA: Sage Publications, Inc.

Jorgenson, D.W. and Wessner, C.W. (Eds.) (2006). *Measuring and Sustaining the New Economy: Software, Growth, and the Future of the U.S. Economy: Report of a Symposium*. 1st ed. Washington, D.C.: The National Academies Press.

Jun, N. (Ed.). (2017). *Brill's Companion to Anarchism and Philosophy*. Leiden, NL: Brill.

Kamenetz, A. (2015). *The Test: Why Our Schools are Obsessed with Standardized Testing – But You Don't Have to Be.* New York, NY: PublicAffairs.

Kinna, R. (2005). *Anarchism: A Beginner's Guide*. Oxford: Oneworld Publications.

Kirst-Ashman, K.K. (2017). *Introduction to Social Work & Social Welfare: Critical Thinking Perspectives*. (5th ed.). Boston, MA: Cengage Learning.

Koertge, N (Ed.). (1998). *A House Built on Sand: Exposing Postmodern Myths about Science*. New York, NY: Oxford University Press.

Kovacs, P.E. (Ed.). (2011). *The Gates Foundation and the Future of U.S. "Public" Schools*. New York, NY: Routledge.

Kraft, M.E. and Vig, N.J. (Eds.). (1988). *Technology and Politics*. London: Duke University Press.

Kropotkin, P. (1902). *Mutual Aid: A Factor in Evolution*. New York, NY: McClure Phillips & Co.

La Grange, Z. (2014). *Good Morning Mr. Mandela: A Memoir*. New York, NY: Viking.

Lapierre, D. (2009). *A Rainbow in the Night: The Tumultuous Birth of South Africa*. Cambridge, MA: Da Capo Press.

Leedy, P.D. and Ormrod, J.E. (2015). *Practical Research: Planning and Design*. (11th ed.). Essex: Pearson Education Limited.

Lessig, L. (2006). *Code: And Other Laws of Cyberspace, Version 2.0*. New York, NY: Basic Books.

Levy, S. (2011). *In the Plex: How Google Thinks, Works, and Shapes Our Lives*. New York, NY: Simon & Schuster.

Lincoln, Y.S. and Guba, E.G. (2013). *The Constructivist Credo*. Walnut Creek, CA: Left Coast Press, Inc.

Loewen, J. (1996). *Lies My Teacher Told Me: Everything Your American History Textbook Got Wrong*. New York, NY: Touchstone.

Lynch, T.L. (2015). *The Hidden Role of Software in Education: policy to practice*. New York, NY: Routledge.

MacMillan, H. and Marks, S. (Eds.). (1989). *Africa and Empire: William Macmillan, historian and social critic*, London: Temple Smith.

Mansell, R. (2012). *Imagining the Internet: Communication, Innovation, and Governance*. Oxford: Oxford University Press.

Marais, H. (2011). *South Africa pushed to the limit: The political economy of change*. Claremont: UCT Press.

Marshall, P. (2008) *Demanding the Impossible: A History of Anarchism*. London: Harper Perennial.

Mavasti, A.B. (2004). *Qualitative Research in Sociology: An Introduction*. London: Sage Publications.

Marx, K. (1859). *A Contribution to the Critique of Political Economy*. Translated by N.I. Stone. Chicago, IL: Charles H. Kerr & Company.

Marx, K. (1976 [1867]). *Capital: A Critique of Political Economy, Volume One*. Translated by B. Fowkes. Middlesex: Penguin Books Ltd.

Matisson, J. (2017). *God, Spies and Lies: Finding South Africa's Future Through its Past*. Vlaeberg: Ideas for Africa (Pty) Ltd.

Mayr, E. (1997). *This Is Biology: The Science of the Living World*. Cambridge, MA: Harvard University Press.

Mayer-Schönberger, V. and Cukier, K. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. New York, NY: Houghton Mifflin Harcourt Publishing Company.

Mayer-Schönberger, V. and Ramge, T. (2018). *Reinventing Capitalism in the Age of Big Data*. New York, NY: Basic Books.

Mbah, S. and Igariwey, I.E. (1997). *African Anarchism: The History of A Movement*. Available at: https://theanarchistlibrary.org/library/sam-mbah-i-e-igariwey-african-anarchism-the-history-of-a-movement

McCoy, A. (2009). *Policing America's Empire: The United States, the Philippines, and the Rise of the Surveillance State*. Madison: The University of Wisconsin Press.

McChesney, R. (2007). *Communication Revolution: Critical Junctures and the Future of Media*. New York, NY: The New Press.

McChesney, R. (2013). *Digital Disconnect: How Capitalism is Turning the Internet Against Democracy*. New York, NY: The New Press.

McChesney, R. and Nichols, J. (2016). *People Get Ready: The Fight Against a Jobless Economy and a Citizenless Democracy*. New York, NY: Nation Books.

McKinley, Dale. (2017). *South Africa's corporatised liberation: A critical analysis of the ANC in power*. Auckland Park: Jacana Media (Pty) Ltd.

McMillan, J. and Schumacher, S. (2010). *Research in Education: Evidence-Based Inquiry*. (7th ed.). Boston, MA: Pearson Education Limited.

Meredith, M. (2007). *Diamonds, Gold, and War: The British, the Boers, and the Making of South Africa*. New York, NY: PublicAffairs.

Michalopoulos, S. and Papaioannou, E. (2017). *The long economic and political shadow of history – Volume 2: Africa and Asia*. London: Centre for Economic Policy Research.

Michels, R. (2001 [1915]). *Political Parties: A sociological study of the oligarchical tendencies of modern democracy*. Translated by E. Paul and C. Paul. Kitchener, ON: Batoche Books.

Miles, J. and Gilbert, P. (2005). J.Miles and P. Gilbert, (2005), *A Handbook of Research Methods for Clinical and Health Psychology*, Oxford: Oxford University Press.

Moore, J.A. (1993). *Science as a Way of Knowing*. Cambridge, MA: Harvard University Press.

Morozov, E. (2011). *The Net Delusion: The Dark Side of Internet Freedom*. New York, NY: Public Affairs.

Mosco, V. (2015). *To the Cloud: Big Data in a Turbulent World*. New York, NY: Routledge.

Nasaw, D. (1979). *Schooled to Order: A Social History of Public Schooling in the United States*. New York, NY: Oxford University Press.

Newman, M. (2005). *Socialism: A Very Short Introduction*. New York, NY: Oxford University Press.

Noble, S.U. (2018). *Algorithms of Oppression: How Search Engines Reinforce Racism*. New York, NY: New York University Press.

Nunan, D. (1992). *Research Methods in Language Learning*. Cambridge, MA: Cambridge University Press.

Omond, R. (1986). *The Apartheid Handbook: A Guide to South Africa's Everyday Racial Policies*. 2nd ed. Middlesex, England: Penguin Books Ltd.

Orton-Johnson, K. and Prior, N. (Eds.). (2013). *Digital Sociology: Critical Perspectives*. New York, NY: Palgrave Macmillan.

Pasquale, F. (2015). *The Black Box Society: The Secret Algorithms That Control Money and Information*. Cambridge, MA: Harvard University Press.

Parenti, C. (2003). *The Soft Cage: Surveillance in America, from Slavery to the War on Terror*. New York, NY: Basic Books.

Pariser, E. (2011). *The Filter Bubble: What the Internet is Hiding from You*. New York, NY: The Penguin Press.

Papert, S. (1980). *Mindstorms: Children, Computers, and Powerful Ideas*. New York, NY: Basic Books.

Pinar, W.F. (Ed.). (2010). *Curriculum Studies in South Africa: Intellectual Histories & Present Circumstances*. New York, NY: Palgrave Macmillan.

Philip, J. (1828). *Researches in South Africa; Illustrating the Civil, Moral, and Religious Condition of the Native Tribes (Vol. II)*. London: James Duncan.

Pillay, D., Daniel, J., Naidoo, P. and Southall, R. (2011). *New South African Review 2: New Paths, Old Compromises?* Johannesburg: Wits University Press.

Pinker, S. (2002). *The Blank Slate: The Modern Denial of Human Nature*. New York, NY: Penguin Books.

Popkin, R. (1979). *The History of Skepticism: from Erasmus to Spinoza*. Los Angeles, CA: University of California Press.

Proudhon, P. (2011). *Property is Theft! A Pierre-Joseph Proudhon Anthology*. Edited by I. McKay. Oakland, CA: AK Press.

Ramnath, M. (2011). *Decolonizing Anarchism: An Antiauthoritarian History of India's Liberation Struggle*. Oakland, CA: AK Press.

Ray, M. (2016). *Free Fall: Why South African Universities are in a Race Against Time*. Johannesburg: Bookstorm.

Raymond, E.S. (1998). The Cathedral and the Bazaar. *First Monday*, 3(3). Available at: http://ojphi.org/ojs/index.php/fm/article/view/578/499

Rifkin, J. (2011). *The Third Industrial Revolution: How Lateral Power is Transforming Energy, the Economy, and the World*. New York: Palgrave Macmillan.

Rifkin, J. (2014). *The Zero Marginal Cost Society*. New York, NY: Palgrave Macmillan.

Rodney, W. (1981 [1972]). *How Europe Underdeveloped Africa*.

Ruparelia, N.B. (2016). *Cloud Computing*. Cambridge, MA: The MIT Press.

Schor, J. (2005). *Born to Buy*. New York, NY: Scribner.

Schmidt, J. (2001). *Disciplined Minds: A Critical Look at Salaried Professionals and the Soul-Battering System that Shapes Their Lives*. Lanham, MD: Rowman & Littlefield Publishers, Inc.

Schneier, B. (2015a). *Data and Goliath: The Hidden Battles to Collect Your Data and Control Your World*. New York, NY: W.W. Norton & Company.

Schneier, B. (2018b). *Click Here to Kill Everybody: Security and Survival in a Hyper-Connected World*. New York, NY: W.W. Norton & Company.

Schwab, K. (2016). *The Fourth Industrial Revolution*. New York, NY: Crown Business.

Schwab, K. (2018). *Shaping the Fourth Industrial Revolution*. Geneva: World Economic Forum.

Sclater, N. (2017). *Learning Analytics Explained*. New York, NY: Routledge.

Selwyn, N. (2013a). *Education in a Digital World: Global Perspectives on Technology and Education*. New York, NY: Routledge.

Selwyn, N. (2013b). *Distrusting Education Technology: Critical Questions for Changing Times*. New York, NY: Routledge.

Shannon, D., Nocella II, A.J. and Asimakopoulos, J. (Eds.). (2012). *The Accumulation of Freedom: Writings on Anarchist Economics*. Oakland, CA: AK Press.

Shantz, J. and Tomblin, J. (2014). *Cyber Disobedience: Re://presenting Online Anarchy*. 2nd revised ed. Winchester: Zero Books.

Shantz, J. and Williams, D.M. (2013). *Anarchy and Society: Reflections on an Anarchist Society*. Leiden: Brill.

Shirky, C. (2010). *Cognitive Surplus: Creativity and Generosity in a Connected Age*. New York, NY: The Penguin Press.

Smith, M.P. (1983). *The Libertarians and Education*. London: George Allen & Unwin (Publishers) Ltd.

Söderberg, Johan. (2008). *Hacking Capitalism: The Free and Open Source Software Movement*. New York, NY: Routledge.

Sokal, A. (2008). *Beyond the Hoax: Science, Philosophy and Culture*. New York, NY: Oxford University Press Inc.

Southall, R. (2016). *The New Black Middle Class in South Africa*. Johannesburg: Jacana Media (Pty) Ltd.

Spinello, R.A. and Bottis, M. (2009). *A Defense of Intellectual Property Rights*. Cheltenham: Edward Elgar.

Spring, J. (1999 [1975]). *A Primer of Libertarian Education*. London: Black Rose Books.

Spring, J. (2012). *Education Networks: Power, Wealth, Cyberspace, and the Digital Mind*. New York, NY: Routledge.

Stallman, R.M. (2010a). *Free Software, Free Society: Selected Essays of Richard M. Stallman*. Second Edition. Boston: Free Software Foundation.

Stanford, J. (2008). *Economics for Everyone: A Short Guide to the Economics of Capitalism*. Ann Arbor: Pluto Press.

Stavrianos, L.S. (1981). *Global Rift: The Third World Comes of Age*. New York, NY: William Morrow & Co.

Starr, P. (2004). *The Creation of the Media: Political Origins of Modern Communications*. New York, NY: Basic Books.

Stretton, H. (2000). *Economics: A New Introduction*. Revised ed. London: Pluto Press.

Stochetti, M. (Ed.). (2014). *Media and Education in the Digital Age: Concepts, Assessments, Subversions*. Frankfurt: Peter Lang.

Tabatha, I.B. (1980 [1959]). *Education for Barbarism: Bantu (Apartheid) Education in South Africa*. Pall Mall: UK.

Tandon, Y. (2015). *Trade is War: The West's War Against the World*. New York, NY: OR Books.

Taylor, E. (2013). *Surveillance Schools: Security, Discipline and Control in Contemporary Education*. New York, NY: Palgrave Macmillan.

Terreblanche, S. (2002). *A History of Inequality in South Africa, 1652-2002*. Scottsville: University of Natal Press.

Terreblance, S. (2012). *Lost in Transformation: South Africa's Search for a New Future Since 1986*. Sandton: KMM Review Publishing Company (PTY) Ltd.

Tozzi, C. (2017). *For Fun and Profit: A History of the Free and Open Source Software Revolution*. Cambridge, MA: The MIT Press.

Tufekci, Z. (2017). *Twitter and Tear Gas: The Power and Fragility of Networked Protest*. New Haven, CT: Yale University Press.

Turrow, J. (2017). *The Aisles Have Eyes: How Retailers Track Your Shopping, Strip Your Privacy, and Define Your Power*. New Haven, CT: Yale University Press.

Vaidhyanathan, S. (2011). *The Googlization of Everything (And Why We Should Worry)*. Berkeley and Los Angeles: University of California Press.

Van den Brande,Y., Coughlan, S. and Jaeger, T. (Eds.). (2014). *The International Free and Open Source Software Law Book* 2nd ed. München: Open Source Press.

Vally, S and Motala, E. (Eds.). (2014a). *Education, Economy & Society*. Pretoria: Unisa Press.

Voogt, J. and Knezek, G. (Eds.). (2008). *International Handbook of Information Technology in Primary and Secondary Education.* Boston, MA: Springer.

Waghid, Y. (2010). *Education, Democracy and Citizenship Revisited: Pedagogical Encounters*. Stellenbosch: SUN MeDIA Stellenbosch.

Weller, M. (2014). *The Battle for Open: How openness won and why it doesn't feel like victory*. London: Ubiquity Press Ltd.

Williamson, B. (2017a). *Big Data in Education: The digital future of learning, policy and practice*. London: SAGE Publications Ltd.

Worger, W. (1987). *South Africa's City of Diamonds: Mine Workers and Monopoly Capitalism in Kimberley, 1867-1895*. New Haven, CT: Yale University Press.

Wu, T. (2011). *The Master Switch: The Rise and Fall of Information Empires*. New York, NY: Vintage Books.

## **Book Chapters**

Agur, C. (2016). ICTs and education in developing countries: The case of India. In: C. Greenhow, J. Sonnevend and C. Agur, (Eds.), *Education and Social Media: Toward a Digital Future*, Cambridge, MA: The MIT Press, pp. 61-78.

Armaline, W.T. and Armaline, W.D. (2012). Education's Diminishing Returns and Revolutionary Potential in the United States and Beyond. In: D. Shannon, A.J. Nocella II and J. Asimakopoulos, (Eds.), *The Accumulation of Freedom: Writings on Anarchist Economics,* Oakland, CA: AK Press, pp. 178-202.

Baatjes, I., Baduza, U. and Sibiya, A.T. (2014). Building a transfomative pedagogy in vocational education. In: S. Vally and E. Motala (Eds.), *Education, Economy & Society*, Pretoria: Unisa Press, pp. 81-102.

Bakunin, M. Statism and Anarchy. ( In: Bakunin, M., *Bakunin on Anarchy: Bakunin on Anarchy: Selected Works by the Activist-Founder of World Anarchism*, Edited by S. Dolgoff, New York, NY: Random House, pp. 323-350.

Beane, J.A. and Apple, M. (1995). The Case for Democratic Schools. In: M. Apple and J.A. Beane, *Democratic Schools,* Alexandria, VA: Association for Supervision and Curriculum Development, pp. 1-25.

Chomsky, N. (1994). Prospects for Democracy. In: N. Chomsky, *Chomsky on Democracy & Education* (Edited by C.P. Otero), New York, NY: Routledge, pp. 236-259.

Cloete, N. and Gillwald, A. (2014). Informational development in South Africa. In: M. Castells and P. Himanen, (Eds.), *Reconceptualizing Development in the Global Information Age*, Oxford: Oxford University Press, pp. 140-174.

Curran, G. (2007). Technologies of Dissent. In: G. Curran, *21st Century Dissent: Anarchism, Anti-Globalization and Environmentalism*, New York, NY: Palgrave Macmillan, pp. 75-97.

Fylan, F. (2005). Semi-structured interviewing. In: J.Miles and P. Gilbert, (2005), *A Handbook of Research Methods for Clinical and Health Psychology*, Oxford: Oxford University Press, pp. 65-78.

Gómez-Diago, G. (2014). Emancipative Technology in Formal Education: the case for "Free and Open Source Software (FOSS)". In: M. Stochetti (Ed.), *Media and Education in the Digital Age: Concepts, Assessments, Subversions*, Frankfurth, Peter Lang, pp. 341-357.

Gordon, U. (2012). Anarchist Economics in Practice. In: D. Shannon, A.J. Nocella II and J. Asimakopoulos, (Eds.), *The Accumulation of Freedom: Writings on Anarchist Economics,* Oakland, CA: AK Press, pp. 204-218.

Guadamuz, A. (2009). Free and Open Source Software. In: L. Edwards and C. Waelde, (Eds.), *Law and the Internet*, 3rd ed, Oxford: Hart, pp. 361-393. Available at: http://sro.sussex.ac.uk/46019/1/%28M%29_Ch11_E%26Wpress%5B25Aug%5D-15.pdf

Jedwab, R., Kerby, E. and Moradi, A. (2017). How colonial railroads defined Africa's economic geography. In: S. Michalopoulos and E. Papaioannou, (Eds.), *The long economic and political shadow of history – Volume 2: Africa and Asia*, London: Centre for Economic Policy Research, pp. 88-98.

Lakhani, K.R. and Wolf, R.G. (2005). Why Hackers Do What They Do: Understanding Motivation and Effort in Free/Open Source Software Projects. In: J. Feller, B. Fitzgerald, S. Hissam, and K.R. Lakhani, (Eds.), *Perspectives on Free and Open Source Software*, Cambridge, MA: The MIT Press, pp. 3-21. Available at: https://ocw.mit.edu/courses/sloan-school-of-management/15-352-managing-innovation-emerging-trends-spring-2005/readings/lakhaniwolf.pdf

Le Roux, J. (2011). In: J.J. Booyse, C.S. le Roux, J. Seroto and C.C. Wolhuter (Eds.), *A History of Schooling in South Africa: Method and Context*, Pretoria: Van Schaik, pp. 57-122.

Motala, E. and Vally, S. (2014a). ‘NO ONE TO BLAME BUT THEMSELVES’: Rethinking the Relationship between Education, Skills and Employment. In: S. Vally and E. Motala (Eds.), *Education, Economy & Society*, Pretoria: Unisa Press, pp. 1-25.

Okley, J. (1994). Thinking through fieldwork. In: A. Bryman and R.G. Burgess, (Eds.), *Analyzing Qualitative Data*, London: Routledge, pp. 18-34.

Proudhon, J. (1840). What is Property? Translated by B. Tucker. In: J. Proudhon, *Property is Theft! A Pierre-Joseph Proudhon Reader*, Edited by I. McKay, Oakland, CA: AK Press, pp. 87-138.

Rens, A. (2014). South Africa. In: Y. Van den Brande, S. Coughlan and T. Jaeger (Eds.), *The International Free and Open Source Software Law Book*, 2nd ed, München: Open Source Press, pp. 325-339.

Ross, R. (1989) James Cropper, John Philip and the *Researches in South Africa*. In: H. Macmillan and S. Marks (Eds.), *Africa and Empire: William Macmillan, historian and social critic*, London: Temple Smith, pp. 140-152.

Scott, A. (2006). Panel I: The Role of Software—What Does Software Do? In: D.W. Jorgenson and C.W. Wessner (Eds.), *Measuring and Sustaining the New Economy: Software, Growth, and the Future of the U.S. Economy: Report of a Symposium*, Washington, D.C.: The National Academies Press, pp. 47-53.

Seroto, J. (2011). Indigenous education in the pre-colonial era. In: J.J. Booyse, C.S. le Roux, J. Seroto, and C.C. Wolhuter (Eds.), *A History of Schooling in South Africa: Method and Context*, Pretoria: Van Schaik, pp. 33-55.

Sharife, K. and Bond, P. (2011). Above and beyond South Africa’s minerals-industrial complex. In: D. Pillay et al., (Eds.), *New South African Review 2: New Paths, Old Compromises?* Johannesburg: Wits University Press, pp. 279-299.

Skocpol, T. (1985). Bringing the State Back In: Strategies of Analysis in Current Research. In: P. Evans, D. Rueschemeyer and T. Skocpol, (Eds.), *Bringing the State Back In*, Cambridge, MA: Cambridge University Press, pp. 3-37.

Soudien, C. (2010). “What to Teach the Natives”: A Historiography of the Curriculum Dilemma in South Africa. In: W. Pinar (Ed.), *Curriculum Studies in South Africa: Intellectual Histories & Present Circumstances*, New York, NY: Palgrave Macmillan, pp. 19-50.

