



The 4IR and the Humanities in South Africa

Perspectives on innovation,
power and potentialities

EDITED BY

Bhaso Ndzendze, Asheel Singh & Suzall Timm

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SOUTH AFRICAN HUMANITIES DEANS' ASSOCIATION



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The 4IR and the Humanities in South Africa

**Perspectives on innovation,
power and potentialities**

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Peer-review declaration

The publisher (AOSIS) endorses the South African 'National Scholarly Book Publishers Forum Best Practice for Peer-Review of Scholarly Books'. The book proposal form was evaluated by our Social Sciences, Humanities, Education and Business Management editorial board. The manuscript underwent an evaluation to compare the level of originality with other published works and was subjected to rigorous two-step peer review before publication by two technical expert reviewers who did not include the volume editors and were independent of the volume editors, with the identities of the reviewers not revealed to the contributing editors or authors. The reviewers were independent of the publisher, editors and authors. The publisher shared feedback on the similarity report and the reviewers' inputs with the manuscript's editors to improve the manuscript. Where the reviewers recommended revision and improvements, the editors and authors responded adequately to such recommendations. The reviewers commented positively on the scholarly merits of the manuscript and recommended that the book be published.

Research justification

This book's main treatise is that the Fourth Industrial Revolution (4IR) is not only a commercial development but also one with implications and impacts for what the humanities and social sciences study, as well as how they go about studying it. This book's argument is that the 4IR is not a wholly negative phenomenon, as it is ultimately the convergence of a set of tools that are changing society and which therefore enables its own study through the methods of humanities and social science.

The chapters of this book represent original research. In light of the innovative nature of the 4IR, numerous prior studies have focused primarily on identifying issues and tackling specific inquiries. In contrast, this book explores the broader implications of this significant transformation on entire academic disciplines. The chapters do so by utilising in-depth empirical research and aim to present novel ideas on the impact of the 4IR in anthropology, cultural studies, development studies, gender studies, media studies, political science, international relations, sociology and social work. In this regard, among others, this book's chapters inform us that the 4IR is changing how policymakers should provide service delivery in light of the gender disparities reinforced by the 4IR; the fundamental embeddedness of algorithms in cultural artefacts; the erosion of trust in digital news sources; the mutual interests that exist across physical boundaries, such that different countries have a predictive pattern of engagement with the politics of another; the changing fundamental questions in democratic politics; and the ways in which social work can be taught in the 4IR era. Furthermore, this book concludes by reflecting on the necessity of increased collaboration and partnership among universities, businesses and government entities in order for South Africa to reverse inequalities within and between countries globally.

This book makes a methodological contribution in the realms of big data and the analysis of trust in media during the 4IR era, as well as the scholarship of teaching and learning across a number of humanities and social science disciplines.

The contributing authors employed various research methods, including surveys, interviews, quantitative analysis, and desktop research. The authors adhered to academic standards to ensure compliance with proper citation and ethical conduct.

Sections in the chapter entitled 'Extraditing the oral-based knowledge of indigenous games to the computational-based approach of the 4IR' represent a substantial reworking of a PhD thesis (not applicable to other chapters).

The chapters have been subjected to similarity checking via iThenticate, and the authors have confirmed that their work is not plagiarised.

The 4IR and the Humanities in South Africa: Perspectives on innovation, power and potentialities is written by scholars for scholars. The target audience is scholars in the fields of the humanities and social sciences and their constituent disciplines.

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Contents

Notes on contributors	xiii
Acknowledgements	xxi
Abbreviations and acronyms, figures and tables appearing in the text and notes	xxiii
List of abbreviations and acronyms	xxiii
List of figures	xxv
List of tables	xxvi
Preface	xxvii

Part 1

What it is: The Fourth Industrial Revolution in social practice

Chapter 1: Fourth Industrial Revolution and gender-responsive budgeting in South Africa: Policy challenges and alternatives	3
<i>Tinuade A Ojo & Zainab M Olaitan</i>	
Introduction	3
South Africa's stance on women in the Fourth Industrial Revolution	5
Gender-responsive budgeting	8
Fourth Industrial Revolution gender budgeting and South Africa's response	10
Policy challenges	13
Alternatives or recommendations	15
Conclusion	17
Chapter 2: Artificial intelligence sword and shield: Implications for cybersecurity in South Africa	19
<i>Mancha J Sekgololo</i>	
Introduction	19
Conceptualisations of critical terms	20
What is artificial intelligence?	21
Cybersecurity	21
Digital student protest	21
Quality assurance	22
Evolution of student protest in South Africa	22
Digital student protest	24

Operational and economic challenges to digital student protest and policy interventions	24
Cybersecurity challenges and possible policy interventions for digital student protest	25
Quality assurance in the era of remote learning and policy interventions	26
South African perspective and searches for digital help with academic work	28
Interventions by universities to assure quality assurance of assessments: Policy interventions	29
Plagiarism in the era of artificial intelligence	30
Implications for the humanities	31
Conclusion	32

Part 2

Disciplinary debates and perspectives

Chapter 3: (Mis)trust in the news media’s anthropomorphic framing of artificial intelligence technologies in the (future) world of work: Perceptions of humanities students in South Africa **35**

Susan I Brokensha

Introduction	35
Literature review	37
Typologies of framing	40
Methods	41
Preamble: Exploratory research	41
Sample, participants’ tasks and data collection tools	41
Research rigour	43
Presentation and discussion of the findings	44
Questionnaire	44
Focus-group discussions	46
Conclusion	52

Chapter 4: Inequalities in South African indigenous languages during the Fourth Industrial Revolution **55**

Ndivhuwo D Sundani & Mmatlou J Malatji

Introduction	55
Statement of the problem	58
Theoretical framework	59
The use of digital platforms in South Africa	60

South African indigenous languages and Fourth Industrial Revolution	61
Strategies to help bridge linguistic inequality amid the Fourth Industrial Revolution in South Africa	62
Adopted methodology	65
Results and discussion	65
Limitation of the study and recommendations	67
Chapter 5: Neopatrimonialism and digital client politics: The use of big data in African electoral campaigns	69
<i>Zimkhitha Manyana</i>	
Introduction	69
Methodology	70
Big data and political micro-targeting	71
Digital campaigns	71
The impacts of digital campaigns	74
Neopatrimonialism and client politics	75
African presidential elections	77
Kenyan political dynamics	77
Political context	77
Kenyan presidential campaign of 2017	79
Senegalese political dynamics	80
Political context	80
Senegalese presidential campaign in 2019	81
Ugandan political dynamics	83
Political context	83
Ugandan presidential campaign in 2021	84
Discussion	85
Conclusion	86
Chapter 6: Googling and electoral cycles in the United States of America and South Africa: Mutual interests, big data and digital global citizenship	87
<i>Bhaso Ndzendze & Mancha J Sekgololo</i>	
Introduction	87
Literature	89
Methods	94
Election cycles in the USA and South Africa	94

Data	95
South African searches for USA presidential candidates	96
US searches for South African presidential frontrunner party leaders	98
Analysis	101
Towards 'global digital citizenship'	104
Conclusion	105

Part 3

Social and intellectual potentialities

Chapter 7: Humanising the Fourth Industrial Revolution: Graduate employability and the career paths of sociology postgraduate students at a South African higher education institution **109**

Pragna Rugunanan & Celine Meyers

Introduction	109
Literature review	111
Methodology	115
Results	116
Decision to pursue an honours degree in sociology	116
Value of sociology in the workplace	118
Preparing for a new technological future	120
Conclusion	121

Chapter 8: Extraditing the oral-based knowledge of indigenous games to the computational-based approach of the Fourth Industrial Revolution **123**

Thizwilondi J Madima, Pfarelo E Matshidze & Vhonani O Netshandama

Introduction	123
Sankofaism	126
Application of the theory in various studies	128
Implications for this study	129
Childhood, physical activity and movement practices	129
Play	130
Games	131
Synopsis on indigenous games	131
Digitising children's indigenous games: Prospects, complexities and controversies	133
Synopsis of challenges associated with digitising indigenous games	135
Possible tools for digital sharing indigenous games	137

Music	137
Roleplay	137
Graphics	137
Photography	137
Conclusion	138
Chapter 9: The holism of <i>ubuntu</i>: The missing link in Fourth Industrial Revolution-led environmental justice solutions	141
<i>Nombulelo T Shange</i>	
Introduction	141
Fourth Industrial Revolution and the South African context	142
Fourth Industrial Revolution and ecology	144
Holism of <i>ubuntu</i>	147
Mirroring sustainable traditional solutions supported by modern technology	151
Conclusion	153
Acknowledgement	155
Chapter 10: Collaborative efforts between universities and industries in South Africa amid the Fourth Industrial Revolution	157
<i>Bhaso Ndzendze, Asheel Singh & Suzall Timm</i>	
Introduction	157
Literature	158
The South African system of innovation	160
Higher education and patents in South Africa	162
Methods	163
Analysis of findings	164
Conclusion	169
References	171
Index	197

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Abbreviations and acronyms, figures and tables appearing in the text and notes

List of abbreviations and acronyms

1IR	First Industrial Revolution
2IR	Second Industrial Revolution
3IR	Third Industrial Revolution
4IR	Fourth Industrial Revolution
AAG	automatic article generator
ACME	African Center for Media Excellence
AI	artificial intelligence
AGI	artificial general intelligence
ANC	African National Congress
APR	Alliance for the Republic
ARIPO	African Regional Intellectual Property
BA	Bachelor of Arts degree; bachelor's degree
Bt	<i>Bacillus thuringiensis</i>
CDs	compact discs
CNN	<i>Cable News Network</i>
CORD	Coalition for Reform and Democracy
COVID-19	coronavirus disease 2019
CIPC	Companies and Intellectual Property Commission
CSIR	Council for Scientific and Industrial Research
DA	Democratic Alliance
DFRLab	Digital Forensic Research Lab
DHET	Department of Higher Education and Training
DNC	Democratic National Convention
DRC	Democratic Republic of the Congo
DSI	Department of Science and Innovation
DSP	digital student protest
DST	Department of Science and Technology
EC	Eastern Cape province
ELWCs	European (or 'europhone') languages of wider communication
GBV	gender-based violence

GRB	gender-responsive budgeting
GCI	Global Competitiveness Index
GDP	gross domestic product
GERD	government expenditure on research and development
GMO	genetically modified organism
GRPBMEAF	Gender Responsive Planning, Budgeting, Monitoring, Evaluation and Auditing Framework
HASS	humanities and social sciences
HE	higher education
HEI	higher education institution
HEIs	higher education institutions
Hons	Honours degree
HPA	Highveld Priority Area
IA	intelligent automation
ICB	inauthentic cooperative behaviour
ICT	information and communication technology
ILO	International Labour Organization
IOL	<i>Independent Online</i>
IoT	Internet of Things
IP	intellectual property
KZN	KwaZulu-Natal
MA	Master of Arts degree; master's degree
MENA	Middle East and North Africa
MMS	Media Monitoring System
NASA	National Aeronautics and Space Administration
NC	Northern Cape province
NDP	National Development Plan
NGOs	non-governmental organisations
NRM	National Resistance Movement
NSI	national system of innovation
NWU	North-West University
OAPI	Organisation Africaine de la Propriete Intellectuelle
OECD	Organization for Economic Co-operation and Development
PanSALB	Pan South African Language Board
PC4IR	Presidential Commission on the Fourth Industrial Revolution
PCT	Patent Cooperation Treaty
PhD	Doctor of Philosophy degree

PMT	political micro-targeting
PwC	PricewaterhouseCoopers
R&D	research and development
RISDP	Regional Indicative Strategic Development Plan
RNC	Republican National Convention
RPA	robotic process automation
RSA	Republic of South Africa
SADC	Southern African Development Community
SADiLaR	South African Centre for Digital Language Resources
SAWBI	South African Women’s Budget Initiative
SDGs	sustainable development goals
SoTL	scholarship of teaching and learning
SRCs	student representative councils
StatsSA	Statistics South Africa
STEM	science, technology, engineering and mathematics
SPSS	Statistical Packages of Social Sciences
TCP/IP	transmission control protocol/internet protocol
TSG	traditional sport and games
TV	television
UJ	University of Johannesburg
UN	United Nations
UNCRC	United Nations Convention on the Rights of the Child
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WC	Western Cape province
WEF	World Economic Forum
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

List of figures

Figure 2.1:	Google searches for paraphrasing tools, March 2020–June 2022, South Africa.	28
Figure 6.1:	South African Google searches for US presidential candidates, 2004.	96
Figure 6.2:	South African Google searches for US presidential candidates, 2008.	97

Figure 6.3: South African Google searches for US presidential candidates, 2012.	98
Figure 6.4: South African Google searches for US presidential candidates, 2016.	99
Figure 6.5: North American Google searches for South African frontrunner party leaders, 2004.	99
Figure 6.6: North American Google searches for South African frontrunner party leaders, 2009.	100
Figure 6.7: North American Google searches for South African frontrunner party leaders, 2014.	101
Figure 6.8: North American Google searches for South African frontrunner party leaders, 2019.	102
Figure 6.9: North American states with significant Google searches for South African frontrunner party leaders.	103
Figure 10.1: Capacity for innovation.	164
Figure 10.2: New patent applications in South Africa, 2011–2017.	165
Figure 10.3: University–industry research and development collaboration in South Africa.	166
Figure 10.4: Correlation between university–industry collaboration and new patent applications: Scores in the WEF Index from 2011 to 2017.	167

List of tables

Table 3.1: Two typologies to describe AI or science.	40
Table 3.2: Data Collection Instrument 1: Qualitative questionnaire.	42
Table 6.1: Internet penetration in South Africa and the USA, 2004–2016.	94
Table 10.1: South African patent applications.	166
Table 10.2: Top South African patent applicants, 2017–2019.	168

Preface

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■ Introduction

The Fourth Industrial Revolution (4IR) introduces a new frontier in technology advancement that incorporates physical, digital and biological worlds and is predicted to have an immediate and long-term impact on all disciplines, economic sectors and relationships, and even challenge ideas about what it means to be human. The basis of this transformation is a convergence of technologies such as artificial intelligence (AI), big data, the Internet of Things (IoT), additive manufacturing and blockchain, among others. These changes do not come about in a vacuum, however. Indeed, they are led by actors with vested interests and sometimes faulty records on facets such as ethical standards, reliable performance, inclusion and algorithmic bias. Since the early 2010s, the world has seen significant technological shifts centred explicitly on mobile technology and applications, driven by powerful – mostly American and Chinese – corporations, including IBM, Microsoft, Oracle, Alphabet/Google, Facebook/Meta, Huawei, Alibaba, Baidu, ByteDance and OpenAI, among others. Many of these are, in turn, staffed or led by personnel who have ‘revolving doors’ or direct links with powerful governments, militaries and academic communities. Moreover, many 4IR technologies have had downsides, such as when used in the service of cybercrime or election interference and manipulation, as well as algorithmic bias, among others. Additionally, the labour of the Global South, particularly African workers in the 4IR value chain, often goes unrecognised and unfairly compensated – amid the excitement over ChatGPT, for example, *Quartz* journalist Faustine Ngila revealed that the project’s final stages had been strongly reliant on the work of some 200 Kenyan workers, who were dismissed after its completion (Ngila 2023). In the wake of these technologies and their convergences, the nature and place of humanity itself are changing.

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The impacts are uneven and not globally distributed. For the Global South, concerns arise – particularly for sustainability, knowledge creation, agency and self-determination. Who designs, who produces and who benefits are central questions as they determine pathways of power and dependency in this new era. This presents both a challenge and an opportunity for the humanities and social sciences (HASS) in its constituent fields, as well as in its broader umbrella, to engage critically with these dynamics, to interrogate their ongoing impact and to participate in the imagining of better, more human-centred futures.

■ Towards a humanities and social sciences-centred historiography of technology and the Fourth Industrial Revolution

Many objects of humanities and social scientific study – minds, people, communities, political parties, states, etc. – are assumed to be immediately self-evidently relevant substances for enquiry for HASS scholars. But that is not always the case for technology, particularly in our South African scholarship. It often requires justification and caveats. But, as we will see, the question of technology is foundational to the humanities and social sciences. Innovation is socially regulated. Perhaps nowhere is this more evident than in the origins of ‘modernity’ in Europe, which in turn has shaped the rest of the world through colonisation and globalisation. Between the Dark Ages (traditionally placed as beginning in 529 CE) and the 15th century, there was almost nothing new in the world of science, then called natural philosophy, in Europe (Barzun et al. 2023). There was no innovation, as social life was dominated by religiosity. The Church controlled what books could contain, and any work that contradicted orthodoxy, particularly on questions of science, was banned and its writers persecuted (Barzun et al. 2023). George Orwell, in his 1941 essay ‘Literature and Totalitarianism’, juxtaposes reality against modern authoritarian regimes. At least, he says, in this period, there was predictability, so the banned ideas were consistently banned (Orwell [1941] 2020):

[...] there are several vital differences between totalitarianism and all orthodoxies of the past, either in Europe or in the East. The most important is that the orthodoxies of the past *didn't change*, or at least didn't change rapidly. In medieval Europe the Church dictated what you should believe, but at least it allowed you to retain the same beliefs from birth to death. It didn't tell you to believe one thing on Monday and another on Tuesday. (p. 9)

That is, there was uniformity, and people knew what to think and what not to think or say in order to stay on the good side of the regime, whereas, in modern dictatorships, we do not have this. Things are constantly changing through the technology of ideology. One of the permanent but incorrect

ideas of the Dark Ages in Europe was the notion that the sun revolved around the earth instead of the other way around. This was justified through theology: human beings were the centre of the universe because we were the centre of God's universe and his masterpiece creation. So, original thought was lost. And then, Greek philosophical thought was revived. Or, put differently, interest in the primary Greek sources became revived and accessible. Thanks to the Arabic world, the works of Plato, Aristotle, Hippocrates and others were rediscovered by Europeans, and eventually, this led to a Renaissance. But before then, they still had to go through a phase of acceptance.

This interest in original sources and empiricism was heightened by a number of events that occurred, including the actions of Martin Luther.¹ Luther was an innovator, in a sense, quite different from the other thinkers of his time. His action was a religious revolution, which had wider repercussions because of religion's permeating influence in every facet of life. He essentially broke the monopoly of the Roman Catholic Church. He was a monk who was unhappy with what he saw as the corruption of his faith and who, in 1517, protested by penning 90 complaints against corrupt practices within the Church and went on to preach his radical new message. This led to the birth of Protestantism. He also faced potential persecution, but he quickly garnered powerful supporters among the German princes who converted to his message and turned their backs on the Roman Catholic Church. What was this persuasive new message? He essentially taught that each individual's relationship with God is personal and encouraged everyone to think for themselves. One did not need the priest or the pope to mediate the meaning of God's message. He went on to translate the Bible into German and thus made it accessible to a wide range of people who ordinarily would not have been able even to have their own copies. He was able to do this, thanks particularly to the technology of the printing press then (presumably) invented by Johannes Guttenberg in 1455, possibly inspired by the *intaglio* techniques most commonly used by painters to mass-produce replicas. The message of Luther was further taken up by others, most prominently John Calvin. Calvin made the assertion that everyone is born with a pre-determined life or destiny that they cannot escape. His argument was quite philosophical: since God is all-knowing and all-powerful, there is no basis for anyone to change his mind, either through prayer or good deeds. This, according to sociologist Max Weber, paved the way for capitalism. He makes this argument in his book *The Protestant Ethic and the Spirit of Capitalism* (Weber 1904). Basically, everyone wanted to seem as though they were destined for good things in

1. For a discussion and overview of the life of Martin Luther and his impact, see The Editors of Encyclopaedia Britannica (2021).

the afterlife by appearing successful in this world. According to Pillay (2017):

The new doctrines stressed the necessity of doing well at one's earthly calling as the best way to please God, and emphasised diligence and hard work. These doctrines subsequently led to the spiritualising of economic processes. (p. 6)

It has also been suggested that this pursuit of Godliness led to the free-market liberalism that shapes modern economics (Rössner 2019). Basically, price controls up to then were deemed to be distortions of 'the truth'. Instead, the price ought to be determined by the free exchange of goods and services. This is called the just price principle, ironically safeguarded by the state machinery, which guarantees currencies, for example. We may thus consider the technology of the state and, indeed, conceptualise the state itself as a technology. We have discussed Luther's impact on the world of ideas, but it is important to also consider his impact on the physical world. Ideas are bound to produce action, after all, if they are far-reaching. Luther's idea, and the revolution in further ideas that came about, was the most far-reaching in modern Europe. The chief effect of Luther's ideas was to break up Europe's theological uniformity and political unity. There was no longer one Church. As a result, the continent was engulfed, over the subsequent 120 years, in wars of religion. The most famous (and the last) of these was the Thirty Years' War (1618–1648). The war gave the world the concept of the modern state in Europe through the Treaties of Westphalia, which codified the principle of sovereignty among leaders. Europe, finally at peace with itself for the time being, could be able to go out into the world and colonise. In international affairs, science has always been at the service of the state. As Steven Shapin put it in his seminal book *The Scientific Revolution* (1996):

The 'militarisation of science' is nothing qualitatively new in the twentieth century: practical studies of surveying and military fortifications were important branches of 'the mathematical sciences' in classical times; astronomy was always associated with the arts of navigation and long-distance political control, and it assumed even more importance in the great age of European expansion in the New World; the introduction of gunpowder meant that ballistics and metallurgy came to possess enormous significance to European states almost constantly at war with each other in the sixteenth and seventeenth centuries. (pp. 126–127)

Buitendag (2023, p. 6) argues that: '[F]rom the first complex societies, political rule had relied on technologies whether abstract (the law) or concrete (borders) to capture increasing energy yields'. In other words, the coincidence of scientific revolution, war, industrial revolution and colonial expansion was a predictable, and even inevitable, outcome. Conceived in these terms, it is evident that capitalist innovation is rooted in social and power relations.

Of all present technologies, perhaps none evince this more than the Internet. Half the world's population has used it at some point (Roser, Ritchie

& Ortiz-Ospina 2015). Yet, only a few decades ago, between 1969 and 1970, there were only ten devices connected to the Internet worldwide (Ball 2020). These were computers that were the size of a room and existed only in elite universities in the United States of America (USA) and the United Kingdom (UK), as well as in key departments in the United States (US) government, particularly the military – a fact we will return to. Then, by the close of the 1970s, there were about 100. In 1985, there were 1,000, and in 1987, there were roughly 100,000. In 1993, just four years later, there were 1 million computers in the world. Today, there are about 23 billion. A crucial date is important to interrogate: 1969. Firstly, to demonstrate the political origins of the Internet, and secondly, to demonstrate the precarious nature of the Internet and to draw out a philosophical point about innovation and capitalism.

On 21 October that year, the Internet was born, and it crashed almost immediately. The trial was meant to transmit the word ‘LOGIN’ from a mainframe at the University of California Los Angeles (UCLA) to another at Stanford. It could only transmit the first two letters before malfunctioning. Eventually, the trial succeeded. But why were the academics at UCLA and Stanford, many of them postgrad students, doing this? In short, they were doing it because the US military, through its research division, DARPA, told them to and gave them an offer they could not resist: US\$1 million to develop a networking system that would allow two or more computers to ‘speak’ to each other while still being able to perform other functions. The reason for this was so that they could enable efficient and resilient control of the American nuclear arsenal – in other words, to command and control it remotely – so that, if the USA were attacked, the government would still be able to have a means of relaying instructions and have second strike capabilities by sending ‘packets’ through TCP/IP (transmission control protocol/internet protocol) to different devices in distant locations. The US government was eager to do this because a little over ten years before, in 1957, the Soviet Union had launched Sputnik, the first satellite, which beamed signals detectable to many American homes through their radios. The US government, its president and Congress were thus in a panic and began investing heavily in any idea that had the potential to counter the Soviet Union technologically and militarily in the arms and space race that so defined the era. When considered in relation to history, ironically, we can understand why the Internet is so unsafe. It was intended for military purposes, but everyone working on it knew everyone else; so small was the epistemic community that it was assumed it would always be used among peers, and there was thus no need to make it secure. Only decades into its existence did security become a concern (Ball 2020, p. 36). Its creators did not envision its widened, near-egalitarian spread.

Herein emerges our perspective on the fundamental nature of capitalist innovation: it came about through a change in social ideas and went on to

forge competition among arbitrarily defined nation-states, with innovation often in the hands of private entities who were explicitly or implicitly at the service of their states, often to colonial and military ends. Moreover, capitalist innovation unleashes new problems, which it then portends to solve, rendering itself autopoietic. Industrial revolutions are thus impossible to understand outside of the methods and critiques that only HASS can bring to bear.

■ Literature: The Fourth Industrial Revolution and the humanities in South Africa and Africa

This book's constituent chapters will provide literature reviews in a contextualised fashion in relation to their areas of focus. Nevertheless, we provide an overview of the most recent works on the 4IR in Africa. Noting their immense contributions and identifying ways in which the present volume will extend the conversation.

In *The Fourth Industrial Revolution* (2017), Klaus Schwab introduced and popularised the concept of the 4IR. In this book, the World Economic Forum (WEF) founder and chairman contends that new narratives must be developed to guide humanity through the 4IR. The technologies that allow this transformation have the potential to radically alter how people work, communicate and live together. Clearly describing how technological developments are already disturbing the foundations of industry and society, it makes a strong case for the value of variety as a vital resource. A comprehensive and illuminating discussion outlining the many varied rewards and problems that humanity might expect as it progresses further into a new and unexpected wave of industrial growth permeates the text. This book is more than just an introduction to a muddled phrase; Schwab also aims to address the various social worries about industrial advancements, as well as outlines what can be done to guarantee that we make the most of this fascinating but mostly unknown new phenomenon. Its author makes recommendations, particularly on avoiding mass unemployability. Perhaps no other organisation has been more at the forefront of the propagation of the 4IR discourse than the WEF. In turn, the WEF's corporate ties are not lost on Sutherland (2019, n.p.), who argues that '4IR is not the result of careful historical analysis, rather it is a flag to rally and a rhetorical device for those trying to create particular economic and commercial futures, hoping to ride waves of Schumpeterian economic disruption caused by "extreme automation and extreme connectivity"'. Some scholarship on the 4IR, however, has sought to present the case for 4IR readiness, especially when it comes to education acquisition and future-oriented skilling.

Published three years before Sutherland's work, the book *Robot-Proof: Higher Education in the Age of Artificial Intelligence* by Joseph E Aoun (2017) has as one of its main contributions the suggestion of a method for educating the next generation of university students to develop, create and discover in order to address societal requirements that even the most powerful AI agents cannot. The same phenomenon is discussed in *The Fourth Education Revolution* by Anthony Seldon and Oladimeji Abidoye (2018), which significantly contributes to our understanding of the influence of 4IR, particularly AI, on education. In *Higher Education in the Era of the Fourth Industrial Revolution*, edited by Nancy W Gleason (2018), the contributors assert that in the 4IR age, the purpose of higher education is to assure the quality of learning in order to enable students to get the most up-to-date information through exploratory research. Other titles bearing mention for their contributions are discussed in turn.

These books offer interesting and vital pieces of academic work that tackle the broad phenomenon of the 4IR and its interface with higher education. However, there is not enough focus on appraising the opportunities for, as well as difficulties and challenges related with, Africa and the 4IR in the academic disciplines of HASS. In other words, these preceding works posit interpretations of the phenomenon from a global and universalist perspective, thereby not focusing sufficiently on HASS in South Africa and Africa.

There have been works with a discipline-specific focus on the 4IR, with works applying perspectives of their discipline, including ethics, sociology and politics. These works include *The Fourth Industrial Revolution and the Recolonisation of Africa: The Coloniality of Data* by Everisto Benyera (2021), *The Fourth Industrial Revolution: A Social Critique* edited by Trevor Ngwane and Malehoko Tshoedi (2021) and *African Values, Ethics, and Technology: Questions, Issues, and Approaches* by Beatrice Dedaa Okyere-Manu (2021). Each of these works presents an important contribution and has raised numerous fundamental questions that this book seeks to contribute to by answering and taking further issues of method, power dynamics, knowledge-creation and social trust, among others. This book also presents original insights across the wide spectrum of African HASS, tackling almost every discipline. In this work, we delve into such diverse fields as anthropology, political science, social work, journalism, sociology and linguistics. This book is also set apart by its pragmatic approach to the 4IR: it is neither idealistic nor pessimistic. Rather, the chapters present ways in which the 4IR is playing out and seek to enhance ways in which beneficial outcomes can be optimised and the downsides mitigated.

■ Overview of the book and contributions

This book addresses contemporary issues within the 4IR era and its interaction with the humanities and social sciences disciplines. This involves spotlighting conceptual debates and appraising social dynamics at the behest of new technologies in the hands of individuals or wielded by governments in South Africa and the broader Global South. This book thus assesses the prospects and challenges arising from the fourth industrial revolution from the perspectives of the humanities. Programmatically, this book aims to strengthen interdisciplinary approaches in providing robust academic research on contemporary issues.

Proceeding in three parts, we begin with an interrogation of what the 4IR 'is' – practically and in the context of South African social policy. This involves critical engagement with regard to the provenance of the idea of the 4IR itself, as well as shining a light on its arrival and empirical manifestation in the lives of South Africans, the loci of much of humanities research. This book proceeds, in Part 2, to a set of chapters whose investigations are concerned with understanding the 4IR from the vantage points of numerous HASS disciplines. Central to this second part is a critical evaluation of scholarly engagement with the 4IR. Part 3 investigates the emancipatory potentialities still to be derived from (critical) engagement. Throughout the second and third parts, this book explores themes applicable to the scholarship of teaching and learning (SoTL), as well as aspects of decolonisation and feminism.