Taylor, E. (2012). The rise of the surveillance school. In: K. Ball, K. Haggerty and D. Lyon, *Routledge Handbook of Surveillance Studies*, New York, NY: 225-231.

Turrow, J. (2006). In: K.D. Haggerty and R.V. Ericson (Eds.), *The New Politics of Surveillance and Visibility*, Toronto: University of Toronto Press Incorporated, pp. 279-307.

Vally, S. and Motala, E. (2014b). EDUCATION AND ECONOMY: Demystifying the Skills Discourse. In: S. Vally and E. Motala (Eds.), *Education, Economy & Society*, 1st ed. Pretoria: Unisa Press, pp. 26-47.

Van der Walt, L. (2017). Anarchism and Marxism. In: N. Jun, (Ed.), *Brill's Companion to Anarchism and Philosophy,* Leiden: Brill, pp. 505-558.

Vig, N. (1988). Technology, Philosophy and the State. In: M.E. Kraft and N.J. Vig, (Eds.), *Technology and Politics*, London: Duke University Press, pp. 8-32.

Voogt, J. (2008). IT and Curriculum Processes: Dilemmas and Challenges. In: J. Voogt and G. Knezek, (Eds.), *International Handbook of Information Technology in Primary and Secondary Education*, Boston, MA: Springer, pp. 117-132.

## Journal Articles

Allais, S. (2012). Will skills save us? Rethinking the relationships between vocational education, skills development policies, and social policy in South Africa. *International Journal of Educational Development*, 32(5), pp. 632-642).

Angelidou, M. (2017). Smart city planning and development shortcomings. *TeMA: Journal of Land Use, Mobility and Environment*, 10(1). Available at: http://www.tema.unina.it/index.php/tema/article/view/4032

Apple, M. (2005). Education, markets, and an audit culture. *Critical Quarterly*, 47(1-2), pp. 11-29.

Apple, M.W. (2012). Rethinking Education, Rethinking Culture, Rethinking Media: *Rethinking Popular Culture and Media*, edited by Elizabeth Marshall & Ozlem Sensoy (Milwaukee Rethinking Schools, 2011). *Educational Policy*, 26(2), pp. 339-346.

Atkinson, R. and Flint, J. (2001). Accessing Hidden and Hard-to-reach Populations: Snowball Research Strategies. *Social Research Update*, 33. Available at: http://sru.soc.surrey.ac.uk/SRU33.pdf

Avila, R. (2018b). Digital Sovereignty or Digital Colonialism? *International Journal on Human Rights*. Available at: http://sur.conectas.org/en/digital-sovereignty-or-digital-colonialism

Azevedo, M. (1981). The Human Price of Development: The Brazzaville Railroad and the Sara of Chad. *African Studies Review*, 24(1), pp. 1-20.

Badat, S. (2010). Educational Politics in the Transition Period. *Comparative Education*, 31(2), pp. 141-160.

Badat, S. and Sayed, Y. (2014). Post-1994 South African Education: The Challenge of Social Justice. *The Challenge of Social Justice*, 652(1), pp. 127-148.

Baker, K. (2007). Are International Tests Worth Anything? *Phi Delta Kappa*, 89(2), pp.101-104.

Balkin, J. (2014). Digital Speech and Democratic Culture: A Theory of Freedom of Expression for the Information Society. *New York University Law Review*, 79(1), pp. 1-55.

Balkin, J. (2016). Information Fiduciaries and the First Amendment. *UC Davis Law Review*, 49(4), pp. 1183-1234.

Balkin, J. (2018a). Free Speech in the Algorithmic Society: Big Data, Private Governance, and New School Speech Regulation. *UC Davis Law Review*, 51(3), pp. 1149-1210.

Balkin, J. (2018b). Free Speech is a Triangle. *Columbia Law Review, Forthcoming.* Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3186205

Ball, S. (2016). Following policy: networks, network ethnography and education policy mobilities. *Journal of Education Policy*, 31(5), pp. 549-566.

Barbrook, R. (2005). The High-Tech Gift Economy. *First Monday*, 3(12). Available at: http://journals.uic.edu/ojs/index.php/fm/article/view/631/552

Barriball, K.L. and While, A. (1994). Collecting data using a semi-structured interview: a discussion paper. *Journal of Advanced Nursing*, 19, pp. 328-335.

Benkler, Y. and Nissenbaum, H. (2006). Commons-based Peer Production and Virtue. *The Journal of Political Philosophy*, 14(4), pp. 394-419.

Benkler, Y. (2013). Practical Anarchism: Peer Mutualism, Market Power, and the Fallible State. *Politics & Society*, 41(2), pp. 213-251. Available at: http://www.benkler.org/benkler_Peer_Mutualism.pdf

Blackledge, P. (2010). Marxism and Anarchism. *International Socialism*, 125. Available at: http://isj.org.uk/marxism-and-anarchism

Bond, P. (2013). Debt, Uneven Development and Capitalist Crisis in South Africa: from Moody's macroeceonomic monitoring to Marikana microfinance *mashonisas*. *Third World Quarterly*, 34(4), pp.569-592.

Boulanger, A. (2005). Open-source versus proprietary software: Is one more reliable and secure than the other? *IBM Systems Journal*, 44(2), pp. 239-248.

Botha, A. and Herselman, M. (2015). A *Teacher Tablet Toolkit* to meet the challenges posed by 21st century rural teaching and learning environments. *South African Journal of Education*, 35(4), pp. 1-19.

boyd, d. and Crawford, K. (2012). Critical questions for big data. *Information, Communication & Society*, 15(5), pp. 662-679.

Carr, M. (2015a). Power Plays in Global Internet Governance. *Millennium: Journal of International Studies*, 43(2), pp. 640-659.

Chisholm, L. (1999). The Democratization of Schools and the Politics of Teachers' Work in South Africa. *Compare*, 29(2), pp. 111-126.

Chisholm, L. (2015). Why education and skills alone can't create growth and end unemployment: an essay review. *Education as Change*, 19(1), pp. 208-222.

Chomsky, N. (2007). Biolinguistic explorations: Design, development, evolution. *International Journal of Philosophical Studies*, 15, pp. 1-21.

Chomsky, N. (2009). The Mysteries of Nature: How Deeply Hidden? *Journal of Philosophy*, 106(4), pp. 167-200.

Chowdhury, S.R., Roy, A.R., Shaikh, M. and Daudjee, K. (2014). A taxonomy of decentralized online social network. *Peer-to-Peer Networking Applications*, 8(3), pp.367-383.

Coleman, E.G. (2017). From Internet Framing to Weapons of the Geek. *Current Anthropology*, 58(15), pp. S97-S102.

Cornforth, C. (1995). Patterns of Cooperative Management: Beyond the Degeneration Thesis. *Economic and Industrial Democracy*, 16(4), pp. 487-523.

Coppedge, M. and Gerring, J., with Altman, D., Bernhard, M., Fish, S., Hicken, A. … and Teorell, J. (2011). Conceptualizing and Measuring Democracy: A New Approach. *Perspectives on Politics*, pp. 247-267.

Crenshaw, K. (1991). Mapping the Margins: Intersectionality, Identity Politics, and Violence against Women of Color. *Stanford Law Review*, 43(6), pp. 1241-1299.

Crootof, R. (2018). The Internet of Torts. *Forthcoming*.

Crush, J. (1993). Scripting the compound: power and space in the South African mining industry. *Environment and Planning D: Society and Space*, 12(3), pp. 301-324.

Curran, G. and Gibson, M. (2013). Wikileaks, Anarchism and Technologies of Dissent. *Antipode*, 45(2), pp. 294-314.

Dale, R. (1999). Specifying globalization effects on national policy: a focus on mechanisms. *Journal of Education Policy*, 14(1), pp. 1-17.

Davis, K. (2008). Intersectionality as buzzword: A sociology of science perspective on what makes a feminist theory successful. *Feminist Theory*, 9(1), pp. 67-85.

De Montjoye, Y., Hidalgo, C.A., Verleysen, M. and Blondel, V.D. (2013). Unique in the Crowd: The privacy bounds of human mobility. *Nature, Scientific Reports*, 3, pp. 1-5. Available at: https://www.nature.com/articles/srep01376.pdf

De Montjoye, Y., Radaelli, L., Singh, V.K. and Pentland, A.S. (2015). Unique in the Shopping Mall: On the reidenifiability of credit card metadata. *Science*, 347(6221), pp. 536-539.

Deepty, G. and Surbhi. (2017). Adopting Free and Open Source Software (FOSS) in Education. *Journal of Educational Technology*, 14(4), pp. 53-60.

Demchenko, Y., De Laat, C. and Membrey, P. (2014). Defining architecture components of the Big Data Ecosystem. *2014 International Conference on Collaboration Technologies and Systems (CTS)*. Available at: http://www.uazone.org/demch/papers/bddac2014-bd-ecosystem-archi-v05.pdf

Desai, Ashwin and Pithouse, Richard. (2004). 'But We Were Thousands': Dispossession, Resistance, Repossession and Repression in Mandela Park. *Journal of Asian and African Studies*, 39(4), pp. 239-269.

Desai, Ashwin and Vahed, Goolam. (2017). The Guptas, the Public Protector's Report and Capital Accumulation in South Africa. *Alternation*, 24(1), pp. 26-49.

Diefenbach, T. (2018). Why Michels' 'iron law of oligarchy' is not an iron law – and how democratic organisations can stay 'oligarchy-free'. *Organization Studies*, 35(11), pp. 1-18.

Dreeben, R. (1967). The Contribution of Schooling to the Learning of Norms. *Harvard Educational Review*, 37(2), pp. 211-237.

Dupuis-Déri, F. (2016). Is the State Part of the Matrix of Domination and Intersectionality? An Anarchist Inquiry. *Anarchist Studies*, 24(1), pp. 36-61.

Edwards, P.N. and Hecht, G. (2010). History and the Technopolitics of Identity: The Case for Apartheid South Africa. *Journal of Southern African Studies*, 36(3), 619-639.

Farley, S., Gerard, A., Sayre, M. and Carter, J. (2015). South Africa ICT in Education Challenge Scoping Lab: Lab Report, August 2016. *Global Knowledge Initiative*. Available at: http://globalknowledgeinitiative.org/wp-content/uploads/2016/10/South-Africa-ICT-in-Education-Lab-Report_DRAFT-FOR-REVIEW.pdf

Franks, B. (2003). Direct action ethic. *Anarchist Studies*, 2(1), pp. 13-41.

Gagliardone, I., Kalemera, A., Kogen, L., Nalwoga, L., Stremlau, N. and Wairagala, W. (2015). In Search of Local Knowledge on ICTs in Africa. *International Journal of Security and Development*, 4(1), p.Art. 35.

Gale, T. (2001). Critical policy sociology: historiography, archaeology and genealogy as methods of policy analysis. *Journal of Education Policy*, 16(5), pp. 379-393.

Garrison, D.R. and Kanuka, H. (2004). *Internet and Higher Education*, 7(2), pp. 95-105.

Gemie, S. (1996). Anarchism and feminism: a historical survey. *Women's History Review*, 5(3), pp. 417-444.

Gerstl-Pepin, C. (2015). Popular Media Portrayals of Inequity and School Reform in The Wire and Waiting for “Superman”. *Peabody Journal of Education*, 90(5), pp. 691-710.

Gillwald, A. (2010). The Poverty of ICT Policy, Research, and Practice in Africa. *Information Technologies & International Development* [Special Issue], 6, pp. 79-88.

Gillwald, A. (2016). From Research to Policy Influence. *Information Technologies & International Development* [Special Issue], 12(2), pp. iii-v.

Giroux, H.A., and Penna, A.N. (1979). Social Education in the Classroom: The Dynamics of the Hidden Curriculum. *Theory and Research in Education,* VII(I), pp. 21-42.

Giroux, H.A. and Saltman, K. (2009). Obama’s Betrayal of Public Education? Arne Duncan and the Corporate Model of Schooling. *Cultural Studies Critical Methodologies*, 9(6), pp. 772-779.

Gordon, U. (2009). Anarchism and the Politics of Technology. *WorkingUSA: The Journal of Labor and Society,* 12(3), pp. 489-503.

Grimmemann, J. (2005). Regulation by Software. *Yale Law Journal*, 114(7), pp. 1719-1758. Available at: https://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=4961&context=ylj

Grodzinsky, F., Miller, K.W., and Wolf, M.J. (2003). Ethical Issues in Open Source Software. *Journal of Information, Communication and Ethics in Society*, 1(4), pp. 193-205.

Harber, C. and Mncube, V. (2011). Is schooling good for the development of society?: the case of South Africa. *South African Journal of Education,* 31, pp. 233-245.

Hars, A. and Ou, S. (2002). Working for Free? Motivations for Participating in Open-Source Projects. *International Journal of Electronic Commerce*, 6(3), pp. 25-39.

Hart, S.A. and Laher, S. (2015). Perceived usefulness and culture as predictors of teachers attitudes towards educational technology in South Africa. *South African Journal of Education*, 35(4), pp. 1-13. Available at: https://www.ajol.info/index.php/saje/article/view/127075

Hashemnezhad, H. (2015). Qualitative Content Analysis Research: A Review Article. *Journal of ELT and Applied Linguistics (JELTAL)*, 3(1), pp. 54-62. Available at: https://pdfs.semanticscholar.org/eb79/0d12b813076402e0f63c46ac76353ffb07b7.pdf

Hermansen, P.M. (2014). “There Was No One Coming With Enough Power to Save Us”: Waiting for “Superman” and the Rhetoric of the New Education Documentary. *Rhetoric and Public Affairs*, 17(3), pp. 511-540.

Herreid, C.F. and Schiller, N.A. (2013). Case Studies and the Flipped Classroom. *Journal of College Science Teaching*, 42(5), pp. 62-67.

Hertel, G., Niedner, S. and Herrmann, S. (2003). Motivation of software developers in Open Source projects: an Internet-based survey of contributors to the Linux kernel. *Research Policy*, 32(7), pp. 1159-1177.

Heystek, J. and Terhoven, R. (2015). Motivation as critical factor for teacher development in contextually challenging underperforming schools in South Africa. *Professional Development in Education*, 41(4), pp. 624-639.

Higginson, J. (2007). Privileging the Machines: American Engineers, Indentured Chinese and White Workers in South Africa's Deep-Level Gold Mines, 1902-1907. *International Review of Social History*, 52(1), pp. 6-16.

Hollands, R.G. (2008). Will the real smart city please stand up? *City*, 12(3), pp. 303-320.

Hong, N. (1992). Constructing the anarchist beast in American periodical literature, 1880–1903. *Critical Studies in Mass Communication*, 9(1), pp. 110-130.

Hope, A. (2009). CCTV, school surveillance and social control. *British Educational Research Journal,* 35(6), pp. 891-907.

Hope, A. (2015). Governmentality and the 'selling' of school surveillance devices. *The Sociological Review*, 63(4), pp. 840-857.

Horan, H. (2017). Will The Growth of Uber Increase Economic Welfare? *Transportation Law Journal*, 44(33), pp. 33-105.

Huett, J.B., Sharp, J.H. and Huett, K.C. (2010). What's all the FOSS? How Freedom and Openness are Changing the Face of Our Educational Landscape. *International Journal of Open Source Software and Process,* 2(1), pp. 1-14. Available at: https://pdfs.semanticscholar.org/4bfb/4713aa33aabed60a610b90359e19abb9a03a.pdf

Inman, Robert P. and Rubinfeld, Daniel L. (2013). Understanding the Democratic Transition in South Africa. *American Law and Economics Review*, 15(1), pp. 1-38.

Jandrić. P. and Kuzmanić, A. (2016). Digital Postcolonialism. *IADIS International Journal on WWW/Internet*, 13(2), pp. 34-51.

Jansen, J. (2002). Globalization, Curriculum and the Third World State: In Dialogue with Michael Apple. *Current Issues in Comparative Education*, 1(2), pp. 42-47.

Johnston, K., Begg, S. and Tanner, M. (2013). Exploring the factors influencing the adoption of Open Source Software in Western Cape schools. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 9(2), pp.64-84.

Juan, A. and Visser, M. (2013). Solid foundations: the role of the home in education. *HSRC Review*. 11(2), pp.18-20. Available at: http://www.hsrc.ac.za/en/review/hsrc-review-may-2013/solid-foundations-the-role-of-the-home-in-education

Jun, N. (2013). Rethinking the Anarchist Canon: History, Philosophy, and Interpretation. *Anarchist Developments in Cultural Studies*, 1, pp. 82-116.

Katz, A., Lundell, B. and Gamalielsson. (2016). Software, copyright and the learning environment: an analysis of the IT contracts Swedish schools impose on their students and the implications for FOSS. *International Free and Open Source Software Law Review*, 8(1). Available at: https://www.ifosslr.org/ojs/ifosslr/article/view/108

Kennedy, D. (2017). Anarchism, Schooling, and Democratic Sensibility. *Studies in Philosophy and Education*, 36(5), pp. 551-568.

Khan, L.M. (2016). Amazon's Antitrust Paradox. *Yale Law Journal*, 126(3), pp. 710-805. Available at: https://digitalcommons.law.yale.edu/ylj/vol126/iss3/3

Khan, L.M. and Vaheesan, S. (2017). Market Power and Inequality: The Antitrust Counterrevolution and Its Discontents. *Harvard Law Review & Policy Review*, 11(1), pp. 235-294. Available at: http://harvardlpr.com/wp-content/uploads/2017/02/HLP110.pdf

Khunou, G. (2015). Editorial: South Africa's emergent middle class. *Development Southern Africa*, 32(1), pp. 1-2.

Kinna, R. (1995). Kropotkin's Theory of Mutual Aid in Historical Context. *International Review of Social History*, 40(2), pp. 259-283.

Kinna, R. and Prichard, A. (2018). Anarchism as Non-Domination. *Journal of Political Ideologies*, *Forthcoming*.

Kinzler, K., Dupoux, E. and Spelke, E. (2007). The native language of social cognition. *Proceedings of the National Academy of Sciences*, 104(30), pp.5802-5805. Available at: http://www.pnas.org/content/104/30/12577.full.pdf

Krogh, G.V., Haefliger, S., Spaeth, S. and Wallin, M.W. (2012). Carrots and Rainbows: Motivation and Social Practice in Open Source Software Development. *MIS Quarterly*, 36(2), pp. 649-676.

Kwet, M. (2017c). Operation Phakisa Education: Why a Secret? Mass Surveillance, inequality, and race in South Africa's emerging national e-education system. *First Monday*, 22(12). Available at: https://journals.uic.edu/ojs/index.php/fm/article/view/8054/6585

Kwet, M. (2018b). Digital Colonialism: US Empire and the New Imperialism in the Global South. Forthcoming, *Race & Class*. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3232297

Lindh, M. and Nolin, J. (2016). Information We Collect: Surveillance and Privacy in the Implementation of Google Apps for Education. *European Educational Research Journal*, 15(6), pp. 644-633.

Loideain, N.N. (2017). Cape Town as a Smart and Safe City: Implications for Governance and Data Privacy. *Journal of International Data Privacy Law, Forthcoming*. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3035336

Lupton, D. and Williamson, B. (2017). The datafied child: The dataveillance of children and implications for their rights. *New Media & Society*, 19(5), pp. 780-794.

Madlingozi, T. (2007). Post-Apartheid Social Movements and the Quest for the Elusive `New' South Africa. *Journal of Law and Society*, 34(1), pp. 77-98.

Madlingozi, T. (2017). Social justice in a time of neo-apartheid constitutionalism: critiquing the anti-black economy of recognition, incorporation and distribution. *Stellenbosch Law Review*, 28(1), pp. 123-147.

Mayisela, T. (2013). The potential use of mobile technology: enhancing accessibility and communication in a blended learning course. *South Africa Journal of Education*, 33(1), pp. 1-18. Available at: https://www.ajol.info/index.php/saje/article/view/85004

Mayosi, B.M. and Benetar, S.R. (2014). Health and Health Care in South Africa — 20 Years after Mandela. *The New England Journal of Medicine*, 371, pp. 1344-1353. Available at: https://www.nejm.org/doi/full/10.1056/NEJMsr1405012

McLeod, D.M. and Detenber, B.H. (1999). Framing effects of television news coverage of social protest. *Journal of Communication*, 49(3), pp. 3-23.

McCoy, A. (2015). Policing the Imperial Periphery: The Philippine-American War and the Origins of U.S. Global Surveillance. *Surveillance & Society*, 13(1), pp. 4-26.

Miller, K. (2014). Total Surveillance, Big Data, and Predictive Crime Technology: Privacy's Perfect Storm. *Journal of Technology Law & Policy*, 19(2), pp. 105-146. Available at: http://www.journaloftechlaw.org/uploads/7/5/6/8/75689741/7-k._miller.pdf

Moglen, E. (1997). The Invisible Barbecue. *Columbia Law Review*, 97(4), pp.945-954.

Moglen, E. (1999). Anarchism Triumphant: Free Software and the Death of Copyright. *First Monday*, 4(8). Available at http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/684/594

Mncube, V. (2008). Democratisation of education in South Africa: issues of social justice and the voice of learners? *South African Journal of Education*, 28, pp. 77-90.

Murphy, J.T., Carmody, P. and Suborg, B. (2014). Industrial transformation or business as usual? Information and communication technologies and Africa’s place in the global information economy. *Review of African Political Economy*, 41(140), pp. 264-283.

Nissenbaum, H. (2011). From Preemption to Circumvention: If Technology Regulates, Why Do We Need Regulation (And Vice Versa)? *Berkeley Technology Law Journal*, 26(3), pp. 1367-1386.

Nwanosike, O.F. and Onyije, L.E. (2011). Colonialism and Education. Mediterranean *Journal of Social Sciences*, 2(4), 41-47.

Ozga, J. and Jones, R. (2006). Travelling and embedded policy: the case of knowledge transfer. *Journal of Education Policy*, 21(1), pp. 1-17.

Padayachee, K. (2017). A snapshot survey of ICT integration in South African schools. *South African Computer Journal*, 29(2), pp. 36-65.

Padayachee, K. (2017). The myths and realities of Generational Cohort Theory on ICT Integration in Education: A South African Perspective. *The African Journal of Information Systems*, 10(1), pp. 54-84. Available at: https://digitalcommons.kennesaw.edu/cgi/viewcontent.cgi?article=1529&context=ajis

Pasquale, F. (2013b). Privacy, Antitrust, and Power. *George Mason Law Review*, 20(4), pp. 1009-1024.

Peck, J. and Theodore, N. (2010). Mobilizing policy: Models, methods, and mutations. *Geoforum*, 41(2), pp. 169-174.

Penney, J.W. (2016). Chilling Effects: Online Surveillance and Wikipedia Use. *Berkeley Technology Law Journal*, 31(1), pp.117-182.

Penney, J.W. (2017). Internet surveillance, regulation, and chilling effects online: a comparative case study. *Internet Policy Review*, 6(2), pp. 1-39.

Painta, R.C. and Ansari, A. (2018). Does Attendance in Private Schools Predict Student Outcomes at Age 15? Evidence From a Longitudinal Study. *Educational Researcher*, pp. 1-16.

Pirie, G.H. (1982). The Decivilizing Rails: Railways and Underdevelopment in Southern Africa. *Journal of Economic and Social Geography*, 73(4), pp. 221-228.

Pithouse, R. (2016). Frantz Fanon: Philosophy, Praxis, and the Occult Zone. *Journal of French and Francophone Philosophy*, XXIV(1), pp. 116-138.

Porter, G., Hampshire, K., Milner, J., Munthali, A., Robson, E., De Lannoy, A. … Abane, A. (2016). Mobile phones and education in Sub-Saharan Africa: From youth practice to public policy. *Journal of International Development*, 28(1), pp. 22-39. Available at: https://onlinelibrary.wiley.com/doi/pdf/10.1002/jid.3116

Prinsloo, P. and Slade, S. (2016). Student Vulnerability, Agency, and Learning Analytics: An Exploration. *Journal of Learning Analytics*, 3(1), 159-182.

Raekstad, P. (2017). Revolutionary practice and prefigurative politics: A clarification and defense. *Constellations: An International Journal of Critical and Democratic Theory*. Available at: https://onlinelibrary.wiley.com/doi/full/10.1111/1467-8675.12319

Rahman, K.S. (2018). The New Utilities: Private Power, Social Infrastructure, and the Revival of the Public Utility Concept. *Cardozo Law Review*, Forthcoming, 39(5). Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2986387

Reinberg, J.R. (1998). Lex Informatica: The Formulation of Information Policy Rules Through Technology. *Texas Law Review*, 76(3), pp. 553-593.

Richards, N. (2013). The Dangers of Surveillance, *Harvard Law Review*, 126(7), pp. 1934-1965.

Roberts, J.A., Hann, I. and Slaughter, S.A. (2006). Understanding the Motivations, Participation, and Performance of Open Source Software Developers: A Longitudinal Study of the Apache Projects. *Management Science*, 52(7), pp. 984-999. Available at: https://pdfs.semanticscholar.org/ee89/0a32879bd4209a695c44bf260052c9318b12.pdf

Robertson-Mahoney, H., Means, A. and Garrison, M. (2016). Netflixing human capital development: personalized learning technology and the corporatization of K-12 education. *Journal of Education Policy*, 31(4), pp. 405-420.

Robeyns, I. (2006). Three models of education. *Theory and Research in Education*, 4(1), pp. 69-85.

Sadowski, J. and Pasquale, F. (2015). The spectrum of control: A social theory of the smart city. *First Monday*, 20(7). Available at: http://firstmonday.org/article/view/5903/4660

Saltman, K. (2016). Putting the Public Back in Public Schooling. *Depaul Journal for Social Justice*, 3(1), pp. 9-40. Available at: https://via.library.depaul.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1051&context=jsj

Samuelson, P. (2003). Digital Rights Management {and, or, vs.} the Law. *46 Comm. ACM*. Available at: https://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=3386&context=facpubs

Sayed, Y. and Ahmed, R. (2015). Education quality, and teaching and learning in the post-2015 education agenda. *International Journal of Educational Development*, 40(1), 330-338.

Sayed, Y. and Motala, S. (2014). Equity and ‘No Fee’ Schools in South Africa: Challenges and Prospects. *Social Policy & Administration*, 46(6), pp. 672-687.

Schryen, G. (2011). Is Open Source Security a Myth? *Communications of the ACM*, 54(5), pp. 130-139.

Shannon, D. and Willis, A. (2010). Theoretical polyamory: Some thoughts on loving, thinking, and queering anarchism. *Sexualities*, 13(4), pp. 433-443.

Shub, D. (1953). Kropotkin and Lenin. *The Russian Review*, 12(4), pp. 227-234.

Siddiquee, N.A. (2014). Malaysia’s government transformation programme: A preliminary assessment. *Intellectual Discourse*, 22(1), pp. 7-31.

Sisulu, Z. (1987). People’s Education for People’s Power. *Issue: A Journal of Opinion*, 15, pp. 18-29.

Slater, D. (1975). Underdevelopment and Spatial Inequality. *Progress in Planning*, 4(2), pp. 97-167.

Sonleitner, F.J. (1986). What Did Karl Popper Really Say About Evolution? *Creation Evolution Journal*, 6(2), pp. 9-14.

Southall, Roger. (2014). The black middle class and democracy in South Africa. *The Journal of Modern African Studies*. 52(4), pp. 647-670.

Spring, J. (1983). The Public School Movement vs. the Libertarian Tradition. *The Journal of Libertarian Studies*, VII(1), pp. 61-79.

Sternberg, R.J., Grigorenko, E.L. and Kidd, K.K. (2005). Intelligence, Race, and Genetics. *American Psychologist*, 60(1), pp. 46-59.

Stoycheff, E. (2016). Under Surveillance: Examining Facebook's Spiral of Silence Effects in the Wake of NSA Internet Monitoring. *Journalism & Mass Communication Quarterly*, 93(2), pp.296-311.

Suissa, J. (2008). Anarchism, Utopias and Philosophy of Education. *Journal of Philosophy of Education*, 35(4), pp. 627-646.

Swalwell, K. and Apple, M.W. (2011). Starting the Wrong Conversations: The Public School Crisis and "Waiting for Superman". *Educational Policy*, 25(2), pp. 368-382.

Sweeney, L. (2013). Discrimination in Online Ad Delivery. *Queue*, 11(3), pp. 1-19.

Swire, P. (2012). Social Networks, Privacy, and Freedom of Association: Data Protection vs. Data Empowerment. *North Carolina Law Review*, 90(5), pp. 1371-1416.

Taylor, E. (2011). UK schools, CCTV and the Data Protection Act of 1998. *Journal of Education Policy*, 26(1), pp. 1-15.

Taylor, S. and von Fintel, M. (2016). Estimating the impact of language of instruction in South African primary schools: A fixed effects approach. *Economics of Education Review*, 50, pp.75-89.

Thankachan, B. and Moore, D.R. (2017). Challenges of Implementing Free and Open Source Software (FOSS): Evidence from the Indian Educational Setting. *International Review of Research in Open and Distance Learning*, 18(6), pp. 186-199.

Thatcher, J., O'Sullivan, D. and Mahmoudi, D. (2016). Data colonialism through accumulation by dispossession: New metaphors for daily data. *Environment and Planning D: Society and Space*, 34(6), pp. 990-1006.

Thompson, G. (2016). Computer adaptive testing, big data and algorithmic approaches to education. *British Journal of Sociology of Education*, 38(6), pp. 827-840.

Tikly, L. and Barrett, A.M. (2011). Social justice, capabilities and the quality of education in low income countries. *International Journal of Educational Development*, 31(1), pp. 3-14.

Tufekci, Z. (2015). Algorithmic Harms Beyond Facebook and Google: Emergent Challenges of Computational Agency. *Colorado Technology Law Journal*, 13, pp. 203-217.

Uys, S. (1965). Apartheid: The Opium of the Afrikaner. *Transition*, 19, pp. 13-16.

Vally, S. (2007). From People's Education to Neo-Liberalism in South Africa. *Review of African Political Economy*, 34(111), pp. 39-56.

Vandeyar, T. (2013). Practice as policy in ICT for education: Catalysing communities of practice in education in South Africa. *Technology in Society*, 35(4), pp. 248-257.

Vandeyar, T. (2014). 'Windows' on Teachers' Beliefs and Attitudes about School ICT Policy Statements. *Mediterranean Journal of Social Sciences*, 5(14), pp. 339-351.

Vandeyar, T. (2015). Policy intermediaries and the reform of e-Education in South Africa. *British Journal of Education Technology*, 46(2), pp. 344-359.

Vandeyar, T. and Killen, R. (2007). Educators' conceptions and practice of classroom assessment in post-apartheid South Africa. *South African Journal of Education*, 27(1), pp. 101-115.

Van der Walt, L. (2011). Debating Black Flame, revolutionary anarchism and historical Marxism. *International Socialism*, 130, pp. 193-207.

Van der Walt, L. (2013a). (Re)constructing a Global Anarchist and Syndicalist Canon: A response to Robert Graham and Nathan Jun on *Black Flame. Anarchist Developments in Cultural Studies*, 1, pp. 193-203.

Van der Walt, L. (2013b). Who Rules South Africa? An Anarchist/Syndicalist Analysis of the ANC, the Post-Apartheid Elite Pact and the Political Implications. *Zabalaza: a journal of southern African revolutionary anarchism*, 13, pp. 7-13.

Van Sittert, L. (2014). Writing on Skin: The Entangled Embodied Histories of Black Labour and Livestock Registration in the Cape Colony, c. 1860–1909. *Kronos*, 40, pp. 74-98.

Van Wyk, J. (2016). Crouching tigers, leaping lions? Developmental leadership for South Africa from China and Malaysia. *African East-Asian Affairs*, 2016(1). Available at: http://aeaa.journals.ac.za/pub/article/view/168/130

Verma, A., Kshirsagar, D. and Khan, S. (2013). Privacy and Security: Online Social Networking. *International Journal of Advanced Computer Research*, 3(1), pp. 310-315.

Visser, M. and Juan, A. (2013). A climate of achievement: factors that impact scholarly performance. *HSRC Review*. 11(2), pp. 20-22.

Visser, M., Juan, A. and Feza, N. (2015). Home and school resources as predictors of mathematics performance in South Africa. *South African Journal of Education*, 35(1), pp. 1-10.

Wachhaus, T.A. (2012). Anarchy as a Model for Network Governance. *Public Administration Review*, 72(1), pp. 33-42.

White, R.J. and Williams, C.C. (2014). Anarchist economic practices in a ‘capitalist’ society: Some implications for organisation and the future of work. *Ephemera*, 14(1), pp. 951-975.

Whiting, L.S. (2008). Semi-structured interviews: guidance for novice researchers. *Nursing Standard*, 22(23), pp. 35-40.

Williamson, B. (2014a). Digital education governance: data visualization, predictive analytics, and ‘real-time’ policy instruments. *Journal of Education Policy*, 31(2), pp. 123-141.

Williamson, B. (2014b). Governing software: networks, databases and algorithmic power in the digital governance of public education. *Learning, Media and Technology*, 40(1), pp. 83-105.

Williamson, B. (2015a). Governing methods: policy innovation labs, design and data science in the digital governance of education. *Journal of Educational Administration and History*, 47(3), pp. 251-271.

Williamson, B. (2015b). Digital education governance: An introduction. *European Educational Research Journal*, 15(1), pp. 3-13.

Williamson, B. (2018). Silicon startup schools: technocracy, algorithmic imaginaries and venture philanthropy in corporate education reform. *Critical Studies in Education*, 59(2), pp. 218-236.

Wu, T. (2003). Network Neutrality, Broadband Discrimination. *Journal on Telecommunications and High Technology Law*, 2, pp. 141-179.

Ylijoki, O. and Porras, J. (2016). Perspectives to Definition of Big Data: A Mapping Study and Discussion. *Journal of Innovation Management*, 4(1), pp. 69-91. Available at: https://journals.fe.up.pt/index.php/IJMAI/article/viewFile/198/161

Zanella, A., Bui, N., Castellani, A., Vangelista, L. and Zorzi, M. (2014). Internet of Things for Smart Cities. *IEEE Internet of Things Journal*, 1(1), pp. 22-32.

Zeide, E. (2017). The Structural Consequences of Big Data-Driven Education. *Big Data*, 5(2), pp. 164-172.

Zook, M., Barocas, S., boyd, d., Crawford, K., Keller, E., Gangadharan, S.P. … Pasquale, F. (2017). Ten simple rules for responsible big data research. *PLoS Computational Biology*, 13(3), pp. 1-10. Available at: https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1005399

## Conference Papers


Babu, S. (2011). FOSS as a tool for Development: The Kerala Experience. *2011 IEEE Global Humanitarian Technology Conference*, pp. 108-110.

Bender, W., Solomon, C. and Urrea, C. (2013). (More than) Twenty Things to Do in Turtle Blocks. *Constructionism and Creativity*. Available at: http://constructionism2014.ifs.tuwien.ac.at/papers/2.4_1-8533.pdf

Goosen, L. and Vorster, J. (2018). Beyond familiar territories towards educational technologies: Framework for higher education institutions and e-schools partnerships. *South Africa International Conference on Educational Technologies 2018*. Available at: http://aa-rf.org/wp-content/uploads/2018/08/SAICET-2018-Proceedings.pdf#page=137

Jensen, C. and Scacchi, W. (2007). Role Migration and Advancement Processes in OSSD Projects: A Comparative Case Study. *Proceedings - International Conference on Software Engineering*. Available at: https://www.researchgate.net/publication/4251362_Role_Migration_and_Advancement_Processes_in_OSSD_Projects_A_Comparative_Case_Study

Feigenbaum, J. and Koenig, J. (2014). On the Feasibility of a Technological Response to the Surveillance Morass. *Security Protocols Workshop 2014*, pp. 239-252. Available at: https://pdfs.semanticscholar.org/7ab2/bed9d6ed2ed764d9b6c37f59098ba915e046.pdf

Khalil, M.; Prinsloo, P. and Slade, S. (2018). The unbearable lightness of consent: Mapping MOOC providers' response to consent. In: L@S '18: Proceedings of the Fifth Annual ACM Conference on Learning at Scale, ACM, New York, article no. 61. Available at: https://www.researchgate.net/publication/325864520_The_unbearable_lightness_of_consent_mapping_MOOC_providers'_response_to_consent

Le, H. and Safavi-Naini, R. (2018). On De-anonymization of Single Tweet Messages. *IWSPA '18 Proceedings of the Fourth ACM International Workshop on Security and Privacy Analytics*, pp. 8-14.

Narayanan, A. and Shmatikov, V. (2008a). Robust De-anonymization of Large Sparse Datasets. *IEEE Symposium on Security and Privacy, 2008*. Available at: https://www.cs.utexas.edu/~shmat/shmat_oak08netflix.pdf

Narayanan, A. and Shmatikov, V. (2008b). De-anonymizing Social Networks. *IEEE Symposium on Security and Privacy, 2008*. Available at: https://www.cs.utexas.edu/~shmat/shmat_oak08netflix.pdf

Padayachee, K. (2016). A Stepwise Framework Towards ICT Integration in Education: A South African Perspective. *I2016 International Conference on Advances in Computing and Communication Engineering (ICACCE)*.

Pezer, M., Lazić, N. and Odak, M. (2017). Free and Open Source Software in the secondary education in Bosnia and Herzegovina. *2017 40th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)*.

Prinsloo, P. and Slade, S. (2015). Student privacy self-management: implications for learning analytics. In: Proceedings of the LAK '15 Fifth International Conference on Learning Analytics And Knowledge, ACM pp. 83–92. Available at: http://oro.open.ac.uk/42395/1/LAK15%20Student%20privacy%20self-management%20-%20implications%20for%20learning%20analytics%20%28revised%29.pdf

Razaghphanah, A., Nithyanand, R., Vallina-Rodriguez, N., Sundaresan, S., Allman, M., Kreibich, C., and Gill, P. (2018). Apps, Trackers, Privacy, and Regulators: A Global Study of the Mobile Tracking Ecosystem. *Proceedings of NDSS 2018*. Available at: https://haystack.mobi/papers/ndss18_ats.pdf

Rekha V, S. and Adinnarayanan, V. (2014). A free and open source framework for rural education. *2014 Seventh International Conference on Contemporary Computing (IC3)*.

Samuelson, P. (2003). Digital Rights Management {and, or, vs.} the Law. *46 Comm. ACM*. Available at: https://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=3386&context=facpubs

Schaffers, H., Komninos, N., Pallot, M., Trousse, B., Nilsson, M. and Oliveira, A. (2011). Smart Cities and the Future Internet: Towards Cooperation Frameworks for Open Innovation. *FIA 2011: The Future Internet*, pp. 431-446.

Van der Berg, S. (2005). Apartheid's enduring legacy: Inequalities in education. Paper to Oxford University/University of Stellenbosch conference on *The South African Policy under Democracy: A 10 year review*, Stellenbosch, 27-28 October 2005. Available at: http://www.saide.org.za/resources/Library/VanderBerg%20-%20Apartheid%27s%20Enduring%20Legacy.pdf

Youyou, W., Kosinski, M. and Stillwell, D. (2015). Computer-based personality judgments are more accurate than those made by humans. *Proceedings of the National Academy of Sciences*, 112(4), pp.1036-1040.

## Reports

Abrahams, L. and Pillay, K. (2015). The Lived Costs of Communications: Experiencing the lived cost of mobile communications in low and very low income households in urban South Africa 2014. *Right2Know and LINK Centre*. Available at: http://pmg-assets.s3-website-eu-west-1.amazonaws.com/160921R2K-lived-cost-communications.pdf

Alarcorn, A., Zeide, E., Rosenblat, A., Wikelius, K., boyd, d., Gangadharan, S.P. and Yu, C. (2014). Data & Civil Rights: Education Primer. Available at: http://www.datacivilrights.org/pubs/2014-1030/Education.pdf

Ames, M.G. [no date]. Learning Outcomes of One Laptop per Child in Paraguay: The Importance of Social Support. Available at: http://paraguayeduca.org/wp-content/uploads/2017/08/evaluacion-morgan-eng.pdf

Baker, D. (2003). The Artistic Freedom Voucher: An Internet Age Alternative to Copyrights. *Center for Economic and Policy Research*. Available at: http://cepr.net/documents/publications/ip_2003_11.pdf

Baker, D., Jayadev, A. and Stiglitz, J. (2017). Innovation, Intellectual Property, and Development: A Better Set of Approaches for the 21st Century. Available at: http://cepr.net/images/stories/reports/baker-jayadev-stiglitz-innovation-ip-development-2017-07.pdf

Barabas, C., Narula, N. and Zuckerman, E. (2017). Defending Internet Freedom through Decentralization: Back to the Future? *The Center for Civic Media & The Digital Currency Initiative, MIT Media Lab*. Available at: https://static1.squarespace.com/static/59aae5e9a803bb10bedeb03e/t/59ae908a46c3c480db42326f/1504612494894/decentralized_web.pdf

bridges.org. (2005). Comparison Study of Free/Open Source and Proprietary Software in an African Context: Implementation and Policy-Making to Optimise Public-Access to ICT. *bridges.org*. Available at: http://www.share4dev.info/telecentreskb/documents/4709.pdf

*CENATIC*. (2010). Report on the International Status of Open Source Software 2010. Available at: https://opensource.org/files/Report%20on%20the%20International%20Status%20of%20Open%20Source%20Software%202010.pdf

Chisholm, L. (2013). Understanding the Limpopo textbook saga. *HSRC*. Available at: http://www.hsrc.ac.za/en/review/hsrc-review-september-2013/understanding-the-limpopo-textbook-saga

Christl, W. (2017). Corporate Surveillance in Everyday Life: How Companies Collect, Combine, Analyze, Trade, and Use Personal Data on Billions. *Cracked Labs*. Available at: http://crackedlabs.org/dl/CrackedLabs_Christl_CorporateSurveillance.pdf

Clark, C. (2007). Why It Is Important to Involve Parents in Their Children's Literacy Development: A Brief Research Summary. *National Literacy Trust.* Available at: https://files.eric.ed.gov/fulltext/ED496346.pdf

Department of Education (UK). (2014). Reforming the accountability system for 16 to 19 providers: Government response to the consultation on 16 to 19 accountability. *GOV.UK*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/365979/DfE_consultation_response_16-19_Accountability_final.pdf

Dwolatzky, B. [no date]. Africa: The Next Frontier for Digital Innovation. *Tshimologong*. Available at: http://www.tshimologong.joburg/Innovation-Today.pdf

Duncan, J. (2014b). Communications surveillance in South Africa: The case of the Sunday Times newspaper. In: Association for Progressive Communications (APC) and Humanist Institute for Cooperation with Developing Countries (Hivos), *Global Information Society Watch*. Available at: http://giswatch.org/sites/default/files/gisw2014_communications_surveillance.pdf

Dutro, E. (2011). Review of Waiting for Superman. *National Education Policy Center*.

Eckersley, P. (2010). How Unique Is Your Web Browser? *Electronic Frontier Foundation*. Available at: https://panopticlick.eff.org/static/browser-uniqueness.pdf

*Education Reimagined*. (2015). A transformational vision for education in the U.S. Available at: https://education-reimagined.org/wp-content/uploads/2015/10/A-Transformational-Vision-for-Education-in-the-US-2015-09.pdf

*Epic*. [no date]. Facebook and Datalogix. Available at: https://epic.org/privacy/facebook/facebook_and_datalogix.html

Financial and Fiscal Commission. (1998). Public Expenditure on Basic Social Services in South Africa: An FCC Report for UNICEF and UNDP.