Chapter 1 ('4IR and gender-responsive budgeting in South Africa: Policy challenges and alternatives') aims to assess the potential of gender-responsive budgeting (GRB) for engendering social change and supporting gender equality, especially the place of women in the 4IR. In this chapter, the contributors argue that GRB has the potential to strengthen accounting's set of constitutive values to challenge the seemingly neutral and genderless character of budgeting. The authors contribute to critical accounting and gender-in-accounting research by fleshing out this potential. They identify the features of GRB, its objectives and principles, provide a critique of existing GRB practices, and outline the role it can play in addressing the shortcomings we identify. So far, neither mainstream nor feminist accounting scholarship has contributed to the debate around GRB's development, implementation and support. In their view, this topic should be of interest to policymakers, academics, and practitioners because of the magnitude of the issues involved concerning budgeting and women.

Following that, the chapter looks at how gender-responsive budgeting can inform the gender sensitivity of policy on 4IR, enabling the inclusion of

women not just as second status but as active participants in the digital economy. Policy challenges and alternatives will be discussed to highlight the possible hindrance to executing the gender-responsive budgeting policy in South Africa.

Chapter 2 ('AI sword and shield: Implications for cybersecurity in South Africa') investigates and updates the discourse on universities' vulnerabilities due partly to remote learning. The findings indicate that AI is becoming a sword and shield, but more importantly, AI is weakening quality assurance, quality education and academic integrity. The use of AI to produce and paraphrase academic work obfuscates laziness, incompetence and criminality. Between 2020 and the cardinal six months into 2022, Google searches for 'paraphrasing tools' have seen a rise in South Africa. The year 2022 became the quintessential year, with 100 searches about plagiarism tools in both May and June. Based on these searches, AI is anathematic to academic integrity. South Africa has not witnessed the use of pedagogical websites for digital student protests. On the contrary, South African students are content to use social media sites for mass mobilisation, rather than protest during online lectures. The findings indicate the need for a human-AI interface in efforts to limit academic dishonesty. AI cannot be completely relied upon; human beings can provide the needed assiduity. AI-enhanced Invigilation apps, while capable of detecting some misconduct, cannot be considered a panacea. The shortfalls in AI justify the AI-Human interface in academic settings against academic dishonesty.

Chapter 3 ('[Mis]trust in the news media's anthropomorphic framing of AI technologies in the [future] world of work: Perceptions of humanities students in South Africa'), utilising framing theory that is premised on the notion that how realities are framed influences how individuals conceive of them, describes a small-scale exploratory study aimed at examining postgraduate humanities students' perceptions of AI and its place in the world of work. How laypeople view AI is predominantly shaped by fictional narratives or (popular) media, and so the study undertaken examined one tertiary institution's (applied) linguistics and literary/cultural studies students' reflections on three articles published by South African news outlets that reported on AI-enabled technologies' capacities. Since all three news articles attributed human cognition and human traits to AI, it was deemed important to determine how anthropomorphic framing may mould the attitudes of students who have little or no understanding of AI technologies. Identifying students' perceptions of anthropomorphic AI is key to gaining insights into the extent to which they (mis)trust AI's role in the workplace and either exaggerate or understate its capabilities. Challenging skewed perceptions and demystifying unrealistic expectations should go some way to preparing South African humanities graduates for workplace ecosystems in which AI is becoming ubiquitous. The study was guided by two specific research

questions: 'What are postgraduate humanities students' general perceptions of AI and of its place in the world of work?' and 'How do journalists' conceptualisations of AI in anthropomorphic terms influence how students imagine AI futures in the workplace?'

Chapter 4 ('Inequalities in South African Indigenous Languages During the Fourth Industrial Revolution [4IR]') adopts a non-empirical research design: a systematic review to explore linguistic inequality and propose solutions to bridge linguistic inequality amid 4IR in South Africa. To support the study, grounded theory was used. Journal articles, books, dissertations, conference papers, organisational reports and presentations were used to collect data for the study. As a result, descriptive analysis was used to analyse the collected data. According to the findings, South African indigenous language speakers can create and feed technological gadgets, applications and services to fit into the global space of the 4IR. For instance, the occupation of the YouTube digital platform through the creation of channels is one method used by South African indigenous language speakers to populate digital content in their respective languages. Therefore, the study recommends that the government, in collaboration with language organisations such as the South African Centre for Digital Language Resources (SADiLaR), language experts, human language technology researchers, policymakers and information and communications technology (ICT) companies, implement strategies to bridge linguistic inequality in South Africa through 4IR.

Chapter 5 ('Neopatrimonialism and digital client politics: The use of big data in African electoral campaigns') observes that political parties are increasingly relying on data analytics to profile the public and provide targeted advertising to certain voting groups based on their demographic criteria and political concerns. Political micro-targeting has emerged as a significant role in contemporary campaigns because of its ability to influence public opinion, mobilise allies and turn out voters. Recent research has shown that African countries have not been left behind in the wake of this upsurge. The aim of this chapter was to investigate the consequences of neopatrimonialism as an agent of digital client politics in the context of the usage of big data during digital campaigning and marketing in the African context. This chapter focuses on three recent presidential campaigns that have used big data techniques in Africa. The Kenyan presidential election in 2017, the Senegalese presidential election in 2019 and the Ugandan general elections in 2021. The findings suggest that the likelihood of data being a strong weapon that will be abused cannot be completely ruled out, especially in nations with neo-patrimonial renters as clients. Neopatrimonialism has the potential to redirect public resources to benefit private interests rather than the common good. In neo-patrimonial regimes,

resource distribution is always driven by the patron's desire to maintain electoral success.

Chapter 6 ('Googling and electoral cycles in the United States and South Africa: Mutual interests, big data and digital global citizenship') traces online queries over the 2004–2019 period for American major party (Democratic or Republican) presidential frontrunners in the United States of America (USA) and for South African ANC party leaders (qua presidential frontrunners) and incumbents *vis-à-vis* their opponents. Findings indicated growth in search volumes for each successive winner by South Africans, from Bush to Obama to Trump. However, searches in the US for South African presidential candidates or party leaders grew from Mbeki to Zuma but declined for Ramaphosa, with a third-party candidate unprecedentedly garnering a higher proportion of searches than the eventual winner in sixteen states, whereas the previous two ANC leaders had registered at least 96% in all 50 states. We develop a theoretical framework of 'digital global citizenship', drawing from the original findings and synthesising it with literature on the digitalisation of politics, hegemony and diasporas.

Opening up Part 3 of the book, Chapter 7 ('Humanising the 4IR: Graduate employability and the career paths of sociology postgraduate students at a South African higher education institution') observes that graduate unemployment is a rising concern in South Africa and that graduates tend to experience obstacles during the employment phase largely due to the lack of required labour market skills. While the 4IR is perceived to promote unemployment for soft-skilled professions, it is widely applauded by highly skilled technological careers. Given the broad career and employment possibilities in sociology, this chapter aims to provide an understanding of the experiences of former sociology students with a postgraduate qualification in the labour market.

This chapter had a two-pronged approach, reviewing the biographical data of sociology students embarking on their honours degree in sociology in 2019 and 2020 and juxtaposing this against the career paths of sociology alumni between 2013 and 2019 at a South African higher education institution. Data were collected qualitatively through emailed questionnaires. Research participants included new entrants into the honours programme, unemployed graduates or recently employed graduates. The findings reveal important insights into (1) reasons for choosing to do an honours degree in sociology, (2) career aspirations and career paths of sociology alumni, (3) the value of an honours degree in sociology in increasing the likelihood of finding employment and (4) their level of preparedness for technological aspects required in their current employment. The findings contribute to a better understanding of the skills needed to better prepare future sociology

students for the 4IR and how this may advance youth employment in South Africa. In discussing ways to humanise the 4IR, this chapter contributes to work that seeks to theorise how 'pathways' to employment could be improved by acquiring a sociology degree.

Chapter 8 ('Extraditing the oral-based knowledge of indigenous games to the computational-based approach of the 4IR') begins by recalling that, in pre-colonial Africa, children would learn values by being apprentices and understudies to communal elders who would teach them games that had moral significance. Without diminishing the role of elders, relationships and particularly the corpus in the transmission of knowledge, it is the central argument of this study that digitisation can be used alongside traditional methods of knowledge transmission and preservation to fill the deficit in a social environment where knowledge on cultural practices is diminishing.

Modernisation is here, and it cannot be done away with. However, this study is not meant to entirely oust Westernised and Eurocentric physical activities but rather to position Africa at the centre of defining and shaping its own discourses by purposively using technology to package, frame and disseminate its forms of cultural heritage. The moment one speaks of digitisation inherently implied in the same term are issues of affordability, electricity, technical know-how and other imperatives that are needed for its implementation to be effective, and yet, they are scarce in marginalised segments of society, a fact that cannot be wished away. The study's objective would be to identify the challenges that are associated with the digital space in the preservation of traditional children's games. Adults and youth from the University of Venda were sampled in this study. Semi-structured and WhatsApp interviews were employed and analysed thematically. This study found that the digital divide and de-contextualisation are matters of concern.

Chapter 9 ('The holism of ubuntu: The missing link in 4IR led environmental justice solutions') discusses the exclusion of important African indigenous knowledge systems in important social change like 4IR and climate mitigation strategies. It highlights the importance of centring African knowledge systems like the creation of energy through biogas, an old practice still used by rural African women in parts of the Eastern Cape, South Africa, and all over the African continent. This chapter suggests that strategies such as these, wherein the true custodians of the knowledge are not alienated from the process, would not only address the climate crisis but also ensure the active production of African knowledge in important innovation within 4IR. Strategies like this would result in the kind of holistic change we do not find in the blind adoption of Western-led energy solutions. It can potentially elevate African sciences and empower the women who collectively share this knowledge while creating important

industries that, in some ways, address even South Africa's unemployment challenges. This discussion will be supported by Mogobe Ramose and Puleng LenkaBula's theorising on *ubuntu* and ecology, which highlights the much-needed holism of *ubuntu* in climate solutions.

Chapter 10 ('Collaborative efforts between universities and industries in South Africa amid the Fourth Industrial Revolution (4IR)') utilises three WEF Global Competitiveness Index (GCI) scores over the 2009–2017 period to review the extent of university-industry collaboration in South Africa, and what implications it has had for the country's innovation, measured through registered patents. The findings indicate a lacklustre university-industry collaboration despite growth in both the country's perceived importance of the capacity for innovation and patents filed annually. This is changing gradually as, interestingly, all stakeholders (government, business and higher education) are dissatisfied with the current direction of this collaboration. This chapter makes recommendations on how the country's innovation ecosystem can be improved and what the humanities and social sciences can contribute to such efforts.

■ Conclusion

Taken together, the chapters in this book present an opportunity for reflection on research methodology and its implications for the study of 4IR in humanities. Most importantly, it provides insights into the value of qualitative and quantitative research approaches for unpacking 4IR in a specific context. The qualitative studies in the book shed light on the experiences and the meaning-making process in research (Creswell & Creswell 2023). Quantitative studies in the book tested the relationship between variables (Creswell & Creswell 2023) and provided suggestions for future research. While the intention here is not to put the two at odds, there are limitations of studies that are more quantitative and studies that are more qualitative in nature. For this reason, future studies on 4IR and humanities can benefit from a mixed method research approach (also highlighted in Chapter 8). A mixed method research approach has the potential for developing a comprehensive analysis of the contradictions (Creswell & Creswell 2023), complexities and potentialities that this research may offer not only in academia but also in the broader society.

The general point is that the humanities and social sciences must continue to adapt and evolve. With ever-decreasing funding and departmental closures, the decades-long concern about the continued existence of the humanities and social sciences shows no sign of abating. Trading notes, as it were, between the various HASS disciplines, venturing

out of our silos – such measures are called for by the age. The virtues of academic openness and intellectual courage transcend disciplines. As their bearers, we, too, must be open and valiant enough to regather in the agora, like our philosophical forebears, and rigorously discuss the brave new world that is fast approaching.

As this book evinces, vital contributions can and must be made by HASS scholars in order to ensure that the coming technological shifts are appropriately understood, directed, and, indeed, tempered. A precautionary approach often appears to be anathema to the techno-optimists driving the 4IR, but the posited benefits to humanity of this new technological age cannot be taken on faith. As is so often the case, HASS scholars must be the voice of reason and advocate for the inviolable dignity of human beings. In this ongoing conversation, more voices from Africa may be heard; we hope that this book is an indication of the fruitful dialogue that will continue to emerge from this part of the world.

Part 1

**What it is: The Fourth
Industrial Revolution in
social practice**

Fourth Industrial Revolution and gender-responsive budgeting in South Africa: Policy challenges and alternatives

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■ Introduction

Gender-responsive budgeting (GRB) is becoming a necessary instrument that the government needs to employ to engender gender equality across all spheres of society. Pledging to erase the gender gap is not enough, as implementing active instruments to correct gender inequalities is the right step. This need is why several countries embrace active instruments in their fight against gender inequality, such as gender mainstreaming as a targeted measure to achieve this. Weaponising gender mainstreaming enables the government and relevant stakeholders in society to direct specific

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instruments towards addressing the gender imbalance across all spheres and to dedicate resources to ensuring the success of such policy. Gender budgeting, which falls under the gender mainstreaming strategy, allows for the equitable allocation of resources based on gender. It is one of the numerous instruments often used to actualise gender mainstreaming, primarily within the government's fiscal policy. It deals with allocating resources to address the gender imbalance within society.

Technological space is one of the many spheres within which GRB can be used. Looking at the gradual popularity of the Fourth Industrial Revolution (4IR), 4IR signals the movement from previous technological developments to more advanced ones like artificial intelligence, big data, the Internet of Things (IoT) and other innovations. Interestingly, as with other spheres, women have historically been excluded and underrepresented in technology, with most technological innovations and substantive professions dominated by men. The science, technology, engineering and mathematics (STEM) sector that informs these innovations has more men than women, resulting from gendered norms of the kind of professions men and women can engage in. With this gendered narrative, women often do not venture into STEM-related studies, which invariably affects their participation in related professions.

Drawing from the above, South Africa as a country is not immune to this reality, as there are more men than women engaging in the technological space. The question then is, how do we resolve this gender imbalance considering the gradual popularity of the 4IR? We cannot have gender inequality in the First (1IR), Second (2IR) and Third (3IR) Industrial Revolutions. Yet, we are about to venture into the 4IR with no workable actions or policy to avert this. Gender mainstreaming-cum-GRB can be focused on to aid in strategically including women as participants in the 4IR. It is based on this that this chapter intends to look at the 4IR and how GRB can be used to correct the gender imbalance inherent within that space. The chapter looks at the potential GRB offers in balancing gender inequalities in the 4IR. It further explores the policy on digital economy and 4IR by the South African government and how they intend to ensure the inclusion of women in the sphere using GRB. We ask if there are any policies targeted towards this goal and what are the various policy actions that will correct the low participation of women in the 4IR. By examining these efforts by the government, there can be a discussion on the policy challenges that bedevil such efforts at employing GRB to ensure the increased participation of women in the 4IR. By identifying the policy challenges, this work will recommend alternatives that will consolidate the current policy to ensure that the inclusion of women in the 4IR is achieved through GRB and gender mainstreaming strategy.

Research needs to be carried out to document the efforts that the government and other relevant stakeholders are making to ensure that women are not seen as benchwarmers and to investigate if the policy on GRB in South Africa is suitable enough to respond to the exclusion of women in the 4IR and achieve an equitable representation of women. This chapter will start by understanding South Africa's stance on women in the 4IR. It stems from recognising the minimal space women currently hold in the tech space; it then highlights the government's reaction and pledges to improve the situation. This chapter examines GRB, what it is about, how it works and other issues to establish that there is an instrument that can be used to carry women along in the 4IR. This chapter will discuss how GRB can be used to enable the increased inclusion of women in the 4IR. Policy challenges and alternatives will be looked at to determine obstacles limiting the potential of GRB working to include women in the 4IR and what alternatives exist to mitigate this.

■ South Africa's stance on women in the Fourth Industrial Revolution

With the advent of the 4IR, South Africa has entered a new era of technology that is bringing about the changing nature of work and new modes of living (Chauke 2022, p. 1). During the 4IR, gender inequality has not been as important and, therefore, has been overlooked. Little attention is paid to the pervasive low participation of women in STEM-related jobs and the eradication of gender inequality in the technology space. Women are vastly underrepresented in STEM, which forms the basis of the 4IR (University of Johannesburg 2021). UNESCO (2019) noted that less than 30% of the researchers working in STEM are women, and South Africa is no different. The studies on the 4IR in South Africa concerning women are structured in a manner that identifies a gap in 4IR perception in the country. General discourse on technology and the 4IR often do not include women's significant role, adversely affecting the recommendations for further development.

PricewaterhouseCoopers (PwC) reports that only 19% of jobs related to information and communications technology (ICT) are held by women (Chauke 2022, p. 1). The lower number of women working in the ICT sector is a result of the extreme inequality in access to job opportunities within this sector. Compared to their male colleagues, women in this industry currently earn lower incomes. According to Malinga (2022), there is a gender pay gap and gender inequality in the ICT industry, with women in the sector earning up to 25% less than men. As a result, the gender divide will continue to widen in 4IR unless appropriate measures are taken to adopt sustainable

digital policies relating to gender. Speaking on the importance of 4IR on the economy, South African President Cyril Ramaphosa states, 'South Africa must be a technologically driven country that finds solutions that move us forward, with 4IR as a pivot for economic recovery' (cited in Chauke 2022, p. 1). In addition, he stated that while women have made progress towards equality in sectors like the government and the legal system, it has been challenging for them to obtain equal opportunities in the digital economy. In South Africa, women are no longer producing technology; instead, they are becoming consumers. Today, women must embrace technology and develop tech-related abilities to function as important makers of technologies. To incorporate women into the national technological innovation process, the ICT sector must play a significant role in this. The government of South Africa hopes to have completely realised the promise of technological innovation to boost its economy and improve the lives of its citizens by 2030 (Brookings Institution 2020). To actualise the creation of a comprehensive national response plan, the president formed the Presidential Commission on the Fourth Industrial Revolution.

One question that comes up when reading about the 4IR in South Africa, its pillars and the recommendations is, 'Where do women fit in all this?' This question comes after reading the report from the 4IR commission, which dates back to 2020. Firstly, the commission acknowledges the inequality in the country, that there are more women than men in the country and that women's life expectancy is generally longer than that of men (Republic of South Africa [RSA] 2020a). The challenge is that despite acknowledging inequality in this country, which largely stems from gender lines (Matotoka & Odeku 2021), there is little said about how the 4IR will improve women's position in society or at least include them in various ways. This is alarming because factors such as gender stereotyping, digital illiteracy, inaccessibility to data and discrimination have confirmed digital exclusion in the country. Also, finding information on women related to the 4IR in South Africa on the Internet is not easy. There is no clear indication of where women fit into all this or the government's approach concerning women. This is an indication that needs to be clear, considering the vulnerability of women in this instance. This is further alarming as women have already been left out in various platforms in 'professional' South Africa, including managerial positions (Matotoka & Odeku 2021). Furthermore, even the fact that this work attempts to justify why women should be included is a fundamental problem. It demonstrates how society has been gendered and how that has been accepted as a norm.

There are concerns that work primarily done by women will be among the first to be automated, and the 4IR might make gender inequalities worse. On the contrary, 4IR offers incredible benefits and is likely to improve the quality of life of people, women included (Chiweshe 2019, p. 3).

Nevertheless, threats are inevitable. Jobs within these industries are undergoing a transformation, becoming more decentralised and diverse. This shift in employment dynamics raises concerns about instability, particularly for women. For instance, the increasing fragmentation of work, marked by heightened competition for individual tasks, poses a potential threat to the strides made by women in securing continued employment through paid maternity leave. In many parts of Africa, women face challenges in owning assets such as houses and cars, which are essential for active participation in emerging shared economies. Prevailing patriarchal norms and practices have primarily marginalised women, especially in terms of ownership of productive assets like land, as highlighted by Chiweshe (2019). However, the technological advancements of the 4IR present specific opportunities to enhance the quality of life for women across the African continent.

Furthermore, the gendering of STEM could be another reason why it seems as though women are left out in the 4IR or why there are no visible policies on the place of women in the 4IR. Studies demonstrate that women remain underrepresented in the sector, with only 23% of women visible in core STEM occupations (Chiweshe 2019). Findings also indicate that only 13% of STEM graduates in South Africa are women (SkillsPortal 2022). It is argued that women are underrepresented in the top ten global tech companies and only hold 28% of the managerial positions therein (Letsebe 2018). This underrepresentation of women in this field in South Africa seems to have been institutionalised; hence, it is unsurprising that women are not visible in conversations around the 4IR in South Africa. What is alarming is the consequence of this, that we are growing and creating a future that has perpetuated the exclusion of women.

It is not about only thinking of women in STEM but also how women can be involved in this digital advancement to ensure that they are not disadvantaged more than they are right now and remain employable. Research has demonstrated that the existing gender gap in South Africa means that women will be left out of digital work opportunities, as jobs at the greatest risk of being replaced by automation are those that women have traditionally occupied (Adams 2021). This is once again alarming as this could potentially harm many women, particularly black women in South Africa. The leaving out of women raises concerns about the continued perpetuation of the inequality (socio-economic and gender) that exists and puts women at risk of harm, like gender-based violence. This is of interest as research has demonstrated that gender inequality is a leading cause of violence against women (Nyoka 2022). These consequences are a big problem in a country like South Africa, where gender-based violence is rife, with an average of 123 cases per day reported between October and December 2021 (Nyoka 2022).

■ Gender-responsive budgeting

Gender budgeting came into being in the international context of economic globalisation; efforts at gender equality used this approach to respond to the ongoing restructurings and imposed structural adjustment programmes to reduce public tasks. Quinn (2009) defined it as a gender-based assessment of budgets, incorporating a gender perspective at all levels of the budgetary process and restructuring revenues and expenditures to promote gender equality. Gender-responsive budgeting is an initiative that uses fiscal policy and administration to address gender inequality and women's advancement (Stotsky 2016, p. 1). These initiatives believe that gender equality can be promoted by influencing gender budgeting (International Labour Organization [ILO] 2006). Gender-responsive budgeting aims to promote accountability and transparency in fiscal planning, advance gender equality and women's rights, and increase gender-responsive participation in the budgeting process (European Institute for Gender Equality n.d.). When funds are distributed in a way that ensures gender parity and promotes equal opportunity for everyone, a gender-responsive budget will benefit all females and males, adults and children alike (Stephenson 2018). Analysing government budgets for their impact on various genders, as well as the norms and roles that go along with them and the interactions between them, is a crucial part of GRB, which is necessary for both fiscal and gender justice (Stephenson 2018). It also entails changing these budgets to guarantee that promises made on gender equality are fulfilled. Gender-responsive budgeting can take many forms and governments can carry it out locally or nationally. Parliamentarians and civil society organisations can play an essential role in putting pressure on the government to carry out GRB by performing the necessary oversight functions. Gender-responsive budgeting involves considering the gender impact at all stages of the budget process for gender to be reflected in budget decisions. The gender budgeting process does not aim at gender equality directly but operates to prioritise resource policies (Downes, Von Trapp & Nicol 2017). This is because the participation of men and women in public decision-making is dependent on the distribution of resources in a society, which also informs their social status. Gender-responsive benefits are that it creates greater transparency regarding the criteria that form the basis for budget-related political decisions. It facilitates increased accuracy and sustainability because funds are more precisely tailored to the real needs of the different social groups. This approach aims to expedite the institutional change necessary to eradicate the systemic disparity that exists between men and women. Its focus is on the whole budget, making sure that every facet of the budget and the ensuing expenditure or usage of resources benefit both men and women equally. It starts with the idea

that the current budgets are gender biased in favour of males and works to change this reality so that females and males can gain equally.

UN Women (2015) argued that:

[G]ender-responsive budgeting is not about creating separate budgets for women or increasing spending on women's programmes. Instead, it seeks to ensure that the collection and allocation of public resources are carried out in ways that are effective and contribute to advancing gender equality and women's empowerment. (p. 1)

This budgeting is essential, particularly in countries like South Africa, with high inequality levels based on gender lines; for instance, close to 42% of women live below the lower-bound poverty line, compared to 38% of men (Statistics South Africa 2015). Gender mainstreaming that includes GRB has become mandatory under various international instruments binding on South Africa.

Australia pioneered attempts at gender budgeting from 1984 onwards in response to calls from women's rights activists. Over the past decade, more than 90 countries have experimented with some form of gender budgeting (Downes et al. 2017). While Australia was the first country to attempt these gender-responsive budget initiatives in the 1980s through the Women's Budget Statements (ILO 2006), South African women have also been fighting for this type of equality for a considerable amount of time. This has taken place through adapting the South African Women's Budget Initiative (SAWBI) in 1995, which was also modelled based on the Australian version (Commission for Gender Equality 2021). This initiative aimed to be intentional about the inclusion of gender into government budgets; this was done so that gender would be a priority in government and budgets and not something that was side-lined (Commission for Gender Equality 2021).

Despite the failure of the SAWBI, the South African government showed interest in GRB by approving the Gender Responsive Planning, Budgeting, Monitoring, Evaluation and Auditing Framework, and Country Gender Indicator Framework in 2018. This framework recognises that a number of the policies for women are outdated, such as (Department of Women Youth and People with Disabilities 2018, p. 5):

- the South African policy framework for women's empowerment and gender equality, which dates back to 2000
- that South Africa has experienced a regression in gender mainstreaming, a consequence of which is the reinforcement of existing gender inequality and norms
- that there is very little evidence of gender mainstreaming in practice across the country.

This shows that very little work may have been done since the failure of the SAWBI. Furthermore, there is little accountability in the responsible organisations, and not much work is being done to ensure that GRB is prioritised in South Africa.

Lastly, this report is further accompanied by the country's goals and strategy concerning GRB. The short-term goal would be to focus on gender mainstreaming within existing government-wide planning, monitoring and evaluation systems and institutions (DWYPD 2018). The medium-term goals would last until 2024 and are also in line with the National Development Plan (NDP). These goals involve a change in legislature, evidence-based diagnostics and a gender audit of the government, as well as the development of an implementation plan and a monitoring and evaluation plan (DWYPD 2018). Lastly, the development of a gender indicator framework is based on an overall theory of change, where programme outcomes would contribute towards gender outcomes and lead to this impact at the country level (DWYPD 2018).

■ Fourth Industrial Revolution gender budgeting and South Africa's response

The 4IR will impact all aspects of society, yet little attention has been paid to how these developments will affect women. The technological advancements of this era include biotechnology, artificial intelligence and the IoT. The advances shape cities, government systems, social relations, media and the economy. The determining factor of the revolution is to make life easier and better for all. The world of science and technology is male-dominated and rides on the back of unpaid labour, which is likely increasing in an environment where women have little access to the Internet and technology (Adams 2019). The phrase 'digital divide' was created to characterise the disparity in access to technology, particularly ICT, that results from a divide between those who have and do not have access to information (Mulrean 2020). The lack of female representation in STEM is one of the biggest barriers for South African women to pursue a career in such subjects. Women are generally underrepresented in the STEM field, which has negative consequences for ensuring gender parity in the digital economy. A report by the International Development Research Centre (2019) noted that no African country is ready to reap the full benefits of artificial intelligence (AI) and that women run the risk of being left behind by advances in AI (Mulrean 2020). The World Economic Forum (WEF) (2018) stated that data science and AI are part of eight professional clusters forming part of the new economy; however, women only represent 26% of that cluster. As demands continue to rise for individuals with machine learning and data science skills, the nature and quality of women's career prospects are shifting.

Consequently, they run the risk of being negatively impacted (WEF 2019). Artificial intelligence has a gender bias in personal assistants like Siri, and these concerns may impact South African women's livelihoods (Adams 2021). The difficulties women encounter in achieving digital inclusion reflect the pervasive gender inequality in the real world. While technology and digitalisation provide women and girls many opportunities, they can also exacerbate gender-based inequality. The 2030 sustainable development goals (SDGs) are an international acknowledgement of the role that gender equality and ICTs play in advancing sustainable development on a global scale. According to a 2017 survey, women in South Africa are closer to parity when it comes to Internet usage, with 50% of them compared to 57% of men (Mulrean 2020). Compared to other African countries, South African women have the highest degree of Internet access. Considering the high unemployment rate in South Africa and the existing lack of talent with digital skills, enhancing women's digital fluency can have a big impact on economic growth. Gender-responsive budgeting and legislation can address gender bias and discrimination in the 4IR. Gender-responsive budgeting is a step towards accountability for women's underrepresentation in the technology sector and towards greater public transparency and can shift economic policies to increase the role of females in the 4IR. There is a renewed push to build GRB and planning within the broader public policy cycle because of the realisation of the gender gap in the country. The cabinet approved the gender-responsive planning, budgeting, monitoring, evaluation and auditing framework (GRPBMEAF) in 2019 to ensure the formalisation of the country's strategy (Clifton et al. 2021). In addition to mandating the National Treasury to take the lead in this policy, this framework encourages the advancement of GRB.

In 2019, a Presidential Commission was established to guide policy response to the 4IR. White Paper was then published by the Department of Science and Innovation, outlining the state's trajectory during the 4IR. The department contends that the 2019 White Paper's main aim is to encourage and enable scientific and technological innovation for an inclusive and sustainable South Africa. President Ramaphosa stated that one million people will be trained in data science and related skills by 2030, albeit policy conditions that are neither conducive nor inclusive of digital reskilling by neglecting the lived experiences of women and other marginalised groups as the difference in access to digital technology (Devdiscourse 2019).

The policy is meant to address the issues of unemployment, inequality and poverty as outlined by the NDP of 2013; however, Gillward (2019) contended that eradicating the triple threat is impossible without an intersectional understanding of the group within which development is sought. Gillward (2019) further postulated that technological transfers

without a localised understanding of communities, value systems and social roles would result in increased workloads, subordinate positions within the family and a loss of rights to resources for South African women. South Africa is ranked highest in gender-based violence, and there is a link between the societal treatment of women and socio-cultural-technological phenomena and how world views and relationships are structured.