Gillwald, Alison. (2017). Beyond Access: Addressing Digital Inequality in Africa. *Centre for International Governance and Chatham House*.

GSMA Intelligence. (2017). *Global Mobile Trends 2017*. Available at: https://www.gsmaintelligence.com/research/?file=3df1b7d57b1e63a0cbc3d585feb82dc2&download

*House of Lords*. (2018). AI in the UK: ready, willing, and able? Available at: https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf

Howie, S.J., Combrinck, C., Roux, K., Tshele, M., Mokoena, G.M., & McLeod Palane, N. (2017). PIRLS LITERACY 2016: South African Highlights Report. Pretoria: Centre for Evaluation and Assessment.

Human Sciences Research Council (HSRC). (2012). *Highlights from TIMSS 2011: The South African Perspective*. Available at: http://www.hsrc.ac.za/uploads/pageContent/2929/TIMSSHighlights2012Dec7final.pdf

HSRC. (2017). TIMSS Grade 9 National Report: Understanding mathematics and science achievement amongst Grade 9 learners in South Africa. Available at: http://www.timss-sa.org.za/download/TIMSS-2015-Grade-9-National-Report.pdf

Hungi, N., Makuwa, D., Ross, K., Saito, M., Dolata, S., van Capelle, F. . . . Vellien, J. (2011). *SACMEQ III Project Results: Levels and Trends in School Resources among SACMEQ School Systems*. Available at: http://microdata.worldbank.org/index.php/catalog/1246/download/22689

Jewler, S. (2014). Mission Creep-y: Google is Quietly Becoming One of the Nation's Most Powerful Political Forces While Expanding Its Information-Collecting Empire. *Public Citizen*. Available at: https://www.citizen.org/sites/default/files/google-political-spending-mission-creepy.pdf

Joburg Centre for Software Engineering (JCSE). [no date]. Current events. *Joburg Centre for Software Engineering*. Available at: https://web.archive.org/web/20170319032923/http://www.jcse.org.za/events/current-events

JCSE. (2015). 10-year review. Joburg Centre for Software Engineering. *Joburg Centre for Software Engineering*. Available at: https://www.jcse.org.za/wp-content/uploads/2018/05/JCSE_AR_2015.pdf

JCSE. (2016). Annual Report: The Transformation Issue, 2015/16. *Joburg Centre for Software Engineering*. Available at:https://www.jcse.org.za/wp-content/uploads/2018/05/JCSE_AR_2016.pdf

Kasinathan, G. (2018). Domination and Emancipation: A Framework for Assessing ICT and Education Programs. *IT For Change*. Available at: https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/56846/56892.pdf

Lehohla, P. (2012). *Census 2011: Census in brief*. Pretoria: Statistics South Africa. Available at: http://www.statssa.gov.za/census/census_2011/census_products/Census_2011_Census_in_brief.pdf

Mare, A. (2016b). A qualitative analysis of how investigative journalists, civic activists, lawyers and academics are adapting to and resisting communications surveillance in South Africa. *Media Policy and Democracy Project*. Available at: http://www.mediaanddemocracy.com/uploads/1/6/5/7/16577624/duncan_2_comm_surveillance.pdf

MarketLine. (2015). Software in South Africa. *MarketLine*.

Maul, A. and McLelland, A. (2013). Review of National Charter School Study 2013. *National Education Policy Center*. Available at: https://nepc.colorado.edu/thinktank/review-credo-2013

Mills, I.V.A., Martin, M.O., Foy, P. and Hooper, M. (2017). PIRLS 2016: International Results in Reading. Chestnut Hill, MA: TIMSS & PIRLS International Study Center. Available at: https://nicspaull.files.wordpress.com/2017/12/p16-pirls-international-results-in-reading.pdf

Miron, G. and Applegate, B. (2009). *Review of "Multiple choice: Charter school performance in 16 states."* Boulder and Tempe: Education and the Public Interest Center & Education Policy Research Unit. *Education Policy Research Unit: Arizona State University*. Available at: http://epicpolicy.org/thinktank/review-multiple-choice

Moloi, M. and Chetty, M. (2010). *The SACMEQ project in South Africa: A study of the conditions of schooling and the quality of education*. Available at: http://www.sacmeq.org/sites/default/files/sacmeq/reports/sacmeq-iii/national-reports/s3_south_africa_final.pdf

New York City Charter School Center. (2010). New York State Charter Schools Act of 1998 (as amended). Available at: http://schools.nyc.gov/NR/rdonlyres/BFE40F47-A2B4-4AB6-B551-CEEBFF4EC6B3/109596/new_york_state_charter_schools_act4.pdf

Parse.ly. (2018). The Authority Report. Available at: https://learn.parsely.com/rs/314-EBB-255/images/authority-report-15.pdf

PEN America. (2013). *Chilling Effects: NSA Surveillance Drives U.S. Writers to Self-Censor*. New York, NY: PEN American Center. Available at: https://pen.org/sites/default/files/Chilling%20Effects_PEN%20American.pdf

PEN America. (2015). *Global Chilling: The Impact of Mass Surveillance on International Writers*. Available at: https://pen.org/sites/default/files/globalchilling_2015.pdf

President's Council of Advisors on Science and Technology (PNAC). (2014). Big Data and Privacy: A Technological Perspective. Available at: https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_big_data_and_privacy_-_may_2014.pdf

Ravitch, D. (2013). *Reign of Error: The Hoax of the Privatization Movement and the Danger to America's Public Schools*. New York: Knopf.

Reddy, V., Prinsloo, C.H., Netshitangani, T., Moletsane, R., Juan, A. and van Rensburg, D.J. (2010). An Investigation into Educator Leave in the South African Ordinary Public Schooling System. *Department of Basic Education*. Available at: http://www.education.gov.za/Portals/0/Documents/Reports/REPORT%20ON%20EDUCATOR%20LEAVE%2016%20JULY%202010.pdf

Reddy, V., Zuze, T.L., Visser, M., Winnaar, L., Juan, A., Prinsloo, C.H. . . . Rogers, S. (2015). *Beyond Benchmarks: What twenty years of TIMSS data tell us about South African education*. Cape Town: HSRC Press. Available at: http://www.iea.nl/fileadmin/user_upload/Publications/National_reports/TIMSS_2011_report_SouthAfrica.pdf

Reddy, V., Visser, M., Winnaar, L., Arends, F., Juan, A. and Prinsloo, C.H. (2016). *TIMSS 2015: Highlights of Mathematics and Science Achievement of Grade 9 South African Learners*. Human Sciences Research Council. Available at: http://us-cdn.creamermedia.co.za/assets/articles/attachments/66002_timss_2015_highlights_report_-_grade_9.pdf

Right2Know. (2015). Big Brother Exposed: Stories of South Africa's intelligence structures monitoring and harassing activist movements. Available at: http://bigbrother.r2k.org.za/wp-content/uploads/Big-Brother-Exposed-R2K-handbook-on-surveillance-web.pdf

Right2Know. (2016). The Surveillance State: Communications Surveillance and Privacy in South Africa. Available at: https://www.mediaanddemocracy.com/uploads/1/6/5/7/16577624/sa_surveillancestate-web.pdf

Right2Know. (2018). Spooked: Surveillance of Journalists in SA. Available at: https://www.r2k.org.za/wp-content/uploads/R2K-Surveillance-of-Journalists-Report-2018-web.pdf

Schofield, A. (2016). 2016 JCSE ICT Skills Survey. *Joburg Centre for Software Engineering*. Available at: https://www.wits.ac.za/media/wits-university/news-and-events/images/documents/JCSE%20Skills%20Survey.pdf

Schryen, G. (2009). A Comprehensive and Comparative Analysis of the Patching Behavior of Open Source and Closed Source Software Vendors. *2009 Fifth International Conference on IT Security Incident Management and IT Forensics(IMF)*, pp. 153-168. Available at: https://epub.uni-regensburg.de/21294/1/Schryen_-_Patching_behavior_of_open_source_and_closed_source_software_vendors_-_IMF_2009.pdf

Schwab, K. (Ed.). (2015). The Global Competitiveness Report: 2015-2016. Available at: http://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf

Smith, J and Abrahams, M. (2015). 2015 PACSA Food Price Barometer Annual Report. *PACSA*. Available at: http://www.pacsa.org.za/images/books/PACSA_Annual_report/2015_PACSA_food_price_barometer.pdf

South African Institute of Race Relations (SAIRR). (2016). *South Africa Survey 2016*. South African Institute of Race Relations, pp. 437-558.

Spaull, N. (2013a). *South Africa's Education Crisis: The quality of education in South Africa 1994-2011*, 1st ed. Centre for Development an Enterprise. Avaialbe at: http://www.section27.org.za/wp-content/uploads/2013/10/Spaull-2013-CDE-report-South-Africas-Education-Crisis.pdf

Spaull, N. (2013b). Accountability in South African education. *Transformation Audit*, 2013, pp.47-66. Available at: http://transformationaudit.org/blog/wp-content/uploads/2014/03/Accountability%20in%20South%20African%20education.pdf

*SRI Education*. (2016). Lessons Learned from Early Implementations of Adaptive Courseware. Available at: https://www.sri.com/sites/default/files/brochures/almap_final_report.pdf

Staker, H. and Horn, M.B. (2012). Classifying K-12 Blended Learning. *Innosight Institute*.

*Statistics South Africa*. [no date]. Employment, unemployment, skills and economic growth. Available at: http://www.statssa.gov.za/presentation/Stats%20SA%20presentation%20on%20skills%20and%20unemployment_16%20September.pdf

*Statistics South Africa*. (2015). Government education expenditure on the rise. Available at: http://www.statssa.gov.za/?p=5837

*Statistics South Africa*. (2017). General Household Survey 2016. Available at: https://www.statssa.gov.za/publications/P0318/P03182016.pdf

Sula, V. and Zikhali, P. (2018). Overcoming Poverty and Inequality in South Africa: An Assessment of Drivers, Constraints and Opportunities. *International Bank for Reconstruction and Development / The World Bank*.

Swart, H. (2016). Communications Surveillance by the South African Intelligence Services. *Media Policy and Democracy Project*. Available at: https://www.mediaanddemocracy.com/uploads/1/6/5/7/16577624/comms-surveillance-nia-swart_feb2016.pdf

TIMSS SA. [no date]. Examining Inequality in South African Education. *TIMSSSA*. Available at: http://www.timss-sa.org.za/download/Infographic%20Examining%20inequality%20in%20South%20African%20education.pdf

TIMSS and PIRLS. [no date]. *TIMMS 2011 Languages Used for the Assessment Instruments*. Available at: https://timssandpirls.bc.edu/methods/pdf/Languages_Assessment_T11.pdf

UNAIDS. (2014). *The Gap Report*. Available at: http://files.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2014/UNAIDS_Gap_report_en.pdf

UNAIDS. (2016). *Prevention Gap Report*. Available at: http://www.unaids.org/sites/default/files/media_asset/2016-prevention-gap-report_en.pdf

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2016). Every Child Should Have a Textbook. Policy Paper 23. *United Nations Educational, Scientific and Cultural Organization*. Available at: http://unesdoc.unesco.org/images/0024/002433/243321E.pdf

University of the Witwatersrand Centre for Applied Legal Studies, Cornell Law School Avon Global Center for Women and Justice and Cornell Law School International Human Rights Clinic. (2014). *Sexual Violence by Educators in South African Schools: Gaps in Accountability*. Avon Global Center for Women and Justice and Dorothea S. Clarke Program in Feminist Jurisprudence. Available at: http://scholarship.law.cornell.edu/cgi/viewcontent.cgi?article=1005&context=avon_clarke

Van Broekhuizen, Hendrik. (2013). In: N. Spaull, *South Africa's Education Crisis: The quality of education in South Africa 1994-2011*, 1st ed. Centre for Development an Enterprise, pp. 45-52. Available at: http://www.section27.org.za/wp-content/uploads/2013/10/Spaull-2013-CDE-report-South-Africas-Education-Crisis.pdf

*We are Social*. (2018). Digital in 2018 in Southern Africa. Available at: https://www.slideshare.net/wearesocial/digital-in-2018-in-southern-africa-86865907

*World Wide Worx*. (2016). Exec Summary – Online Retail in SA 2016. Available at: http://www.worldwideworx.com/retail2016/exec-summary-online-retail-in-sa-2016

*World Wide Worx*. (2017). Internet Access in South Africa 2017: Executive Summary. Available at: http://www.worldwideworx.com/wp-content/uploads/2017/07/Exec-Summary-Internet-Access-in-SA-2017.pdf

## Policy Papers

*African National Congress (ANC)*. (2017a). 5th National Policy Conference: Education, Health, Science and Technology: Discussion Document. Available at: http://www.anc.org.za/sites/default/files/National%20Policy%20Conference%202017%20Educ%2C%20health%2C%20science_0.pdf

*ANC*. (2017b). 5th National Policy Conference: Communications and the Battle of Ideas: Discussion Document. Available at: http://www.anc.org.za/sites/default/files/National%20Policy%20Conference%202017%20Communications_1.pdf

*ANC*. (2017c). 54th National Conference: Report and Resolutions. Available at: http://www.anc.org.za/sites/default/files/54th_National_Conference_Report.pdf

Cavoukian, A. (2011). *Privacy by Design* in Law, Policy and Practice: A White Paper for Regulators, Decision-makers and Policy-makers. Information Privacy Commissioner: Ontario, Canada. Available at: http://www.ontla.on.ca/library/repository/mon/25008/312239.pdf

*Department of Basic Education (DBE)*. (2011). Action Plan to 2014: Towards the Realisation of Schooling 2025: Full Version. Available at: http://www.poa.gov.za/education/Supporting%20Documentation/Action%20Plan%202014.pdf

*DBE*. (2014). Guidelines for Schools: ICT Hardware Specifications. *Department of Basic Education*. Available at: http://www.education.gov.za/Portals/0/Documents/Publications/Guidelines_for_Schools_ICT_Hardware_Specifications.pdf?ver=2014-11-28-122120-000

*DBE*. (2015a). Action Plan to 2019: Towards the Realisation of Schooling 2030: Taking forward South Africa's National Development Plan 2030. Available at: http://www.education.gov.za/Portals/0/Documents/Publications/Action%20Plan%202019.pdf

*DBE*. (2015b). Education Statistics in South Africa 2013. Available at: http://www.education.gov.za/Portals/0/Documents/Publications/Education%20Statistic%202013.pdf

*DBE*. (2015c). Basic Education on World Economic Forum competitive report rankings on education. *South African Government*. Available at: http://www.gov.za/speeches/world-economic-forum-competitive-report-rankings-are-bizarre-and-lack-credibility-05

*DBE*. (2016a). Implementation of ICT in Education: Portfolio Committee on Basic Education.

*DBE*. (2016b). Data Driven Districts (DDD): Pockets of Success. DBE Dashboard. Department of Basic Education. Available at: https://www.dbedashboard.co.za/timeline/content/media/DDDSuccessStories_April2016.pdf

*Department of Education (DoE)*. (2003). Draft White Paper on e-Education: Transforming Learning and Teaching through ICT. Available at: http://www.education.gov.za/Portals/0/Documents/Legislation/Call%20for%20Comments/DRAFT%20E-EDUCATION%20WHITE%20PAPER.pdf

*DoE*. (2004). White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (ICTs). Available at: http://www.education.gov.za/Portals/0/Documents/Legislation/White%20paper/DoE%20White%20Paper%207.pdf?ver=2008-03-05-111708-000

*DoE*. (2007). *Guidelines for Teacher Training and Professional Development in ICT. Department of Education*. Available at: http://www.thutong.doe.gov.za/ResourceDownload.aspx?id=35998

*Department of Public Service and Administration (DPSA)*. (1997). Batho Pele – "People First": White Paper on Transforming Public Service Delivery. Department of Public Service and Administration. Available at: http://www.dpsa.gov.za/dpsa2g/documents/acts&regulations/frameworks/white-papers/transform.pdf

DPSA. (2002). Handbook on Minimum Information Interoperability Standards (MIOS): A Blueprint to Guide Seamlessness and Interoperability in Public Service as Presented by the Department of Public Service and Administration. Available at: https://www.westerncape.gov.za/text/2004/10/mios_v3_16_april_02.pdf

*DPSA*. (2006a). POLICY ON FREE and OPEN SOURCE SOFTWARE USE for SOUTH AFRICAN GOVERNMENT. Appendix A: Policy Implementation Strategy. *Department of Public Service and Administration*.

*DPSA*. (2006b). POLICY ON FREE and OPEN SOURCE SOFTWARE USE for SOUTH AFRICAN GOVERNMENT. Appendix B: Policy Implementation Strategy. *Department of Public Service and Administration*.

*DPSA*. (2006c). POLICY ON FREE and OPEN SOURCE SOFTWARE USE for SOUTH AFRICAN GOVERNMENT. Appendix C: Multi-stakeholder Conference Declaration. *Department of Public Service and Administration*.

*DPSA*. (2006d). POLICY ON FREE and OPEN SOURCE SOFTWARE USE for SOUTH AFRICAN GOVERNMENT. Appendix D: How Free and Open Source Software and Open Content (FOSS/OC) is Linked to Development. *Department of Public Service and Administration*.

DPSA. (2006e). POLICY ON FREE and OPEN SOURCE SOFTWARE USE for SOUTH AFRICAN GOVERNMENT. Appendix E: FOSS SECURITY ISSUES. *Department of Public Service and Administration*.

*Department of Telecommunications & Postal Services (DTPS).* (2016). National Integrated ICT Policy: White Paper. Department of Telecommunications & Postal Services. Available at: https://www.dtps.gov.za/images/phocagallery/Popular_Topic_Pictures/National_Integrated_ICT_Policy_White.pdf

*Government of the Republic of South Africa*. [no date]. General Procurement Guidelines. Available at: http://www.treasury.gov.za/legislation/pfma/supplychain/General%20Procurement%20Guidelines.pdf

*Government Information Officers' Council* (*GITOC*). (2003). Using Open Source Software in the South African Government.

*Ministry of Human Resource Development (MHDR), Government of India (GoI)*. (2014). Implementations in Government Schools in India. Available at: http://mhrd.gov.in/sites/upload_files/mhrd/files/upload_document/Annexure%20IV.pdf

Narayanan, A. and Felten, E.W. (2014). No silver bullet: De-identification still doesn't work. *White Paper*. Available at: https://iapp.org/resources/article/no-silver-bullet-de-identification-still-doesnt-work

*National Advisory Council on Innovation (NACI), Open Software Working Group*. (2002). Open Software & Open Standards in South Africa: A Critical Issue for Addressing the Digital Divide. National Advisory Council on Innovation. Available at: http://www.naci.org.za/wp-content/uploads/pdf/NACI%20Resources%20studies,%20reports%20and%20publications/2002/NACI%20Resources%20Studies,%20etc.%20Open%2520Software%2520and%2520Open%2520Standards%202002.pdf

*NACI, Open Software Working Group. (2004)*. Free/Libre & Open Source Software and Open Standards in South Africa: A Critical Issue for Addressing the Digital Divide. *Geo-Information Society of South Africa*. Available at http://www.gissa.org.za/special-interest-groups/open-source/foss-documents/foss-advisory-document/at_download/file

*National Planning Commission (NPC)*. (2012). Our Future: Make It Work: National Development Plan, 2030. Available at: http://www.poa.gov.za/news/Documents/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf

*Presidential National Commission (PNC)*. (2004). Open Source Software and the Information Society: Policy and strategy recommendations to the Presidential National Commission of the Republic of South Africa.

*Republic of South Africa (RSA)*. (2014). Unlocking the Potential of South Africa's Oceans: Marine Protection Services and Governance Final Lab Report. Available at: https://www.operationphakisa.gov.za/operations/oel/pmpg/Marine%20Protection%20and%20Govenance%20Documents/Marine%20Protection%20and%20Govenance/OPOceans%20MPSG%20Executive%20Summary.pdf

RSA. (2015). Operation Phakisa: Ideal Clinic Realisation and Maintenance: Final Lab Report. Available at: https://www.idealclinic.org.za/docs/2016/phakisa/Operation%20Phakisa%20Ideal%20Clinic%20Realisaation%20&%20Maintenance%20Final%20report%20May%202015.pdf

*South African Government.* (1998). Report of the Presidential Review Commission on the Reform and Transformation of the Public Service in South Africa. https://www.gov.za/documents/report-presidential-review-commission-reform-and-transformation-public-service-south

## Working Papers

Barbrook, R. (2007). Cyber-Communism. *Hypermedia Research Centre*. Available at: http://www.imaginaryfutures.net/2007/04/17/cyber-communism-how-the-americans-are-superseding-capitalism-in-cyberspace

Bitzer, J., Schrettl, W. and Schröder, P. (2004). Intrinsic motivation in open source software development. *Diskussionsbeiträge, No. 2004/19, Freie Universität Berlin, Fachbereich Wirtschaftswissenschaft, Berlin*. Available at: https://www.econstor.eu/bitstream/10419/49926/1/668836490.pdf

Broockman, G., Ferenstein, G.F. and Malhotra, N. (2017). The Political Behavior of Wealthy Americans: Evidence from Technology Entrepreneurs. *Stanford Graduate School of Business*. Available at: https://www.gsb.stanford.edu/faculty-research/working-papers/political-behavior-wealthy-americans-evidence-technology

Gramstad, A.R. (2016). Software Piracy and Linux Adoption. *University of Oslo, Department of Economics*. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2728248

Gustafsson, M, Van der Berg, S., Shepherd, D, and Burger, C. (2010). The costs of illiteracy in South Africa. *Stellenbosch Economic Working Papes: 14/10*.