Hildebrandt (2015) argued that technology reinforces cultural myths through virtual assistants (e.g. Siri), whereby women are commanded to be submissive and their place and role in society are delimited and subjugated (Adams & Loidean 2019). According to James et al. (2006), managerial positions in ICT are male-dominated. The *Employment Equity Act 55 of 1998* was promulgated to address historical and systemic discrimination in the workplace; 24 years later, females, especially black females, are lagging and disproportionately underrepresented in both the public and corporate sectors (Matotoka & Odeku 2021).

The NDP identifies digital transformation as a critical feature in transforming South Africa into a more digital society. The pillars are divided into three, and digital access outlines the right to digital access by all citizens as well as the potential for a better quality of life using ICT (National Planning Commission 2017). Additionally, digital inclusion is mandated to ensure no exclusion from the benefits of a digital economy and knowledge.

Implementing these reforms has been delayed; thereby, women are still saturated in routinised work and secretarial positions in the digital market, as outlined by Matotoka and Odeku (2020). Antonio and Tuffley (2014) posited that women in developing countries are not placed to benefit from knowledge and technology because they have little access to scientific and technical education. The Worldwide Web Foundation (2015) reported that women lack confidence in accessing online resources and education. There is a direct correlation between access to ICT and social development (Esselaar et al. 2010, p. 23). With a feminised poverty rate of 71% in South Africa, the objectives of the 2017 NDP are far from being realised (National Planning Commission 2017). The 4IR's technological advancements present unique chances to raise women's standards of living throughout Africa. With more equipment at home and in the office being connected to the Internet, women may now work from home and set their own hours, improving their work-life balance. This is made possible by the IoT. Connectivity will also give professional African women in metropolitan areas access to resources for education and mentoring, which will help them become more marketable and skilled. Research indicates that educating women in STEM fields early in life and providing them with sufficient preparation for the job can lead to increased opportunities for

economic growth and development. For women who lose their employment to automation, there are options for retraining programmes. These strategies ought to concentrate on combining sectors like renewable energy and encouraging female entrepreneurs, particularly in rural areas.

South Africa created commissions on the 4IR in response to the World Economic Forum 2018 report, emphasising the need to become future-ready. However, gender was not central in setting up the commission, but there is scope to advocate for gender mainstreaming in its actualisation. Chiweshe (2019, p. 3) argued that in the 4IR, the assumption is that computer programmes are bias-free and algorithms can reduce the influence of gender, race or any factors that may affect how people are evaluated. However, these programmes are created by humans with an in-built gender bias in their language or indicators, which may perpetuate inequalities. This is why it is essential to make extra effort to ensure that these biases are prevented at the root. The sociocultural structures that support gender inequality and women's exclusion in Africa have not changed to keep up with technological progress. Since women still do not have equal access to resources like land, credit or technology, there is a risk that these new technologies would further reinforce patriarchal inequities. Because women's exclusion from the workforce was largely replicated by earlier industrialisation processes in Africa, which resulted in their being assigned to low-paying jobs and further entrenching their underrepresentation, Bhatasara and Chirimambowa (2018, pp. 23–28) noted that the 4IR is likely to perpetuate the structural inequality.

■ Policy challenges

South Africa's policy on GRB is still encountering several challenges hindering its actualisation, specifically regarding how it can help ensure the inclusion of women in the 4IR. Some of these challenges will be discussed to help understand what the problem is and what solutions there are.

There is a lack of aggregated data to assist in reviewing and analysing the entire planning and budgeting process (Department of Women, Youth and Persons with Disabilities 2018, p. 5). When instituting GRB, necessary and up-to-date data regarding the number of females excluded are needed and disaggregated based on demography. This ensures that the relevant department possesses all the required information to make accurate and informed decisions. Most notably, during the analysis and budget planning process, these data will feed the approach to addressing the problem and how resources should be allocated based on the data collected. However, without such detailed data, GRB will not be possible. Data are crucial in implementing policy because it is based on the collected data, ensuring that the authorities can understand how and where to focus.

Lack of adequate formulation, allocation and expenditure of budgets results in the exclusion of females in planning and budgeting processes that hold potential developmental opportunities for women (Department of Women, Youth and Persons with Disabilities 2018, p. 5). A primary principle of gender budgeting is that the fiscal budget can be used as a strategy to cater equitably for the needs of marginalised groups, in this case females. Thus, drafting the budget and carrying it out must be guided to ensure that the intention is fulfilled. If women were considered in formulating a budget to ensure that they are catered for and resources have been highlighted towards this end, it would be problematic if this is not executed. It becomes a huge problem when the government pledges that it will formulate and implement a gender-responsive budget. Still, in the actual allocation of the budget, the needs of women are not targeted and the resources are not equitably allocated for the identified problem. What happens is that there will be no improvement to the problem as the proposed resources needed to drive the solution have not been actualised.

A lack of necessary gender-aware indicators to inform the relevant inputs, outputs and outcomes of plans and budgets (i.e. having equity as an explicit performance indicator) (Department of Women, Youth and Persons with Disabilities 2018) would make it impossible to ascertain the extent to which the approach has been successful. Therefore, it is essential for there to be gender-conscious indicators that guide the monitoring and evaluation process. When measuring the success of a policy, relevant indicators must be stated; in this case, equity must be outlined as an indicator to look out where the budget was equitably allocated and how it was able to address the intended problem. This challenge points to a lack of adequate policy formulation because when formulating the question of what the outputs are, intended outcomes and indicators are determined.

A lack of political willpower forms a more significant part of this challenge, as the bulk of implementing GRB lies in the readiness and intention of the government. Without the willingness of the government to implement, policy formulation ends at formulation; therefore, the first significant challenge to employing GRB to ensure the inclusion of women in the 4IR is government commitment through active measures. The success of a policy depends significantly on how committed the relevant stakeholders are in the implementation phase, as the willpower behind it is the primary driving force for adequate implementation. Gender-responsive budgeting needs action-oriented stakeholders to actualise it before achieving the desired aim, as it is an actionable strategy for mainstreaming gender in fiscal budget allocation.

Gender-responsive planning and budgeting-related activities continue in South Africa, although the intensity and scope of activities have

diminished over time. South Africa has had two GRB initiatives, one led by the National Treasury, a government initiative and the other led by non-governmental organisations and parliamentarians (Women's Budget Initiative) (Department of Women, Youth and Persons with Disabilities 2018). In South Africa and internationally, it has been concluded that top managers' commitment is critical if the process of gender mainstreaming is successful and sustainable. It is, therefore, necessary to raise awareness among decision-makers that gender matters in terms of policies and budgeting and that there are clear implementation guidelines developed in this regard, with continued engagement from the related stakeholders.

Other challenges include, firstly, the absence of an integrated meaning of gender and its role within the development objectives of the country and its economy so that gender mainstreaming can be delivered efficiently and effectively. Secondly, the existing departmental initiatives are not coherently aimed at ensuring that all plans, policies and programmes are directed and produced as a government-wide budgeting framework. Thirdly, the National Treasury needs to be enabled to prescribe a set of minimum standards for government departments so that they can be tracked and observed in a gender-equitable manner that considers the unique needs and priorities of males and females, both adults and children (Department of Women, Youth and Persons with Disabilities 2018).

■ Alternatives or recommendations

Gender-responsive budgeting is a process of continuous learning and not a one-time project; therefore, lessons learnt and good practice models must be shared and repeated year in and year out to improve subsequent efforts. On that basis, this section makes recommendations on consolidating current efforts at GRB.

In 2019, McKinsey Global Institute published a report titled 'The future of women at work: transitions in the age of automation'. It recommends that to ensure the inclusion of women, there is a need for concerted and creative new solutions that will enable them to seize new opportunities in the automation age. This is because women may fall further behind in the world of work if they do not possess the needed skills to transition. Between 7% and 24% of those will likely need to transition into their position before 2030 if they stay relevant (McKinsey Global Institute 2019). This transition into the 4IR working world of the future is going to require greater mobility and flexibility, the ability to be tech-savvy, and the acquisition of new and more skills. While this may be difficult for many, given the socio-economic constraints women experience globally, there are still opportunities.

Any attempts at correcting gender inequality to ensure the inclusion of women in the 4IR using gender budgeting must first work on the societal narrative and norms. The patriarchal norms, narratives and attitudes in society that place women in inferior status, which reinforces the unequal gender relations, need to be discarded. This process must start with the sensitisation of key government officials who are often in charge of the policy process. Before officials can be saddled with the responsibility of implementing GRB, they must understand the importance of GRB and how it will aid in fostering gender equality. Proper training must be done for them to understand the mechanisms involved in developing GRB to advance the participation of women. Secondly, there needs to be the development of a transversal digital policy that is comprehensive and inclusive. In trying to be inclusive, this digital policy must explicitly state how it intends to include women and equitably ensure that resources are allocated to this effect.

Furthermore, the Department of Women, Youth and Persons with Disabilities should take more active steps in leading and bringing together the various role players and assisting them in implementing a gender-responsive planning and budgeting strategy. The department should undertake functions designed to inform and govern all matters relating to women's economic empowerment through developing an implementable national GRB. The planning process must inform resource allocation, enabling effective implementation of programmes that can be better assessed and monitored to inform further planning and consistent improvement. Gender-responsive budgeting is often handled by the relevant financial and gender mainstreaming department. All officials should be conversant with and must adhere to the framework's principles (Department of Justice and Constitutional Development 2005).

Through GRB, funding can be channelled towards training more STEM professionals who are women. For instance, there is a gendered stereotype regarding who can and should enrol in STEM subjects in schools. This gendered stereotype restricts access of certain people who are mostly women into the field such that they are significantly underrepresented. Gender-responsive budgeting can be applied to ensure that females are visible within this field. The National Treasury and the Department of Higher Education and Training can set up a scholarship fund that will motivate females to enrol in the STEM field. Budgeting provisions can be made to ensure that funds are specifically directed to increasing the number of females in the tech space.

There needs to be the implementation of robust policy frameworks for social inclusion programmes in education to train more young females in STEM. The 4IR commission should be re-organised with a key objective to

ensure the inclusion of women through gender mainstreaming (Chiweshe 2019, p. 7). The South African government should endeavour to work on gender representation in the national institutions in charge of technology and innovations, organise programmes dedicated to spotlighting women in the energy sector and employ gender quotas to increase the presence of women in the 4IR by compelling the need for the presence of women in the STEM space and create a special fund for women to promote female entrepreneurship in STEM (Chiweshe 2019):

Push for gender-sensitive research agendas; provide targeted support to women researchers and techno-entrepreneurs; develop gender-sensitive monitoring and evaluation mechanisms; put mechanisms in place to unearth bias against women in science and technology. (p.1)

Appropriate measures must be developed to address the risk of gender biases being perpetuated in AI programmes.

■ Conclusion

The problem of the underrepresentation of women in most sectors is not a new phenomenon, as scholars have sought to understand the reason for this. However, as this underrepresentation deepens in specific sectors, more research is carried out to allow for a detailed understanding of why this is inherent. The technology space is often not identified as one of the major sectors in which females are underrepresented; as such, focus is placed on politics, economy and public decision-making. This underestimation has encouraged the further increase of gender inequality in STEM-related studies and, invariably, the technology sector. It becomes imperative to understand why women are not participating and the policy efforts the government is instituting to address this problem. Recognising that often the exclusion of women from spaces is rooted in systemic patriarchal norms and attitudes does not take away the fact that something can be done.

Hence, this work examined South Africa's readiness for the 4IR and the various efforts by the government to demonstrate this preparedness. It focused on governmental and policy actions that aim to ensure the parity of gender representation in the 4IR. It notes that whatever measures are being employed must first understand why there is a prevalence of low women's participation and find ways to address it adequately. By focusing on gender mainstreaming strategy, it explored how GRB is a needed instrument that can be used to ensure the increased participation of women in the 4IR. By equitably allocating resources and guiding the drafting of budget and other related fiscal issues, GRB provides a framework for how the government can direct resources to cater for the needs of females, which would alleviate the common reasons for why they do not or cannot

participate in the tech space. For instance, to encourage more female children to study STEM-related subjects, resources can be directed to provide funding for them so they do not have to worry about how to fund their degrees. This will also include providing resources to actively include women already working in STEM-related fields in the digital economy policy project to create more recognition for their work.

The effectiveness of any policy majorly depends on the degree of political willpower behind it; merely formulating a policy does not guarantee its success. Therefore, this work highlighted specific challenges hindering the operations of GRB as a tool to foster women's increased participation in the technological space, especially the 4IR. Policy approaches to addressing these challenges were also recommended to consolidate the current policy efforts by the government and other relevant stakeholders. Including women in the 4IR is not a one-off project because the barriers that limit them are systemic. Therefore, the solutions must be bottom-up, inclusive and specific to ensure that the barriers restricting women are efficiently and duly tackled. Even though women are the key beneficiaries of GRB, its impact benefits everyone.

Artificial intelligence sword and shield: Implications for cybersecurity in South Africa

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■ Introduction

The sudden shift to remote learning because of the coronavirus disease 2019 (COVID-19) pandemic has raised concerns about the quality of education. With schools and universities closing their doors and transitioning to online platforms, there are doubts about the effectiveness of remote teaching and the ability of students to learn and retain information without face-to-face interaction. The lack of access to necessary resources and technology, as well as the challenges of adapting to a new learning environment, has added to these concerns. While technology and its apparatus saturated the pedagogical landscape, the rise of artificial intelligence (AI) posed a direct threat to quality assurance in education. Universities, without previously using technologies to teach, suddenly had to scramble to adopt these technologies without first prioritising security measures. This chapter investigates and updates the discourse on universities' vulnerabilities, due partly to remote learning.

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The findings indicate that AI is becoming a sword and shield, but more importantly, AI is weakening quality assurance, quality education and academic integrity. The use of AI to produce and paraphrase academic work obfuscates laziness, incompetence and criminality. Between 2020 and the cardinal six months into 2022, Google searches for 'paraphrasing tools' have seen a rise in South Africa. The year 2022 became the quintessential year, with 100 searches about plagiarism tools in both May and June. Based on these searches, AI is anthemic to academic integrity. South Africa has not witnessed the use of pedagogical websites for digital student protests (DSP).

On the contrary, South African students are content to use social media sites for mass mobilisation rather than protesting during online lectures. The findings indicate the need for a human-AI interface in efforts to limit academic dishonesty. Artificial intelligence cannot be completely relied upon; human beings can provide the needed assiduity. Artificial intelligence-enhanced invigilation applications, while capable of detecting some misconduct, cannot be considered a *panacea*. The shortfalls in AI justify the AI-human interface in academic settings against academic dishonesty.

The first part conceptualises AI and cybersecurity, DSP, quality assurance and plagiarism. Then, the chapter discusses the evolution of student protest. A discussion on student digital protest follows. Quality assurance is then discussed. Plagiarism in the era of AI is then discussed. In the penultimate section, the implications for the humanities discipline are succinctly captured. The chapter ends with a conclusion and future research agenda-setting.

■ Conceptualisations of critical terms

Abstract concepts carry different meanings unless the user of such concepts provides context and relevance. According to Davis (2019), authors should take the time to develop specific meanings for the keywords they use in their study. By doing this, authors will have a clear explanation of how they will observe, use or measure these meanings in their particular study. This process helps to ensure that the study is well-defined and that the author and any readers of the study precisely understand the keywords used. In essence, well-defined terms create a shared understanding of the study's focus and goals, which is essential for effective communication and analysis. Against this backdrop, this section conceptualises AI and cybersecurity, DSP, quality assurance and plagiarism.

■ What is artificial intelligence?

Artificial intelligence provokes different reactions and emotions in other people. The implications of AI on various features of society have policymakers and scholars seized with multiple permutations. To some, AI is a threat, while others see it as a *panacea* to various human endeavours such as mining, electricity, cybersecurity, health care, and more. According to Marwala (2020), the ability of machines and computers to make sound, rational and intelligent decisions is AI. To Ndzendze and Marwala (2021), the concept of AI refers to:

Algorithm-based machines and processes which can act autonomously, learning as they do so through machine learning and in so doing appear to mimic the cognitive as well as behavioural patterns of human beings. (p. 6)

The ability to recognise patterns, learn speech, write and drive cars autonomously is the mark of AI. To fulfil all the features of AI, a system must be able to assess, interpret and associate independently. In this chapter, AI is applicable for its ability to produce written work independently, edit text, and strengthen and compromise cybersecurity.

■ Cybersecurity

The art and practice of protecting cyberspace or the digital sphere is the essence of cybersecurity. The fulcrum of cybersecurity is the protection of communication, business, diplomacy and other digital transactions, postulates DeNardis (2014). Securing the Internet against malicious entrants similarly speaks to cybersecurity. In this chapter, cybersecurity represents the ability to protect online pedagogical tools against disturbance or DSP.

■ Digital student protest

Digital student protest, according to Hove and Dube (2021), alludes to the use of digital technologies by mobilising students to protest, a way to show their disapproval of student-related challenges. For this chapter, a distinction is made between direct university websites and social media platforms used to protest. For DSP to be activated, the protest must be enacted against and on the university's pedagogical sites. For example, using pedagogical websites' videos or microphones by students to disturb the lecture proceedings qualifies as DSP. In other words, DSP is also achieved when students can physically bar other students from accessing libraries or computer labs to log in for a class.

■ Quality assurance

The key to quality assurance is achieving and maintaining a high performance standard. Gamage et al. (2020) posit that quality assurance in universities refers to a set of systematic actions and measures taken to ensure and maintain high academic standards and the quality of education provided to students. These actions include regular evaluation of teaching and learning methods, continuous monitoring of academic performance and progress, and the implementation of policies and procedures that promote fairness, transparency and accountability in all academic activities. The goal of quality assurance is to improve the overall quality of education and to provide students with the necessary skills and knowledge to succeed in their fields of study and beyond.

Thus, according to Baharun et al. (2021), quality assurance is activated in pursuance of critical national education standards against any endeavour denuding a high standard of education. For this chapter, quality assurance thus becomes all efforts used to ascertain that expected high standards in the level of education are achievable for the benefit of the student and the higher learning institutions.

According to Stacey (2020), plagiarism needs a reconfiguration because of the impact of free access to and advancement in paraphrasing tools. Against this backdrop, the traditional definition of plagiarism cannot hold when knowledge through open-access journals is publicly and freely available. However, plagiarism alludes to presenting another person's written or verbal words as your own. To Coats (2009, p. 149), plagiarism is not present when the submitted work is 'original and has not been published'. Thus, for this chapter, plagiarism stands for the use of advanced technologies to paraphrase someone's original work so it can be passed off as something new.

In concluding this section, the chapter notes pedagogical websites as any website used by universities for teaching purposes in an online environment. Such sites are in the mould of Blackboard (used by the University of Johannesburg [2022]) and Ulwazi (used by the University of the Witwatersrand, after having used Sakai), among others. For protests to qualify as DSP, they must take place on these pedagogical websites and not on Facebook, WhatsApp, Twitter or other non-pedagogical websites. Against this backdrop, the following section discusses the evolution of student protest.

■ Evolution of student protest in South Africa

Mass mobilisation by students is not new to South Africa. Prior to the advent of democracy in 1994, South African students led mass mobilisations

and various shows of disapproval against the apartheid regime. For example, Glaser (2015, pp. 159–171) and the University of the Witwatersrand (Wits) (2021) note the much-publicised 16 June 1976 Youth Uprising in Soweto by over 3,000 students against the *Bantu Education Act 47 of 1953* and an education policy introducing Afrikaans as the teaching language. A combination of unchecked socio-economic dynamics tends to erupt in the form of protest. Chikwanha (2009) noted increased inequalities and injustices as some of the impetus feeding possible student protests in Africa.

As South Africa embraced democracy in 1994, some of the recalcitrant socio-economic factors got parachuted into the new dispensation. For example, even post-1994, poverty, inequality and racism continue to define South Africa, argued Seekings and Nattrass (2005). Equally, post-apartheid South Africa has seen its fair share of student protests. Most student protests in South Africa are inextricably linked to university fee affordability or the lack thereof. The quintessential protest against university fees is the late 2015 #FeesMustFall movement, where students protested against increased university fees. On financial exclusion, Booysen (2016) argues that the uncured apartheid exclusion of Africans based on financial exclusion in university settings continues in 'apartheid-free' South Africa. However, financial difficulty is not the only reason for protest by South African students. Other reasons for student protests in South Africa, according to SA History Online (2022), are the 'slow transformation process, language policy and other academic policies'.

It must be noted that the student protests in 1976 took place in a different setting to the one in 2015. For example, the 1976 cohort did not have access to the Internet or social media platforms like Facebook, which were still obscured by emerging technologies. The 2015 student body had access to the Internet and various social media platforms such as Twitter, Facebook, WhatsApp and more. While the latter used digital technologies to mobilise nationally, the former had to rely on word of mouth to reach as many students as possible. However, both protests can be noted for having achieved national attention, although with differing levels of success. The 2015 #FeesMustFall protest can be reported for having used external websites like Facebook to popularise the movement while internal websites of universities were left intact (Pillay 2016). Hove and Dube (2021, p. 102) correctly observed that, in today's digital age, student activism has shifted its focus from traditional forms of protest to virtual spaces. With the advent of social media, students are now able to connect with like-minded individuals and spread their message across the globe at a faster pace than ever before. Despite the change in tactics, student activism remains a powerful tool for fighting injustice. From advocating for racial equality to promoting environmental sustainability, students continue to use their

voices to bring about positive change in the world. Ultimately, external 'virtual sites' are used for the publication of protest. Students' protests have eventually been energised by digital technologies, enabling the students to reach as many students as possible. The implications are that digital tools can become the anathema of curricula, plans and agendas. For example, students can use Facebook to alert other students to join them in a 'stay away' from the class campaign.

For mobilisation through digital technologies to have an impact, it must reach as many students as possible. Hove and Dube (2021, p. 103) buttress the mass mobilisation argument when they state that mass media is a conduit for amplifying the message to reach the public, demonstrating the need to have as many people as possible for the protest to make an impact. In the DSP setting, one student would need to compromise the disruption of pedagogical settings for cybersecurity to be compromised. In other words, while external protesting requires many to be effective, the opposite is true for DSP. For example, it requires only one student to speak over the lecturer in pedagogical settings for the lecture to be disrupted.

■ Digital student protest

COVID-19 coerced learning and teaching into migrating to online settings. The directive of the South African government through the *Disaster Management Act 57 of 2002* that social distancing be one of the methods curtailing the spread of COVID-19 meant the quiescence of traditional teaching methods. Fearing the derailment of academic plans, universities in South Africa scrambled for online teaching methods in what Landa, Zhou and Marongwe (2021, p. 167) call 'education in emergencies'. The distance created between students and campuses can potentially limit the magnitude of student protests, but it does not entirely remove it, argue Hove and Dube (2021).

■ Operational and economic challenges to digital student protest and policy interventions

In 2020, at the height of COVID-19, the student representative councils (SRCs) of various universities in South Africa threatened a 'National boycott if this (equal access to online learning by all students) condition is not met', argues Nowicki (2020, n.p.). The threat to boycott comes after the Department of Higher Education and Training (DHET) encouraged higher education institutions (HEIs) to begin online classes on 04 May 2020, with other stakeholders arguing that equal access should be a priority and not a deadline. On this score, Deputy Minister of Higher Education, Science and Technology, Buti Manamela, chastised some South African universities for

planning to start online classes before there was assurance that all students would have access to online learning (Inside Education 2020).

Socio-economic conditions, Hove and Dube (2021) argue, are an indicator and enabler of DSP. For example, students need digital autonomy to be able to participate effectively in anything online-related. There is a need, first, to upskill students from poor backgrounds to master navigation on websites. Hove and Dube (2021) contend that digital ineptitude, insufficient or subpar Internet access and electrical outages represent prevalent obstacles that impede the online educational pursuits of university students.

Some South African universities issued loan laptops to students from disadvantaged backgrounds. For example, the then-Wits University Vice-Chancellor Adam Habib (2020) pointed out that to help bridge the gap in digital access for underprivileged students, Wits issued over 5,000 laptops to students for temporary use. This initiative aimed to provide equal opportunities for all students, regardless of their economic background, and ensure that students have access to the necessary tools for their education. Universities in South Africa issued students with data on a monthly basis to thwart data-affordability issues. For example, the University of Johannesburg topped its students up with 30 gigabytes of data every month between mid-2020 and November 2021 (University of Johannesburg 2020).

Access to information and communication technologies on its own is not sufficient. There is also the second challenge of usage. Sekgololo (2021, n.p.) argues that 'most learners do not boast automatic access to information and communication technology (ICT) gadgets'. Students with pre-existing and autonomous skills are likely to benefit from online learning. Consequently, these are students from well-off backgrounds and unlikely to participate in DSP, argues Chikwanha (2009).

■ **Cybersecurity challenges and possible policy interventions for digital student protest**

Student protestors can hamper online classes by physically blocking other students from accessing libraries or computer labs to attend online courses. For example, O'Regan (2022) writes that there were several instances of campus disruptions that affected both online and face-to-face classes at the University of Cape Town in 2022. Some students had barricaded the campus entrances and interfered with a few online and on-campus lectures. As a result, the regular academic schedule was disrupted, which caused inconvenience to the students, faculty and staff following the failure of the

University to register all students before the beginning of the academic calendar.

Cybersecurity breaches can sometimes occur not only because of malice but also because of negligence. For example, in 2020, a wife to a member of the South African Parliament appeared naked on his Zoom Videoconferencing screen (Independent Online [IOL] 2021). The disruption to the proceedings of Parliament is noted for its proximity to DSP because it directly affected the work of Parliament. Protests can morph into unpalatable optics. For example, in 2013, three topless German women protested against Russian President Vladimir Putin, calling him 'a dictator', while the former was visiting Germany (Evans 2013). Students can also use unbecoming methods to compromise the pedagogical setting in protest. Given the example of the 'naked woman', there is a need to invest in AI technologies that can censor such scenes before being witnessed by others. Perhaps this is another layer of development that the nascent AI must still undergo. Universities can note the need to upskill educators regarding the settings on their pedagogical sites, allowing audio or video capabilities to students only if necessary.

Without single-login access to pedagogical sites, Sekgololo (2021) notes that in some cases, students may resort to sharing their login details and links with different groups in order to cause online disruptions as an act of retaliation against their demands not being met. This action can lead to serious consequences ranging from system malfunctions to security breaches. To mitigate against similar threats, multiple logins by a single user can be disabled through access management settings. Artificial intelligence can also play a role by cross-referencing Internet protocol addresses and distance against a user login. For example, assuming against omnipresence, AI can deny access to multiple logins by a single user. While cybersecurity is noted for DSP, the other threat to developing digital technologies is quality assurance.

■ Quality assurance in the era of remote learning and policy interventions

The relocation of teaching and learning from traditional contact settings into remote learning posed a direct challenge to quality assurance, the South African Council on Higher Education (CHE) (2020) noted. Apart from getting certificates, students and other stakeholders want to be sure the certificate represents quality. Hence, Baharun et al. (2021) argued that there can only be quality education with a robust quality assurance regime. In the era of 'Education in emergencies', as stated by Landa et al., traditional quality assurance protocols proved inadequate. Of note, quality assurance engages both the teaching and learning aspects.

The World Economic Forum (WEF) (2020, n.p.) notes that a top Chinese university, Zhejiang University, ensured that: 'As part of the quality assurance process; Zhejiang University organised a series of training sessions in mid-February for 3,670 faculty members'. The upskilling of students and the faculty is integral to quality assurance. Higher education institutions in South Africa undertook various measures to upskill students from disadvantaged backgrounds, although with varying degrees of success. The CHE (2020, pp. 8–9) notes the following ten actions and interventions by HEIs in South Africa:

- Higher education institutions have procured laptops for students from socio-economically disadvantaged backgrounds who need access to online learning resources. Some laptops were donated, while others were distributed on a loan basis. These computers are pre-loaded with the required learning resources before being delivered to the students via courier services or the South African Post Office.
- To reduce the cost of accessing and browsing relevant websites and online platforms, the DHET and HEIs have entered into agreements with telecommunications companies to zero-rate the access to and browsing of HEI websites and learning management systems. However, such agreements do not apply to browsing other websites, such as YouTube and other video sources. Moreover, the amount of free data might also be limited. To address this issue, some HEIs have invested significant financial resources to secure monthly data packages per student.
- In addition to offering face-to-face lectures, HEIs have also developed mobile applications to access resources and lectures anytime, anywhere. For students with no access to any device or data, delivery of paper-based material has been considered.
- Higher education institutions have also worked with the country's broadcasting houses to explore using the available teaching and learning channels.
- Several HEIs have made arrangements to distribute memory sticks or compact discs (CDs) that are pre-loaded with learning material via the South African Post Office. Additionally, several HEIs have packaged learning materials and uploaded them on platforms like Blackboard or Sakai or sent them as email attachments.
- Finally, some HEIs have explored video conferencing platforms such as Zoom, Skype and Microsoft Teams, which may data-intensive.

While the efforts by HEIs are to be applauded, remote learning and teaching have their caveats and pitfalls. For example, the speedy adoption of remote learning technologies can compromise the quality of education dispersed, noted the CHE.