Mako Hill, B. (2005). To Fork or Not To Fork: Lessons From Ubuntu and Debian. *Mako.cc*. Available at: https://mako.cc/writing/to_fork_or_not_to_fork.html

Marthews, A. and Tucker, C. (2015). *Government Surveillance and Internet Search Behavior*. Available at: https://www.sebastianwendt.de/wp-content/uploads/2015/06/Government-Surveillance-and-Internet-Search-Behavior.pdf

Orthofer, A. (2016b). Wealth inequality – striking new insights from tax data. *Econ3x3*, pp. 1-7.

Packin, N.G. and Lev-Aretz, Y. Learning Algorithms and Discrimination. In: W. Barfield and U. Pagallo (Eds.), *Research Handbook of Artificial Intelligence and Law*, 2018 forthcoming; Baruch College Zicklin School of Business Research Paper No. 2018-04-03. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3168579

South African Institute of Race Relations (SAIRR). (2016). *South Africa Survey 2016*. South African Institute of Race Relations, pp. 437-558.

Spaull, N. (2011). *A Preliminary Analysis of SACMEQ III South Africa*. Stellenbosch: University of Stellenbosch, Department of Economics. Available at: www.ekon.sun.ac.za/wpapers/2011/wp112011/wp-11-2011.pdf

Taylor, S. and Yu, D. (2009). The importance of socio-economic status in determining educational achievement in South Africa, *Working Papers 01/2009, Stellenbosch University, Department of Economics*.

Terreblanche, S. (2018). A Wealth Tax for South Africa. *The Southern Centre for Inequality Studies, University of the Witwatersrand, South Africa*, pp. 1-20.

Van der Berg, S., Burger, C., Burger, R., De Vos, M., Gustafsson, M., Moses, E., . . . Von Fintel, D. (2011). *Low Quality Education as a Poverty Trap*. Available at: http://www.ekon.sun.ac.za/wpapers/2011/wp252011/wp-25-2011.pdf

Van der Berg, S., Spaull, N., Wills, G., Gustaffson, M. and Kotzé, J. (2016). *Identifying Binding Constraints in Education: Synthesis Report for the Programme to Support Pro-poor Policy Development (PSPPD)*. Available at: http://resep.sun.ac.za/wp-content/uploads/2016/06/PSPPD_BICiE-email-01062016.pdf

## **Primary Sources**


Accenture. (2016). Accenture and Avanade Named Microsoft 2016 Alliance Partner of the Year. *Accenture*. Available at: https://newsroom.accenture.com/news/accenture-and-avanade-named-microsoft-2016-alliance-partner-of-the-year.htm

Bay, S. (2012). eScholar – Education Datapalooza. [Online Video]. *YouTube (Office of Ed Tech)*. Available at: https://www.youtube.com/watch?v=9RIgKRNzC9U

Core Group. [no date]. About Us. *Core Group*. Available at: https://web.archive.org/web/20170423021007/https://www.core.co.za

Ferreira, J. (2012). Knewton – Education Datapalooza. [Online Video]. *YouTube (Office of Ed Tech)*. Available at: https://www.youtube.com/watch?v=Lr7Z7ysDluQ

Ferreira, J. (2013). Knewton Adaptive Learning and its role in Learning and Online Education featuring Jose Ferreira. [Online Video]. *YouTube (Center for Online Innovation and Learning)*. Available at: https://www.youtube.com/watch?v=4uNHR0uo5Y4

Gabashane, M. (2016). District Leadership focused advocacy video. [Online Video]. *YouTube (Helen Jervis)*. Available at: https://www.youtube.com/watch?v=fnO_ptVJOws

*Gates Foundation.* (2014). Gates Foundation Announces Finalists for $20 Million in Digital Courseware Investments. Available at: https://www.gatesfoundation.org/Media-Center/Press-Releases/2014/09/Gates-Foundation-Announces-Finalists-for-%2420-Million-in-Digital-Courseware-Investments

Google. [no date]. Web Search Lessons for Africa. *Google*. Available at: https://web.archive.org/web/20170424190919/https://sites.google.com/site/gwebsearcheducation/bycountry/africa

Harrison, D. (2016). The enormous concentration of economic power in young children: Time to tap it. *The DG Murray Trust*. Available at: http://dgmt.co.za/the-enormous-concentration-of-economic-power-in-young-children-time-to-tap-it

*Huawei*. (2016). Huawei Smart Education Solutions. Available at: https://www.hammer-europe.com/assets/uploads/resources/Huawei%20-%20Solution%20Brief%20-%20Smart%20Education%20Solutions.pdf

*IBM*. (2017). IBM Launches “Digital - Nation Africa”: Invests $70 Million to Bring Digital Skills to Africa with Free, Watson-Powered Skills Platform for 25 million people. Available at: https://www-03.ibm.com/press/us/en/pressrelease/51550.wss

*Knewton*. (2015). Top Dog Education and Knewton Team Up To Personalize Learning for Grade 4-12 Students in South Africa. Available at: https://www.knewton.com/resources/press/top-dog-education-and-knewton-team-up-to-personalize-learning-for-grade-4-12-students-in-south-africa

*Knewton*. (2016). Knewton Powers Top Dog Math And Science Adaptive Learning Products In South Africa. Available at: https://www.knewton.com/resources/press/knewton-powers-top-dog-math-science-adaptive-learning-products-south-africa

Michael & Susan Dell Foundation (MSDF). [no date]. DG Murray Trust: Western Cape Collaboration Schools Pilot. *Michael & Susan Dell Foundation*. Available at: https://www.msdf.org/grants/western-cape-collaboration-schools-pilot/3271

MSDF. (2015). Why DDD. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=xgMRzTJepVY

MSDF. (2016). Collaboration Schools: Improving the future for South African youth. *Michael & Susan Dell Foundation*. Available at: https://www.msdf.org/blog/2016/12/collaboration-schools-improving-the-future-south-african-youth

Microsoft. [no date a]. South African university transforms education through move to cloud and tablet. *Microsoft*. Available at: https://enterprise.microsoft.com/en-us/customer-story/industries/citynext/university-of-venda

Microsoft. [no date b]. Microsoft Partners in Learning creates opportunities. Microsoft. Available at: https://web.archive.org/web/20170423001447/https://www.microsoft.com/southafrica/partnersinlearning

Microsoft. [no date c]. Microsoft Partners and Learning. *Microsoft*. Available at: https://web.archive.org/web/20170424163923/https://www.microsoft.com/southafrica/partnersinlearning/contact.aspx

Russell, D., Bergson-Michelson, T. and Maverick, T. (2011a). Africa Search Workshop – Lesson Two: Using your Browser. *Google*. Available at: https://docs.google.com/presentation/d/1o0wzNkbEbll_uNQnF5X3jwfC0hOsP5HJj-3Iy67Ntl4/present#slide=id.i0

Russell, D., Bergson-Michelson, T. and Maverick, T. (2011b). Africa Search Workshop – Lesson Eight: Language Tools. *Google*. Available at: https://docs.google.com/presentation/d/1ZAFk7PGC0AeM9KD30oBVMX81C9ktdu2IyQhgYwyHoSo/present#slide=id.i0

Russell, D., Bergson-Michelson, T. and Maverick, T. (2011c). Africa Search Workshop – Lesson Nine: Brainstorming Tools. *Google*. Available at: https://docs.google.com/presentation/d/1pNfpmAyB1dc9M4wGFo1q8qAqYZEgmaClk2yJY9wmZWM/present#slide=id.i0

Russell, D., Bergson-Michelson, T. and Maverick, T. (2011d). Africa Search Workshop – Lesson Seven: Believe It or Not. *Google*. Available at: https://docs.google.com/presentation/d/1Pq5CnWrva-X-PYK0EH1AR25VvPK0C1UP57efiZsOHVI/present#slide=id.i0

## Speeches and Government Press Releases

City of Johannesburg. (2009). Course boosts ICT students' skills. *City of Johannesburg*. Available at: https://joburg.org.za/index.php?option=com_content&view=article&id=4155&catid=118&Itemid=199

City of Johannesburg. (2015). Gauteng education launch paperless classrooms. *City of Johannesburg*. Available at: https://joburg.org.za/index.php?option=com_content&view=article&id=9438

City of Johannesburg. (2016a). City, Microsoft in R200m deal to empower the poor. *City of Johannesburg*. Available at: https://joburg.org.za/index.php?option=com_content&id=10741&Itemid=266

City of Johannesburg. (2016b). Tshimologong hub open for hi-tech business. *City of Johannesburg*. Available at: https://joburg.org.za/index.php?option=com_content&id=10790&Itemid=266

Corbyn, J. (2018). A British Press for the Many, Not the Few. *Jacobin*. Available at: https://www.jacobinmag.com/2018/08/british-press-democratization-bbc-corbyn

Cwele, S. (2016). South African Minister for Telecommunications Dr Cwele - AfricaCom Keynote Address 2016. [Online Video]. *YouTube (Connecting Africa)*. Available at: https://www.youtube.com/watch?v=HPDr2A6DA2s

Davis, G. (2016a). TIMSS: Why is Motshekga celebrating? *Democratic Alliance*. Available at: https://web.archive.org/web/20170408013041/https://www.da.org.za/2016/11/timss-motshekga-celebrating

ICT Policy White Paper Symposium. (2016). Integrated ICT promo. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=V4QzKgQCoSI

Leepile, G. (2017). MECs deliver on their promise. *Gauteng Online*. Available at: http://www.gautengonline.gov.za/News/Pages/MECs-deliver-on-their-promise.aspx

Maboya, M.J. (2018). Portfolio Committee Meeting on Operation Phakisa ICT Rollout in Basic Education.

Motshekga, A. (2010). Statement by Minister of Basic Education Angie Motshekga on the Signing of the Delivery Agreement for Basic Education. *SANews.gov*. Available at: https://www.sanews.gov.za/south-africa/statement-minister-basic-education-angie-motshekga-signing-delivery-agreement-basic

Motshekga, A. (2015). Minister Angie Motshekga: Drop All and Read Campaign. *South African Government*. Available at: http://www.gov.za/speeches/minister-angie-motshekga-drop-all-and-read-campaign-6-sep-2015-0000

*Parliamentary Monitoring Group (PMG)*. (2017). Learner Transport Memorandum of Understanding; ICT in schools, with Deputy Minister of Basic Education. Available at: https://pmg.org.za/committee-meeting/24676

*PMG*. (2018). ICT Roll-Out in Schools; School Governing Board (SGB) Elections; with Minister and Deputy Minister. Available at: https://pmg.org.za/committee-meeting/25855

Radebe, J. (2015). Minister Jeff Radebe: Planning, Monitoring and Evaluation Dept Budget Vote 2015/16. Available at: https://www.gov.za/speeches/minister-jeff-radebe-planning-monitoring-and-evaluation-dept-budget-vote-201516-5-may-2015

Ramaphosa, C. (2015). Address by Deputy President Cyril Ramaphosa at the Youth Engagement Harare Library, Khayelitsha. *The Presidency Republic of South Africa*. Available at: https://web.archive.org/web/20160831135754/http://www.thepresidency.gov.za/pebble.asp?relid=19016

*Republic of South Africa (RSA)*. (2018). Analysis of Basic Education Report on the ICT Rollout.

Sekoati, S. (2017). Keynote Address on the Free and Open Source Software Day Delivered by the MEC for Economic Development, Environment and Tourism: Honourable Seaparo Sekoati. Bolivia Lodge, Polokwane. *Limpopo Connexion*. Available at: https://limpopoconnexion.co.za/wp-content/uploads/2017/03/FOSS_DAY-Keynote_Address.pdf

*South African Government News Agency (SAnews)*. (2014). Motshekga moots biometric system for teachers. Available at: https://web.archive.org/web/20170410231656/http://www.sanews.gov.za/south-africa/motshekga-moots-biometric-system-teachers

*South African Government (SA Gov)*. (2015a). Ministers Angie Motshekga and Jeff Radebe launch 2015 leg of Operation Phakisa, 6 Sept: Operation Phakisa goes online as ICT in Education LAB convenes at Birchwood. *South African Government*. Available at: http://www.gov.za/speeches/operation-phakisa-goes-online-ict-education-lab-convenes-birchwood-4-sep-2015-0000

SA Gov. (2015b). Western Cape Education announces details on E-learning “smart schools” project. *South African Government*. Available at: http://www.gov.za/ss/speeches/media-release-wced-announces-details-e-learning-%E2%80%9Csmart-schools%E2%80%9D-project-23-feb-2015-0000

*SA Gov*. (2015c). Minister Siyabonga Cwele: Launch of the National ICT Forum. *South African Government*. Available at: http://www.gov.za/speeches/minister-siyabonga-cwele-launch-national-ict-forum-15-may-2015-0000

*SA Gov*. (2018). Minister Angie Motshekga participates in NCOP debate on World Literacy. Available at: https://www.gov.za/speeches/minister-angie-motshekga-participates-ncop-debate-world-literacy-4-sep-2018-0000

*South African Government News (SA Gov News)*. (2016). Free digital training for disadvantaged Joburgers. *South African Government News*. Available at: http://www.sanews.gov.za/south-africa/free-digital-training-disadvantaged-joburgers

Zille, H. (2013). Naming Education. *Democratic Alliance*. Available at: https://www.da.org.za/2013/05/naming-educations-elephant-in-the-room

Zille, H. (2016a). Premier Helen Zille's State of the Province Address 2016. *Western Cape Government*. https://www.westerncape.gov.za/speech/premier-helen-zilles-state-province-address-2016

Zille, H. (2016b). Inside Government: How collaboration can transform under-performing schools. *Western Cape Government*. Available at: https://www.westerncape.gov.za/news/how-collaboration-can-transform-under-performing-schools

Zuma, J. (2015). Address by President Jacob Zuma at the launch of Operation Phakisa: ICT in Education, Boksburg, Gauteng. South African Government. Available at: http://www.gov.za/speeches/president-jacob-zuma-launch-operation-phakisa-ict-education-2-oct-2015-0000

Zuma, J. (2017a). Opening Address by President Jacob Zuma to the Basic Education Sector Lekgotla, Pretoria. *South African Government*. Available at: https://www.gov.za/speeches/president-jacob-zuma-basic-education-sector-lekgotla-24-jan-2017-0000

Zuma, J. (2017b). State of the Nation Address by Jacob G Zuma, President of the Republic of South Africa on the occasion of the Joint Sitting of Parliament Cape Town. *Eyewitness News*. Available at: https://ewn.co.za/2017/02/09/in-his-own-words-president-zuma-s-2017-sona

## Theses

Anley, C. (2015). *Learner perceptions of the motivating role of learning technology in education*. MEd thesis, Stellenbosch University. Available at: http://scholar.sun.ac.za/handle/10019.1/96801

Botha, J. (2014). *Beliefs and attitudes of school management about the implementation of ICT in schools*. MEd thesis, University of Pretoria. Available at: https://repository.up.ac.za/handle/2263/43288
Brandt, I. (2006). *Models of Internet connectivity for secondary schools in the Grahamstown Circuit*. MSc thesis, Rhodes University. Available at: https://core.ac.uk/download/pdf/145055147.pdf

Carr, M. (2011). *The Irony of the Information Age: US Power and the Internet in International Relations*. PhD thesis, The Australian National University.

Coleman, E.G. (2006). *The Social Construction of Freedom in Free and Open Source Software: Hackers, Ethics, and the Liberal Tradition*. PhD thesis, University of Chicago.

Maholwana-Sotashe, N.L. (2007). *Challenges faced by secondary school teachers in integrating ICT into the curriculum: A multiple case study in the Grahamstown Circuit*. MEd thesis, Rhodes University. Available at: https://core.ac.uk/download/pdf/11984106.pdf

Mare, A. (2016a). *Facebook, Youth and Political Action: A Comparative Study of Zimbabwe and South Africa*. PhD thesis, Rhodes University. Available at: http://contentpro.seals.ac.za/iii/cpro/DigitalItemViewPage.external?lang=eng&sp=1021259

Mooi, A. (2011). *Effectiveness of ICT Education in the Northern School Area of Port Elizabeth*. MA thesis, Nelson Mandela Metropolitan University.

Mukhari, S.S. (2016). *Teachers' experience of information and communication technology use for teaching and learning in urban schools*. PhD thesis, University of South Africa. Available at: http://uir.unisa.ac.za/handle/10500/22045

Ndlovu, N. (2015). *The Pedagogical Integration of ICTs by Seven South African Township Secondary School Teachers*. PhD thesis, The University of the Witwatersrand. Available at: http://wiredspace.wits.ac.za/bitstream/handle/10539/20692/NSN%20PhD%20Thesis.docx.pdf?sequence=2&isAllowed=y

Odero, J. (2017). *ICT-based Distance Education: A Study of University Students' Views and Experiences in Early Post-Apartheid South Africa*. PhD thesis, Stockholm University. Available at: http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1091919&dswid=1373

Osah, U. (2012). *A Process Assessment Framework for Rural ICT Projects in Developing Countries: An Exploration of the Siyakhula Living Lab, South Africa*. MSc thesis, Rhodes University. Available at: http://vital.seals.ac.za:8080/vital/access/manager/Repository/vital:1133?f0=sm_subject%3A%22Rural+development+projects+--+South+Africa+--+Eastern+Cape%22

Prince, G. (2007). *Implementation in Schools: A Case Study of Five Schools in the Mkana and Somerset East Districts*. MEd thesis, Rhodes University. Available at: https://core.ac.uk/download/pdf/145043469.pdf

Ramoroka, T.M. (2016). *Planning and governance for blended pedagogies and engagement of knowledge economy for South Africa's national development agenda*. PhD thesis, University of Limpopo. Available at: http://ulspace.ul.ac.za/handle/10386/1698

Suhuhula-Mooketsi, B. (2016). *The impact of contextual factors on the implementation of E-Education policy in previously disadvantaged areas in Cape Town*. PhD thesis, University of Cape Town. Available at: https://open.uct.ac.za/bitstream/handle/11427/22890/thesis_com_2016_sehuhula_mooketsi_bojelo_ester.pdf?sequence=1

Vandeyar, T. (2011). *The appropriation of education policy on information and communication technology in South African schools*. PhD thesis, University of Pretoria. Available at: https://repository.up.ac.za/handle/2263/25178

## OTHER

Abrams, J.J., Cruise, T., McQuarrie, C. and Myers, J. (Producers) and McQuarrie, C. (Director). (2018). Mission: Impossible – Fallout. United States: Paramount Pictures.

African Legal Centre (ALC). (2015). Supreme Court of Appeal judgment – Minister of Basic Education v BEFA. *African Legal Centre*. Available at: http://africanlegalcentre.org/2015/12/02/430505-2

Barbrook, R. and Cameron, A. (1995). The Californian Ideology. *Mute*. Available at: http://www.metamute.org/editorial/articles/californian-ideology

Binney, W. (2013). The Government is Profiling You (The NSA is Spying on You). *YouTube*. Available at: https://www.youtube.com/watch?v=qB3KR8fWNh0

Chilcott, L. (Producer) and Guggenheim, D. (Director). (2010). *Waiting for "Superman"* [Motion Picture]. United States: Participant Media.