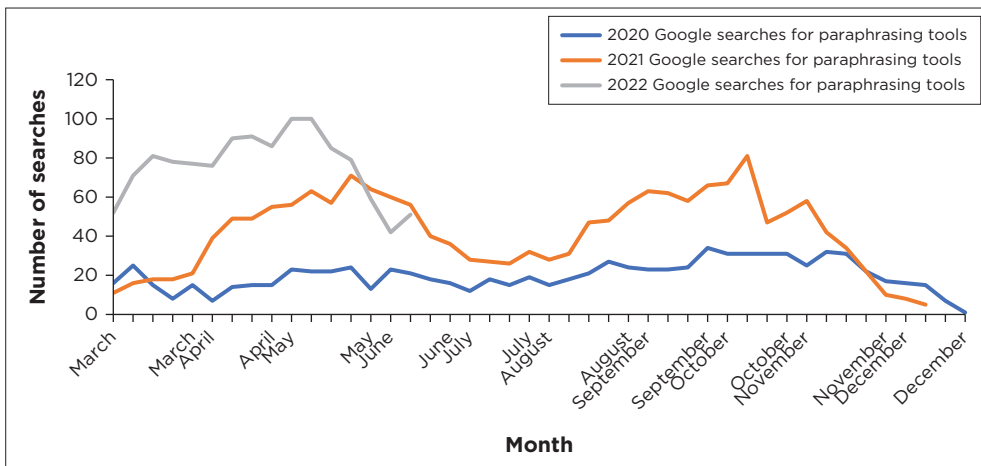
Removing students from observable, in-person assessment settings has given rise to apprehensions about cheating. The latter is more relevant to

the topic at hand because AI tools are becoming a burgeoning industry. Abd-Elaal et al. (2019, p. 2), in a conference paper titled ‘Artificial intelligence Is a Tool for Cheating Academic Integrity’, note the rise of AI education tools such as ‘automatic article generator’ (AAG), which can generate a complete journal article or book independently and algorithmically. Accordingly, AI is becoming a threat to quality education.

■ South African perspective and searches for digital help with academic work

The use of AI tools to ‘perfect the work’ denudes quality assurance. The purpose of quality assurance is to ascertain that the right things are done. More than being ‘right’, things must be ethical, which goes beyond just assuring that student and faculty members are trained for remote learning. Thus, the rise in searches for ‘paraphrasing tools’ in South Africa alludes to the negation of quality assurance. As Figure 2.1 shows, most searches for paraphrasing tools occur towards and around exam periods in South Africa (i.e. May–June and October–November), with dormancy occurring around March, July, August and December. Data for Figure 2.1 were sourced from Google Trends.

The lowest search volume for paraphrasing tools was in the week ending 27 December 2020, with only one search, while the highest search volume occurred in September 2020, with 34 searches. The number of searches for paraphrasing tools rose sharply in 2021. The highest volume of searches was noted in October 2021, with 81 searches, while the lowest recording took place in December 2021, with five searches. The first six months of



Source: Author’s own work using data sourced from Google Trends.

FIGURE 2.1: Google searches for paraphrasing tools, March 2020–June 2022, South Africa.

2022 have produced some of the highest search volumes, hitting two sets of 100 in two consecutive weeks in May 2022.

Furthermore, Abd-Elaal et al. (2019) presented a conference paper noting the danger of ghostwriting, where someone writes the take-home assessments for a student. In addition, Sekgololo (2021) also noted that ‘without the conservative way of verifying that the right person takes a test or exam, the integrity of e-learning is compromised’. In this case, technological advancements cripple education, per se, instead of enhancing it. Contract cheating, as explained by Mafolo and Shoba (2021), occurs when a student engages the services of an agent, be it an individual or an enterprise, to execute scholastic duties in place of their own effort; it is frequently denominated as academic impropriety or perfidy. Such actions encompass a spectrum of undertakings, encompassing assignments, coursework, the undertaking of examinations and even the attendance of lectures. Such a possibility is enabled by remote learning, which is short of traditional verification methods. Abd-Elaal et al. (2019) indicate that ghostwriting is experiencing a decline while AAGs are on the rise, a perfect example of a human being replaced by a machine. For example, according to an analysis of Google search trends from 2004 to 2019, Abd-Elaal et al. (2019) found that students in Australia searched for the phrases ‘ghostwriting’ and ‘article generation’ more frequently than their counterparts in any other English-speaking country. The search score for both phrases was found to be 100, indicating a significantly higher interest in these topics among Australian students.

Further analysis of Google trends revealed that the popularity of the phrase ‘Ghost writing’ witnessed a decline of 75% over the years 2004–2019 (Abd-Elaal, Gamage & Mills n.d.). On the contrary, the phrase ‘Article generation’ showed a steady increase in search interest from 2004 to 2014, after which it started to witness a decline. These findings suggest that the demand for ghostwriting services has decreased in Australia, while the interest in article generation has increased in the past few years (Abd-Elaal et al. 2019).

■ Interventions by universities to assure quality assurance of assessments: Policy interventions

While the AAGs and ghostwriting denude the quality of education, universities in South Africa are noted for having implemented measures to counteract unethical conduct by students during remote learning and teaching. The University of Cape Town is noted for referring some of the unethical conduct by their students to disciplinary action (Mafolo & Shoba 2021).

To mitigate against cheating in exams, universities such as the University of South Africa (Unisa), the University of Johannesburg (UJ), Rhodes University, North-West University (NWU), the University of Cape Town and the Durban University of Technology procured and implemented the Dikikamva Invigilation App, downloadable via the Apple App Store and Google Play Store (Unisa 2022). The system makes use of advanced AI algorithms to perform a variety of tasks such as authenticating photos, identifying and flagging recordings containing speech and generating unique verification codes that can be seamlessly integrated into a learning management system. By leveraging cutting-edge machine learning techniques, the system is able to accurately and efficiently perform these tasks, providing a highly reliable and secure solution for a wide range of applications (Mafolo & Shoba 2021). The AI-enhanced invigilation application must be switched on during the exam period while it checks the phone against text and emails so that the student does not receive additional assistance. In addition, the application also evaluates the environment against chatter, a sign that the student is communicating with someone, while using AI and a global positioning satellite to map possible grouping by students. However, Mafolo and Shoba (2021, n.p.) are not persuaded that the application fully covers cybersecurity breaches: they contend that a student can 'receive answers through a second phone'.

While the mitigations by universities are noted, the downside manifests in the inescapable conclusion that it appears sanity will be restored by AI against AI. While some use AI to cheat (i.e. AAGs), AI is required to stop the cheating (i.e. invigilation applications). Consequently, AI is becoming indispensable to education while it simultaneously threatens the quality of education. Artificial intelligence as a technological tool is peculiar. The contradictions inherent to its utility do not bode well for education. For example, AI cannot fully guarantee total integrity in remote learning settings. There are ways in which sagacious students can circumvent the invigilator applications. Conversely, it is undeniable that AI tools are used to produce written work without the involvement of a human, but with humans taking credit.

■ Plagiarism in the era of artificial intelligence

Anthony Stacey (2020, p. 28), in a journal article titled 'Reimagining Academic Writing in Academia 4.0 to De-incentivise Plagiarism', calls for a paradigm shift on plagiarism in the era of AI because the reasons to plagiarise have suddenly received a new member: ease of access to sources. The author argues against open-access journals because now that research publications are easily and reliably accessible, regardless of any drawbacks,

a consequence that has yet to be fully explored is that open-access research, being freely available to the public, now meets the criteria for common knowledge. Consequently, this has significant implications for how knowledge is attributed and referenced (Stacey 2020, p. 28). The contestation is that once knowledge becomes ubiquitous, it adopts everyday usage and becomes common knowledge. Consequently, when a phrase or term is used every day, it is easy for people to assume automatic ownership.

The rise in remote learning has also seen a parallel rise in AI-enhanced plagiarism-circumventing tools. Stacey (2020, p. 31) notes the rise in tools such as ‘plagiarism analysis’, ‘plagiarism checking’ or ‘anti-plagiarism’. The author further cautions against hook-line-and-sinker reliance on plagiarism detection software because most software looks for or searches against similar text, while plagiarism can also take other forms, such as ‘theft of thoughts’ (Stacey 2020, p. 32). Artificial intelligence-enhanced plagiarism tools can only be as good as the algorithms feeding them; eventually, a better algorithmic AI-circumventing plagiarism tool makes a mockery of heavy reliance on AI to thwart plagiarism, with some implications to be noted.

■ Implications for the humanities

There is no promise that post-COVID-19, its implications will dissipate as well, even on the academic front. While remote learning might lay dormant, certainly the use of AI tools by students to enhance their work and circumvent plagiarism-detecting software will remain for the near future. While in-person cheating is noted as another form of misconduct, Singh and Remenyi (2016) illustrated that online learning has increased academic misconduct.

While AI can play some role in curbing academic dishonesty, it is not a panacea for academic misconduct. Artificial intelligence itself is a threat to academic honesty when used to circumvent good conduct; it does not provide bullet-proof protection against related academic dishonesty practices. For example, the much-praised Dikikamva Invigilation App is noted for shortfalls. Students could use two phones instead of one to communicate with each other during exams. As one of the disciplines that use extensive essays to evaluate students, the discipline can note the existence of plagiarism-circumventing tools aided by AI. Internally, the discipline can invest in external workshops on ways to differentiate between human written work and mechanically written work. Here, the discipline can note the work done by Gehrman, Strobelt and Rush (2019), who developed a tool that uses statistical analysis to identify automatically generated text on a word-by-word basis. While AI is encouraged, the caveat

is that reliance on AI removes human intervention and bets on 'let the best algorithm win' hope.

■ Conclusion

The chapter explored the vulnerabilities introduced into education by AI. The migration into remote learning, coerced by COVID-19, became the impetus to technological saturation. Unfortunately, while technology has its benevolence, a malevolent side exists as well. Paraphrasing tools are on the rise in South Africa, an indication that students are looking elsewhere for help with academic work, denuding and defeating quality assurance mechanisms. Artificial intelligence adoption ought to be cautious because AI tools do not completely protect against cheating. At times, AI aids in cheating. Digital student protest is narrowly seen through the barricading of campuses to deny students access to libraries. However, there have not been many cases of students attacking pedagogical sites in protest. Ultimately, there is a need for cybersecurity to be enhanced on pedagogical sites in order to maintain the integrity of academic learning.

Further research can quantitatively investigate the level of plagiarism between 2020 and 2021 in South Africa while also noting if punishment was used as a deterrent among universities in South Africa.

Part 2
**Disciplinary debates and
perspectives**

(Mis)trust in the news media's anthropomorphic framing of artificial intelligence technologies in the (future) world of work: Perceptions of humanities students in South Africa

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■ Introduction

Artificial intelligence (AI) does not have a clear definition, but according to Lv, Chen and Alazab (2021, p. 293), AI may be defined in basic terms as constituting 'technologies that provide human levels of intelligence through ordinary computer programs'. The literature makes a distinction between weak and strong AI, where the former exhibits a narrow focus on a pre-learned task (Neubauer 2021), and the latter refers to machines that

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are able to carry out cognitive functions aimed at either simulating or transcending the cognitive functions of human beings. Considering their perennial technological and infrastructural deficits, the majority of African nations are currently ill-prepared to harness the benefits of AI (Auriacombe & Van der Walt 2021). However, a few countries, such as Egypt, Kenya, and Mauritius, are poised to benefit from this disruptive technology, with South Africa itself on the brink of unveiling an AI strategy suited to its unique and precarious socioeconomic realities (Oxford Insights 2022). A significant challenge entails South Africa's ability to equip its youth population with the knowledge and skills needed to inhabit the (future) world of work in which AI is becoming increasingly pervasive. This is no mean feat, given that the country's youth population comprises approximately 20.4 million people (IQbusiness 2021). As recently as 2018, a report published by Accenture (2018) made the dire prediction that more than 5.5 million jobs in the country are threatened by automation. The report does not explicitly differentiate between robotic process automation and intelligent automation, where the former refers to machines that perform predictable and repetitive tasks driven by rules set by humans, while the latter describes systems that employ machine learning and AI to carry out complex tasks without human intervention. Whether or not the general public is aware of the distinction, research in the Global North and Global South shows that tertiary actors – defined by Wairegi, Omino and Rutenberg (2021) as individuals who have no expert knowledge of AI or direct involvement in designing it – may be fairly ambivalent about its risks and benefits (Neudert, Knuutila & Howard 2020). In countries that include Canada, Germany, Estonia and India, scholars such as Mehta, Harish and Bilimoria (2021), Abdelwahab, Rauf and Chen (2022), Chounta et al. (2021) and Kala (2022) have attempted to ascertain how university students, who fall into the tertiary actor category, perceive AI in the workplace. However, there is a paucity of knowledge as to how South African students pursuing professional disciplines outside of science, technology, engineering and mathematics (STEM) view its possibilities and perils. By contrast, what has been published in recent years are several (South) African studies of employee attitudes towards AI (see the 'Literature review' section).

In light of the gap in the research and utilising framing theory, which is premised on the notion that how realities are framed influences how individuals conceive of them, this chapter describes a small-scale exploratory study aimed at examining postgraduate humanities students' perceptions of AI and its place in the world of work. How lay people view AI is predominantly shaped by fictional narratives or (popular) media (Salles, Evers & Farisco 2020), and so, the study undertaken examined one

tertiary institution's (applied) linguistics and literary or cultural studies students' reflections on three articles published by South African news outlets that reported on AI-enabled technologies' capacities. As all three news articles attributed human cognition and human traits to AI, it was deemed important to determine how anthropomorphic framing may mould the attitudes of students who have little or no understanding of AI technologies. Identifying students' perceptions of anthropomorphic AI is key to gaining insights into the extent to which they (mis)trust AI's role in the workplace and either exaggerate or understate its capabilities. Challenging skewed perceptions and demystifying unrealistic expectations should go some way to preparing South African humanities graduates for workplace ecosystems in which AI is becoming ubiquitous. The study was guided by two specific research questions: 'What are postgraduate humanities students' general perceptions of AI and of its place in the world of work?' and 'How do journalists' conceptualisations of AI in anthropomorphic terms influence how students imagine AI futures in the workplace?'

■ Literature review

Several studies conducted in South Africa and other African countries have focused on employee perceptions of AI in the context of professions that run the gamut from law (Adeyoju 2018) and radiography (Antwi, Akudjedu & Botwe 2021) to accounting (Kamau 2021) and librarianship (Lund et al. 2020). The results of such studies cannot be extended to South Africa's population as a whole, given that perceptions of AI technologies inevitably vary within and across communities, organisations and institutions, as well as according to education, location and profession. Perceptions also differ in terms of AI's myriad applications and types, as explicated in a study by Horowitz and Kahn (2021). Notwithstanding demographic differences, most of these studies signal equivocation, with employees generally placing some degree of trust in AI's benefits while simultaneously citing fears related to loss of agency and replacement by machines. Whether or not university students in South Africa who are about to embark upon professional careers share this ambivalence is virtually unknown, owing to scant research in this regard. A recent South African study that has examined student perceptions of AI is one by Petersen and Batchelor (2019), who focused on student-teachers' responses regarding the future influence of AI and robots on the teaching profession. Two of the main findings emanating from this study were that students conceptualised the roles of AI and robot teachers in naïve terms yet also held the view that robots are not substitutes for human teachers, as teaching is a complex act demanding mindfulness and the understanding of human reasoning.

A study by Mbilini, Le Roux and Parry (2019) explored undergraduate students' awareness and beliefs about automation. They concluded, among other things, that the majority of students across faculties located at five research-intensive universities did not believe that their occupations would be negatively affected by automation. These scholars speculate that if automation is indeed a threat, then ignorance about its impact is problematic, and educators need to ensure that graduates are able to live in a world increasingly driven by this technology. The same could, of course, be said about unfamiliarity with the epistemological and ethical consequences of other types of AI.

As noted, most lay people's sources of knowledge about AI – whether narrow or strong – originate from literary or (popular) media sources, and if students glean information about this technology from these sources, their perceptions regarding its nature and ramifications could be slanted. How AI technologies are portrayed in the media is particularly troublesome, coupled as it is with a tendency to frame them in anthropomorphic terms (Brokensha 2020). Anthropomorphism in this context may be defined as (1) conflating human and AI intelligence (Watson 2019) or (2) assigning a human-like appearance or attributes to AI (Ullrich, Butz & Diefenbach 2020). The construction of these two types of anthropomorphism is not unexpected: with respect to the former type, generating an exact definition of AI is impossible, and so, humans are inclined to draw comparisons between an AI system and human intelligence, working on the assumption that the former functions in much the same way as the latter (Mueller 2020). Contrary to popular belief, however, and as asserted by Burns (2020 p. e290), 'true AI with the capacity for reasoning remains in the realm of science fiction'. With respect to the latter, Epley, Waytz and Cacioppo (2007) provide a psychological account of two motivational factors underlying the tendency to anthropomorphise non-human entities. One of these factors revolves around what they refer to as *sociality motivation*, which is 'the fundamental need for social connection with other humans' (Epley et al. 2007, p. 875). In the event that humans are unable to establish bonds with others, they may form attachments to non-human agents. According to Złotowski et al. (2015), anthropomorphising these agents appears to facilitate acceptance of and interaction with them. The second factor is *effectance motivation*, which refers to the human desire to comprehend and control non-human entities. This motivation, to some extent, offers an explanation as to why journalists anthropomorphise AI: both uncertainty about AI as a technical artefact and concern about the consequences of its deployment abound, and research indicates that contested technologies that are not clearly understood may be couched in ambivalent or competing terms (i.e. as

'good' or 'bad'). By anthropomorphising a non-human agent (such as AI), Waytz et al. (2010) assert that journalists make it less alien to news consumers, in a sense mitigating its 'uncertainty, unpredictability, and randomness' (Waytz et al. 2010, p. 424).

Although several scholars across the globe, such as Sun et al. (2020) and Vergeer (2020), have addressed how journalists frame AI, few have explored their use of anthropomorphic tropes. One interesting study conducted by Bunz and Braghieri (2021) on media coverage of AI in the health care sector indicates that anthropomorphic framing regularly constructs this technology as being superior to human doctors, which undoubtedly obfuscates its ethical risks. A study by Brokensha and Conradie (2021) on the use of anthropomorphism in news reports on AI published in South African news outlets yielded similar results: AI's capabilities in areas such as education, human-AI interaction and business or finance were, to some extent, exaggerated, although journalists also attempted to attenuate their claims through strategies that introduced a degree of scepticism about these claims. These strategies included employing competing frames to signal uncertainty (e.g. by portraying AI as both beneficial and risky), enclosing expressions such as 'super-intelligent AI' in scare quotes and either paraphrasing or quoting AI stakeholders to distance themselves from inflated assertions.

To understand how lay people (such as non-STEM students) perceive anthropomorphic AI as constructed in news articles, framing theory is particularly useful because it has, as Lupton (2021 p. 3) contends, 'made a major contribution to understanding the kinds of topics and perspectives that have dominated in news coverage of novel digital technologies'. Indeed, several studies have (partially) employed a framing approach to make sense of news coverage of AI and how it may shape the attitudes of extant society; in addition to those already mentioned, these studies include those by Ouchchy, Coin and Dubljević (2021), Brennen, Howard and Nielsen (2022) and Köstler and Ossewaarde (2022). How AI is framed in everyday discourse is noteworthy, as it frequently entails portraying it in terms of competing metaphors that Crafts and Mills (2017, p. R60) described as 'techno-optimism' and 'techno-pessimism'. Following Tigard (2021), these metaphor frames are partly defined in broad terms, given their wide-ranging connotations. In addition to helping scholars determine how journalists make sense of AI, framing theory also enables them to ascertain how this sensemaking, in the words of Köstler and Ossewaarde (2022, p. 249), ultimately 'affect[s] the envisioning of [AI] futures', which is one of the concerns of this chapter in the context of the workplace in South Africa.

■ Typologies of framing

As it would not make sense to generate a new set of categories to describe how AI is framed by journalists, an existing typology proposed by Jones (2015) is utilised in this chapter and is one that has been employed in previous studies conducted on the framing of AI in news articles by Brokensha (2020) and Brokensha and Conradie (2021). It is augmented by a coding scheme proposed by Nisbet (2009), who attempted to describe the public framing of scientific debates in general. This generic coding scheme is considered to be useful in describing a novel technology about which lay people know little. Both typologies frame AI or science in utopian and dystopian terms and are summarised in Table 3.1.

Any of the frames in Table 3.1 may evoke the anthropomorphism of AI. For example, the newspaper report titled 'AI system spots childhood disease like a doctor' (AFP 2019) simultaneously reflects the frames of social progress and competition - while an AI system that can detect disease in children is clearly beneficial to humankind, what is also implied is that the system poses a threat to doctors, as it could replace them (although it is important to note that the article itself challenges the notion that machines could become a substitute for human health care practitioners). The two frames are also coupled with a specific anthropomorphic trope, namely, that the diagnostic capability of the model is on par with that of a human doctor.

TABLE 3.1: Two typologies to describe AI or science.

Typology	Element	Description
Jones' (2015) typology	Artifice	AI is portrayed as a mysterious phenomenon that has the potential to exceed the cognitive capabilities of humans
	Competition	AI is framed as a technology that poses a threat to humans and the natural environment, possibly reducing the human workforce and depleting a variety of material resources
	Nature	AI is framed in terms of its traits or attributes. It is also frequently romanticised and may be described as having emotional intelligence, for example
Nisbet's (2009) typology	Accountability	Science is depicted as having to be regulated or controlled
	Ethics or morality	Science is framed as holding ethical or moral risks for humankind
	Middle way	A middle way (compromise) position is suggested to resolve polarised stances on a scientific debate
	Pandora's Box	Science is described as having the potential to cause catastrophies that cannot be reversed
	Social progress	Science is framed as holding a number of benefits for humankind

Source: Adapted from Jones (2015) and Nisbet (2009).
Key: AI, artificial intelligence.

■ Methods

■ Preamble: Exploratory research

Three Hons and three MA students majoring in either (applied) linguistics or literary and cultural studies at a local university were recruited for this exploratory case study. It specifically utilised a questionnaire followed by a qualitative frame analysis of two in-depth focus-group discussions (comprising three students each), which were organised around three news articles on AI published by three South African news outlets. As frame analysis has its origins in sociology, the study may be described as a social science exploration. Given that the research is qualitative and exploratory in nature, the intention was not to generate findings that would encompass a larger population of students. It has, in any case, been established that generalisability is difficult to attain, owing to the fact that perceptions of AI across a variety of spaces – or even *within* a particular arena – tend to differ on the basis of individuals' demographic features, the types of AI in question and the various contexts in which AI technologies are deployed. According to Crouch and McKenzie (2006, p. 492), exploratory studies aim 'to indicate rather than conclude', although the absence of confirmatory results that this implies by no means signals the dismissal of rigour, as expanded on later. An exploratory approach to examining perceptions of a given phenomenon is particularly appropriate when facts about that phenomenon are relatively new, under-researched or fragmentary (Swedberg 2020). In this case, and as noted in the previous section, a novel technology such as AI reflects uncertainty and contestation (Mialhe & Hodes 2017). Moreover, although several studies have examined perceptions of AI among students, how they conceptualise anthropomorphic AI is not clearly understood.

■ Sample, participants' tasks and data collection tools

Purposeful sampling was employed with a view to identifying research participants who could generate insights into a distinct phenomenon conceptualised within a specific context; that is, perceptions of the press's anthropomorphic depiction of AI by humanities students located at a tertiary institution. The distinguishing characteristics for inclusion were as follows: (1) Hons and MA students in an English department and Theoretical Linguistics department were specifically recruited given that they are interested in careers in areas such as education (Alam 2021) and translation (Kirov & Malamin 2022) and which are currently being impacted by AI-driven technologies. (2) Humanities students, in particular, were targeted as it was hypothesised that non-technical students – as opposed to those

pursuing STEM subjects – would be unlikely to have high levels of awareness about the technical nature of AI (Gherheş & Obrad 2018).

To verify the hypothesis, participants from whom formal consent was first obtained completed a qualitative questionnaire describing the nature of their postgraduate studies, their intended career path, their sources of information about AI, their general understanding of AI and their level of technical awareness about AI and its role in the workplace (see Table 3.2).

Within the Hons group, the three students recruited are at present majoring in applied linguistics, displaying interests in sociolinguistics, (critical) discourse analysis and English language teaching, respectively. Within the MA group, two students are completing their dissertations in the fields of literary or cultural studies, while the remaining student has embarked on a study in theoretical linguistics. All six are learning facilitators or tutors in the fields of English literary or cultural studies, linguistics or academic literacy, and they intend to pursue careers in education or academia.

On completion of the questionnaire, and in preparation for their focus-group discussion, each group was tasked with reading through three news articles on AI published in the *Daily Maverick*, *Independent Online* (IOL) and *the Mail & Guardian Online*, respectively. The first article, entitled 'AI better at finding skin cancer than doctors: study', reported on an AI system being used to assist doctors in diagnostics (AFP 2018). The second featured 'Xiaolce', a chatbot 'designed to hook users through lifelike, empathetic conversations, satisfying emotional needs where real-life communication too often falls short' (AFP 2021). Although the article did not explicitly cover AI's place in the world of work, it tangentially referred to the workplace when it quoted a chatbot user describing interaction with chatbots like 'Xiaolce' as being less expensive and more beneficial than that generated in consultation with a human therapist. The final article described an AI

TABLE 3.2: Data Collection Instrument 1: Qualitative questionnaire.

Question number	Question
1	Within the humanities, what is the postgraduate degree you are currently pursuing?
2	What is the career path you would like to embark upon once you have graduated?
3	Describe your understanding of AI.
4	Do you ever access information about AI? If you do, from where do you obtain this information? (For example, do you read about AI online or look at YouTube videos about AI? Do you watch movies in which AI technologies [such as AI-enabled robots] are depicted? Do you discuss AI with others?)
5	Would you describe your technical awareness about AI and its applications in the workplace as non-existent, minimal, average or good? Explain your answer.

Source: Author's own work.
Key: AI, artificial intelligence.

system called 'DABUS', which supposedly 'simulates human brainstorming and creates new inventions' (Naidoo 2021, para. 3).

Each of the two focus-group discussions (i.e. Data Collection Instrument 2) took place over 70 minutes and was conducted via Blackboard Collaborate. The researcher acted as moderator of the discussions and asked a number of open-ended engagement, exploration and exit questions to facilitate structured conversations. According to Purvis, Rodger and Beckingham (2020), engagement questions are ice-breakers that make respondents comfortable with one another and initiate interaction about a given topic. Typical engagement questions asked in this study (and which were to some extent also reflected in the questionnaire) included: 'Do you enjoy watching movies in which AI features?' and 'Do you make use of AI technologies in your everyday lives?' Exploration questions are those structured around a study's main research questions (Masadeh 2012). In the case of this study, the two questions (organised around the news articles and the two framing typologies) were: 'What are your general perceptions of AI and of its place in the world of work?' and 'How do journalists' conceptualisations of AI in anthropomorphic terms influence how you imagine AI futures in the workplace?' These questions were accompanied by prompt questions to guide participants in their analysis of each news article. Thus, for example, based on the first article, participants were asked to identify the frame(s) reflected in 'The computer was better than human dermatologists at detecting skin cancer in a study that pitted human against machine in the quest for better, faster diagnostics'. Exit questions are simply those that are posed at the end of a discussion to monitor whether or not participants have anything to add that they might not have had the opportunity to discuss when the exploration questions were asked.

■ Research rigour

A legitimate criticism of this exploratory research study is the use of a small number of participants. However, in the realm of exploratory research, the use of restricted samples is to be expected as the topic is an emerging one (Daniel 2012), and the study is generally the precursor to a much larger research project to be carried out in the future. According to Świątkowski and Dompnier (2017, p. 114), 'there is nothing wrong with conducting exploratory research per se'. However, it would be unethical to create the impression that the findings emanating from the study constitute generalisable results. In a paper entitled 'The logic of small samples in interview-based qualitative research', Crouch and McKenzie (2006) argue that the use of a limited number of respondents is justified when the focus falls on collecting data about the respondents' perceptions as opposed to

simply amassing so-called objective facts about their social conditions. To achieve rigour, a number of strategies were adhered to. Given that different data sources (i.e. a qualitative questionnaire and a focus-group discussion), as well as more than one framing perspective on how AI may be shaped or anthropomorphised, were employed to determine levels of awareness and perceptions of AI, both data and theory triangulation were achieved (Vu 2021). In addition, with a view to fostering transparency around the analysis and interpretation of the data collected, a detailed audit trail of the research processes was maintained. Further, to ensure adequate engagement with the data generated on the basis of the two focus-group discussions, each comprising three participants, it was decided that extending each discussion beyond 80 minutes would not yield any additional insights about perceptions of AI. In the interest of transparency, it is important to mention that the kind of engagement described here is not equivalent to achieving data saturation (Vasileiou et al. 2018). In a recent systematic review of 23 empirical studies conducted in the context of qualitative research, Hennink and Kaiser (2022) found that with respect to focus-group discussions, four to eight discussions were required to achieve saturation. They do concede that a limitation of their review is that it focused solely on health care research and that their conclusions can therefore not be extended to other disciplines. Of interest is that in a 2017 study of saturation in qualitative research, Guest et al. (2017) concluded that:

[A] sample size of two to three focus groups will likely capture about 80% of themes on a topic – including those most broadly shared – in a study with a relatively homogeneous population, and using a semi-structured guide. (p. 16)

Focus-group discussions yielded data that were sufficiently rich to answer the two research questions posed, and theoretical saturation was realised. In other words, gathering additional data would not have resulted in identifying any new theoretical insights into a bounded context such as the one described here.