Electronic Frontier Foundation (EFF-US). (2015). *Petitioner v. Google Inc: Respondent. Complaint and Request for Investigation, Injunction, and other Relief.* Available at: https://www.eff.org/files/2015/12/01/ftccomplaint-googleforeducation.pdf

EFF-US. (2016). Green v. U.S. Department of Justice. Available at: https://copyrightalliance.org/wp-content/uploads/2016/10/EFF-v-DOJ-EFF-complaint.pdf

Harbour, P.J. (2011). Foreword. In: A. Cavoukian, *Privacy by Design* in Law, Policy and Practice: A White Paper for Regulators, Decision-makers and Policy-makers, pp. 1-2. Available at: http://www.ontla.on.ca/library/repository/mon/25008/312239.pdf

Federal Trade Commission (FTC). (2018). Federal Trade Commission Announces Hearings on Competition and Consumer Protection in the 21st Century. Available at: https://www.ftc.gov/system/files/attachments/hearings-competition-consumer-protection-21st-century/hearings-announcement_0.pdf

*Monthly Review* (The Editors). (2016). Notes from the editors. Available at: https://monthlyreview.org/2016/05/01/mr-068-01-2016-05_0

## News and press releases

Ackerman, S. (2014). Piketty's Fair-Weather Friends. *Jacobin*. Available at: https://www.jacobinmag.com/2014/05/pikettys-fair-weather-friends

Adams, R. (2016). Government drops plan to make all schools in England academies. *The Guardian*. Available at: https://www.theguardian.com/education/2016/may/06/government-backs-down-over-plan-to-make-all-schools-academies

*Africa Check*. (2016). Fact-checking the #SoNA2016 debates. Available at: https://africacheck.org/reports/fact-checking-the-sona2016-debates

Africa News Agency. (2016). Quality of maths teaching is poor, says Motshekga. *Citizen Press*. Available at: http://citizen.co.za/news/news-national/1373191/maths-teaching-poor-quality-says

Akoob, R. (2017a). If You Were Arrested During #FeesMustFall You Might Have A Criminal Record. *Daily Vox*. Available at: https://www.thedailyvox.co.za/arrested-feesmustfall-might-criminal-record-rumana-akoob

Akoob, R. (2017b). Here's Why Metered Taxis Are So Pissed Off With Uber In South Africa. *The Daily Vox*. Available at: https://www.thedailyvox.co.za/heres-why-metered-taxis-are-so-p-d-off-with-uber-in-south-africa-rumana-akoob

Albright, J. and Kunstel, M. (1990). Ex-Official: CIA Helped Jail Mandela. *Chicago Tribune*. Available at: http://www.chicagotribune.com/news/ct-xpm-1990-06-10-9002170271-story.html

Amadeo, R. (2018). Google's iron grip on Android: Controlling open source by any means necessary. *Ars Technica*. Available at: https://arstechnica.com/gadgets/2018/07/googles-iron-grip-on-android-controlling-open-source-by-any-means-necessary

Andy. (2014). Microsoft: We've Always Had Freemium, It's Called Piracy. *TorrentFreak*. Available at: https://torrentfreak.com/microsoft-weve-always-had-freemium-its-called-piracy-141021

Angwin, J., Larson, J., Mattu, S. and Kirchner, L. (2016). Machine Bias. *Pro Publica*. Available at: https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing

Anthony, L. (2013). 'Don't bring back inspections at schools'. *IOL*. Available at: https://www.iol.co.za/news/politics/dont-bring-back-inspections-at-schools-1558518

Ark EPG. (2016). How collaboration can transform under-performing schools—Premier Helen Zille of the Western Cape, South Africa. *Medium*. Available at: https://medium.com/@ArkEPG/how-collaboration-can-transform-under-performing-schools-premier-helen-zille-of-the-western-cape-df497a7c5f5b

Asthana, A. and Stewart, H. (2016). Every English school to become an academy, ministers to announce. *The Guardian*. Available at: https://www.theguardian.com/education/2016/mar/15/every-english-school-to-become-an-academy-ministers-to-announce

Avila, R. (2018a). Resisting Digital Colonialism. *Newsclick*. Available at: https://www.newsclick.in/resisting-digital-colonialism

Baker, D. (2012). The Surefire Way to End Online Piracy: End Copyright. *Huffington Post*. Availa le at: https://www.huffingtonpost.com/dean-baker/the-surefire-way-to-end-o_b_1224165.html

Baker, D. (2015). The job-killing-robot myth. *LA Times*. Available at: http://www.latimes.com/opinion/op-ed/la-oe-baker-robots-20150507-story.html

Baker, D. (2016). Lack of Demand Is the Economy's Problem, No Automation. *The New York Times*. Available at: https://www.nytimes.com/roomfordebate/2016/10/04/easing-the-pain-of-automation/lack-of-demand-is-the-economys-problem-not-automation

Baker, D. (2017). Myths of Job-Killing Robots Obscure Real Causes of Inequality. *Truthout*. Available at: https://truthout.org/articles/the-data-defying-job-killing-robot-myth

Balkin, J. and Zittrain, J. (2016). A Grand Bargain to Make Tech Companies Trustworthy. *The Atlantic*. Available at: https://www.theatlantic.com/technology/archive/2016/10/information-fiduciary/502346

Banerji, R. (2016). Photographer Uses Drones To Capture The Inequality Between The Rich And Poor, And The Difference Will Make You Weep. *India Times*. Available at: http://www.indiatimes.com/culture/who-we-are/photographer-uses-drones-to-capture-the-inequality-between-the-rich-and-poor-257208.html

Basset, L. (2018). Facebook After Capitalism. *Jacobin*. Available at: https://www.jacobinmag.com/2018/08/facebook-social-media-capitalism-regulation-advertising

Beaumont, C. (2008). Apple's Jobs confirms iPhone 'kill switch'. *The Telegraph*. Available at: http://www.telegraph.co.uk/technology/3358134/Apples-Jobs-confirms-iPhone-kill-switch.html

Bell, T. (2018). Un-schooling is better for education. *Mail & Guardian*. Available at: https://mg.co.za/article/2018-08-31-00-un-schooling-is-better-for-children

Berners-Lee, T. (2018). The web can be weaponised – and we can't count on big tech to stop it. *The Guardian*. Available at: https://www.theguardian.com/commentisfree/2018/mar/12/tim-berners-lee-web-weapon-regulation-open-letter

Bhartiya, S. (2017). Making Munich Microsoft again. *CIO*. Available at: http://www.cio.com/article/3173073/open-source-tools/making-munich-microsoft-again.html

Blumenthal, R. and Wu, T. (2018). What the Microsoft Antitrust Case Taught Us. *The New York Times*. Available at: https://www.nytimes.com/2018/05/18/opinion/microsoft-antitrust-case.html

Bright, P. (2015). Windows 10 updates to be automatic and mandatory for Home users. *Ars Technica*. Available at: https://arstechnica.com/information-technology/2015/07/windows-10-updates-to-be-automatic-and-mandatory-for-home-users

*Business Day*. (2016). 'Indebted teachers cannot afford tertiary education for their children'. Available at: https://web.archive.org/web/20160909151443/http://www.bdlive.co.za/national/education/2016/09/08/indebted-teachers-cannot-afford-tertiary-education-for-their-children

*BusinessTech*. (2013). ANC considers tablets for schools: report. Available at: https://businesstech.co.za/news/government/42466/anc-considers-tablets-for-schools-report

*BusinessTech*. (2015a). South Africa's education system vs the world. Available at: https://businesstech.co.za/news/lifestyle/87310/south-africas-education-system-vs-the-world

*BusinessTech*. (2015b). South Africa's poor living on R7 a day. Available at: https://businesstech.co.za/news/general/101560/south-africas-poor-living-on-r7-a-day

*BusinessTech*. (2016a). Government celebrates South Africa's dismal maths and science results. Available at: https://businesstech.co.za/news/government/145121/government-celebrates-south-africas-dismal-maths-and-science-results

*BusinessTech*. (2016b). South Africa's unemployment rate vs the world. Available at: https://businesstech.co.za/news/general/125145/south-africas-unemployment-rate-vs-the-world

*BusinessTech*. (2017a). Big changes are coming to SA schools in 2017 – starting with language policies. Available at: https://businesstech.co.za/news/business/149969/big-changes-are-coming-to-sa-schools-in-2017-starting-with-language-policies

*BusinessTech*. (2017b). This is what a new R100 million SA government school looks like. Available at: https://businesstech.co.za/news/lifestyle/165835/this-is-what-a-new-r100-million-sa-government-school-looks-like

Butho. (2016). Silence on Basic Education. *SECTION27*. Available at: http://section27.org.za/2016/02/silence-on-basic-education

Cawe, P. (2017). Digital classrooms enhance pupils learning. *Vukani*. Available at: https://www.vukaninews.co.za/news/digital-classrooms-enhance-pupils-learning-10502159

Chabalala, J. (2016). Meningitis kills pupil, 8, after alleged assault by teacher. *News24*. Available at: http://www.news24.com/SouthAfrica/News/meningitis-kills-pupil-8-after-alleged-assault-by-teacher-20160220

Chambers, D. (2017). SA literacy bottom of the class. *The Sowetan.* Available at: https://www.pressreader.com/south-africa/sowetan/20171206/281612420732634

Chawla, M. (2018). A school in India defies the traditional education model. *Opensource.com*. Available at: https://opensource.com/article/18/1/tamarind-tree-school-india

Chiel, E. (2016). The man who predicted Silicon Valley 20 years ago has hope for the future. *Splinter*. Available at: https://splinternews.com/the-man-who-predicted-silicon-valley-20-years-ago-has-h-1793861377

Chirume, J. (2016). School in resort town faces shortage of textbooks and teachers. *GroundUp*. Available at: http://www.groundup.org.za/article/school-resort-town-faces-shortage-textbooks-and-teachers

Chomsky, N. (2013). Chomsky: The Corporate Assault on Public Education. *Alternet*. https://www.alternet.org/education/chomsky-corporate-assault-public-education

Chutel, L. (2017). South Africa's notoriously high crime rate is down, but it doesn't feel that way. *Quartz*. Available at: https://qz.com/africa/1110367/south-africa-crime-statistics-violent-crime-shows-a-steady-increase-even-as-the-overall-rate-declined

Chutel, L. (2018). Netflix is finally getting serious about building a library of African movies and shows. *Quartz*. Available at: https://qz.com/africa/1293569/netflix-in-africa-hiring-content-producer-for-africa-turkey-middle-east-more-nollywood-arab-language-shows

*City Press*. (2013). Motshekga: Only 36% of school principals are women. Available at: http://www.news24.com/Archives/City-Press/Motshekga-Only-36-of-school-principals-are-women-20150429

Clements, J. (2018). Is it Safe to Send Your Child To School in 2018? *Saturday Star*. Available at: http://www.democraticeducation.co.za/sa-policy/is-it-safe-to-send-your-child-to-school-in-2018

Cooper, R. (2017). How Uber could become a nightmarish monopoly. *The Week*. Available at: https://theweek.com/articles/675434/how-uber-could-become-nightmarish-monopoly

Coren, M.J. (2017). A Stanford study finds the tech elite aren't libertarians at all–just a strange breed of liberals. *Quartz*. Available at: https://qz.com/1070846/a-stanford-study-finds-silicon-valley-techies-arent-libertarians-like-peter-thiel-at-all-just-a-strange-breed-of-liberals-that-favor-democrats-and-the-democratic-party

Crabtree, J. (2018). Cambridge Analytica is an 'example of what modern day colonialism looks like,' whistleblower says. *CNBC*. Available at: https://www.cnbc.com/2018/03/27/cambridge-analytica-an-example-of-modern-day-colonialism-whistleblower.html

Das, S. (2018). Facebook controversy raises wrong questions. *Nikkei Asian Review*. Available at: https://asia.nikkei.com/Opinion/Facebook-controversy-raises-wrong-questions2

Davis, R. (2013). Equal Education to SA government: Lay down basic standards for schools. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2013-06-18-equal-education-to-sa-government-lay-down-basic-standards-for-schools

Davis, G. (2016b). State capture is killing poor schools. *Politicsweb*. Available at: http://www.politicsweb.co.za/politics/state-capture-is-killing-poor-schools--gavin-davis

Davis, R. (2017). SADTU: SA's most controversial union faces human rights probe. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2017-05-11-sadtu-sas-most-controversial-union-faces-human-rights-probe

Davis, R. (2018). As third term begins, the crisis of broken schools remains unresolved. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2018-07-17-as-third-term-begins-the-crisis-of-broken-schools-remains-unresolved

De Blanc, M. (2018). Apple App Store anniversary marks ten years of proprietary appsploitation. *Free Software Foundation*. Available at: https://www.fsf.org/blogs/community/apple-app-store-anniversary-marks-ten-years-of-proprietary-appsploitation

De la Merced, M.J. (2014). Renaissance Learning Is Sold to Hellman & Friedman for $1.1 Billion. *The New York Times (Dealb%k)*. Available at: https://dealbook.nytimes.com/2014/03/13/renaissance-learning-is-sold-to-hellman-friedman-for-1-1-billion

De Vos, P. (2015). Basic Education: Democratic South Africa has failed the children. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/opinionista/2015-12-03-basic-education-democratic-south-africa-has-failed-the-children

Debusmann, B. (2011). Occupy Wall Street and rose-tinted glasses. *Reuters*. Available at: https://www.reuters.com/article/idUS129717886120111007

Diphoko, M. (2016). City of Joburg, Microsoft to train 1 million people in computer skills. *SABC*. Available at: http://www.sabc.co.za/news/a/705d9a804da2f52a92abfbcfeb4bc468/City-of-Joburg,-Microsoft-to-train-1-million-people-in-computer-skills-20162607

Doctorow, C. (2014). What happens with digital rights management in the real world? *The Guardian*. Available at: https://www.theguardian.com/technology/blog/2014/feb/05/digital-rights-management

Duncan, J. (2018). How CCTV surveillance poses a threat to privacy in South Africa. *The Conversation*. Available at: https://theconversation.com/how-cctv-surveillance-poses-a-threat-to-privacy-in-south-africa-97418

Dwolatzky, B. (2015). The plan to make Johannesburg home to a digital revolution. *The Conversation*. Available at: https://theconversation.com/the-plan-to-make-johannesburg-home-to-a-digital-revolution-43125

Dwyer, U. (2011). Decentralizing the Internet So Big Brother Can't Find You. *The New York Times*. Available at: https://www.nytimes.com/2011/02/16/nyregion/16about.html

EE. (2016a). PRESS STATEMENT: Upcoming 2015 Matric Results Require Careful Scrutiny! *Equal Education*. Available at: https://web.archive.org/web/20160201120728/http://www.equaleducation.org.za/article/2016-01-03-upcoming-2015-matric-results-require-careful-scrutiny

EE. (2016b). Minister Motshekga and MECs Will Violate School Infrastructure Law on 29 November 2016. *Equal Education*. Available at: https://equaleducation.org.za/2016/11/15/minister-motshekga-and-mecs-will-violate-school-infrastructure-law-on-29-november-2016

Evans, D. (2014). Colleges to track student progress after education as part of 'demanding' new regulations. *tes*. Available at: https://www.tes.com/news/further-education/breaking-news/colleges-track-student-progress-after-education-part-demanding

Evans, S. (2014). R147bn lost through money illegally leaving SA. *Mail & Guardian*. Available at: https://mg.co.za/article/2014-12-16-billions-lost-through-illegal-outflows

Everatt, D. (2016). What must fall: fees or the South African state? *The Conversation*. Available at: https://theconversation.com/what-must-fall-fees-or-the-south-african-state-67389

Fairweather, A. (2015). Uber is excellent, not evil. *Mail & Guardian*. Available at: https://mg.co.za/article/2015-06-22-uber-is-excellent-not-evil

Finley, K. (2016). The Inventors of the Internet are Trying to Build a Truly Permanent Web. *Wired*. Available at: https://www.wired.com/2016/06/inventors-internet-trying-build-truly-permanent-web

Forrest, C. (2016). US will hand over DNS supervision to ICANN, lessening its control of the naming system. *TechRepublic*. Available at: https://www.techrepublic.com/article/us-will-hand-over-dns-supervision-to-icann-lessening-its-control-of-the-naming-system

Fox-Brewster, T. (2015). Why Microsoft Took A Year To Fix Critical Windows Bug That Allowed Hackers To Spy On Worker PCs. *Forbes*. Available at: https://www.forbes.com/sites/thomasbrewster/2015/02/10/microsoft-windows-flaw-survives-for-a-year

Fuller, T. (2003). TECHNOLOGY; How Microsoft Warded Off Rival Software. *The New York Times*. Available at: http://www.nytimes.com/2003/05/15/business/technology-how-microsoft-warded-off-rival-software.html

Futures. (2015). Are FE providers missing a trick with their student destination data? *Futures*. Available at: https://www.futuresadvice.co.uk/news/2015/09/09/are-fe-providers-missing-a-trick-with-their-student-destination-data

Garcia, F. (2016). Former CIA agent admits involvement in Nelson Mandela's arrest. *The Independent*. Available at: https://www.independent.co.uk/news/world/africa/nelson-mandela-cia-arrest-south-africa-a7030751.html

Gbadamosi, N. (2016). How drone photographs showcase racism in South African architecture. *CNN*. Available at: http://www.cnn.com/2016/07/06/africa/south-africa-apartheid-drone-photography-unequal-scenes/index.html

Goel, V. (2018). India Pushes Back Against Tech ‘Colonization’ by Internet Giants. *The New York Times*. Available at: https://www.nytimes.com/2018/08/31/technology/india-technology-american-giants.html

Govender, P. (2016a). SA still bottom of the class in science and maths but there’s cause for some optimism. *Mail & Guardian*. Available at: https://mg.co.za/article/2016-12-01-00-sa-still-bottom-of-the-class-in-science-and-maths-but-theres-cause-for-some-optimism

Govender, P. (2016b). ‘Rich’ schools to raise fee after textbook squeeze. *Mail & Guardian*. Available at: https://mg.co.za/article/2016-06-17-00-rich-schools-to-raise-fees-after-textbook-squeeze

Govender, P. (2016c). It's not kids bunking – it's teachers. *Mail & Guardian*. Available at: https://mg.co.za/article/2016-06-02-its-not-kids-bunking-its-teachers

Grauer, Y. (2017). Staggering Variety of Clandestine Trackers Found in Popular Android Apps. *The Intercept*. Available at: https://theintercept.com/2017/11/24/staggering-variety-of-clandestine-trackers-found-in-popular-android-apps

Greenberg, A. (2013). Leaked NSA Doc Says It Can Collect And Keep Your Encrypted Data As Long As It Takes To Crack It. *Forbes*. Available at: https://www.forbes.com/sites/andygreenberg/2013/06/20/leaked-nsa-doc-says-it-can-collect-and-keep-your-encrypted-data-as-long-as-it-takes-to-crack-it

Greenberg, A. (2016). Anonymous' Barrett Brown is Free – And Ready to Pick New Fights. *Wired*. Available at: https://www.wired.com/2016/12/anonymous-barrett-brown-free-ready-pick-new-fights

Greenwald, G., MacAskill, E., Poitras, L, Ackerman, S. and Rushe, D. (2013). Microsoft handed the NSA access to encrypted messages. *The Guardian*. Available at: https://www.theguardian.com/world/2013/jul/11/microsoft-nsa-collaboration-user-data

Greenwald, G. (2018). Facebook Says It Is Deleting Accounts at the Direction of the U.S. and Israeli Governments. *The Intercept*. Available at: https://theintercept.com/2017/12/30/facebook-says-it-is-deleting-accounts-at-the-direction-of-the-u-s-and-israeli-governments

Griffith, E. (2018). Everyone Hates Silicon Valley Except Its Imitators. *Wired*. Available at: https://www.wired.com/story/everyone-hates-silicon-valley-except-its-imitators

GroundUp (Anonymous). (2016). Black hair hierarchy is a metaphor for life. *GroundUp*. Available at: http://www.groundup.org.za/article/black-hair-hierarchy-metaphor-life

GroundUp Staff. (2016). The economics of African women's hair. *GroundUp*. Available at: http://www.groundup.org.za/article/economics-african-womens-hair

Guadamuz, A. (2017). Digital colonialism and decentralisation. *TechnoLlama*. Available at: https://www.technollama.co.uk/digital-colonialism-and-decentralisation

Guest, K. (2018). Another R2.8bn for Gauteng broadband network. *ITWeb*. Available at: https://www.itweb.co.za/content/mYZRXv9P11QqOgA8

Habib, A. (2017). Op-Ed: Is South Africa suffering from a case of 'déjà vu'? *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2017-06-26-op-ed-is-south-africa-suffering-from-a-case-of-dj-vu

Haffajee, F. (2018). Uber, Netflix, love and taxes. *Sunday Times* / *Business Times*. Available at: https://www.businesslive.co.za/bt/opinion/2018-05-12-ferial-haffajee-uber-netflix-love-and-taxes

Harber, A. (2017). How Google and Facebook are the biggest threat to South African news media. *Financial Mail*. Available at: https://www.businesslive.co.za/fm/features/cover-story/2017-11-16-how-google-and-facebook-are-the-biggest-threat-to-south-african-news-media

Harrison, D. (2016). The enormous concentration of economic power in young children: Time to tap it. *The DG Murray Trust*. Available at: http://dgmt.co.za/the-enormous-concentration-of-economic-power-in-young-children-time-to-tap-it

Hatmaker, T. (2018). Facebook's Free Basics program ended quietly in Myanmar last year. *TechCrunch*. Available at: https://techcrunch.com/2018/05/01/facebook-free-basics-ending-myanmar-internet-org

Heard, J. (2016). Cash crunch: 63% of SA is feeling the pinch. *City Press*. Available at: http://city-press.news24.com/News/cash-crunch-63-of-sa-is-feeling-the-pinch-20160217

Heard, J. (2017). Zuma must go, according to latest poll. *City Press*. Available at: http://city-press.news24.com/News/zuma-must-go-according-to-latest-poll-20170405

Heath, N. (2016). Microsoft's Satya Nadella on how the cloud will bring machine learning to the masses. *TechRepublic*. Available at: http://www.techrepublic.com/article/microsofts-satya-nadella-on-how-the-cloud-will-bring-machine-learning-to-the-masses

Heath, N. (2017a). Linux in Munich: 'No compelling technical reason to return to Windows,' says city's IT chief. *TechRepublic*. Available at: http://www.techrepublic.com/article/linux-in-munich-no-compelling-technical-reason-to-return-to-windows-says-citys-it-chief

Heath, N. (2017b). Ten questions Munich must answer about Windows before turning its back on Linux. *TechRepublic*. Available at: http://www.techrepublic.com/article/ten-questions-munich-must-answer-about-windows-before-turning-its-back-on-linux

Henderson, J. (2018). How Google took control of the classroom, through the channel. *ARN from IDG*. Available at: https://www.arnnet.com.au/article/633245/how-google-took-control-classroom-through-channel

Herrman, J. (2018). Have the Tech Giants Grown Too Powerful? That's an Easy One. *The New York Times*. Available at: https://www.nytimes.com/2018/07/11/magazine/facebook-google-uber-tech-giants-power.html

Higgens, P. (2016). Research and Remixes the Law Won't Allow. *Electronic Frontier Foundation*. Available at: https://www.eff.org/deeplinks/2016/07/research-and-remixes-law-wont-allow

Hoover, J. (2007). Microsoft Updates Windows Without User Permission, Apologizes. *InformationWeek*. Available at: https://web.archive.org/web/20080321021339/http://www.informationweek.com/news/showArticle.jhtml?articleID=201806263

House, R. (2016). Selling out education: the mass academisation of England's schools. *NNA*. Available at: http://www.nna-news.org/news/article/selling-out-education-the-mass-academisation-of-englands-schools-2550

Jagarnath, V. (2018). Why only revolutionary change will deliver real freedom. *The Conversation*. Available at: https://theconversation.com/why-only-revolutionary-change-will-deliver-real-freedom-95665

Jameel, M.J. (2017). What Exactly Is 'Spatial Apartheid' And Why Is It Still Relevant In 2017? *The Daily Vox*. Available at: http://www.thedailyvox.co.za/what-exactly-is-spatial-apartheid-and-why-is-it-still-relevant-in-2017-mohammed-jameel-abdulla

Jansen, J. (2013). Are you schooled or are you educated? Times LIVE. Available at: https://www.ufs.ac.za/docs/default-source/timeslive-documents/2013-05-16-are-you-schooled-or-are-you-educated-1243-eng.pdf?sfvrsn=0

Jansen, J. (2014). Failure breeds 'success' in SA schools. *Sunday Times*. Available at: http://www.timeslive.co.za/sundaytimes/2014/01/05/Failure-breeds-success-in-SA-schools

Jansen, J. (2015). Ten things I would do first if I were your Minister of Schools (new title). *Facebook*. Available at: https://web.archive.org/web/20170411040232/https://www.facebook.com/jonathan.jansen.923/posts/10153872148330229

Jansen, J. (2016a). Jonathan Jansen: Bid to make schools work. *Herald LIVE*. Available at: http://www.heraldlive.co.za/opinion/2016/07/28/jonathan-jansen-bid-make-schools-work

Jansen, J. (2016b). Change the teacher and you change the school. *Dispatch*. Available at:F http://www.dispatchlive.co.za/opinion/2016/07/28/change-teacher-change-school

Jeffries, A. (2017). Why is this company tracking where you are on Thanksgiving? *The Outline*. Available at: https://theoutline.com/post/2490/why-is-this-company-tracking-where-you-are-on-thanksgiving?zd=2&zi=vuvx3esq

John, V. (2012b). Schoolbook shortage a chronic issue in SA. *Mail & Guardian*. Available at: https://mg.co.za/article/2012-08-10-00-schoolbook-shortage-a-chronic-issue

Joubert, J. (2017). Sadtu is not linked to jobs-for-cash scandal, says Angie Motshekga. *Business Day*. Available at: https://www.businesslive.co.za/bd/national/education/2017-05-24-sadtu-is-not-linked-to-jobs-for-cash-scandal-says-angie-motshekga

Just Net Coalition. (2014). The Dehli Declaration for a Just and Equitable Internet. Available at: https://justnetcoalition.org/delhi-declaration

Kalenga, A. (2015). SA Ranked 138th in WEF's Global Competitiveness Report. *EWN*. Available at: http://ewn.co.za/2015/10/01/SA-ranked-138th-in-WEF-s-Global-Competitiveness-Report

Kamanetz, A. (2013). What if You Could Learn Everything? *The Daily Beast*. Available at: https://web.archive.org/web/20130716112641/http://www.thedailybeast.com/newsweek/2013/07/10/what-if-you-could-learn-everything.html

Kasrils, R. (2013). From Marxism to Neoliberalism: Ronnie Kasrils on How Mandela & ANC Shifted Economic Views. *Democracy Now*. Available at: https://www.democracynow.org/2013/12/12/from_marxism_to_neoliberalism_ronnie_kasrils

Keane, J. (2015). Julian Assange on Google, surveillance and predatory capitalism. *The Conversation*. Available at: https://theconversation.com/julian-assange-on-google-surveillance-and-predatory-capitalism-43176

Keizer, G. (2009). NSA helped with Windows 7 development. *Computerworld*. Available at: http://www.computerworld.com/article/2521809/government-it/nsa-helped-with-windows-7-development.html

Kelly, R. (2018). Report: Adaptive Learning, Learning Analytics Are Most Wanted Tech for Online Programs. *Campus Technology*. Available at: https://campustechnology.com/articles/2018/03/29/report-adaptive-learning-and-learning-analytics-are-most-wanted-tech-for-online-programs.aspx

Koornhof, P.G.J. (2015). The pitfalls of enforcing copyright protection in the digital age. *The Conversation*. Available at: https://theconversation.com/the-pitfalls-of-enforcing-copyright-protection-in-the-digital-age-48848

Kretzman, S. (2017). Education at the heart of African growth. *News24 (City Press)*. Available at: http://www.fin24.com/Economy/education-at-the-heart-of-african-growth-20170205-2

Kwet, M. (2017a). Cmore: South Africa's New Smart Policing Surveillance Engine. *Counterpunch*. Available at: https://www.counterpunch.org/2017/01/27/cmore-south-africas-new-smart-policing-surveillance-engine

Kwet, M. (2017b). Apartheid in the Shadows: the USA, IBM and South Africa's Digital Police State. *Counterpunch*. Available at: https://www.counterpunch.org/2017/05/03/apartheid-in-the-shadows-the-usa-ibm-and-south-africas-digital-police-state

Kwet, M. (2018a). Break the hold of digital colonialism. *Mail & Guardian*. Available at: https://mg.co.za/article/2018-06-29-00-break-the-hold-of-digital-colonialism

Kwet, M. (2018c). Google and Apple's Systems to Track you in Person: What the Media Isn't Telling You. *Counterpunch*. Available at: https://www.counterpunch.org/2018/09/06/google-and-apples-systems-to-track-you-in-person-what-the-media-isnt-telling-you

Kuchler, H. (2016). Facebook, Google and the race to sign up India. *Financial Times*. Available at: https://www.ft.com/content/91539fc4-ebc5-11e5-888e-2eadd5fbc4a4

LaFrance, A. (2016). Facebook and the New Colonialism. *The Atlantic*. Available at: https://www.theatlantic.com/technology/archive/2016/02/facebook-and-the-new-colonialism/462393
Lapowsky, I. (2015). Inside the School Silicon Valley Thinks Will Save Education. *Wired*. Available at: https://www.wired.com/2015/05/altschool

Lardinois, F. (2014). Google Capital Invests $40M In Learning Analytics Firm Renaissance Learning At $1B Valuation. *TechCrunch*. Available at: https://techcrunch.com/2014/02/19/google-capital-invests-40m-in-learning-analytics-firm-renaissance-learning-at-1b-valuation

Love, D. (2014). A Conversation With Linus Torvalds, Who Built The World's Most Robust Operating System And Gave It Away For Free. *Business Insider*. Available at: https://www.businessinsider.com/linus-torvalds-qa-2014-6

*Información desde América Latina (LaInfo)*. (2014). Assange urges implement free software against espionage. Available at: http://lainfo.es/en/2014/09/22/assange-urges-implement-free-software-against-espionage

Louw, P. (2013). Study finds 68% of pupils fear assault at school. *Times LIVE*. Retrieved at: http://www.timeslive.co.za/thetimes/2013/04/03/Study-finds-68-of-pupils-fear-assault-at-school

Mabotja, K. (2015). Grade 4 literacy levels decried. *IOL (The Star)*. Available at: http://www.iol.co.za/news/south-africa/gauteng/grade-4-literacy-levels-decried-1882768

MacGregor, A. (2016). Teachers 'unwittingly' spying on school children with surveillance software. *The Stack*. Available at: https://thestack.com/security/2016/11/08/teachers-unwittingly-spying-on-school-children-with-surveillance-software

Maheshwari, S. (2017). That Game on Your Phone May Be Tracking What You're Watching on TV. *The New York Times*. Available at: https://www.nytimes.com/2017/12/28/business/media/alphonso-app-tracking.html

Makoni, M. (2011). SOUTH AFRICA: Bill is a threat to democracy, research. *University World News*. Available at: http://www.universityworldnews.com/article.php?story=20111216171950703

Mamabolo, M. (2017). SA's ICT sector likely to suffer from cabinet reshuffle. *ITWeb Africa*. Available at: http://www.itwebafrica.com/ict-and-governance/267-south-africa/237630-sas-ict-sector-likely-to-suffer-from-cabinet-reshuffle

Masola, M. (2016). Making local knowledge matter in the classroom. *Mail & Guardian Thought Leader*. Available at: http://thoughtleader.co.za/athambilemasola/2016/02/04/making-local-knowledge-matter-in-the-classroom

Mason, P. (2018). Choice: Break up Facebook – or Take It Into Public Ownership? I Am Not Kidding. *Novara Media*. Available at: https://novaramedia.com/2018/03/19/choice-break-up-facebook-or-take-it-into-public-ownership-i-am-not-kidding

Masondo, S. (2015). Education is held hostage by the Sadtu Mafia. *City Press*. Available at: http://city-press.news24.com/Voices/Education-is-held-hostage-by-the-Sadtu-Mafia-20150522

Masondo, (2016a). 'Break Sadtu's power'. *City Press*. Available at: http://city-press.news24.com/News/break-sadtus-power-20160514

Masondo, S. (2016b). Sadtu's power at full throttle. *City Press*. Available at: http://city-press.news24.com/Voices/sadtus-power-at-full-throttle-20160602

McDougall, P. (2007). If You're Going to Steal Software, Steal from Us: Microsoft Exec. *InformationWeek*. Available at: http://www.informationweek.com/if-youre-going-to-steal-software-steal-from-us-microsoft-exec/d/d-id/1052865

McGroarty, P. and Parkinson, J. (2016). South Africa's Schools, Like the Nation, Are Falling Short. *Wall Street Journal*. Available at: https://www.wsj.com/articles/south-africas-schools-like-the-nation-are-falling-short-1470148770

McLeod, D. (2017). Internet access in SA: rural areas falling far behind. *TechCentral*. Available at: https://techcentral.co.za/internet-access-sa-rural-areas-falling-far-behind/75789

Merten, M. (2016). SA's volatile (un)employment crisis: Even jobs that are created may not last. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2016-05-10-sas-volatile-unemployment-crisis-even-jobs-that-are-created-may-not-last

Miltner, K.M. (2017). Taking a second look at the learn-to-code craze. *The Conversation*. Available at: https://theconversation.com/taking-a-second-look-at-the-learn-to-code-craze-86597

Mkhize, N. (2016). Education for the elite lacks local intelligence. *Business Day*. Available at: https://web.archive.org/web/20160213101928/http://www.bdlive.co.za/opinion/columnists/2016/01/26/education-for-the-elite-lacks-local-intelligence

Moglen, E. and Choudhary, M. (2015). Mark Zuckerberg's support for 'Net Neutrality': Why it is a false argument. *The Indian Express*. Available at: https://indianexpress.com/article/blogs/mark-zuckerberg-nobly-carries-white-mans-burden-poor-indians-data-packets

Moglen, E. and Choudhary, M. (2018). Asserting Control Over Data by Enforcing Data Localisation Policies is Wrong. *First Post*. Available at: https://www.firstpost.com/tech/news-analysis/data-localisation-as-a-means-for-law-enforcement-is-a-wrong-approach-when-exercising-digital-sovereignty-4510153.html

Monbiot, G. (2016). Neoliberalism – the ideology at the root of all our problems. *The Guardian*. Available at: https://www.theguardian.com/books/2016/apr/15/neoliberalism-ideology-problem-george-monbiot

Mojapelo, Lebohang. (2016). Do 60% of South African workers earn less than R5,000 a month? *Africa Check*. Available at: https://africacheck.org/reports/do-60-of-south-african-workers-earn-less-than-r5000-a-month

Morozov, E. (2013). The Snowden saga heralds a radical shift in capitalism. *The Financial Times*. Available at: https://www.ft.com/content/d2af6426-696d-11e3-aba3-00144feabdc0

Morozov, E. (2018). There is a leftwing way to challenge big tech for our data. Here it is. *The Guardian*. Available at: https://www.theguardian.com/commentisfree/2018/aug/19/there-is-a-leftwing-way-to-challenge-big-data-here-it-is

Moyo, A. (2016). Google holds 'unique position in SA'. *ITWeb*. Available at: http://www.itweb.co.za/index.php?option=com_content&view=article&id=152977:Google-holds-unique-position-in-SA-

*MyBroadband*. (2015). South Africa's education quality is shocking: WEF report. Available at: https://mybroadband.co.za/news/government/140358-south-africas-education-quality-is-shocking-wef-report.html

*MyBroadband*. (2016). Smartphone penetration in South Africa hits major milestone. Available at: https://mybroadband.co.za/news/smartphones/180894-smartphone-penetration-in-south-africa-hits-major-milestone.html

Mzekandaba, S. (2016). ZA: Gov't spends big bucks on ICT. *ITWeb*. Available at: http://www.itweb.co.za/index.php?option=com_content&view=article&id=157472

Mzekandaba, S. (2017). Analysis: Smart cities make safer cities. *ITWeb*. Available at: https://www.itweb.co.za/content/p6GxRKqYJdyvb3Wj

Mzekandaba, S. (2018). R700m for grade 10 paperless classrooms. *ITWeb*. Available at: https://www.itweb.co.za/content/G98YdMLxO4wMX2PD

Naicker, N. (2015). Food insecurity is a reality for millions of South Africans living in informal settlements. *The Conversation*. Available at: https://theconversation.com/food-insecurity-is-a-reality-for-millions-of-south-africans-living-in-informal-settlements-48519

Naughton, J. (2017). It's time to face the facts about our digital world. *The Guardian*. Available at: https://www.theguardian.com/commentisfree/2017/dec/31/face-the-facts-about-the-internet-gig-sharing-economy

*News24*. (2013a). Survey: More see bullying as a problem. Available at: http://www.news24.com/SouthAfrica/News/Survey-More-see-bullying-as-a-problem-20131126

*News24*. (2013b). More than 50% of kids bullied – survey. Available at: http://www.news24.com/SouthAfrica/News/More-than-50-of-kids-bullied-survey-20130124

*News24*. (2013c). R480m clocking-in system for teachers. Available at: http://www.news24.com/SouthAfrica/News/R480m-clocking-in-system-for-teachers-20130214

News24. (2016a). Pretoria Girls' High hair policy tops the news. *News24*. Available at: http://www.news24.com/SouthAfrica/News/pretoria-girls-high-hair-policy-tops-the-news-20160904

*News24*. (2016b). Black girls in tears at Pretoria school hair protest. Available at: http://www.news24.com/SouthAfrica/News/black-girls-in-tears-at-pretoria-school-hair-protest-20160829

*News24*. (2016c). Black schoolgirls forced to straighten hair, say blackness discouraged. Available at: http://www.news24.com/SouthAfrica/News/black-schoolgirls-forced-to-straighten-hair-say-blackness-discouraged-20160829

Nguyen, N. (2018). A Lot Of Apps Sell Your Data. Here's What You Can Do About It. *Buzzfeed*. Available at: https://www.buzzfeednews.com/article/nicolenguyen/how-apps-take-your-data-and-sell-it-without-you-even

Nkosi, B. (2012). SA schools at rock bottom in international assessments. *Mail & Guardian*. Available at: https://mg.co.za/article/2012-12-11-studies-reveal-performance-gap-between-rural-and-urban-pupils

Nkosi, B. (2015). Teacher unions to block members invigilating assessments. *Mail & Guardian*. Available at: https://mg.co.za/article/2015-09-21-teacher-unions-to-block-members-invigilating-assessments

Nkosi, B. (2016). Lack of textbooks hampering learning at schools. *Times LIVE*. Available at: http://www.timeslive.co.za/local/2016/06/02/Lack-of-textbooks-hampering-learning-at-schools

Nunez, M. (2016). Former Facebook Workers: We Routinely Suppressed Conservative News. *Gizmodo*. Available at: https://gizmodo.com/former-facebook-workers-we-routinely-suppressed-conser-1775461006

O'Brien, S. and Kwet, M. (2018). Android Users: To Avoid Malware, Try the F-Droid App Store. *Wired*. Available at: https://www.wired.com/story/android-users-to-avoid-malware-ditch-googles-app-store

Oram, A. (2016). Open source in Brazil. *O'Reilly*. Available at: https://www.oreilly.com/ideas/open-source-in-brazil

Orthofer, A. (2016a). South Africa needs to fix its dangerously wide wealth gap. *The Conversation*. Available at: https://theconversation.com/south-africa-needs-to-fix-its-dangerously-wide-wealth-gap-66355

Osborne, C. (2015a). Microsoft slams Google for spilling the beans on Windows 8.1 security flaw. *ZDNet*. Available at: http://www.zdnet.com/article/microsoft-slams-google-for-spilling-the-beans-on-windows-8-1-security-flaw

Osborne, C. (2015b). Ex-Microsoft privacy advisor: I don't trust Microsoft, thanks to PRISM. *ZDNet*. Available at: https://www.zdnet.com/article/ex-microsoft-privacy-advisor-i-dont-trust-microsoft-thanks-to-prism

Oxford, A. (2013). Google in Cape Town: TV White Spaces work. *htxt.africa*. Available at: http://www.htxt.co.za/2013/11/08/google-in-cape-town-tv-white-spaces-work

Pasquale, F. (2013a). Privacy, Antitrust, and Power. *George Mason Law Review*. Available at: https://digitalcommons.law.umaryland.edu/fac_pubs/1343

Paton, C. (2016). SA schools under Sadtu domination. *Business Day*. Available at: https://web.archive.org/web/20160121221147/http://www.bdlive.co.za/opinion/2016/01/20/sa-schools-under-sadtu-dominion

Phakathi, B. (2016). Jobs-for-cash report an 'attempt to destroy' teachers' union. *Business Day*. Available at: https://www.businesslive.co.za/bd/national/education/2016-11-30-jobs-for-cash-report-an-attempt-to-destroy-teachers-union

Phakathi, B. (2017a). Education department says dismal science and maths score is still 'improvement'. *Business Day*. Available at: https://www.businesslive.co.za/bd/national/education/2017-02-21-education-department-says-dismal-science-and-maths-score-is-still-improvement

Phakathi, B. (2017b). Fraud and chaos: the four universities keeping government awake at night. *Business Day*. Available at: https://www.businesslive.co.za/bd/national/education/2017-11-24-fraud-and-mismanagement-claims-at-varsities-worry-department

Phillip, X. (2018). Learning must evolve to future-proof Africa. *Business Day*. Available at: https://www.businesslive.co.za/bd/national/education/2018-06-01-learning-must-evolve-to-future-proof-africa

Pijoos, I. (2017). Acid thrown in Uber driver's face. *News24*. Available at: https://www.news24.com/SouthAfrica/News/acid-thrown-on-uber-drivers-face-20170806

Pithouse, R. (2017). Manichean Delirium (In the Time of Jacob Zuma). http://www.theconmag.co.za/2017/03/30/manichean-delirium-in-the-time-of-jacob-zuma

Purkayastha, P. and Bailey, R. (2014). U.S. Control of the Internet: Problems Facing the Movement to International Governance. *Monthly Review*. Available at: https://monthlyreview.org/2014/07/01/u-s-control-of-the-internet

Rawlins, L.K. (2017). Google trains 1m young Africans in digital skills. *ITWeb*. Available at: http://www.itweb.co.za/index.php?option=com_content&view=article&id=160216:Google-trains-1m-young-Africans-in-digital-skills

RDM Newswire. (2015). British Intelligence caught spying on South Africa's leftie lawyers. *Sunday Times*. Available at: https://www.timeslive.co.za/news/south-africa/2015-06-22-british-intelligence-caught-spying-on-south-africas-leftie-lawyers

Reilly, C. (2018). Is Personalized Learning the Next Big Thing in K-12 Philanthropy? *Inside Philanthropy*. Available at: https://www.insidephilanthropy.com/home/2018/1/11/is-personalized-learning-the-next-big-thing-in-k-12-philanthropy

Ridester. (2018). Uber Fees: How Much Does Uber Pay, Actually? (With Case Studies). Available at: https://web.archive.org/web/20180906065219/https://www.ridester.com/uber-fees

Ritchie, K. (2018). Zuma's #FreeEducation announcement an 11th-hour master stroke. *IOL*. Available at: https://www.iol.co.za/news/opinion/zumas-freeeducation-announcement-an-11th-hour-master-stroke-12631040

Röhrs, S. (2016a). Corporal punishment: Sparing the rod is constitutional. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/opinionista/2016-02-16-corporal-punishment-sparing-the-rod-is-constitutional

Röhrs, S. (2016b). Twenty years on, corporate punishment in schools is alive and well. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/opinionista/2016-03-14-twenty-years-on-corporal-punishment-in-schools-is-alive-and-well

Rushkoff, D. (2011). Does Facebook really care about you? *CNN*. Available at: http://edition.cnn.com/2011/09/22/opinion/rushkoff-facebook-changes

Samuels, M. (2017). Artificial intelligence: How to build the business case. *ZDNet*. Available at: http://www.zdnet.com/article/artificial-intelligence-how-to-build-the-business-case

Sanchez, A. (2010). Why testing fails in our schools. *Socialist Worker*. Available at: https://socialistworker.org/2010/09/28/why-testing-fails-our-schools

Savant. (2007). South African government leads the open source software revolution. *ITWeb*. Available at: http://www.itweb.co.za/index.php?option=com_content&view=article&id=2159

Schießle, B. (2017). What happened in Munich. *Free Software Foundation Europe*. Available at: https://fsfe.org/news/2017/news-20170301-01.en.html

Schneier, B. (1999). Crypto-Gram: September 15, 1999. *Schneier on Security*. Available at: https://www.schneier.com/crypto-gram/archives/1999/0915.html

Schneier, B. (2014). An Open Letter to IBM's Open Letter. *Schneier on Security*. Available at: https://www.schneier.com/blog/archives/2014/03/an_open_letter_.html

Schneier, B. (2015b). What’s Next in Government Surveillance. *The Atlantic*. Available at: https://www.theatlantic.com/international/archive/2015/03/whats-next-in-government-surveillance/385667

Schneier, B. (2018a). Censorship in the Age of Large Cloud Providers. *Lawfare*. Available at: https://www.lawfareblog.com/censorship-age-large-cloud-providers

Schreuder, B. and Meyer, Naomi. (2016). The future of education and e-learning in South Africa – an interview. *LitNet*. Available at: https://www.litnet.co.za/the-future-of-education-in-south-africa-an-interview

Shah, A. (2017). In PC comeback, ARM will battle Intel in Chromebooks and Windows 10. *PCWorld*. Available at: http://www.pcworld.com/article/3161290/chromebooks/in-pc-comeback-arm-will-battle-intel-in-chromebooks-and-windows-10.html

Shannon, D. and Rogue, J. (2009). Refusing to Wait: Anarchism and Intersectionality. *Anarkismo*. Available at: https://www.anarkismo.net/article/14923