■ Presentation and discussion of the findings

■ Questionnaire

Not unexpectedly, answers to the questionnaire indicated all respondents' lack of (generic) understanding about and technical awareness of AI-enabled technologies. With regards to understanding, typical statements (which contained the words 'understanding' or 'knowledge') included 'I am going to say [my understanding] is quite limited' (Participant 1, questionnaire, n.d.), 'My knowledge is minimal' (Participant 3, questionnaire, n.d.), 'My knowledge about AI [...] can be considered as below average' (Participant 5, questionnaire, n.d.) and '[My understanding is] non-existent' (Participant 6, questionnaire, n.d.). With regards to levels of technical awareness about

AI in the context of the workplace, statements included '[My awareness] is probably closer to nonexistent [*sic*]' (Participant 1, questionnaire, n.d.), 'I think my knowledge is minimal because we do not use it where I work' (Participant 3, questionnaire, n.d.), 'My knowledge about AI and its application in the workplace can be considered as below average' (Participant 5, questionnaire, n.d.) and '[My technical awareness is] non-existent' (Participant 6, questionnaire, n.d.). Respondents' lack of technical awareness was explained in a number of ways, extracts of which are provided:

'I know people use AI to streamline processes like chatbots. I do not have personal experience with AI in the workplace though.' (Participant 3, questionnaire, n.d.)

'Most of the information that I accessed on AI so far was about the use of AI at home, for industrialization, or in medical professions. I have also read about the human perception of AI. However, I know very little about the possible role and application [*of*] AI in my own work environment, which can be considered as a quinary industry.' (Participant 5, questionnaire, n.d.)

'I don't consume content where AI in the workplace is mentioned or a discussion point.' (Participant 6, questionnaire, n.d.)

The reason why the questionnaire made a distinction between *understanding* (perception) and *awareness* is that they are not synonymous. Owsley and Greenwood (2022, p. 2) defined the former as '[including] all the ways a person can see', while the latter, in the words of Tomlin and Villa (1994, p. 193), constitutes 'a particular state of mind in which an individual has undergone a specific subjective experience of some cognitive content or external stimulus'. Of interest here is that all six respondents displayed an awareness of AI that signalled they lacked specific information about this technology and its applications in the workplace. This is to be expected, given that, as Jeffrey (2020, p. 12) puts it, '[a]wareness of AI is not the same as being informed about [it]'.

Respondents' answers indicated that while they are aware that AI is being deployed in the world of work, what the nature of its various deployments entails is virtually unknown to them. The finding is one echoed by Gherheş and Obrad (2018), who, in the context of sustainable development, found that students pursuing technical degrees as opposed to those in the humanities have a better understanding of AI, given that their studies and professions bring them into closer contact with the topic of AI. All respondents reported that their sources of information about AI originated from science fiction movies, YouTube footage (e.g. about developments in AI) and video games. What is potentially problematic about sources such as cinema and video games is that they tend to depict AI as sentient or as consuming humans, thus resulting in skewed perceptions about what its capabilities are. Although not a point for consideration in

the section that follows, to provide an example of a dystopian view expressed when engagement questions around movies were posed during the first focus-group discussion, one Hons student (Participant 3, questionnaire, n.d.) described feeling afraid when she watched *I, Robot*, remarking that 'It was like they were trying to replace humans'. She went on to claim that '[...] the character in the movie didn't trust them and I kind of feel the same way because you don't know what they are thinking'. Clearly, a techno-pessimistic perception such as this one – which may, as averred by Vicsek, Bokor and Pataki (2022), negatively impact students' understanding and acceptance of AI as well as how they ultimately imagine its place in the world of work – needs to be challenged through the guidance of informed educators.

□ Focus-group discussions

Research question 1: What are postgraduate humanities students' general perceptions of AI and its place in the world of work?

Before they generated conversations around the three news articles, all six participants expressed mixed views about AI in general, portraying it in both idyllic and apocalyptic terms. A response that was typical of all students in the focus groups was expressed by Participant 2 when she made the following statements:

'I try to keep an open mind about most things [...] so I think there could potentially be a lot of benefits to this. However [...] if it thinks like a human, how do you know it is not going to backfire on humankind?' (Participant 2, questionnaire, n.d.)

The inclination to perceive AI-enabled technologies in terms of both risks and benefits – or in terms of the frames of competition and social progress – is not new. A number of research studies point to ambivalence towards AI, including those by Attwood and Bruster (2020) and Demir and Güraksin (2022), although most of these studies also indicate that perceptions tend to be more positive than negative. As Naudé (2021) reminds us, uninformed students who adopt equivocation about AI's impacts may not be aware that neither a utopian nor a dystopian scenario is possible in the near future. One reason for perceiving AI as saviour and a threat lies in the perception that artificial general intelligence (AGI) (described in hypothetical terms as any system that replicates *all* tasks performed by humans) is on the verge of being achieved or is even a present-day reality. However, AGI has not been realised – despite what fictional narratives (as well as some classical AI scholars and industry leaders) continue to tell us about its so-called meteoric rise. In *The Myth of Artificial Intelligence: Why Computers Can't Think the Way We Do*, computer scientist Erik Larson (2021, p. 27) offers in-depth insights into why AGI does not exist: among other things, it is not

possible for AI systems to ‘think’, given that they cannot be programmed with intuitive human reasoning: ‘[...] the idea of programming intuition ignores a fundamental fact about our own smarts. Humans have social intelligence. [Humans] have emotional intelligence’. Ragnar Fjelland, a Norwegian physicist and philosopher, who bases much of his argument on Hubert Dreyfus’s (1972) critique of AI, also questions the realisation of AGI, asserting that unlike humans, ‘computers are not in the world’ (Fjelland 2020, p. 1) and that ‘[a]s long as computers do not grow up, belong to a culture, and act in the world, they will never acquire human-like intelligence’ (p. 3). Other notable scholars who have adopted a more circumspect stance on AGI include Maclure (2020), Coeckelberg (2020) and, more recently, Roli, Jaeger and Kauffman (2022). Given that the field of AI has its foundation in the claim that machines can be programmed to simulate human beings’ cognitive abilities and that this has opened up an ethical minefield (Sniecinski & Seghatchian 2018), the recommendation made here is that philosophical reflection on AI should become commonplace for students in the humanities so that they are able to critically interrogate AI’s epistemological and ethical consequences. Van de Poel (2020) suggests the implementation of a *humanities philosophy of technology* and not an *engineering philosophy of technology* that specifically underscores technology’s intersections with society, culture and history. He asserts that three philosophical perspectives should be considered, namely, technological determinism, social determinism and – importantly – ‘a co-evolutionary perspective [...] where neither [technology nor society] determines the other’ (Van de Poel 2020, p. 499). In Van de Poel’s (2020, p. 499) view, the third perspective is particularly pertinent when it comes to techno-optimists and techno-pessimists alike attempting to uncover what he calls ‘blind spots in the current debate’ about AI. In terms of this perspective, AI is regarded as a technology that does not substitute humans but supports them while also fostering their capabilities.

With respect to general perceptions of AI’s role in the workplace, respondents were asked if they could elucidate the difference(s) between robotic process automation (RPA) and intelligent automation (IA). Honours students in the first group were unable to answer this question, while the MA students in the second group hazarded good guesses, with typical responses including those such as ‘[...] they would be like [...] one of those big machines that you have in a factory [...] versus something more intelligent, like they actually act on [their] own’ (Participant 4, questionnaire, n.d.) and ‘The first one sounds more [...] like something that is built and people programme it [...] and the latter sounds to me like it’s capable of learning’ (Participant 5, questionnaire, n.d.). Crucially, when provided with a list of occupations ranging from factory work to professional careers, four students viewed neither RPA nor IA as posing significant or immediate

risks to their own future career paths in teaching or academia, offering a number of reasons for this view. Two participants in the first group, who had undergraduate modules in translation studies, correctly noted that Google Translate is flawed. In this regard, Participant 1 employed the frame of nature to cast doubt on AI's ability to be creative, while Participant 3 evoked the middle way frame when she opined that Google Translate should include the human element: 'It's a machine. You always want the human element because it can provide stuff the machine cannot' (Participant 3, RPA, n.d.). In the second group, Participant 6 framed AI in terms of nature when she questioned its ability to generate news articles based on factual information, at one point describing the articles produced as bordering on the absurd. While these are all valid observations, it should be of concern that most respondents did not warrant automation as a major threat to their careers. Mbilini et al. (2019) point out that a lack of concern about automation may signal one of two scenarios:

It may be the case that the impact of automation on the structure of labour demand has been overhyped, in which case ignoring it as a factor is non-problematic. Conversely, the argument can be made that ignorance of automation is setting many students up for failure. (p. 8)

Even if AI does not significantly impact job losses in education and academia, it will certainly transform these areas, and graduates will have to be prepared for transformations that will include a shift to smart education as opposed to conventional teaching methods (Jaiswal & Arun 2021). Although all the participants under investigation intend to pursue careers in education or academia, four did not express any concerns about what *roles* AI may be playing in these professions. Here, a call is made for educators at the tertiary level to sensitise humanities students to the nature of these roles that unavoidably reflect a number of ethical issues. As succinctly put by Dignum (2021), in the context of AI that is both responsible and trustworthy:

[...] a pressing question is how to ensure the knowledge and skills to develop and deploy AI systems that align with fundamental human principles and values, and with our legal system, and that serve the common good. As industry, research, the public sector and society in general are increasingly experimenting with, and applying, AI across many different domains, governments and policymakers are looking at AI governance, that is, the means to shape the process of decision making in ways that ensure public safety, social stability and continued innovation. (p. 8)

Research question 2: How do journalists' conceptualisations of AI in anthropomorphic terms influence how students imagine AI futures in the workplace?

Cognitive anthropomorphism: All participants were able to recognise the use of anthropomorphic tropes in each of the given news articles. In the

first article on the application of an AI model to diagnose malignant or benign skin conditions, participants identified anthropomorphic language in claims such as ‘A computer was better than human dermatologists at detecting skin cancer in a study that pitted human against machine’ and ‘The machine – a deep learning convolutional neural network or CNN – was [...] shown photos of malignant melanomas and benign moles’. Statements such as these evoke a specific type of anthropomorphism called cognitive anthropomorphism, which Mueller (2020) defines as the propensity to take it for granted that AI is equivalent to human intelligence. What is problematic about conflating artificial and human intelligence is that it creates the mistaken impression that AGI has been realised when it has been established that this is not the case. All participants demonstrated that they were not seduced by the journalist’s claim that AI’s cognitive capabilities have transcended those of human beings. Three arguments against this claim were proffered. Firstly, two students explicitly addressed the journalist’s use of sensational anthropomorphic language. Participant 2, for instance, stated ‘I think [anthropomorphic language is] used actually to gain the trust of the reader. I think these words are used very deliberately to create a connection between the computer and the reader’ (Participant 2, questionnaire, n.d.). Secondly, three students pointed out that algorithmic bias is a potential problem and that an AI system is only as effective as the data it is trained on. Participant 4, for example, referred to ‘code bias’, while Participant 5 made the following observation: ‘Let’s say we only ever capture seven [types of skin cancer] then [...] it’s only going to have data on that seven’ (Participant 5, questionnaire, n.d.). Sensitising students to algorithmic flaws, not only in the area of AI-enabled health care but also in a variety of sectors, is critical, given that a data set that is not representative of a given population group could result in inaccuracies and biases related to age, gender and race, for example (Panch, Mattie & Atun 2019). Thirdly, all participants either indicated or briefly agreed with one another that while they believed that an AI model could accurately diagnose skin cancer, what was missing was the human element, which they claimed they could not do without. In this regard, Participant 2 observed, ‘It’s a good thing to have computers for diagnostics but I also agree that you need that human touch, especially with something like cancer because it is an extremely emotional thing’ (Participant 2, questionnaire, n.d.). Participant 3 stated ‘[Journalists] are trying to make us feel afraid of computers but I don’t feel particularly afraid because for me the human must have the conversation with the patient’ (Participant 3, questionnaire, n.d.). A little later on, she also observed that ‘[...] journalists very effectively use language especially with [topics] that are controversial’ (Participant 3, questionnaire, n.d.). These comments signal (as already indicated) that some students may be aware that journalists employ specific frames couched in alarmist or

sensational anthropomorphic language are aimed at increasing ratings, for example. The comments also point to the students being aware that AI is not sentient and that it therefore cannot display empathy (Montemayor, Halpern & Fairweather 2022).

Participant 3 demonstrated awareness that AI reasoning is not equivalent to human reasoning when she observed that '[...] machines don't have human senses that we use to make our decisions' (Participant 3, questionnaire, n.d.). However, she also stated that '[they] don't make human errors' (Participant 3, questionnaire, n.d.). Students need to be made aware that AI systems are not infallible. Citing a study by Challen et al., Hall and Fitall (2020, para. 9) detail a number of potential diagnostic errors that AI can make that include 'the potential for error resulting from discrepancies between the data used to train AI systems and the real-world clinical scenario due to limited availability of high-quality training data', which is the type of error alluded to by the other participants in the study. According to Durán and Jongsma (2021), a significant problem in medical AI revolves around the use of so-called black box algorithms that concern scholars and medical practitioners alike, given that the computing systems employed to diagnose disease are so opaque that they cannot be surveyed or explained by humans. Epistemologically and ethically speaking, this opacity results in a number of conundrums. Among other things, the question becomes to what extent algorithms can be trusted if they obscure accountability and transparency. During the focus-group discussions, the three Hons students indicated that they were uninformed about what black boxes are and what their ethical and epistemological impacts could be. For humanities students who intend to become education practitioners, understanding AI's black box problem in the field of learning analytics is particularly important for resolving issues of accountability and transparency around the ethical management, analysis and use of student data that can never be neutral, given that it is intertwined with social, political and economic dimensions (Prinsloo 2020). For humanities students interested in academia and who may be employing computational AI to conduct research, it is critical to understand the consequences of opaque AI systems to avoid analyses that are skewed (Yu & Ali 2019).

Social anthropomorphism: In contrast to cognitive anthropomorphism, social anthropomorphism entails the attribution of a human-like appearance or human qualities and behaviours to machines. With regard to the second news article that featured an AI-enabled chatbot designed to '[satisfy] emotional needs where real-life communication too often falls short', all respondents detected anthropomorphism in claims (made by online users) such as '[Xiaolce] replies to her messages at all hours of the day, tells jokes to cheer her up but is never needy' and '[Xiaolce] reference says things that are pretty comforting'. According to Duffy and Joue (2005, p. 1), this type

of anthropomorphism ‘fills the limitations of technology to create perfect humanoids’, which may lead to unrealistic expectations about the chatbot’s capabilities. Participants in this study demonstrated awareness that the use of social anthropomorphism may be deliberate. Looking at the images and videos that accompanied the article, as well as at the journalist’s choice of words, Participant 3, for example, stated that ‘[...] making robots look like humans or making them look cute is actually a kind of way to develop a [...] trust in them because we trust humans as a general rule [...]. The use of [...] specific words [in the article] is intended to have the same effect’ (Participant 3, questionnaire, n.d.). Such comments show awareness that anthropomorphism may be built into AI technologies to facilitate acceptance of and interaction with them.

In this regard, Cheng et al. (2022, p. 2) observe that ‘considering the assumption that chatbots will assume roles hitherto fulfilled by human beings, they are naturally expected to accomplish interactions as human-like as possible’. In the article, the journalist implies that online users may prefer to interact with a chatbot rather than with a human therapist, at one point quoting a chatbot user as saying (AFP 2021):

I have friends who’ve seen therapists before, but I think therapy’s expensive and not necessarily effective [...]. When I unload my troubles on Xiaolce, it relieves a lot of pressure. (para. 5)

Participants were asked about their perceptions of this type of language influencing how they perceive the place of human therapists in the world of work. Again, participants were not duped by the use of sensational language on the part of the journalist. Participant 1 indicated that the journalist’s use of the frame of nature evoked anthropomorphism (through words such as ‘friend’ and ‘boyfriend’), which in turn normalised interaction with chatbots: ‘When I read the article, I want to place it in the categories of nature which is like the person using the chatbot [is] seeing it as normal’ (Participant 1, questionnaire, n.d.). She then immediately stated that ‘it’s also [...] a morality or ethics problem and possibly Pandora’s Box’ (Participant 1, questionnaire, n.d.). The participant qualified this last comment by pointing to an over-reliance on chatbots: ‘this is now sounding like an addiction [...]. Now you actually knew a psychiatrist, but now you’re not going to go to the psychiatrist because the robot’s your psychiatrist’ (Participant 1, questionnaire, n.d.).

These observations signal an awareness of the ethical issues surrounding anthropomorphic AI chatbots. Indeed, as Alabed, Javornik and Gregory-Smith (2022) aver:

When users perceive [*AI agents*] as part of their identity [...] their decision-making abilities may decline, as excessive attachment to AI agents makes people rely on these agents for opinions and ideas. (p. 13)

Other comments that show participants were not 'sold' on the use of anthropomorphic language and were aware of chatbots' deficiencies or ethical consequences included 'I wouldn't trust a machine to handle my emotions' and '[...] almost certainly [human-chatbot interaction] would mean that information is being fed back into it. [...] How is the information being used?' (Participant 2, questionnaire, n.d.). This last extract is significant as it underscores a realistic concern on the part of users that companies designing and deploying AI technologies may not be protecting the information disclosed to chatbots (Gamble 2020). One recommendation proposed here is that humanities and STEM students should be encouraged to work together to critically interrogate possible privacy breaches that the use of chatbots in the world of work may trigger.

Personhood: The third article reports on an AI system called 'DABUS', described as an 'inventor' of food containers that has been granted patent rights in South Africa and that, by implication, is competing with human inventors in the workplace. Clearly, this description reflects anthropomorphism, which projects legal personhood onto AI-powered technologies (Avila Negri 2021). Legal personhood may be defined as the right to equality and to recognition before the law and is a controversial notion in the context of AI, given that it gives a machine legal standing (Gordon 2021). In both discussion groups, participants were of the view that framing AI as an entity that should be afforded personhood or 'trying to make DABUS [...] an individual in its own right is a ridiculous' (Participant 3, questionnaire, n.d.) notion to entertain (the use of 'its' rather than 'his' or 'hers', for example, is also significant as it signals awareness that a machine cannot be perceived as human). Participant 5 remarked that, in his opinion, a more temperate view of AI systems would be to think of them as *processes or tools* rather than as humans, which is a view expressed by a number of critics of awarding legal personhood to machines (Brown 2021). Interestingly, although Participant 2 also did not agree that AI systems should be granted legal rights, she nevertheless stated that 'they're trying to make us think of the future because we're heading there [...]. What might we do if we get these robots who are actually acting like humans and living like humans?'. This is a view held by scholars such as Brown (2021, p. 213), who argues that 'alternatives [such as regarding artificial agents as tools] will reach their limit [...] as AI, including artificial agents, engage in increasingly autonomous, unforeseeable, and uncontrolled actions and decision-making'.

■ Conclusion

With respect to the first research question, this small case study found that the participants downplayed AI's possible threats to their

humanities-oriented careers and could not critically imagine AI's roles and the consequences of these roles in their careers. Even if AI does not replace certain occupations, it will certainly change the landscape of those occupations. For this reason, it is recommended that humanities students pursuing careers in education or academia should receive training that is inclined towards what Van de Poel (2020, p. 499) refers to as a 'humanities philosophy of technology'. Such a perspective acknowledges that AI should not be viewed as replacing humans but rather as improving their existing capabilities. It also critically assesses how AI is embedded in given social, cultural and historical realities. Another recommendation is to sensitise students to what AI as a technical artefact entails and to the epistemological and ethical consequences of its application in the world of work. Such sensitisation training underscores the fact that it is humans who lie behind the design and deployment of AI and that a view of technology that favours technological determinism alone will not help resolve workplace challenges. Finally, students need to be made aware of AI's opacity, which could negatively impact different facets of education and academia. With respect to the second research question, the participants were not seduced by the media's anthropomorphic framing of AI. They were well aware that the use of anthropomorphic tropes by journalists contributes to the current hype around AI's capabilities. This view is summarised in a tongue-in-cheek yet sober comment made by Participant 5 in the context of the workplace: 'It's not the robots I'm afraid of [...]. I'm not afraid of the gun; I'm afraid of the person holding the gun' (Participant 5, questionnaire, n.d.).

In terms of future research, this exploratory study needs to be extended to include a larger contingent of students from different disciplines in order to obtain generalisable results.

Inequalities in South African indigenous languages during the Fourth Industrial Revolution

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■ Introduction

Presently, driven by the Fourth Industrial Revolution (4IR), the global landscape is undergoing comprehensive changes across various aspects of existence (Makgopa 2022). To a particular extent, language serves as the cohesive force in the 4IR, as the revolution is conceptualised, envisioned and communicated through linguistic means. To some degree, language acts as the unifying element in the 4IR, seeing that this paradigm shift is conceptualised, envisioned and conveyed through linguistic channels (Mawela 2021).

As the 21st century commenced, marking the introduction of the 4IR, South African national languages and cultures assumed a significantly

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more prominent role in global affairs and interpersonal relations among people and governments than some analysts and researchers of the 20th century had foreseen (Osborn 2010). Makgopa (2022) points out that indigenous languages serve as the conveyors of communication, culture and identity. Language becomes the medium through which individuals articulate their thoughts, emotions and feelings. Regrettably, according to Makgopa (2022), colonialism has engendered substantial problems and hurdles in the development of indigenous languages. It is universally acknowledged that this circumstance has resulted in linguistic inequality.

As outlined in the South African Constitution (RSA 1996), South Africa recognises eleven official languages, namely, Sepedi, Sesotho, Setswana, siSwati, Tshivenda, Xitsonga, Afrikaans, English, isiNdebele, isiXhosa and isiZulu. According to Deloitte Insights (2020, p. 3), the 4IR refers to the integration of physical assets with advanced digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), robots, drones, autonomous vehicles, 3D printing, cloud computing and nanotechnology. These technologies communicate, analyse and act upon information, enabling organisations, consumers and society to be more flexible and responsive while making intelligent, data-driven decisions.

Preceding the 4IR, earlier transformative periods included the First Industrial Revolution (1IR), the Second Industrial Revolution (2IR) and the Third Industrial Revolution (3IR). According to authors such as Kayembe and Nel (2019), the 1IR spanned the 18th and 19th centuries, marking a transition from agrarian societies to the utilisation of mechanisation. Additionally, the 2IR followed in the early 19th century, characterised by significant technological progress in areas like steel, chemicals, electricity and various other fields. Kayembe and Nel (2019) further expounded that the 3IR commenced in the mid-1900s, driven by advancements in technology related to the manufacturing, distribution and energy sectors.

The 4IR represents the current and evolving landscape where dynamic technologies such as IoT and AI are reshaping people's lifestyles (Kayembe & Nel 2019). Manda and Dhaou (2019) indicate that various governments are harnessing the digital-driven industrial revolution to enhance social and economic inclusion through a transformation towards a smart society. Similarly, according to the World Trade Organization (WTO) (2021), the digital era holds the potential to unlock economic opportunities, particularly in developing countries facing challenges in industrialisation because of resource constraints, including financial limitations and a challenging business environment. Moreover, the WTO explains that over recent decades, the global technological changes have converged into what is commonly referred to as the 4IR – a 'digital era' where data have become

an exceptionally valuable commodity, serving as a source of competitive advantage for countries, industry sectors and businesses alike.

Considering the explanations of 4IR provided earlier, it is evident that a clear association exists between 4IR and information and communication technology (ICT). According to Chen et al. (2015, p. 28), ICT encompasses 'skills around computing and communications devices, software that operates them, applications that run on them, and systems that are built with them'.

Additionally, Manda and Dhaou (2019) emphasise the pivotal role of technology as a driving force behind the 4IR. They point out that cyber-physical systems, controlling and monitoring various processes, lie at the core of the 4IR, employing advanced ICT tools such as robotics, sensors and sophisticated manufacturing techniques like additive manufacturing. Undoubtedly, as Osborn (2010) demonstrates, the localisation of ICT and its content in multiple languages has become an increasingly significant topic for discussion and action. This is particularly pertinent given the global proliferation of computers and Internet access. Osborn (2010) defines localisation as the:

[7]ranslation and cultural adaptation of user interfaces and software applications, as well as the creation of Internet content in a variety of languages and the translation of content from other languages. (p. 1)

In essence, the integration of 4IR in a country like South Africa, with its eleven official languages, holds the potential to convey diverse messages through ICT. This could prove advantageous for government, businesses and other sectors, enabling them to provide services and conduct business in languages comprehensible to the population.

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Undoubtedly, as Osborn (2010) points out, the localisation of ICT and its content in multiple languages has become an increasingly significant topic for discussion and action. This is particularly pertinent given the global proliferation of computers and Internet access. Osborn defines localisation as a process that involves translating and culturally adapting user interfaces

and software applications, along with generating Internet content in multiple languages and translating content from various linguistic sources. In essence, the integration of 4IR in a country like South Africa, with its eleven official languages, holds the potential to convey diverse messages through ICT. This could prove advantageous for government, businesses and other sectors, enabling them to provide services and conduct business in languages comprehensible to people.

Hence, the objective of this study is to investigate the utilisation of 4IR technologies as a means to address linguistic inequality in South Africa, alleviate linguistic disparities through the application of 4IR technologies and contribute insights into the current landscape of 4IR technology use in South Africa. The aim is to provide valuable information for experts in the fields of 4IR and ICT for development, while also establishing a benchmark for evaluating the efficacy of future efforts to localise South Africa's indigenous languages. To achieve this objective, the study poses the following questions: How are digital platforms utilised in South Africa? What roles do indigenous South African languages play in the context of 4IR? What strategies can be employed to address linguistic inequality in South Africa through 4IR? In response to these enquiries, a case study based on secondary data has been conducted, shedding light on the roles of South African indigenous languages in the 4IR and proposing strategies to bridge linguistic disparities in the country through the application of 4IR technologies. The research is structured into various sections: the initial section outlines the research problem, followed by a theoretical framework, a literature review, methodology, results and discussion, and concluding with recommendations.

■ Statement of the problem

In South Africa, indigenous languages primarily serve communication purposes. Most of these languages are not commonly utilised in business settings. Consequently, some speakers of indigenous languages in South Africa perceive their languages as less significant and express a preference for globally spoken languages, believing that proficiency in a business language opens up better opportunities. Manda and Dhaou (2019) highlight that European languages are commonly employed in Africa, serving as official languages in African countries, while indigenous languages are marginalised and often sidelined. This observation aligns with Balfour's (2019) assertion that South African indigenous languages remain notably under-resourced compared to more mainstream languages. Osborn (2010, p. 10) notes that presently, there appears to be a shortage of web content developed in (South) African languages, both within Africa and on a global scale. Moreover, he highlights that African languages are featured on the

web as communication channels, albeit not prominently. This has sparked a growing discourse on the true extent of their utilisation. This suggests that content in African languages (created in the languages themselves rather than merely about them) remains relatively rare and is gradually increasing.

Madadzhe (2019) asserts that the incorporation of (South) African languages across various domains contributes to linguistic imbalances affecting diverse aspects of South African life. Consequently, Olaitan, Issah and Wayi (2021) argue that the magnitude of inequality in (South) Africa is substantial. According to South Africa's National Planning Commission (2020), the expansion of digital connectivity is exacerbating inequality. This is evident not only in the gap between those with online access and those without but also in the disparity between individuals possessing the technical and financial means to utilise the Internet optimally and those who do not. In connection with this, it can be acknowledged that the degree of inequality influences the use of languages on digital platforms and technologies in South Africa. Importantly, Olaitan et al. (2021) emphasise that South Africa grapples with persistent developmental challenges akin to those experienced across the continent, marked by chronic issues of inequality.

Without deliberate efforts to address these linguistic disparities, the divide will persist and South African indigenous languages will consistently fall behind in affording members of their respective linguistic groups access to information. Indigenous languages harbour significant potential and capacity to contribute rich and underutilised content to the rapidly advancing 4IR, potentially generating economic value and positioning these languages for international competitiveness. The limited visibility of South African indigenous languages in a basic Internet search engine serves as an indicator of the linguistic divide highlighted in this study. While information in English is readily accessible in a matter of seconds, the same information may not be as easily available in isiNdebele, siSwati, Xitsonga or Tshivenda.

■ Theoretical framework

Given the absence of a suitable framework and limited research on leveraging 4IR technologies to address linguistic inequality among South African indigenous languages, this chapter on 'inequalities in South African indigenous languages' adopts a grounded theory approach. Originating from sociologists Glaser and Strauss (1967), grounded theory was developed to enable researchers to progress from data to theory, facilitating the emergence of new theoretical frameworks, as highlighted by Nel and Govender (2018). Khan (2014) supports this perspective, noting that grounded theory is employed for conceptual thinking and theory

construction rather than the empirical testing of existing theories. Terwilliger (2021) underscores the utility of grounded theory when no pre-existing theory is available to explain or comprehend a particular process. In essence, grounded theory serves as a design to facilitate the development of new, context-specific theories, aligning with the insights of scholars such as Nel and Govender (2018).

Hence, the aim of the chapter is to urge that scholars in linguistic and communication research construct theoretical frameworks elucidating how 4IR technologies can play a role in mitigating linguistic inequality among South African indigenous languages. The WTO (2021) also underscores the contextual dimension of inequality, highlighting that, alongside the rising prominence of the 4IR, global inequality is becoming increasingly pronounced. The longstanding issue of inequality, encompassing aspects such as employment, social status and mobility, is not a novel concern; however, it appears to have heightened in recent years.

Given the potential impact on these languages, the development of theories could be instrumental in fostering equality among South African indigenous languages. Nel and Govender (2018, p. 2) posit that grounded theories should be specific to the context and firmly rooted in the data from which they originated, without dependence on analytical constructs, predefined categories or variables from existing theories.

■ The use of digital platforms in South Africa

As of January 2022, South Africa had 41.19 million active Internet users, with 28 million of them engaging in social media, constituting approximately 46% of the total population, according to Statista's 2018 digital population report. In its pursuit of inclusive growth, South Africa has integrated digital transformation into its strategies. Examining this endeavour as a case study, the country, classified as a developing nation, has embraced the digital transformation initiative. The objective is to catalyse changes in government, business and society, as highlighted by Manda and Backhouse (2018). These authors shed light on South Africa's adoption of three fundamental pillars guiding its path towards becoming an inclusive digital society: (1) the digital transformation of government, (2) digital access and (3) digital inclusion.

According to the National Planning Commission of South Africa (2020, p. 28), it is emphasised that accessible and affordable communication infrastructure and services should be provided to every South African, along with the capability and resources to access, create and share information, applications, and content in their chosen language. In a *TimesLIVE* newspaper article, Gaanakgomo (2022) highlighted that TikTok has acknowledged users in South Africa who have achieved significant

success on the platform, establishing themselves through the platform. Described as a video-sharing application enabling users to share lip-syncs, sketches, parodies and personal stories with sound bites or audio snippets, TikTok has emerged as a valuable resource in a country grappling with high unemployment rates, particularly among the youth. For some individuals, TikTok has evolved into a platform for income generation and opportunities, prompting certain users to leave traditional employment in favour of becoming content creators. These individuals have swiftly gained recognition and demonstrated business acumen.

Features like lip-sync on the platform enable users to generate content without language limitations. Essentially, individuals can produce content in a language they may not speak. The platform has witnessed the trending of videos in various South African languages. Moreover, users can easily share their content on other social media platforms such as Instagram and WhatsApp. In this context, Gaanakgomo (2022) quoted Saul Moross, the content and media partnerships lead for TikTok in Africa, who highlighted that as a global platform, there is a continuous search for initiatives to empower determination. These initiatives aim to assist content creators in capitalising on the growing digital economy by leveraging their talents and creativity. Consequently, there is anticipation surrounding the emergence of the next generation of digitally savvy youth.

As per Bhengu (2021), two prominent South African content creators – Mac G, a podcast host, and Lasizwe, known for comedy skits – secured positions among the top ten most-watched videos on *TimesLIVE*'s YouTube channel. These YouTubers commonly incorporate both English and various African languages into their shows, catering to audiences who prefer receiving content in their native languages. Consequently, it can be asserted that the 4IR, if approached with seriousness and discernment, has the potential to significantly address linguistics.

■ South African indigenous languages and Fourth Industrial Revolution

Despite the numerous challenges and threats posed by digital technologies to humanity, there is a noteworthy observation that digital innovations are transforming the structure of the global economy. The decrease in search and information costs, the swift proliferation of new products and markets, and the introduction of new participants facilitated by digital technologies hold the promise of enhancing global trade flows, encompassing exports from developing countries (WTO 2021).

Mawela (2021) asserts that language plays a central role in the 4IR. The 4IR is formulated, envisioned and articulated through language, making it

indispensable to any discourse on the topic. Additionally, Osborn (2010) highlights that employing technologies in indigenous languages in South Africa is not only a solution but also unlocks new opportunities for more efficient technology utilisation by the highly educated. This approach complements and extends the potential provided by applications in European (or ‘europhone’) languages of wider communication (ELWCs).

As the global information revolution extends its reach to more languages and as new ICTs become more widespread beyond the capital cities of Africa, there arises an increasing necessity to embrace the diverse use of indigenous languages. This presents a greater potential to leverage the linguistic richness of the continent for development and education, as highlighted by Osborn (2010). Ndzendze (2022) contends that the 4IR holds the promise of dismantling language communication barriers in Africa, including South Africa, by facilitating communication and interaction through smartphones and wireless technology in indigenous languages. Osborn (2010) argues that the utilisation of technologies in (South) African indigenous languages should not be seen merely as a compensatory measure for people lacking proficiency in ELWCs. It is not a second-best or interim solution until proficiency in ELWCs improves. According to Osborn, it is a matter of fairness in terms of access, addressing a long-term practical concern. It is challenging to envision that (South) Africans, like any other population, would universally feel comfortable or efficient in using ELWCs in ICT to the exclusion of their first languages.

Regarding the 4IR, data governance and data justice in South Africa, the National Planning Commission (2020) noted progress in safeguarding citizens, but emphasised the need for additional measures to protect vulnerable groups as they engage online. These measures include ensuring their access to services and meaningful content, as well as the availability of m-government services in user-friendly and multilingual formats, accommodating individuals with hearing or visual impairments. As highlighted in Balfour’s address at the University of South Africa (Unisa) Teaching-Learning Festival in 2019, one of the significant impacts of the 4IR is the sudden and substantial growth of human language technologies. Human language technologies, defined as software facilitating human-computer interaction through written natural language (such as isiZulu), have experienced remarkable expansion.

■ Strategies to help bridge linguistic inequality amid the Fourth Industrial Revolution in South Africa

As the significance of localising technologies in African languages grows, it is imperative to consider the requirements essential for its continual

development and the realisation of its objectives (Osborn 2010). In the specific context of South Africa, Olaitan et al. (2021) propose that the country aims to leverage emerging 4IR technologies to address developmental challenges, particularly those impacting languages. With its substantial presence in African-language web content, content about African languages merits special consideration. This encompasses a diverse spectrum of presentations ranging from informal and occasionally incomplete to well-conceived and sometimes ambitious projects (Osborn 2010). Additionally, Osborn outlines one of the strategies for addressing linguistic inequality through 4IR, which involves the localisation of user interfaces for online tools like search engines. This domain encompasses software localisation, considering terminologies and user profiles, and web content involving the use of African languages on websites that serve as user interfaces.

Regarding software localisation, Osborn (2010) refers to Google's programme, which incorporates various African-language versions, with several more in the development pipeline. Facebook also has a localisation programme, including the development of versions in several African languages, although some languages are still excluded. Notably, indigenous South African languages are part of the software localisation efforts. In light of this context, Mawela (2021) promotes the decolonisation of the language agenda and suggests decentralising English as the primary language of the 4IR by incorporating science and technology into indigenous languages. To address linguistic inequality through 4IR technologies, he suggests that South Africans should actively promote indigenous languages by introducing terms in these languages on platforms such as Twitter, Zoom, Facebook and Instagram, among others.

Crucially, Siziba (2020) proposes the reconsideration of providing space for indigenous languages, such as isiXhosa and others, under 'language and input' tabs in all mobile phone device settings. This move, according to Siziba, would not only be fair but also symbolise respect for nations previously disadvantaged by the legacy of colonialism and capitalism. He further suggests that in the context of 4IR as the new world order, there should be a re-evaluation of language inclusion beyond those dominating the mainstream. Failure to do so risks the perception that the 4IR is a new capitalist venture that could oppress and marginalise those who do not benefit from it, particularly people of African descent.

According to Manda and Dhaou (2019, p. 248), the successful integration of new technologies emerging from the 4IR necessitates the establishment of policies and mechanisms that address the challenges and opportunities arising from digital transformation. One could contend that the policies suggested by Manda and Dhaou (2019) might influence the utilisation of South Africa's indigenous languages. In line with their emphasis,

Marwala (2021) elaborates that, to address language inequality within the framework of 4IR, policies and legislation should be reassessed, modified and established. In concurrence with this perspective, the National Planning Commission (2020) emphasises the significance of considering demand-side barriers, such as device and service affordability, educational capacity or skills required for digital services and the availability of relevant local content in languages used. Moreover, the commission highlights that policy formulation ought to encompass a comprehensive range of demand stimulation measures, spanning from public access through widespread availability to the promotion of the development of pertinent local content in indigenous languages. Marwala (2021) further suggests that to align the South African legislative framework with 4IR, parliament should conduct a thorough review of all legislation, updating it as necessary.

According to Osborn (2010), incorporating indigenous languages into the 4IR requires strategic perspectives, conferences, workshops, training and public education on content localisation in indigenous languages. Additionally, it involves addressing information resources, networking, basic localisation, policy matters, advanced applications and research. Furthermore, Balfour (2019) emphasises that crucial elements for the ongoing development and empowerment of our indigenous languages in the context of 4IR include knowledge transfer, training and capacity-building across all aspects. Of paramount importance, Manda and Dhaou (2019) contend that South Africa, to tackle challenges posed by the 4IR, needs to develop strategies and establish institutional mechanisms. These should address complex issues such as training and education, ICT infrastructure, privacy and security, and regulation. Once people are trained, they can formulate strategies to integrate South African indigenous knowledge. Osborn (2010) stresses the necessity of having a choice of indigenous languages as a key consideration, as technologies play a pivotal role in conveying information for development or other purposes through understandable idioms. He further elaborates that considerations for localised content extend to the cultural appropriateness of themes and images, as well as the approach to communication within the language, encompassing aspects such as dialects and contemporary versus formal styles.

Balfour (2019) suggests that SADiLaR's enabling function should centre on all official languages of South Africa. This involves supporting research and development in the realms of language technologies and language-related studies within the humanities and social sciences. The aim is to address linguistic inequality in the context of 4IR. According to Terwilliger (2021), African leaders must embrace technology and use the 4IR to lift the continent out of poverty and into a better future.

■ Adopted methodology

The approach employed in this research is qualitative. As defined by Busetto, Wick and Gumbinger (2020), qualitative research involves examining the nature of phenomena, encompassing their quality, various manifestations, the context in which they occur or the perspectives from which they can be perceived. This approach excludes considerations of their range, frequency and position in an objectively determined cause-and-effect chain. This study embraces a non-empirical research design, specifically a systematic review, to explore linguistic inequality within the context of the 4IR in South Africa. According to Clarke (2011), a systematic review aims to provide a meticulous summary of all available primary research in response to a research question.

To gather data for this study, scholarly evidence published in the last 26 years (1996–2022) was utilised. This included sources such as journals, books, reports, dissertations, conference papers and websites of organisations and institutions. Hence, the collected data underwent descriptive analysis. As per Baha (2012), descriptive analysis is a method that outlines existing conditions and endeavours to uncover new facts. Baha elaborates that this analytical approach involves gathering data about situations, events, people and other elements, followed by organising, tabulating, depicting and describing the outcomes. According to Müller-Rommel (2016), descriptive analysis seeks to investigate situations with the aim of describing the norm.

In conducting this study, the researchers adhered to principles of credibility to ensure that the reported findings accurately reflect those obtained through the data collection process. Moreover, the researchers demonstrated precision, consistency and thoroughness in the data analysis, enabling readers to assess the credibility of the process. Osborn (2010) emphasises the importance of credibility in employing rigorous techniques and methods to gather high-quality data that are meticulously analysed, with particular attention given to issues of validity, reliability and triangulation.

■ Results and discussion

As previously mentioned, this chapter is dedicated to examining the use of 4IR technologies in mitigating linguistic inequality in South Africa, where many indigenous languages are often overlooked in this transformative era. Consequently, the results of the research focus on three research questions formulated by the researchers. Regarding digital platform usage in South Africa, the results indicated a substantial number of active Internet users, with a majority also engaging on social media platforms. Furthermore,

the study discloses that South Africa has integrated digital transformation into its strategies to foster inclusive growth. Digital government transformation, digital access and digital inclusion were identified as pivotal pillars in this transformation amid the 4IR. The research also found that applications such as TikTok play a role in supporting content creators as they curate and promote content in South African languages of their preference, including indigenous languages.

Additionally, the study delineated the significance of indigenous South African languages in the context of the 4IR. It reveals that employing technologies in these languages creates opportunities for more effective technological utilisation. A consensus among the majority of cited researchers in the study suggests that accommodating indigenous languages in 4IR technologies holds the potential to tap into the country's linguistic wealth for development and education. According to the findings, the 4IR has the capability to dismantle language communication barriers in both rural and urban areas. It enables smartphones, linear wireless technology and other devices to communicate and interact with South Africans in their dialects and indigenous languages. One of the significant impacts of the 4IR is the sudden and substantial growth of human language technologies.

In addressing strategies to alleviate linguistic inequality in South Africa during the 4IR, the book reveals that the nation is actively harnessing emerging 4IR technologies to address developmental challenges, specifically those affecting languages. Notably, due to its prominence in indigenous language web content, special attention is warranted for web content related to indigenous languages.

As emphasised by the most frequently cited researchers in this study, the localisation of user interfaces for online tools, such as search engines, should consider indigenous languages. Additionally, the research emphasises the importance of embracing the decolonisation of the language agenda and decentralising English as the primary language of the 4IR. This involves expanding science and technology into indigenous languages. To further support indigenous languages, the study proposed the creation of indigenous language terms on popular social media platforms like Twitter, Zoom, Facebook and Instagram. A consensus among the majority of cited researchers in the study is that the successful integration of new 4IR technologies necessitates the implementation of policies and mechanisms responsive to the challenges and opportunities brought about by digital transformation. Others highlight the need for support in research and development within the domains of

language technologies. Moreover, the research demonstrates that incorporating indigenous languages into the 4IR requires strategic perspectives, conferences, workshops, training and public education on content localisation in indigenous languages. It also calls for information resources, networking, fundamental localisation and policy measures, as well as advanced applications and research, among other considerations.

■ Limitation of the study and recommendations

The primary focus of the study was on addressing linguistic inequality within the 4IR, specifically highlighting South African indigenous languages. Therefore, this study was distinctive to this specific context. Future research is challenged to explore other contexts to determine if there are additional significant reasons for excluding indigenous South African languages from integration into the development of 4IR technologies and tools. This study confirms that the 4IR is the latest industrial revolution, characterised by a heightened focus on ICT, technological progress, innovation and creativity. Key features include big data, AI, robotics, ICT, 3D printing and quantum computing. The research also elucidates the roles of South African indigenous languages in the 4IR, revealing that it offers enhanced opportunities for content creators to utilise technologies in their local languages.

However, several challenges associated with navigating through the 4IR are identified, such as linguistic inequality and a shortage of web content developed in South African indigenous languages. As a result, the study proposes a number of recommendations. The South African government, in collaboration with language organisations such as SADIaR, language experts, human language technology researchers, policymakers and ICT companies, should enact strategies to mitigate linguistic inequality in South Africa during the 4IR. The Pan South African Language Board (PanSALB) should advocate for ICT companies to include indigenous languages in the development of 4IR technologies. Technology leaders should partner with the South African government to explore ways to integrate and leverage indigenous languages within 4IR technologies. Political leadership should take responsibility for establishing and implementing a conducive environment that supports and advances South African indigenous languages through the utilisation of 4IR technologies. This requires the development and implementation of policies and strategies to address linguistic inequality within the context of the 4IR.

This requires collaboration among the government, SADIaR, PanSALB, language experts, human language technology researchers, policymakers and ICT companies, among others. Such collaboration could unlock more opportunities brought about by 4IR in South Africa and contribute to improving the country's socio-historic, socioeconomic and economic standing. The South African government should therefore communicate how 4IR technologies can be employed to mitigate linguistic inequality and enhance the quality of life and social well-being of all South Africans.

Neopatrimonialism and digital client politics: The use of big data in African electoral campaigns

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■ Introduction

In today's fast-paced, digitally driven world, people's Internet usage creates a digital footprint that may be utilised by various parties to obtain insight into their everyday lives. This digital footprint is created while using the Internet, moving about using smartphones and communicating with acquaintances on social media. Today's reality is characterised by widespread information accessibility, which has fostered the age of 'big data' – referring to society's capacity to use information in creative ways and generate new sources of satisfaction (Kefford et al. 2023). Big data has also infiltrated the political arena, enabling political strategists to discover new techniques to gather and analyse voter data that may be used to influence election results. A notable development is that data-driven campaigning is increasingly becoming a part of political campaigns all around the globe (Dommett 2019).

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The expansion of big data analytics in political campaigning has encouraged research into several big data campaigns. For instance, the Kennedy People Machine campaign in 1960; the Obama digital campaigns in 2008 and 2012; the Brexit Cambridge Analytica campaign in 2016; and Trump's micro-targeting campaign in 2016 (Bimber 2014; Cadwalladr 2017; Donaldson 2007; Risso 2018). Increasingly, political organisations depend on data analytics and micro-targeting² to profile the public and give tailored advertising to specific voter groups based on their demographics and political concerns. Because of its capacity to influence public opinion, motivate supporters and turn out voters, political micro-targeting has emerged as a crucial factor in modern elections. Recent research demonstrates that this trend has not left behind African countries.

The debate is whether 'big data' can be employed to increase democratic efficiency and effectiveness in Africa's political institutions through political campaigns. This research examines the effects of neopatrimonialism as an agent of digital client politics in using big data in digital campaigning and marketing in the African context. Neopatrimonialism has been argued to have the potential to redirect public resources to benefit private interests rather than the general welfare. In neopatrimonial institutions, resource allocation is often viewed as driven by the patron's desire to maintain incumbency (Kareli 2020). This article examines three recent African presidential campaigns that used big data tactics: the presidential election in Kenya in 2017, the presidential election in Senegal in 2019 and the general election in Uganda in 2021. The data indicate that the possibility of misusing such a powerful weapon cannot be ruled out, particularly in countries with neopatrimonial renters as clients. Neopatrimonialism can shift public resources to private interests as opposed to public welfare. In neopatrimonial regimes, the distribution of resources is often motivated by the patron's desire to retain electoral success. As a result, this chapter must reaffirm the methodological method that underpins this analysis.

■ Methodology

This research utilises a qualitative, non-numerical methodology to interpret and apply concepts to phenomena. The use of big data and micro-targeting in African electoral campaigns was examined to deepen the methodological approach, focusing on three recent presidential campaigns in Africa that incorporated big data techniques: Kenya's presidential election in 2017, Senegal's presidential election in 2019 and

2. Political organisations often use microtargeting for election campaigns. It involves direct marketing techniques like predictive market segmentation, called 'cluster analysis'.

Uganda's general election in 2021. Neopatrimonialism and digital client politics served as the theoretical foundation for the investigation.

■ Big data and political micro-targeting

Big data is a collection of sophisticated statistical data forms. Internet of Things (IoT), self-quantified, multimedia and social media data are the critical applications that produce these enormous volumes of data (Yaqoob et al. 2016, p. 1234). This research focuses on the multimedia data generated from various text, image, audio, video and graphic object sources: Facebook, Twitter and other social media networking sites. Since everyone who uses the Internet generates multimedia and social media data, both contribute to an increase in data generation. The use of big new data technology has improved performance and has led to novel business model products and supported services and decision-making processes. Big data methods are needed to evaluate vast volumes of data effectively and quickly. There are several methods that can be used for analysis. These include social network analysis, machine learning, data mining, web mining, visualisation and optimisation methods (Yaqoob et al. 2016, pp. 1240-1241).

The emergence of electronic computers and mathematical game theory has substantially accelerated the simulation of human behaviour to explore the theoretical implications and broaden the analysis of enormous amounts of data given by surveys and similar sources (Roungas, Bekius & Meijer 2019). This has led to data-driven micro-targeting becoming a vital element of the political discourse. Political micro-targeting (PMT) is the process of using big digital data to create communications that are specifically intended to affect certain voter groups or individual voters (Matthes et al. 2022, p. 1). Political micro-targeting has the potential to increase civic participation and make it simpler and more efficient for political parties and movements to reach out to prospective supporters and voters. However, voters' privacy rights are also impacted by the gathering and use of their personal information, which might impede the personal liberty that is crucial to democracy (Witzleb & Paterson 2020).

□ Digital campaigns

To assist John F Kennedy in winning the presidency in 1960, an American data science company (Simulmatics Corporation) employed algorithms and predictive analytics to target voters (De Sola Pool & Abelson 1961; Lepore 2020). The inventors of Simulmatics believed that if they could gather enough information on enough individuals, they would be able to replicate every human mind and then guide it with messages that were as precise as missiles. Simulmatics' initial purpose was to help the Democratic

Party retake the White House. The corporation created a computer algorithm to anticipate how people would react to political events after collecting data on African American voters, segmenting them into 480 microscopic groups (Timberg 2020).

According to De Sola Pool and Abelson (1961, p. 168), each voter type was symbolised by the number 480, which was identified by socioeconomic factors. One voting grouping was of 'eastern, metropolitan, lower-income, white, catholic, female demo-crats'. 'Border state, rural, high class, white, protestant, male independents' was another. The 480 kinds were created by recombining certain types with limited numbers of responders. These were referred to as 'issue clusters' and were symbolised by the number 52. Most of these involved politics, including McCarthyism, United Nations (UN) views, and foreign aid. Indicators of public opinion that were well known to most people, such as 'which party is best for people like you? vote intention and nonvoting', were included in other so-called issue clusters. In conclusion, the voter type would be distributed according to the political features of the issue clusters.

To the extent that would allow for the explicit depiction of the effects of the policy decision, the research relied on social science theories and data to reflect the complexity of actual human behaviour. Firstly, the developments included a body of sociological and psychological theories about voting and other decisions; secondly, a vast mine of empirical survey data that became, for the first time (arguably), available in an archive; and thirdly, the availability of fast computers with big memories. However, Simulmatics might have overhyped its technology, much to the chagrin of Cambridge Analytica, the political consulting firm that used Facebook to micro-target voters and claimed responsibility for President Trump's election in 2016.

The digital media revolution has already resulted in observable changes in the structure and tactics of political organisations worldwide. During Poland's presidential elections in 2020, numerous innovative media strategies, such as micro-targeting, personalisation and continuous engagement, were used (Okumuşoğlu 2021). Parties and candidates have reacted by presenting more tailored pictures to voters while attempting to restrict citizen participation and expression that the digital media environment allows (Piontek & Ossowski 2021). Ryabtsev (2020, p. 74) explains how the 2017 French presidential elections attracted society's attention when Emmanuel Macron's email was hacked to influence the campaign and destabilise his position in the eyes of French voters and the worldwide community. During the runoff elections, fraud and vote-rigging surrounded Macron's campaign. In his door-to-door campaign, the current French president employed Internet micro-targeting. Liegey Muller Pons'

Internet platform gathered and analysed French residents' political opinions. Macron's team acquired this information to create more personalised advertisements. The French National Commission on Informatics and Liberty banned individual micro-targeting during elections. However, Macron's approach managed to bypass this necessity.

The presidential elections in the United States in 2008 and 2012 indicate adapting to the present communication environment, which is still changing fast owing to technological advancement (Bimber 2014). The authenticity and sincerity of the methods in which individuals were engaged with the Obama campaign, particularly in 2008, are being interpreted in various ways, which has sparked considerable contention. The new environment in which campaigns took place made it possible for individuals to connect.

Beckett (2012) argues that campaign data attempts often leverage commercial micro-targeting scores. The author demonstrates how Obama's persuadability score aimed to represent a voter's current view and how it may change the following contact with the campaign. Most importantly, Obama's experts did not presume hesitant voters could be persuaded. Obama's campaign employed randomised trials to find swing voters. Voters were called and asked what they thought about the president before discussing policies. After the discussion, they were questioned again about the president. Using the results of these trials and extensive demographic information about individual voters, the campaign determined what sorts of individuals supported the president and which issues did it. Experiments also evaluated how long the persuasive impact remained after the original phone call and discovered that it was three weeks.

Albright (2016) describes how Donald Trump's campaign used 'military grade' data-driven psychometric micro-targeting and ties this to Cambridge Analytica's strategies to sway voters in favour of the candidate. He also notes that the pro-Brexit side's data-driven 'Leave. EU' campaign gained much of its strategic impetus from the same firm, which has directed campaigns for dozens of prime ministers and governments from Indonesia to Albania, as well as participated in the electoral campaign of Nelson Mandela in 1994 and the 2004 Orange Revolution in Ukraine. Reasoning that the populist, anti-establishment narrative, the success of #Brexit, Nelson Mandela's political campaign, Ted Cruz's primary campaign and Donald Trump's surprise electoral victory share a kind of behavioural science voter targeting. The 2016 Republican presidential nomination contest used the electorate's extreme fragmentation via carefully planned voter targeting and messaging to motivate groups of voters with specific preferences and purposes. While several candidates found some electoral success after adopting this method, it opened the path for Trump, who, whether by design or not, chose to pursue a modified catch-all strategy

that was still somewhat factional to win the nomination. His online and physical populist rhetoric was characterised by self-importance, informality and spontaneity, which might have assisted him in expanding his base of support.

■ The impacts of digital campaigns

According to Witzleb, Paterson and Richardson (2019), *The New York Times* reported in March 2018 that the data analytics firm Cambridge Analytica had obtained information from more than 50 million Facebook profiles to create forecasting methods and influence the behaviour of specific American voters. The information was gathered through a personality test found in a Facebook app created by hired researcher Aleksandr Kogan. When they downloaded the quiz, some 320,000 users gave the application permission to view the personal data of millions of other users who were their friends, in addition to giving the application access to their personal information. The quiz-takers and their Facebook connections were unaware that their information was being collected for commercial and political purposes. These incidents, which Facebook recognised as a serious violation of trust, have exposed significant flaws in how the social media company maintains and safeguards the enormous amounts of user data it collects. The occurrence also greatly heightened concerns about the use of data analytics in the Trump election and Brexit referendum.

In addition to conducting domestic political campaigns, countries like the People's Republic of China are using data-driven analytics to impose social control over their citizens (Dawson 2021, p. 6). WeChat, used by more than 1 billion Chinese users, facilitates more than 60% of their transactions, providing the government with information on what its citizens are purchasing as well as the option to forbid them from doing so. WeChat is an electronic social security identity and identification card recognised by the state (Strittmatter 2021, p. 9). China has utilised WeChat as a weapon in its campaign against anything threatening the nation's peace and stability. For instance, it lists 75 indicators that, according to the report, might be signs of possible religious radicalisation (Dreher, 2019).

The effectiveness of mass data-collecting techniques should also be assessed in the African context. The Institute for Security Studies (cited in Allen 2021) has shown how efficiently algorithms may promote xenophobic narratives. In contrast to the virtual world, the South African case study shows how messages may reach a far broader audience than might be predicted. The commercialisation of such potent social engineering techniques enables data-gathering companies like the previously mentioned Cambridge Analytica to identify voters' most ingrained prejudices, anxieties

and phobias to sway elections. Election results in Kenya between 2013 and 2017 – also the research subject – showed an escalation in previously existing ethnic tensions. Deep fakes, another kind of social engineering, are made possible by technology's ability to autonomously manufacture new information, such as photographs, videos and text (Allen 2021). These significantly affect how social engineering, deception and propaganda will develop in the future. Furthermore, they might generate scenarios based on fake intelligence, opening the path for what some scholars have labelled 'digital dictatorships',³ providing a pretext for societal control and legitimising legislation intended to restrict its use.

By using such fabricated situations, illiberal governments may be able to silence resistance. In 2021, social networking was shut down in Ethiopia and Uganda on the pretext that national security was at risk. A new level of surveillance might be imposed on individuals living in technologically advanced locations just because such data monitoring is being conducted using equipment from other nations, such as China. Further research on the participation of foreign actors in this field is necessary as it is likely that this 'cyber nationalism'⁴ normalises broad digital surveillance.

Considering this, the focus of this research is to investigate the implications of neopatrimonialism as a digital client politics agent within the framework of big data uses in digital campaigning and marketing in the African setting. It has been suggested that neopatrimonialism has the potential to divert public funds away from the well-being of the public and towards the interests of private parties.

■ Neopatrimonialism and client politics

The terms 'patrimonialism' and 'neopatrimonialism' describe the pattern of political organisation, conflict and disconcerting development that results in authoritarian control by the elite and is sometimes characterised by co-optation, factionalism, clientelism and other types of elitist dominance (Moti 2019). Furthermore, the practice of vertically distributing wealth has led, in most instances, to the development of patron-client networks administered by a powerful individual or political party.

Current uses of patrimonial and neopatrimonialism in the context of Africa are theoretically problematic and represent a grave misinterpretation of Max Weber's *Economy and Society* (1920). His usage of the word patrimonial outlined a right kind of rule, not a regime type, and included

3. The use of information technology by the government to influence or control both domestic and international citizens.

4. Nationalist groups that congregate and orchestrate activities using the internet.

concepts of reciprocity and voluntary co-operation between rulers and the ruled. Most interpretations of the terms omit the fact that these reciprocities allowed people to scrutinise the conduct of their rulers, and the modern interpretation carries a different connotation (Weber 2019). Therefore, understanding these concepts is relevant in today's world as neopatrimonial practices affect developing states to varying degrees and are not viewed as blatant corruption by those who depend on the system for sustenance. Neopatrimonialism takes several forms in different countries and has varying effects.

The characteristics can be found in various regimes, including multiparty democracies, single-party systems, personal dictatorships, plebiscitary governments and military oligarchies. Although the idea of 'strongman' regimes distributing resources based on patronage and disregarding institutional restraints on their power appears to be highly adversarial to the idea of democratic rule, Africa, perhaps more than any other region, offers plausible evidence that neopatrimonialism does not always prevent the adoption or survival of democratic institutions (Sigman & Lindberg 2017). There is evidence demonstrating that a kind of democracy, even in neopatrimonial circumstances, may result in increased political and civil rights, the institutionalisation of the rule of law, better governance and greater distribution of public goods and services (Edgell et al. 2018). Furthermore, some have contended that patrimonialism may genuinely advance democratic administration and development (Kelsall 2013). Neopatrimonialism is a prominent factor driving development in countries like Ethiopia and Rwanda. These nations showcase modern examples of developmental patrimonial systems (Kelsall 2011, p. 2).

This research understands neopatrimonialism as a blend of rational-legal dominance⁵ with various patrimonial powers.⁶ The 'neo' in 'neopatrimonialism' refers to the coexistence of patrimonial relationships, formal institutions and rational-legal order.

Guliyev (2011) likens neopatrimonialism to political personalism, which bases authority on the officeholder rather than the institutional office they hold. It is a prevalent phenomenon despite the almost universal acceptance of formal institutional legality and public administration, which derives its organisational form and legitimacy from Weber's rational-legal authority. Personalism in politics refers to a public official confusing their public and private duties, regardless of what other names it may take, such as clientelism, patronage, corruption, cronyism, rent-seeking or favouritism.

5. A system where the laws are implemented and duly followed.

6. A system of government known as patrimonial is one in which the ruler has absolute authority. The boundaries between the public and private sectors are non-existent.