Shezi, L. (2014). Microsoft AppFactory looking for next group of intern developers. *htxt.africa*. Available at: http://www.htxt.co.za/2014/09/16/microsoft-appfactory-looking-for-next-group-of-intern-developers

Shezi, L. (2017). Number of South Africans with access to internet grows to 60%. *Hypertext.* Available at: https://www.htxt.co.za/2017/05/31/number-of-south-africans-with-access-to-internet-grows-to-60

Sidler, V. (2016). South Africa's move towards smart cities. *BusinessTech*. Available at: https://businesstech.co.za/news/industry-news/118372/south-africas-move-towards-smart-cities

Simonite, T. (2016). Largest Study of Online Tracking Proves Google Really Is Watching Us All. *MIT Technology Review*. Available at: https://www.technologyreview.com/s/601488/largest-study-of-online-tracking-proves-google-really-is-watching-us-all

Singer, N. (2017a). How Google Took Over the Classroom. *The New York Times*. Available at: https://www.nytimes.com/2017/05/13/technology/google-education-chromebooks-schools.html

Singer, N. (2017b). The Silicon Valley Billionaires Remaking America's Schools. *The New York Times*. Available at: https://www.nytimes.com/2017/06/06/technology/tech-billionaires-education-zuckerberg-facebook-hastings.html

Solon, O. (2017a). 'It's digital colonialism': how Facebook's free internet service has failed its users. *The Guardian*. Available at: https://www.theguardian.com/technology/2017/jul/27/facebook-free-basics-developing-markets

Solon, O. (2017b). Tim Berners-Lee on the future of the web: 'The system is failing'. *The Guardian*. Available at: https://www.theguardian.com/technology/2017/nov/15/tim-berners-lee-world-wide-web-net-neutrality

Solon, O. (2017c). Tech's terrible year: how the world turned on Silicon Valley in 2017. *The Guardian*. Available at: https://www.theguardian.com/technology/2017/dec/22/tech-year-in-review-2017

Spaull, N. (2014). Education rankings: There's madness in WEF methods. *Mail & Guardian*. Available at: https://mg.co.za/article/2014-06-13-theres-madness-in-wef-methods

Spaull, N. (2016). Serious technical concerns about SACMEQ IV results presented to parliament. *Nicspaull.com*. Available at: https://nicspaull.com/2016/09/14/serious-technical-concerns-about-sacmeq-iv-results-presented-to-parliament

Stallman, R.M. (2010b). What Does That Server Really Serve? *Boston Review*. Available at: http://bostonreview.net/richard-stallman-free-software-DRM

Stallman, R.M. (2017a). Why Schools Should Exclusively Use Free Software. *Gnu.org*. Available at: https://www.gnu.org/education/edu-schools.en.html

Stallman, R.M. (2017b). Opposing Digital Rights Mismanagement (Or Digital Restrictions Management, as we now call it). Gnu.org. Available at: https://web.archive.org/web/20180712003737/https://www.gnu.org/philosophy/opposing-drm.en.html

Stallman, R.M. (2018a). Ubuntu Spyware: What to Do? *Gnu.org*. Available at: https://web.archive.org/web/20180913211806/https://www.gnu.org/philosophy/ubuntu-spyware.en.html

Stallman, R.M. (2018b). 'No Company Is So Important Its Existence Justifies Setting Up a Police State'. *New York Magazine*. Available at: http://nymag.com/selectall/2018/04/richard-stallman-rms-on-privacy-data-and-free-software.html

Stecklow, S. (2008). Microsoft Battles Low-Cost Rival for Africa. *The Wall Street Journal*. Available at: https://www.wsj.com/articles/SB122332198757908625

Steiner, H. (2017). New Collaborations on Exposing Tracking. *F-Droid*. Available at: https://f-droid.org/en/2017/12/14/new-collaborations-on-exposing-tracking.html

Stewart, L. (2016). It's time for ex-Model C schools to stop focusing on rugby and start focusing on real issues. *The Daily Vox*. Available at: http://www.thedailyvox.co.za/laurence-stewart-time-ex-model-c-schools-stop-focusing-rugby-start-focusing-real-issues

Stoddard, E. (2018). U.S. intelligence documents on Nelson Mandela made public. *Reuters*. Available at: https://www.reuters.com/article/us-mandela-usa-documents/us-intelligence-documents-on-nelson-mandela-made-public-idUSKBN1K82SD

Stokes, J. (2009). The Cloud: a short introduction. *Ars Technica*. Retrieved from: https://arstechnica.com/business/2009/11/the-cloud-a-short-introduction/2

Stone, B. (2009). Amazon Erases Orwell Books From Kindle. *The New York Times*. Available at: http://www.nytimes.com/2009/07/18/technology/companies/18amazon.html

Strauss, V. (2013). The bottom line on charter school studies. *The Washington Post*. Available at: https://www.washingtonpost.com/news/answer-sheet/wp/2013/09/24/the-bottom-line-on-charter-school-studies

Streitfeld, D. (2017). Tech Giants, Once Seen as Saviors, Are Now Viewed as Threats. *The New York Times*. Available at: https://www.nytimes.com/2017/10/12/technology/tech-giants-threats.html

Steyn, L. (2016). Boom in low-fee private schools. *Mail & Guardian*. Available at: https://mg.co.za/article/2016-12-09-00-boom-in-low-fee-private-schools

Straumsheim, C. (2016). 4,000 to Lose Jobs as Pearson Restructures. *Insider Higher Ed*. Available at: https://www.insidehighered.com/quicktakes/2016/01/22/4000-lose-jobs-pearson-restructures

Sydell, L. (2018). An Anarchist Explains How Hackers Could Cause Global Chaos. *NPR*. Available at: https://www.npr.org/sections/alltechconsidered/2018/02/26/583682587/how-hackers-could-cause-global-chaos-an-anarchist-explains

Taylor, S. and Coetzee. (2013). Mother-tongue classrooms give a better boost to English study later. *Mail & Guardian*. Available at: https://mg.co.za/article/2013-10-18-mother-tongue-classrooms-give-a-better-boost-to-english-study-later

*Tectonic*. (2007). SA government to switch to open source. Available at: https://tectonic.co.za/?p=1377

*Telesur*. (2017). Global South Internet Activists Fight US 'Digital Colonialism'. Available at: https://www.telesurtv.net/english/news/Global-South-Internet-Activists-Fight-US-Digital-Colonialism-20170412-0030.html

*The Daily Records*. (2018). Top 10 Largest Companies in The World By Market Cap. Available at: http://www.thedailyrecords.com/2018-2019-2020-2021/world-famous-top-10-list/highest-selling-brands-products-companies-reviews/largest-companies-world-by-market-cap-most-valuable/12829

*The Economist*. (2016). Re-educating Rita. Available at: https://www.economist.com/special-report/2016/06/25/re-educating-rita

*The Guardian*. (2013). How GCHQ stepped up spying on South African foreign ministry. Available at: https://www.theguardian.com/world/2013/jun/16/gchq-south-african-foreign-ministry

*The Times of India*. (2017). Survey reveals sorry state of ICT education in schools. Available at: https://timesofindia.indiatimes.com/city/jaipur/survey-reveals-sorry-state-of-ict-education-in-schools/articleshow/60368759.cms

Thomson, I. (2013). Snowden leak: Microsoft added Outlook.com backdoor for Feds. *The Register*. Available at: https://www.theregister.co.uk/2013/07/11/snowden_leak_shows_microsoft_added_outlookencryption_backdoor_for_feds

Timm, T. (2014). Technology law will soon be reshaped by people who don't use email. *The Guardian*. Available at: https://www.theguardian.com/commentisfree/2014/may/03/technology-law-us-supreme-court-internet-nsa

Untersinger, M. (2017a). Des mouchards cachés dans vos applications pour smartphones. *Le Monde*. Available at: https://www.lemonde.fr/pixels/article/2017/11/24/des-mouchards-caches-dans-vos-applications-pour-smartphones_5219892_4408996.html

Untersinger, M. (2017b). Les mouchards des applications mobiles « nous rapprochent d'un monde à la "Minority Report" ». *Le Monde*. Available at: https://www.lemonde.fr/pixels/article/2017/11/24/les-mouchards-des-applications-mobiles-nous-rapprochent-d-un-monde-a-la-minority-report_5219980_4408996.html

Vallina-Rodriguez, N. and Sundaresan, S. (2017). 7 in 10 smartphone apps share your data with third-party services. *The Conversation*. Available at: https://theconversation.com/7-in-10-smartphone-apps-share-your-data-with-third-party-services-72404

Van Aardt, T. (2017). Many Port Elizabeth pupils are battling without textbooks and stationery. *Business Day*. Available at: https://www.businesslive.co.za/bd/national/education/2017-03-06-many-port-elizabeth-pupils-are-battling-without-textbooks-and-stationery

Vaughan-Nichols, S.J. (2017). Why Munich should stick with Linux. *ZDNet*. Available at: http://www.zdnet.com/article/why-munich-should-stick-with-linux

Ventkess, K. (2017). Google upskill programme receives lukewarm SA response. *Fin24*. Available at: http://www.fin24.com/Tech/News/google-upskill-programme-receives-lukewarm-sa-response-20170315

Veriava, F. (2018). Bhisho court judgment makes infrastructure part of the right to basic education. *Daily Maverick*. Available at: https://www.dailymaverick.co.za/article/2018-07-27-bhisho-court-judgment-makes-infrastructure-part-of-the-right-to-basic-education

Vermeulen, J. (2015). These are the companies who control the Internet in South Africa. *MyBroadband*. https://mybroadband.co.za/news/broadband/144145-these-are-the-companies-who-control-the-internet-in-south-africa.html

Vermeulen, J. (2017). These Linux myths need to die. *MyBroadband*. Available at: https://mybroadband.co.za/news/software/191410-these-linux-myths-need-to-die.html

Vermeulen, J. (2018). Netflix killing DStv in South Africa could cost thousands of jobs. *MyBroadband*. Available at: https://mybroadband.co.za/news/broadcasting/258987-netflix-killing-dstv-in-south-africa-could-cost-thousands-of-jobs.html

Wakabayashi, D. (2017). As Google Fights Fake News, Voices on the Margins Raise Alarm. *The New York Times*. Available at: https://www.nytimes.com/2017/09/26/technology/google-search-bias-claims.html

Warren, T. (2013). Google engineer publicizes Windows zero-day bug, claims Microsoft is 'difficult to work with'. *The Verge*. Available at: https://www.theverge.com/2013/5/23/4358400/google-engineer-bashes-microsoft-discloses-windows-flaw

Washkuch, F.J. (2007). Mozilla slams Microsoft for ignoring critical vulnerability. *SC Magazine UK*. Available at: https://www.scmagazineuk.com/mozilla-slams-microsoft-for-ignoring-critical-vulnerability/article/562400

Waters, R. (2016). Can Microsoft get back in the game with AI? *Financial Times*. Available at: https://www.ft.com/content/4afe65a8-b54c-11e6-ba85-95d1533d9a62

Watters, A. (2015a). Technology Imperialism, the Californian Ideology, and the Future of Higher Education. *Hack Education*. Available at: http://hackeducation.com/2015/10/15/technoimperialism

Watters, A. (2015b). The Algorithmic Future of Education. *Hack Education*. Available at: http://hackeducation.com/2015/10/22/robot-tutors

Watters, A. (2015c). What Do We Mean By Open Education. *Hack Education*. Available at: http://hackeducation.com/2015/01/16/what-do-we-mean-by-open-education

Watters, A. (2015d). Updates to 'What Teachers Should Know'. *Hack Education*. Available at: http://guide.hackeducation.com/2015/12/27/updates-what-teachers

Watters, A. (2016). Education Technology and the Ideology of Personalization. *Hack Education*. Available at: http://hackeducation.com/2016/12/19/top-ed-tech-trends-personalization

Wermuth, S. (2017). Pearson plunges as digital switch forces new profit warning. *CNBC (Reuters)*. Available at: https://web.archive.org/web/20170126152650/http://www.cnbc.com/2017/01/18/pearson-plunges-as-digital-switch-forces-new-profit-warning.html

Wilkinson, K. (2013). Is SA's education system the worst in Africa? Not according to the data. *Africa Check*. Available at: https://africacheck.org/reports/is-sas-education-system-the-worst-in-africa-not-according-to-the-data

Wilkinson, K. (2014). Is SA bottom of the class in maths and science? WEF ranking is meaningless. *Africa Check*. Available at: https://africacheck.org/reports/is-sa-bottom-of-the-class-in-maths-and-science-why-ranking-is-meaningless

Wilkinson, K. (2016). Mail Online's claim of 400,000+ poor whites in South Africa incorrect. *Africa Check*. Available at: https://africacheck.org/reports/mail-onlines-claim-of-400000-poor-whites-in-south-africa-incorrect

Wilkinson, Kate and Chiumia, Sintha. (2013). Is SA worse off now than 19 years ago? The facts behind THAT Facebook post. *Africa Check*. Available at: https://africacheck.org/reports/is-sa-worse-off-now-than-19-years-ago-the-facts-behind-that-facebook-post

Williamson, B. (2017b). Coding for What? *Connected Learning Alliance*. Available at: https://clalliance.org/blog/coding-for-what

Woolven, C. (2017). 60 million ID numbers leaked in South Africa's 'worst data breach'. *IT Governance*. Available at: https://www.itgovernance.co.uk/blog/60-million-id-numbers-leaked-in-south-africas-worst-data-breach

Wu, T. (2018). Don't Fix Facebook, Replace It. *The New York Times*. Available at: https://www.nytimes.com/2018/04/03/opinion/facebook-fix-replace.html

Yu, Derek, Kasongo, Atoko, and Moses, Mariana. (2016). How two crucial trends are affecting unemployment in South Africa. *The Conversation*. Available at: https://theconversation.com/how-two-crucial-trends-are-affecting-unemployment-in-south-africa-56296

Zittrain, J. (2014). Facebook Could Decide an Election Without Anyone Ever Finding Out. *The New Republic*. Available at: https://newrepublic.com/article/117878/information-fiduciary-solution-facebook-digital-gerrymandering

## Websites

Bender, W. (2011). Program or be programmed. [Online Video]. *YouTube (TEDxYouth)*. Available at: https://www.youtube.com/watch?v=5bUYtgLhAfo

Bender, W. and Ulibarri, D. (2016). Education needs Free/Libre Software needs Education. *Libre Planet*. Available at: https://media.libreplanet.org/u/libreplanet/m/education-needs-free-libre-software-needs-education

Benkler, Y. with Moglen, E. (2017). Degrees of Freedom, Dimensions of Power. [Online Video]. *Software Freedom Law Center*. Available at: https://downloads.softwarefreedom.org/2017/conference/0-keynote.webm

*CB Insights*. (2017). The Race For AI: Google, Twitter, Intel, Apple In A Rush To Grab Artificial Intelligence Startups. Available at: https://web.archive.org/web/20170421210526/https://www.cbinsights.com/blog/top-acquirers-ai-startups-ma-timeline

Chomsky, N. (2003). Language and the Mind Revisited: The Biolinguistic Turn. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=yJp1-Od67-U

Chomsky, N. (2013). What is Anarchism? Noam Chomsky on Capitalism, Socialism, Free Markets (2013). *C-Span2/BookTV*. Available at: https://www.youtube.com/watch?v=yccBBzSHFAM

Clements, J. [no date]. Hope For The Freedom Charter. Available at: http://www.democraticeducation.co.za/hope-for-the-freedom-charter

*Electronic Frontier Foundation (EFF-US)*. [no date-a]. Secure Messaging Score Card. Available at: https://www.eff.org/node/82654

Exodus Privacy. [no date]. Airbnb. Available at: https://reports.exodus-privacy.eu.org/reports/11160

Fidzup. [no date]. The best way to use our solutions? Available at: https://web.archive.org/web/20171015030737/http://v2.fidzup.com/en//cas-dusage

Fourie, L. (2016). Teaching and Learning with Technology Day 2016 - Prof. Louis Fourie. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=3lAoePsfSF8&feature=youtu.be&t=265

Gnu.org. [no date a]. What is Free Software? Version 1.153. *Gnu.org*. Available at: https://www.gnu.org/philosophy/free-sw.en.html

Gnu.org. [no date b]. Proprietary Back Doors. *Gnu.org*. Available at: https://www.gnu.org/proprietary/proprietary-back-doors.en.html

Gnu.org. [no date c]. What is Copyleft? *Gnu.org*. Available at: https://www.gnu.org/licenses/copyleft.en.html

Hassan, S. (2017). 'How P2P Will Save The World', with Samer Hassan. (King, J.). *TorrentFreak*. Available at: https://torrentfreak.com/steal-show-s02e13-p2p-will-save-world

Independent Examinations Board. [no date]. National Senior Certificate. *IEB*. Available at: https://web.archive.org/web/20170408220602/http://www.ieb.co.za/School/nsc.php

LAK (2016). Learning Analytics and Knowledge. *1st International Conference on Learning Analytics and Knowledge 2011*. Available at: https://tekri.athabascau.ca/analytics

Marx, K. and Engles, F. (1848). The Communist Manifesto. Available at: https://www.marxists.org/archive/marx/works/download/pdf/Manifesto.pdf

Moglen, E. (2003). The dotCommunist Manifesto. *Columbia.edu*. Available at: http://moglen.law.columbia.edu/publications/dcm.pdf

Moglen, E. (2004). "Die Gedanken Sind Frei": Free Software and the Struggle for Free Thought. Wizards of OS 3. *Columbia.edu*. Available at: http://moglen.law.columbia.edu/publications/berlin-keynote.html

Moglen, E. (2007). O'Reilly Open Source Convention. (with Tim O'Reilly). *O'Reilly Static*. Available at: http://cdn.oreillystatic.com/radar/oscon2007/OSCON_2007_Eben_Moglen.ogg

Moglen, E. (2010). Freedom In the Cloud: Software Freedom, Privacy, and Security for Web 2.0 and Cloud Computing. *Software Freedom Law Center*. Available at: https://www.softwarefreedom.org/events/2010/isoc-ny/FreedomInTheCloud-transcript.html

Moglen, E. (2013a). The Union, May it Be Preserved. *Snowden and the Future*. Available at: http://snowdenandthefuture.info/snowdenandthefuture-unionpreserved.pdf

Moglen, E. (2013b). GPL: Eben Moglen's plea for Free Software before the European Parliament, 2013-07-09. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=FI1CoeqyD5o

Moglen, E. (2015b). ISPIRT: Eben Moglen - Why Open Innovation and entrepreneurship are deeply interconnected. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=KB9cKwXF9ds

Moglen, E. (2017). Better than Rage Against the Machine: Saving Privacy in One Hell of a Dangerous World. Transcribed by M. Kwet. *I/O Error*. Available at: http://ioterror.com/items/show/43

Morkel, J. (2016). Teaching and Learning with Technology Day 2016 - J Morkel. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=7tejlrdGItA&feature=youtu.be&t=196

New Leaders. (2016). *Article by @JJ_UFS on the collaboration between public & private to salvage schools with vital resources to tranform*. [Twitter]. 28 August. Available at: https://twitter.com/newleadersSA/status/758684602198360064

*Point Topic*. (2017). Residential broadband tariff scorecard by country – Q4 2016. Available at: http://point-topic.com/free-analysis/residential-broadband-tariff-scorecard-country-q4-2016

Shirky, C. (1999). "The Interest Horizons and the Limits of Software Love". Available at: http://www.shirky.com/writings/interest.html

Snowden, E. (2016). The Last Light House: Free Software in Dark Times. Available at: https://let.snowden.in/2016/03/25/snowden-edward-the-last-lighthouse-free-software-in-dark-times-20160319

Stallman, R. (2012). Copyright vs. Community. [Online Video]. *YouTube (rucomputerscience)*. Available at: https://www.youtube.com/watch?v=eginMQBWII4

Stallman, R.M. (2014). Free software, free society: Richard Stallman at TEDxGeneva 2014. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=Ag1AKIl_2GM&vl=en

Stallman, R.M. (2015b). Free Software, Free Hardware, and other things. *LibrePlanet*. Available at: https://media.libreplanet.org/u/libreplanet/m/richard-stallman-free-software-free-hardware

Stallman, R.M. (2016). Richard Stallman on Free Software: Freedom is Worth the Inconvenience. [Online Video]. *YouTube*. Available at: https://www.youtube.com/watch?v=NB8mCcLRxlg

Taunyane, O. (2016). 'We are being used as a scapegoat', says Sadtu on jobs-for-cash scandal report. *Radio 702*. Available at: http://www.702.co.za/articles/13719/we-are-being-used-as-a-scapegoat-says-sadtu-on-jobs-for-cash-scandal-report

The Linux Information Project. (2007). The Dangers of Tivoization and the GPLv3: An Introduction to Tivoization. *The Linux Information Project*. Available at: http://www.linfo.org/tivoization.html

University of Cape Town (UCT). [no date]. Microsoft software. *University of Cape Town*. Available at: https://web.archive.org/web/20170319202549/http://www.icts.uct.ac.za/microsoft-software

University of the Witswatersrand (Wits). [no date]. Office365. *University of the Witswatersrand*. Available at: https://web.archive.org/web/20170319201712/http://www.wits.ac.za/mywits/office365

Urban-Lurain, M. (1995). Intelligent Tutoring Systems: An Historic Review in the Context of the Development of Artificial Intelligence and Educational Psychology. Available at: https://web.archive.org/web/20070209012655/http://www.cse.msu.edu/rgroups/cse101/ITS/its.htm

*World Economic Forum (WEF)*. [no date-a]. Leadership and Governance. Available at: https://web.archive.org/web/20180913235053/https://www.weforum.org/about/leadership-and-governance

*WEF*. [no date-b]. Centre for the Fourth Industrial Revolution, USA. Available at: https://web.archive.org/web/20180808131325/https://www.weforum.org/centre-for-the-fourth-industrial-revolution