Political institutions are often weak in some of the more recent governments of the post-communist and developing countries, and the line between the public and private spheres is not always respected. In the worst-case scenario, this might lead to the ‘privatisation of the public sector’ (Guliyev 2011). This also refers to elected officials who utilise public resources and their authority to cultivate loyal personal followings to maintain their positions of power.

Neopatrimonial rule is institutionalised, meaning it has a set of rules and a mechanism for enforcing them. Neopatrimonialism influences the formation of policies, particularly those pertaining to development projects, and is often to blame for the mismanagement of government and state resources (Moti 2019, p. 11). Therefore, neopatrimonialism is a broad term that includes modalities such as clientelism, patronage and corruption.

Based on personal relationships between patron and client, clientelism is the trade of services and resources in return for political support, often in the form of votes. A political condition in which politicians do not seek to obtain citizen support via the formulation and execution of party manifestos or public policies but rather through fulfilling their followers’ unique and private needs. Clientelist networks are no longer distributed directly between patron and client but via intermediaries whose job is to attract clients (Kitschelt 2000, p. 5 cited in Saliu 2018, pp. 262–263). At the same time, patronage refers to the selective allocation of positions within the public sector (Von Soest 2021).

Another sign of neopatrimonialism is corruption, which is defined as the abuse of public authority for private benefit. A more detailed conceptualisation focuses on the transaction between private and public-sector actors through which public goods are turned unlawfully into private payoffs. Focusing on the African setting, Bratton and Van de Walle (1997, pp. 63–68) posited three irregular behaviours as fundamental to a neopatrimonial system: (1) political power consolidation; (2) systematic clientelism; and (3) particularistic exploitation of state resources. These and other identified elements of the phenomenon are observable yet varying features of the politics in Kenya, Senegal and Uganda. Therefore, it is imperative to distinguish their impacts on presidential campaigns and PMT effects.

■ African presidential elections

■ Kenyan political dynamics

□ Political context

In 2020, Presidents Kenyatta, Moi and Kibaki families were among Kenya’s top 20 wealthiest families. These three families have all served as Kenya’s

presidential families (Alexia 2021, p. 9; Kebaya 2022, pp. 3–5). The competition between public and private interests in Kenya, which dates back to the time of colonisation and continues to this day, has led to the governing class amassing riches via various corrupt tactics. This is one of the defining characteristics of a neopatrimonial regime. Even while the characteristics and manifestations of corruption have evolved over time, the fundamental reasoning behind it has remained the same while also getting more complicated. The level of political corruption in Kenya is comparable to that seen in many other African nations. However, what makes Kenya's political corruption stand out from other countries is the extent to which it is based on exploiting ethnic preferences (Gowon-Adelabu, Owino & Ndiiri 2018).

The exploitation of ethnicity has been a method that political officeholders have used to utilise national resources to meet their wants and gain fortune, to the disadvantage of the average citizen. It is possible to understand neopatrimonialism in Kenya by assessing the interaction between the nation and the global economy prior to the country's independence. Kenya was one of the nations that provided a supply of raw materials for British businesses, as well as a market for British products. Kenya also functioned as a market for British goods. As a result, British interests were prioritised in formulating social and economic policies implemented in Kenya throughout the colonial era. The colonial government depended on strategies of divide and rule as well as political repression to ensure the continued existence of its unfair system. This led to a bias towards certain ethnic groups and an authoritarian government, which provided a fertile environment for the growth of neopatrimonialism. Consequently, the post-colonial elites in Kenya took control of the neocolonial state to distribute economic benefits in accordance with a hierarchy of regional and ethnic patronage (Githigaro 2019, pp. 363–385).

Kenyans vote every five years on the same day for a presidential nominee, five local and national representatives, and a county assembly member since the introduction of a multiparty system in 1992. Kenya has one of the highest costs per registered voter, owing to increased political competition and the massive people and material resources required to hold elections. This trend of public funds creates a fleeting impression among locals that they are participating in the elite's wrongdoing, as seen in vote-buying by local and national politicians. One of the few corrupt behaviours that connect elites and people is vote-buying. This strategy directly benefits persons from political and administrative corruption during elections. Vote-buying may range from handing out 100-shilling notes in a village (75 cents or the price of a drink) to giving Harambees €50,000 in charity (Jacquemot 2020, cited in Alexia 2021, p. 17). These methods of persuasion, as demonstrated in Chris Wamalwa's 2013

Trans-Nzoia constituency campaign, were primarily used in areas with less certainty of winning (where no single candidate represents the dominant ethnic community). Political leaders use moral ethnicity to establish a neopatrimonial relationship with their ethnic group. During election campaigns, national and local resources bring individuals closer to the rewards of corruption (vote-buying, political party support). The idea is that sharing the rewards of corruption leads to citizens accepting political and administrative corruption.

□ Kenyan presidential campaign of 2017

The 2017 elections in Kenya were hotly contested in every seat, much as in previous elections. However, social media platforms were heavily used during the 2017 elections, especially during campaigns when candidates created websites and hired bloggers and social media managers to handle their social media accounts and consistently broadcast their campaign messages (Mutahi 2020). The election was one of the most costly in Africa. President Uhuru Kenyatta and his primary rival, Odinga, spent millions of dollars on their campaigns, including significant expenditures on global public relations companies that mined data and created targeted advertisements (Voice of America 2017). Kenyatta hired Cambridge Analytica, while Odinga's campaign employed Aristotle International to leverage political campaigning. Global public discourse about data profiling and elections has considerably increased since Cambridge Analytica turned Facebook 'likes' into a profitable business by contaminating the country's political systems (Karunian, Halme & Söderholm 2019).

In 2013, Kenyatta and Odinga were the two leading candidates. It was a 'two-horse race', as in the previous electoral competition. The Jubilee party united the various parties that had made up the Jubilee coalition in 2013; NASA was made up of the same parties as the Coalition for Reform and Democracy (CORD) alliance of 2013. Jubilee was headed by representatives of the Kikuyu and Kalenjin, the only two ethnic groupings that have occupied the president since independence. Like CORD, NASA regarded itself as standing up for Kenya's socially and politically disadvantaged groups (Cheeseman, Kanyinga Lynch & Willis 2019). Kenya's general elections took place on 11 August 2017; after a tense and disputed counting and tallying process, Kenyatta was declared the winner, with 54.17% of the vote. His primary competitor Raila Odinga came in second with 44.94% of the vote.

The use of PMT demonstrates the unfair advantage of power and wealth. The prestige of major parties and the politics of tribalism, clientelism and patronage continue to characterise Kenyan elections. A culture that is tribalist on the ground will be tribalist online. Moreover, although social

networking may have accelerated the spread of knowledge, the information ultimately represented the values of the society the campaign was intended to attract. Peter Kenneth and Miguna Miguna, both candidates for Nairobi governor, are instances of politicians whose social media presence did not transfer into victory on the ground because of their lower tribal numbers. The involvement of companies has become more prominent, causing issues with voting fraud, privacy and the activity of multinational firms in local elections. In 2017, WhatsApp groups, even non-political ones, were overwhelmed with inflammatory ethnic-nationalist speech, misinformation and disinformation, according to similar commercial businesses.

■ Senegalese political dynamics

□ Political context

The political climate of Senegal is one in which communities tend to have solid hierarchical relationships with local leaders, often of traditional or religious importance, and where these leaders have varying degrees of influence over voters (Gottlieb & Larreguy 2020). Since a disproportionate number of local elites have such strong links to their communities, clientelism via local intermediaries, also known as brokers, is a more appealing political mobilisation technique than mass-based ethnic appeals in the country.

Like the rest of Africa, the clientelist structure of the present Senegalese state is undoubtedly founded on the patrimonial power of its pre-colonial traditions – a kind of clientelism that enhances patron-client interactions beyond pecuniary motives and instrumentalist techniques. The French colonial state reversed these pre-colonial power systems to capture and subsequently rule this culturally varied country. Political legitimacy in Senegal's post-colonial state has remained anchored in a clientelist framework for power and administration, which affected both authoritarian leadership under de facto one-party rule after independence and the growth of clientelist democracy towards the end of the 20th century (Beck 2008, p. 49).

The Sufi brotherhoods, particularly its most revered religious families, are the most prominent social force in the nation and have been a crucial component of the clientelist system since Diouf's time (1981–2000) (Beck 2008; Gottlieb & Larreguy 2020). However, it was never the case that a leader could simply give his disciples' votes to his preferred candidate, even if the fundamental principle of brotherhood is the disciples' subordination to the leader's will. Disciples could discriminate between political and religious commands, and a mix of political and economic reasons also affected choices.

According to Sy Camara (2019), under Abdoulaye Wade (2000–12), who openly declared himself a follower, the Mouride brotherhood, in particular, prospered. As a result, Mourides were inclined to embrace Wade. President Wade, who came into office with a reputation for competent leadership, gave the state inspector general instructions to examine the activities of the Diouf government. Many political personalities who had long received negative public attention were imprisoned. The promising new beginning, nevertheless, did not last very long. Wade's cabinet rapidly grew as more ministers and ministerial advisers were added; however, these individuals were not chosen to advance the nation but rather to reward Wade's political and biological relatives. During the time of Wade, a new subfield of politics known as the politics of entrepreneurship was established (Sy Camara 2019). Wade consolidated his political dominance and ensured longevity by seizing complete control of the state's resources. It was via his political connections that he could increase his economic riches and vice versa. The politics of politician entrepreneurs was kept in power by political corruption and favours from the state. This not only entails giving preferential treatment to allied private-sector organisations in granting state contracts but also includes changes in economic policy and regulation that favour a particular entity.

In his presidential campaign, Macky Sall (2012–present) exhibited a more hostile attitude towards all forms of religion, and this indifference can be seen in some of the issues that have risen following his victory (Gifford 2016; Koter 2022). Although Sall made similar promises towards political transformation as Wade before taking office, the transition in power did nothing to modify the political favouritism that the Senegalese people had become used to. After praising the nation's prudent and moral leadership in front of the party, Sall quickly approved of his political rivals' corrupt business practices by utilising auditing files as a cohesive device to compel them to join the governing Alliance for the Republic (APR). Senegalese citizens who believed the nation had at least moved beyond the ubiquitous royal family's meddling in state issues were quickly dismissed. President Sall named his younger brother, Aliou Sall, to the Deposits and Consignments Fund, a public-sector financial organisation, in September 2017 after appointing his brother-in-law Mansour Faye to the same position in 2014. The latter nomination resulted in a significant public outcry.

□ Senegalese presidential campaign in 2019

Allison (2019) argues that Macky Sall may have covertly hired numerous Obama staffers to establish a data-collecting and analysis team for his campaign ahead of Senegal's presidential election in February 2019. Oumar Ba, who worked on Obama's big data campaigns in 2008 and 2012, and

Lex Paulson, a researcher who also provided advice to Emmanuel Macron's campaign in France in 2017, are examples. Ba enlisted more than 4,630 volunteers to knock on doors in every city, town and village in Senegal, reaching all 552 regions. Volunteers did not wear party symbols since doing so would have frightened away non-political individuals or those sympathetic to the opposition. According to Ba, they were not actively campaigning as doing so would have violated Senegalese election law, restricting campaigning to 20 days before the election.

The micro-targeting method collected hundreds of data points on three and a half million individuals. Analysts used advanced algorithms to crunch the information, creating a distinct advertising plan for each location. In one, the president was recommended to pledge to construct a new road in a particular place; in another, he was encouraged to emphasise family values; in another, he was advised not to bother because he would lose anyhow (Allison 2019). Phase One consisted of data-gathering, while phase two consisted of knocking on those same doors to provide comments on the concerns voiced by residents. This gave individuals the impression that they were being heard and that their opinions mattered. It has been shown that gaining the support of prospective voters is more successful than any presidential address. Two of Sall's primary opponents were disqualified from re-election because of corruption convictions, which some critics have labelled politically motivated. In addition, opposition parties said that the election was manipulated, despite the Constitutional Court's verdict to the contrary (Freedom House 2020). While the opposition was going around in trucks with blaring loudspeakers and handing out T-shirts, the governing party was constructing a database of Senegalese residents and a system for communicating with them on an individual home level.

Senegal conducted presidential elections on 24 February 2019. With 58% of the vote in the first round, APR incumbent president Macky Sall was re-elected to a second term. According to BTI Transformation Index (2022), Senegal has long been marketed as an example of peaceful political alternation and democracy in Africa, but with the 2019 Senegalese presidential elections that brought about developing technologies, things seem to have radically shifted. Political reform, which has been raised to the status of culture in violation of morals, was one of the primary concerns. Political harmony and stability were in danger. In response, social networks made up mostly of young activists were established in 2011 in the wake of the Arab Spring, with an emphasis on grassroots lobbying for democratic and good governance among the public. They suggested breaking away from a political system they saw as neocolonialist. Additionally, Senegal's judiciary is routinely accused of being biased, and the Constitutional Council, which serves primarily as an electoral court, has constantly been criticised for its subservience (Kohnert & Marfaing 2019).

BTI Transformation (2022) states that most of Senegal's 300 parties lack organisation and social foundations. Party gatherings are infrequent, and institutional meetings are usually postponed. Most political organisations are just electoral platforms built around a single masculine personality. Additionally, as officeholders are expected to provide access to personal perks, clientelism is still a concern. This issue is especially noticeable on a local level, where the party system of political elites grants access to the property.

Senegal has a long legacy of religious and secular organisations and a thriving civil society. However, in large cities, there is a natural concentration of political influence and lobbying strength. Although the Roman Catholic Church likewise has access to power, the religious brotherhoods have unparalleled networks that span the nation and result in an unbalanced influence. Therefore, some of these power dynamics, big data and PMT during elections. Such a robust tool may be abused. Senegal has relatively strict data protection laws and has ratified the Council of Europe's Convention for the Protection of Individuals concerning Automatic Processing of Personal Data. However, its ability to identify and eliminate potential threats is seriously questioned, given its lack of resources.

■ Ugandan political dynamics

□ Political context

Uganda has been referred to as both a fragile state and an authoritarian neopatrimonial state, both of which are ruled personally by a president who maintains his power via intimidation, force and patronage (Golooba-Mutebi 2008, p. 143). Tapscott (2021, p. 50) argues that Uganda has long-standing regional and ethnic divisions that plague the nation. In the colonial period, the British utilised ethnicity to divide and rule: Bantu southerners were stereotyped as bureaucrats and controlled political power, while Nilotic northerners, especially the Acholi, were presented as naturally militant and composed the bulk of the colonial army. Therefore, regional and ethnic conflicts highlight the problem of leading a nation with a gap between governmental institutions and local politics and society. This split began when Ugandan elites replaced British colonists after independence. These Ugandan elites gained political power via informal cultural traditions, not the post-colonial state's bureaucracy. This produced a non-democratic state where elites maintained patrimonial influence over the populace. Leaders depend on ethnic alliances and military might to manage a fractured nation, resulting in an indirect neopatrimonial rule.

President Yoweri Museveni's National Resistance Movement (NRM) came to power promising equality, democracy and security. He promptly

implemented liberal and democratic political and economic changes. Such changes further concentrated power and reinforced Museveni's grip, eroding civil, economic, political, and traditional authorities. Museveni's NRM was the only political party in his early 'no-party' democracy. All Ugandans would essentially join the NRM, and political rivalry would be decided by personal achievement rather than party loyalty. Museveni rationalised this change with pseudo-Marxist arguments that the 'peasant society' in Uganda lacked class. The no-party state combined state institutions with the NRM, and opposing the party meant opposing the state. Until 2003, there was no legal separation between the state and the NRM; until 2006, it was directly funded by the Ugandan state. This allowed the dictatorship to co-opt non-violent and violent protesters, absorb rebel groups into Uganda's military and pay off political opponents.

In recent years, constitutional revisions have extended Museveni's tenure. The Ugandan Parliament lifted presidential term restrictions in 2005. This enabled Museveni to seek a third term in 2006, the first multiparty elections. In 2019, the Constitutional Court affirmed an amendment enabling Museveni (then 73) to seek another term in power, even after the 2021 elections and beyond 75 (AlJazeera 2018). The 1995 Constitution banned presidents under 35 or over 75. Opposition actors and pressure organisations have utilised these activities to argue that the state is autocratic, monopolistic and dictatorial.

□ Ugandan presidential campaign in 2021

After more than three decades in power, Museveni and his NRM were again proclaimed the victors by the Electoral Commission of Uganda (EC) on 16 January 2021. This political campaign used the Internet from a new perspective (Nanfuka 2021). The attempts of opposition candidates to gather support were severely hindered by the blocking of social media and other digital networks. The nation had a supposedly 'scientific election', in which the media and Internet platforms served as the primary forums for the candidates' campaigns, with physical gatherings mainly prohibited under coronavirus disease 2019 (COVID-19) social distancing norms (Moffat & Bennett, 2021). However, in a country where the governing party is often accused of election fraud, the Internet outage also prevented citizens from accessing essential information they would have needed to make educated voting decisions.

Social media enhanced the potential of digital voter manipulation, even in a nation with little Internet availability (24% or 10.67 million users). Social media users reach around 2.5 million. New media platforms become the next battleground to influence the election's online narrative. This situational analysis focuses on #WeAreRemovingADictator and #SecureYourFuture

to show digital voter manipulation. The Ugandan government used inauthentic cooperative behaviour (ICB) to influence and distort Internet debate in 2021. No evidence suggests opponents have gone this far.

Facebook and Twitter were used to deactivate accounts whose behaviour breached government initiatives. Digital Forensic Research Lab (DFRLab) described the impacted accounts as an organised operation to support Ugandan President Yoweri Museveni (Douek, 2021). The accounts tweeted exact statements praising Museveni and his administration while criticising the opposition, particularly Bobi Wine. In this example, such online activity showed a concerted digital approach to magnify pro-incumbent messaging by contrasting his campaign path with an indication of development.

Museveni has free access to state resources and more favourable media coverage than his challengers. Unfair media coverage has been used to challenge presidential elections. According to the African Center for Media Excellence (ACME), Bobi Wine had the most unfavourable publicity in November 2020. Whereas the incumbent was covered waving to supporters and launching infrastructure projects, his rival made news for police violence or rejection of COVID-19 norms he said were unfairly enforced. Digital spaces are the most recent frontier in the fight to dominate the narrative, even if they are still a privilege only a few Ugandans can access. More sophisticated types of manipulation were used during the 2021 General Election cycle, particularly in framing specific narratives.

■ Discussion

Government studies have been prompted by the widespread use of big data analytics in political campaigns in several nations throughout the globe. Notably, PMT has become a crucial component of modern campaigns because of its capacity to influence public opinion, rally supporters and increase voter turnout. According to the results, it is impossible to rule out the possibility of such a powerful instrument being misused, particularly in countries where neopatrimonial renters are a standard clientele. According to this research, neopatrimonialism combines patrimonial power and rational-legal dominance. This alludes to the presence of formal institutions, patrimonial connections and the rule of law. The patron's desire to continue winning elections often dictates how resources are distributed in neopatrimonial regimes. Uganda, Kenya and Senegal all exhibit various neopatrimonialism traits.

The struggle between public and private interests in Kenya, which stretches back to colonial times and continues to the present day, has resulted in the ruling elite collecting wealth via various corrupt means.

Kenya's political corruption is distinguished from that of other nations by the degree to which it exploits ethnic preferences. In contrast, the political atmosphere of Senegal is characterised by strong hierarchical links between communities and local leaders, often of traditional or religious significance, and various degrees of influence over voters. The clientelist structure of the current Senegalese state, based on the patrimonial authority of its pre-colonial traditions, is a kind of clientelism that improves patron-client relations beyond monetary incentives and instrumentalist approaches. On the other hand, Uganda has been described as both a weak and an authoritarian neopatrimonial state, governed personally by a president who maintains his authority via intimidation, coercion, and patronage. Long-standing regional and ethnic divides in Uganda affect the country.

During the presidential elections that were taking place in all three states, there was an inappropriate use of large amounts of data. The practice of PMT shows the unfair advantage of power and riches. All presidents have used this strategy to advance their presidency by investing a significant amount of state money to mine citizen data in order to create targeted campaigns, making use of social media networks in order to either manipulate the narrative about them or deliver misinformation and employing various forms of Internet censorship.

■ Conclusion

Therefore, 'big data' may promote democratic efficiency and effectiveness in Africa's political institutions via political campaigns. However, the approach can also be corrupted. Therefore, caution and regulation are advised. The improved technology paves the way for higher voter involvement but raises the stakes regarding the possibility of manipulation by those in positions of authority. This research aimed to examine the implications of neopatrimonialism as an agent of digital client politics in using big data in digital campaigning and marketing in the African setting. In this regard, it has been suggested that neopatrimonialism can reroute public resources in such a way that they favour private interests rather than the general welfare. In this case, the employment of digital tools did not make clientelism and patronage in these nations any less prevalent than they already were.

On the other hand, neopatrimonial tendencies manifested themselves in the online environment. This examined three recent presidential campaigns: the campaign for Kenya's presidency in 2017, the campaign for Senegal's presidency in 2019, and the campaign for Uganda's presidency in 2021. Given that each of these states caters to neopatrimonial renters, the evidence suggests that both big data and PMT have been abused to varying degrees.

Googling and electoral cycles in the United States of America and South Africa: Mutual interests, big data and digital global citizenship⁷

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■ Introduction

This chapter traces, over the 2004–2019 period, the online queries for United States of America (USA) presidential frontrunners and eventual winners and incumbents in South Africa, and vice versa in South Africa for the African National Congress (ANC) party leaders and presidential frontrunners and incumbents alongside their frontrunning electoral

7. This section in the chapter represents a substantial reworking of facets from Ndzendze (2020).

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opponents (and eventual leaders of the opposition), who have been supplied by the Democratic Alliance (DA) in the time frame under study. This chapter draws its niche from these three gaps: (1) the paucity of quantitative analysis on external interest in USA presidential elections on a longitudinal basis, especially from Africa; (2) the paucity of literature on USA citizens' interest in South African elections; and (3) the persistence of both these on a comparative basis.

Overall, Mbeki in 2004 and Zuma in 2009 received more of their searches in the USA than the rest of the world. While Zuma in 2014 and both Ramaphosa and Maimane in 2019 obtained more searches worldwide than within the USA, perhaps an indicator of either a declining interest in the USA (for Zuma in 2014), a lack of interest for both party leaders in 2019 in the USA or Internet penetration in the rest of the world. There is likely a combination of the latter two. Whereas worldwide Internet usage, especially in Africa and Asia, is a real trend, there is also an evidence-based case to be made for the decreased interest in the USA in the 2019 election in South Africa. For example, there were not enough searches in fourteen states for the 2019 electoral cycle, whereas Jacob Zuma was most frequently searched in all 50 states in 2014.

Incidentally, most of the southern states of the USA, with the exception of Missouri, New Mexico (a state which had elected Clinton with five Electoral College votes in 2016) and West Virginia (a state which had elected Trump with eight Electoral College votes in 2016), all obtained enough searches to be on the index. On the contrary, the Midwestern states did not get enough searches, and neither did the northeast coast (i.e. New Hampshire and Maine, which had each given Clinton four Electoral College votes in 2016) nor Hawaii (which had elected Clinton with four Electoral College votes in 2016). In a context of ostensible growth in USA isolationism, this complicates the narrative of USA isolationism being prevalent in Trump-voting states. Somewhat in parallel to this have been spikes in xenophobic violence in South Africa. Overall, then, given the prevalence and ubiquity of online queries in both the countries studied here, and in other parts of the world, the findings show a need for a conceptual model which can coalesce and communicate the meanings of mutual online searches in a world that is arguably both globalised and yet occasionally exhibiting isolationist trends.

The second section consists of a literature review. The third section is a breakdown of the methodology utilised in the chapter as well as the electoral cycles of the two countries under study. The fourth is a description of the data used in this chapter. The fifth consists of an analysis of the findings from the data. The sixth section concludes the chapter, highlighting some areas for further research based on the findings.

■ Literature

The US electoral cycle is one of the most closely watched political events in the 21st century. Indeed, each successive year, new records are broken for expenditures on advertising by the campaigns. The digital sphere has become the main arena in which the various campaigns reach out to potential voters. By one 2019 estimate (Adgate 2019):

[S]pending for political ads will reach \$10 billion, an increase of 59% from the 2016 election year when an estimated \$6.3 billion was spent. This represents a potential 16.5% of total local broadcast TV advertising revenue for 2020. Digital media is forecast for 21% of political ads, cable TV 14% and radio nearly 5%. (n.p.)

This disproportional share of digital spending is indicative of what scholars have termed as the rise of computational politics, defined by one study as ‘the application of digital targeted-marketing technologies to election campaigns’ (Chester & Montgomery 2017, p. 1).

Modern political campaigns in the USA and elsewhere rely on the toolbox and data offered by technology corporations such as Facebook and Google, which are leaders in the online advertising industry. The campaigns have advanced enough to be able to cater tailored messages for potential voters based on signals such as ‘political leanings, what articles they have read, what videos they have watched, and what things they have searched for’ (Wakabayashi & Goldmacher 2019, n.p.). Instead of blanketing an entire city with a costly television (TV) spot, the so-called micro-targeting of political advertisements allows advertisers to seek out specific voters and perhaps avoid broader scrutiny of their messages. In the wake of this, in October 2019, Twitter made the announcement that it would ban all political advertising from its platform. In turn, Twitter’s decision was widely interpreted as a response to the controversy caused by Facebook when it refused to de-platform a reportedly false video issued by the Trump campaign accusing a family member of a Democratic candidate for president of improper business conduct in Ukraine (Wakabayashi & Goldmacher 2019). Twitter’s decision also led to Google’s own decision to do the same in November 2019 (Wakabayashi & Goldmacher 2019):

Political advertisers will be able to aim their messages at people based on their age, gender, or location. Google will also allow ads to be targeted to people based on the content of websites they visit. However, the ads can no longer be directed to specific audiences based on their public voter records or political affiliations categorized as ‘left-leaning’, ‘right-leaning’, or ‘independent’. (p. 2)

In an email circular to the various campaigns, Google clarified the new rules, including that ‘election ads will no longer be allowed to target what is called “affinity audiences” that look like other groups that campaigns might want to target’ and that ‘campaigns can also no longer upload their own lists of people to show ads’ (Wakabayashi & Goldmacher 2019).

Reaching new audiences would be more difficult to reach, as Google also banned remarketing, which was the serving of targeted adverts to devices that had previously advertised a campaign's website.

There have been numerous studies looking at the growth, impact and significance of digital advertising. For example, Williams and Gulati studied the 2012 and 2016 campaigns in terms of traditional and digital advertising. In this regard, they found that both campaigns' expenditures on digital media had grown over time. Greater growth in digital advertising expenditures between 2012 and 2016 has been seen among Republicans than in the Democratic party (Williams & Gulati 2017, p. 1).

Another study by Fowler et al. (2018) drew on data from Facebook and television data from the Wesleyan Media Project and found that more candidates advertise on Facebook than on TV. Going a step further, they sought to identify the within-case variation of uses of either TV or Facebook in the 2018 congressional, gubernatorial and state legislative elections. In this regard, they found that of those candidates who used both mediums, Facebook advertisements were more prevalent in the early stages of the campaign, and they not only tended to be less focused on emphasising the negative aspects of the opposition ('negative campaigning') but also to be less issue-focused and more partisan than TV advertising (Fowler et al. 2018, p. 1).

Spenkuch and Toniatti (2018), on the contrary, sought to study the persuasiveness of political advertisements in presidential elections between 2004 and 2012. Their findings demonstrated that total political advertising has little to no effect on total voter turnout (Spenkuch & Toniatti 2018, p. 1). Nevertheless, they found that there was a positive correlation between advertising expenditure and candidates' vote shares. Their estimates, therefore, indicate that 'a regression discontinuity design suggests that advertising affects election results by altering the partisan composition of the electorate' (Spenkuch & Toniatti 2018).

Many of these studies thus look at the USA elections from within the USA domestic context. Among internationally minded studies, the interest is on the role of international dynamics in the actions of incumbents during the electoral cycle. For example, Chiozza (2015, p. 3) 'assesses whether US presidents' major responses in international crises reflect the variability in audience costs in an analysis of 66 international crises between 1937 and 2006' and found that tying-hand commitment strategies - such as the creation of audience costs (potentially unpopular decisions) that they will suffer after the fact if they fail to commit to the threat or commitment made (Fearon 1997, p. 68) - were most preferred when presidential elections were approaching. This indicates that foreign policy is designed with re-electability in mind, lest unpopular foreign policy decisions lead to negative

repercussions and loss of political office (Chiozza 2015, p. 3). The same findings on the foreign policy-electoral cycle nexus were identified by Gadarian. Gadarian's paper makes use of data over the 1980–2004 period to demonstrate that opposing political candidates in the USA system are faced with different incentives for mentioning foreign policy during their campaigns. The paper effectively illustrates that North American voters connect their own views on foreign policy when evaluating Republican candidates, while personal foreign policy views have no impact on their evaluations of Democratic party candidates. Additionally, Gadarian's paper proves that during times of external threat, US voters tend to not only be inclined towards hawkish candidates or incumbents but are even more likely to severely punish candidates who are perceived as holding dovish positions (Gadarian 2010, p. 1046).

These studies have gone a long way towards dispelling the long-held notion, lasting up to the 1980s, that North American voters are not particularly interested in foreign policy matters, with the broad scholarly community previously perceiving voters as possessing 'little information and weak attitudes' on international relations (Aldrich, Sullivan & Borgida 1989, p. 123; also see Perkins 1957). They are also written from the US voters' perspectives and do not indicate how American elections themselves are viewed by the rest of the world. At the same time, however, there is a global audience for US elections because of its economic and political preponderance in the world. As Ladki (2016) put it:

The US presidential election has long ceased to be just a local American story, and with the campaigns approaching the final stretch as the primaries begin, international interest in the race to the White House is set to intensify. It's testimony to the fact that the United States remains the true global power that people and the media in most countries will follow the race closer than they follow even some local stories. (n.p.)

Texas Agricultural and Mechanical (Texas A&M) University and Mississippi University academics Kluver, Hinck and Cooley (2016) similarly observed that:

[B]ecause of the United States' predominant role in geopolitics and global economics, foreign governments and their citizens scrutinize the candidates and their positions, which can hint at future American policies. (p. 3)

Echoing Joseph Nye's concept of soft power, they argue that elections are a window for international observers into how the next USA president will act with regard to their country as well as 'its ability to persuade foreign leaders and exert influence abroad' (Kluver et al. 2016, n.p.).

In this regard, in 2016, Cable News Network (CNN) conducted interviews with ten journalists from outside the USA 'for their take on the race so far, and what their country might be hoping for in America's next president'.

Analysing the responses, we note them to be mostly split between pro-Democrat (Canada, South Africa, Iran and Japan) and neutral (United Kingdom [UK], Venezuela, Israel and Lebanon), with only two international journalists expressing indifference (India) and pro-Republican sentiment (Russia). As the editor in chief of *The Moscow Times*, Mikhail Fishman (2016) put it:

Strategically [...] relations with the West are seen as a zero-sum game, and anything that can be seen as an American failure – whether on the battlefields of Syria or in domestic electoral politics – is seen as a reason to celebrate in Moscow. And from this perspective, Vladimir Putin looks at Mr. Trump – a populist who seems willing to throw the usual values to the wind – as his natural ally, and a potential vehicle for his own global interests. If Trump secures the Republican nomination, Russian officialdom can be expected to celebrate his victory much like Napoleon celebrated his triumph in the battle of three emperors at Austerlitz two centuries ago. (n.p.)

Among the participants was South African journalist and noted editor of some leading national newspapers, Ferial Haffajee (2016), whose contribution centred on the probability of a Trump victory:

Donald Trump? After Barack Obama? For those South Africans paying attention at this point in the US presidential race, the primary campaign has prompted furrowed eyebrows. Indeed, the word ‘incredulous’ best describes the response here to Trump’s howl-a-minute, holler-a-minute, horror-a-minute bid to become the Republican nominee. (n.p.)

She further expands, noting that (Haffajee 2016):

Now the same country that elected Obama seems to be toying with the idea of electing a comb-over king who doesn’t seem to like Muslims and Mexicans very much, leaving some here to wonder what he feels about black Americans and Africans. (n.p.)

If subsequent Pew numbers are any indication, this may indeed be the case, as post-election approvals in South Africa declined with the election of Donald Trump.

The focus on Trump was not coincidental as it fits into the pattern of the interplay between the ratings-driven media and controversial statements by politicians (Jordan 2015). As Haffajee (2016) noted:

I realize that Trump isn’t the only one running for president, but as in the United States, he has dominated the coverage of the race, and the other candidates have simply not found space in South Africa’s coverage of the primaries, outside of small, intellectual circles. It is Trump this and Trump that, outdoing himself again and again with his bigotry. Even the fact that the United States might elect its first woman president in the shape of Hillary Clinton has not yet become a talking point. (n.p.)

Apart from this journalistic account, however, there is little to no literature on the relevance of USA electoral cycles among the rest of the world, much

less studies of a quantitative sort. Kluver et al.'s (2016) work is the most quantitative, with their study 'tracking global media coverage via 60 different news outlets in regions that represent over 1.5 billion people'. Using the Texas A&M University Media Monitoring System (MMS) observatory, which stores and translates foreign-language media, they managed to curate news media from across different languages and then extract data from machine-generated translations of these. Quantitatively, they noted that 'while that claim is probably over the top, there's no question that Russian media has a pro-Trump bias' (Kluver et al. 2016, n.p.), and they were similarly able to draw, ahead of the election, Chinese anxieties over a Trump victory and its likelihood for a trade war. Interestingly, and in a roundabout manner, during the 2016 electoral cycle, Chinese newspapers 'usually hesitate to make outright editorial arguments', and instead, they 'quote international figures and analysts to advance a particular point of view' (Kluver et al. 2016). Nevertheless, international media 'often point to the arrogance of North American politicians, especially those who stress the superiority of the US democratic system over those of other nations' (Kluver et al. 2016). On the contrary, the USA has had as its foreign policy tenet the promotion of democracy in the rest of the world, especially in Africa, and some USA diplomats consider their role as having been significant in South Africa's transition from apartheid. While arguably a position held by the foreign policymaking elite, there is also no evidence that the democratic practices and electoral cycles of other countries are not popularly consumed by the average American.

The chapter thus draws its niche from these three gaps: (1) the paucity of quantitative analysis on external interest in USA presidential elections on a longitudinal basis especially from Africa, (2) the paucity of literature on US citizens' interest in South African elections and (3) the persistence of both these on a comparative basis. We detail the empirical strategy in the section below. Briefly, however, we distil the growth of Internet penetration in South Africa and the USA over the 2004–2016 period (see Table 6.1).

As of 2016, 89% of households had computers in the USA, up from 60% in 2004 (United States Census Bureau 2016). Smartphone penetration rates in the USA for 2016 were 77% (Statista 2021). By contrast, South Africa's computer penetration rate was 21.5% in 2016 (Statistics South Africa [StatsSA] 2016), while household Internet penetration in South Africa by 2016 was 9.5% of the population, or 'one-tenth of the population' (StatsSA 2016). In 2016, 77% of the population in South Africa had smartphones. Therefore, US citizens have multiple Internet access points, with smartphone penetration above 50% (in 2004) and household Internet penetration in 2016 at over 81% (Statista 2021; United States Census Bureau 2020). In contrast, South Africans mostly rely on smartphones for Internet connectivity.

TABLE 6.1: Internet penetration in South Africa and the USA, 2004–2016.

Years	South Africa (%)	USA (%)
2004	8.4	64.8
2005	7.5	68
2006	7.6	68.9
2007	8.1	75
2008	8.4	74
2009	10	71
2010	24	71.7
2011	34	69.7
2012	41	74.7
2013	46.5	71.4
2014	49	73
2015	51.9	74.6
2016	54	85.5

Source: Combined from various sources, including World Bank (2021), Internet World Stats (2021) and Pew Research Centre (2015).

Key: USA, United States of America.

■ Methods

This chapter traces the 2004–2019 period Google queries for American presidential frontrunners and eventual winners and incumbents in South Africa, and vice versa for South African ANC party leaders against their frontrunning opponents. Intra-country differences are also noted in this regard; the data will be broken into geographical concentrations, with the magnitude of each USA and South African candidate’s Google searches ranked by South African provinces and North American states with the highest proportion of searches, respectively. Simultaneous worldwide Google searches will be used as a control group for each search trend per candidate for both countries to note whether mutual interest in each candidate was on par, below or above the global average. Importantly, this is a generative study, and as such, no proposal of cause-and-effect relations is made in this chapter. Rather, findings will generate working hypotheses and areas for further study.

■ Election cycles in the USA and South Africa

American presidential elections occur every four years and are dominated by two parties: the Democratic and Republican parties. With the system

dominated by the two parties, their nomination contests can begin a year prior to the national election. Two of the party conventions of the election cycles took place in July of each year (i.e. 2004 and 2016), whereas in 2008, the parties had conventions in August (Democratic National Convention [DNC]) and September (Republican National Convention [RNC]). In 2012, the RNC was held in August, and the DNC was held in September. Upon the parties nominating their candidates (along with their vice-presidential running mates), the party-to-party contest runs from their party conventions until the first Tuesday of November, which is the election day. As such, the data set will capture and compare data for the electoral years from January to December of each year (i.e. ten months prior to the election and one month after).

The post-apartheid South African general election occurs every five years, and since 1994, it has been won by the ANC. Unlike in the USA, the president is not elected directly by the population. Rather, the population elect members of the legislative branch (Parliament), who in turn nominate a president. This has so far occurred along party lines; with the ANC obtaining a plurality in all post-1994 elections, it has provided the country with all its presidents. In turn, the ANC convenes elective conferences of its own (in Decembers) on a five-year cycle that is at least one year removed from the general election, which tends to occur between April and May. Because of its proportional representation system, the South African legislature has numerous parties beyond the ANC and the official opposition. In the 2004–2019 period, the main opposition has been the DA. While the system is party-centred, the party leaders serve as proxies for the parties, with all the ANC party leaders since 1994 subsequently becoming presidents of the republic. Thus, the USA and South African systems are analogous though dissimilar to each other. Incidentally, 2004 and 2012 in the USA had incumbents running for re-election (George W Bush and Barack Obama, respectively), whereas 2004 and 2014 saw Thabo Mbeki and Jacob Zuma, respectively, leading the ANC for the second time to a general election. Thus, 2008 and 2016 for the USA and 2009 and 2019 for South Africa featured first-term electoral candidates. However, Cyril Ramaphosa, who led the ANC in 2019, had already been in office for a year, two months and three weeks, having succeeded Jacob Zuma, and completed his second term in office. Further, the preponderance of the DA among the opposition parties makes the South African system, for the years under study, a *de facto* two-party system. There is, therefore, a basis for comparison of online queries for the *de facto* nominees of the two parties in either country.

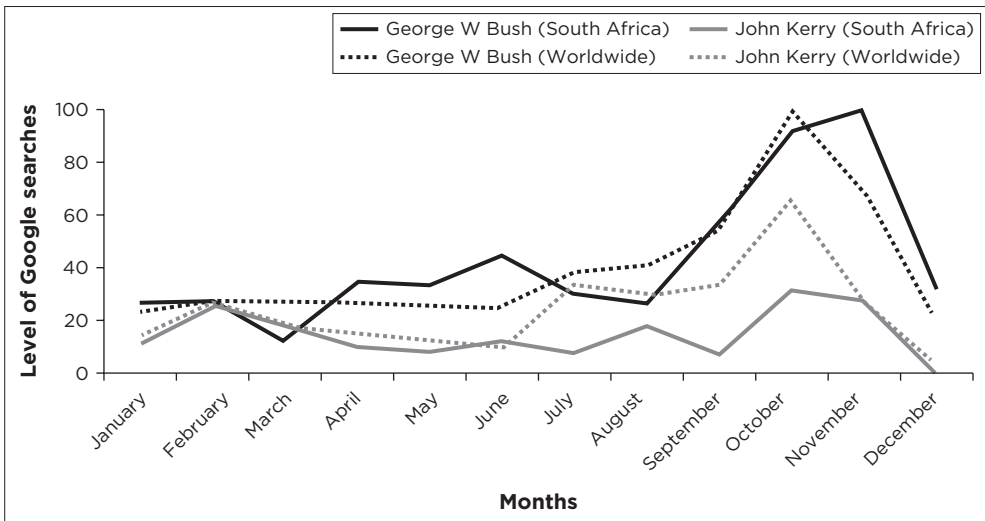
■ Data

All data utilised in this chapter are obtained from Google Trends, a publicly available dataset of worldwide Google searches since 01 January 2004.

All charts were generated by the authors from sorted data. The Google Trends data are values that are calculated on an index that places scores from 0 to 100, 'where 100 is the location with the most popularity as a fraction of total searches in that location, a value of 50 indicates a location which is half as popular' (Google 2020). Importantly, a score of '0' indicates a location where there was not enough data for this term. The timeline for both variables is 2004-2019.

■ South African searches for USA presidential candidates

In 2004, the South African population searched for the Republican incumbent and eventual winner, George W Bush, throughout the year (see Figure 6.1). While the Democratic nominee, John Kerry, surpassed Bush in March of 2004 when they declined, Google searches for Bush in South Africa subsequently grew between April and July. In the decline in August, searches for Bush still outweighed those of Kerry. Google searches for Bush subsequently grew to new peaks in September, October and November, respectively, before subsequently declining in December of that year. Noticeably, searches for both candidates reached their peak in November. South Africa's search frequency for George W Bush during November was above the worldwide average, although the worldwide average search for John Kerry was above South Africa's in the same month. The majority of the searches occurred in the North West province, and the minority in the



Source: Author's own work with data generated from Google Trends.

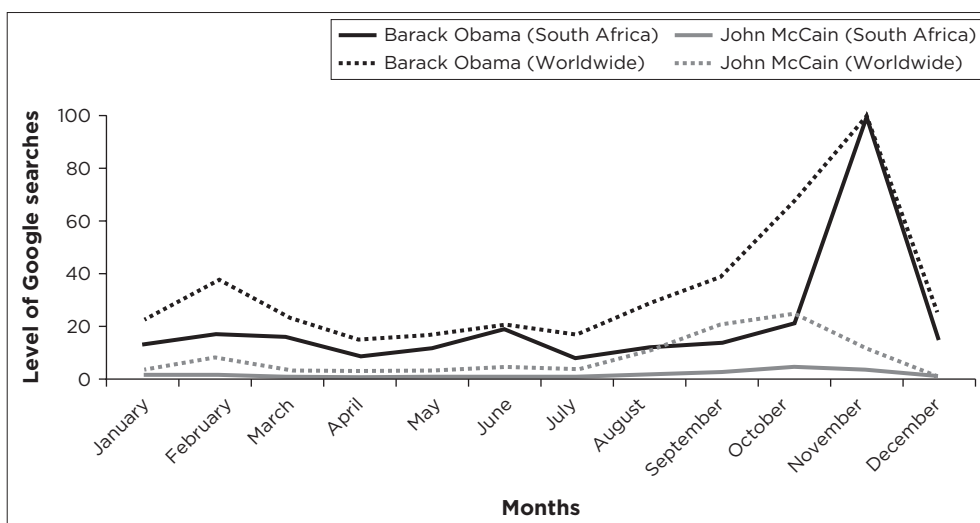
FIGURE 6.1: South African Google searches for US presidential candidates, 2004.

Gauteng province. Bush's share of searches was highest in North West (100%) and lowest in KwaZulu-Natal (KZN) (at 60% to Kerry's 40%).

In 2008, South African Google searches were overwhelmingly for Barack Obama, the eventual winner of the election, though below the worldwide average until November, the month of the election, which was once again the global peak (see Figure 6.2). The majority of the searches for the candidates occurred in the Gauteng province, and the minority in the Northern Cape (NC) province. Barack Obama's share of searches was highest in the Free State (100%) and lowest in the Eastern Cape (EC) province (at 97%, to McCain's 3%).

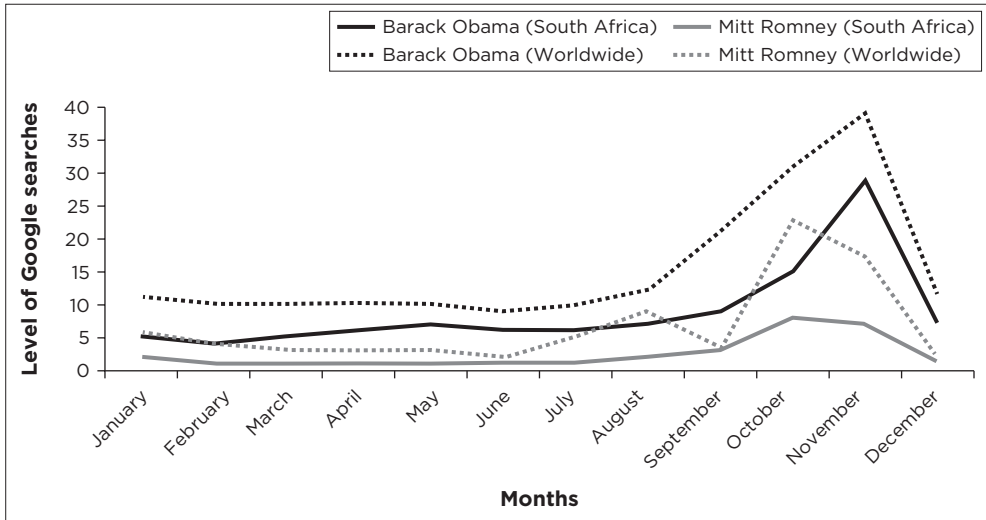
In 2012, South African Google searches were once again tilted towards Barack Obama, who was running for re-election, though the search frequency was now lower than the worldwide average (see Figure 6.3).

This diminished search frequency was also true in November, with the worldwide average outperforming South Africa's by a difference of ten points. Worldwide searches for Mitt Romney were consistently higher than South African searches for Mitt Romney, with searches for Romney outranking South African searches for Obama in October 2012. This marks the only incident in the data set in which a search for an unsuccessful candidate outranks the South African searches for Barack Obama. The majority of the searches for the candidates in 2012 occurred in the Gauteng province, and the minority in the NC province. Barack Obama's share of searches was highest in the NC province (100%) and lowest in the Western Cape (WC) province (at 96% to Romney's 4%).



Source: Author's own work with data generated from Google Trends.

FIGURE 6.2: South African Google searches for US presidential candidates, 2008.



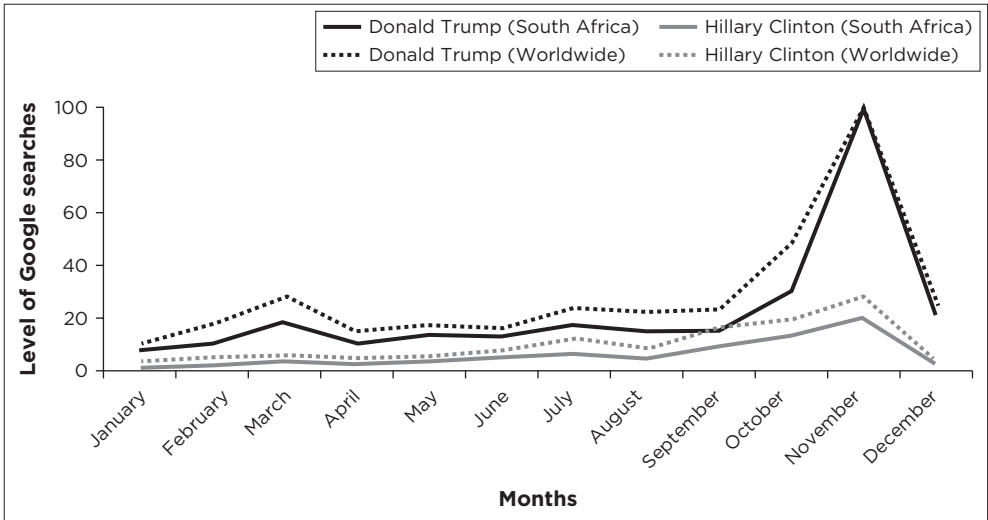
Source: Author's own work with data generated from Google Trends.

FIGURE 6.3: South African Google searches for US presidential candidates, 2012.

In 2016, South African online searches for Donald Trump outranked those of Hillary Clinton for the entire course of the year. South African searches for either candidate were below the worldwide average (see Figure 6.4). Searches for both candidates peaked in November, though searches for Donald Trump matched the worldwide average, while searches for Hillary Clinton were below the worldwide average. The majority of the searches for the candidates in 2016 occurred in the WC province, and the minority in the Free State province. Donald Trump's share of searches was highest in the WC province (100%) and lowest in the Free State province (at 91% to Clinton's 9%).

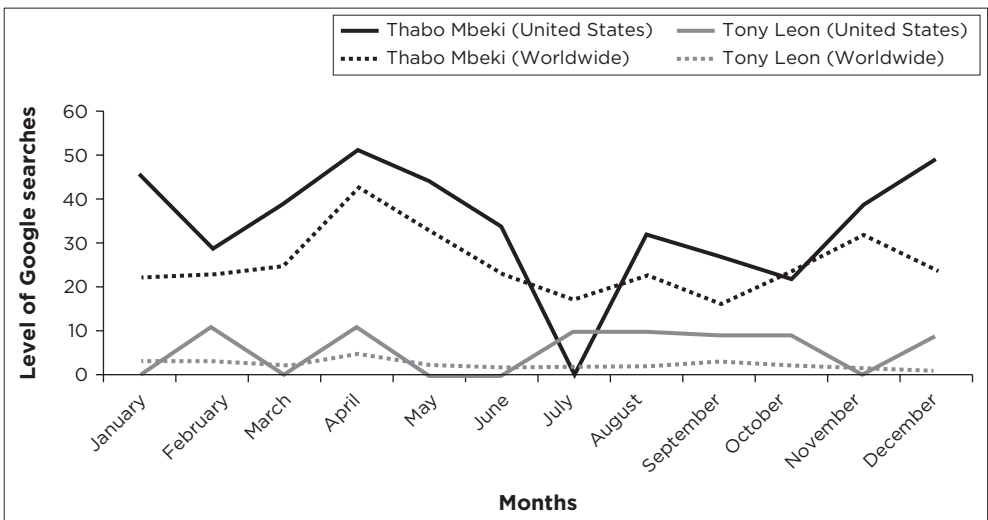
■ US searches for South African presidential frontrunner party leaders

In 2004, North American searches for either party leader in South Africa were overwhelmingly towards Thabo Mbeki, the incumbent and leader of the eventual winning party, which also increased its proportion of the election to 69.69% from 66.35% in the previous election in 1999 (see Figure 6.5). The leader of the opposition (Tony Leon) was mostly searched in the USA. Both party leaders' searches increased in April, the month of the election (taking place on the 14th), from both the USA and the worldwide population. Interestingly, in July of 2004, USA-based searches for Leon were higher than searches for Thabo Mbeki in the USA but still less than worldwide searches for Thabo Mbeki. Thabo Mbeki received the



Source: Author's own work with data generated from Google Trends.

FIGURE 6.4: South African Google searches for US presidential candidates, 2016.



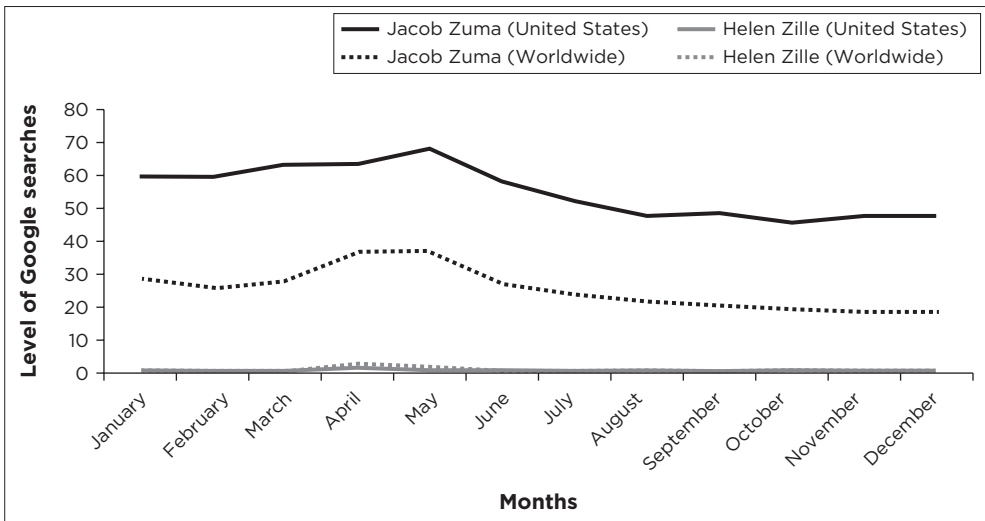
Source: Author's own work with data generated from Google Trends.

FIGURE 6.5: North American Google searches for South African frontrunner party leaders, 2004.

entirety of the share of the frequency in all 31 of the states that garnered enough searches to get onto Google Trends. Of these, searches for Thabo Mbeki obtained 100% in all but California (where they obtained 86% to Leon's 14%). In the USA, Thabo Mbeki received the most searches in Washington DC.

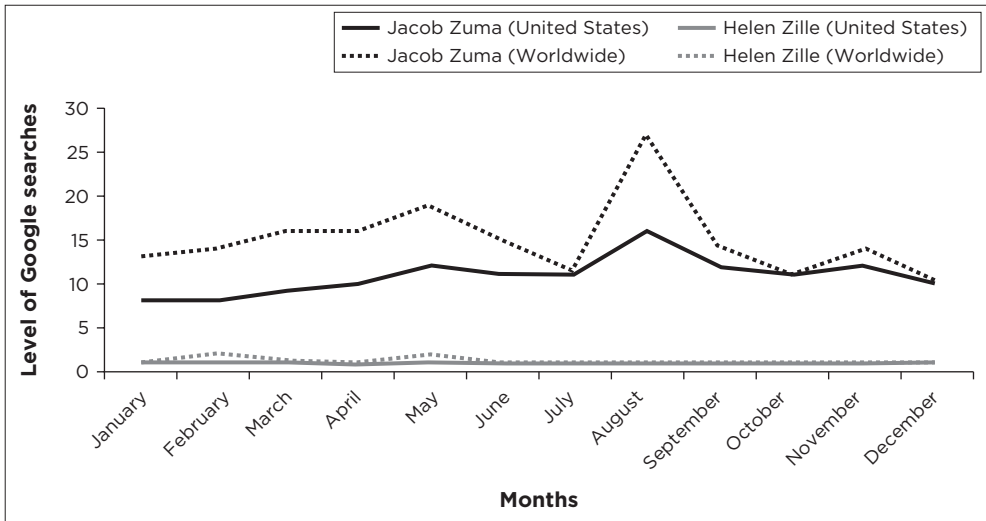
In 2009, North American searches for Jacob Zuma outranked worldwide searches for Jacob Zuma, as well as USA and worldwide searches for Helen Zille (see Figure 6.6). On the contrary, USA searches for Helen Zille were outranked by worldwide searches for Helen Zille. Searches for both candidates increased in April, the month of the election (taking place on the 22nd). However, USA searches for Jacob Zuma continued to increase and reached their peak in the month of the election in May of 2009 before subsequently declining. No similar trend was observed for searches for Zille or other USA presidential candidates (successful or unsuccessful) in terms of South African and worldwide searches. In 2009, searches for Jacob Zuma registered in 49 out of 50 states (with the exclusion of Wyoming). Of these, Zuma obtained the entirety of the searches in 45, while he got 99% to Leon’s 1% in Virginia, Massachusetts, Missouri, Oregon, Illinois and California. The highest proportion of searches for Zuma occurred in Maine.

In 2014, both Jacob Zuma and Helen Zille led their parties in the election (the only repeat contest in the data). With the election taking place on 14 May of that year, the online queries for both party leaders reached their peak up to that point before subsequently declining (see Figure 6.7). Throughout the course of the year, there were more worldwide-based searches for Jacob Zuma than USA searches. Further, though searches for Zille grew in the election month, they were still behind those for Zuma by margins of eleven and seventeen for the USA and worldwide search totals, respectively. Within the USA, Jacob Zuma was the most searched of the



Source: Author’s own work with data generated from Google Trends.

FIGURE 6.6: North American Google searches for South African frontrunner party leaders, 2009.



Source: Author's own work with data generated from Google Trends.

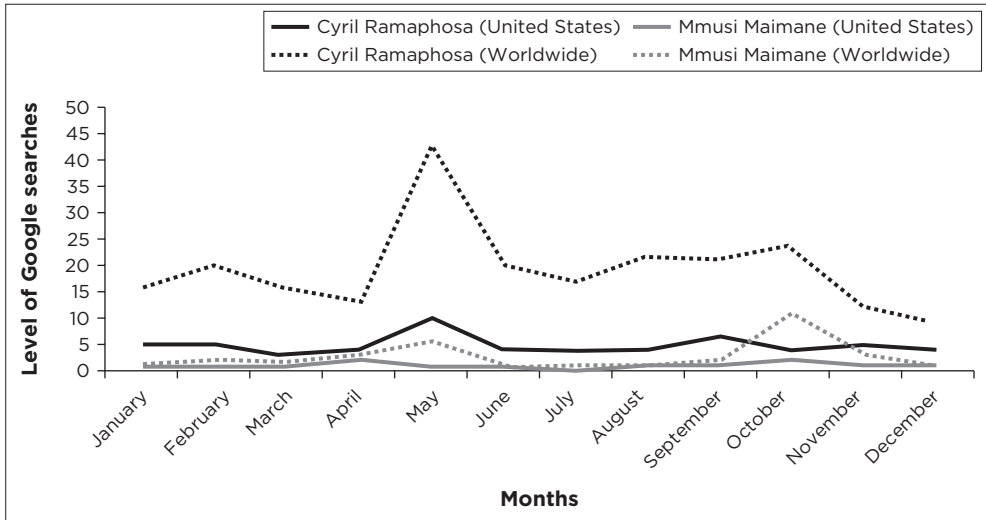
FIGURE 6.7: North American Google searches for South African frontrunner party leaders, 2014.

two party leaders in all 50 states. However, in two states, he obtained less than 100% of the searches, gaining 99% in Oregon and Virginia. Jacob Zuma was the most searched in Oklahoma in the 2014 electoral cycle.

In the 2019 election cycle, searches for Cyril Ramaphosa (ANC leader, presidential incumbent and eventual winner) and Mmusi Maimane, both first-time leaders of their parties for the general elections, peaked in the month of the election (in May) before declining (see Figure 6.8). Searches for Cyril Ramaphosa outranked those of Mmusi Maimane by averages of 3.9 and 16.6 in the USA and worldwide, respectively. Both candidates obtained more searches worldwide than within the USA. In the 2019 electoral cycle, Cyril Ramaphosa obtained the lowest share of searches (99%) in Florida and the majority of searches in Arkansas. However, this election only garnered interest in 36 out of the 50 states.

■ Analysis

In 2004, John Kerry registered the highest Google search rate of any opposition candidate, followed by Hillary Clinton in 2016. Throughout the data set, John McCain was the least searched candidate in South Africa. In terms of proportions, the province that registered the highest search of an eventually unsuccessful candidate was KZN, in which searches for the 2016 Democratic party nominee were at 40%. Noticeably, however, only five provinces registered enough searches to qualify for Google's frequency



Source: Author's own work with data generated from Google Trends.

FIGURE 6.8: North American Google searches for South African frontrunner party leaders, 2019.

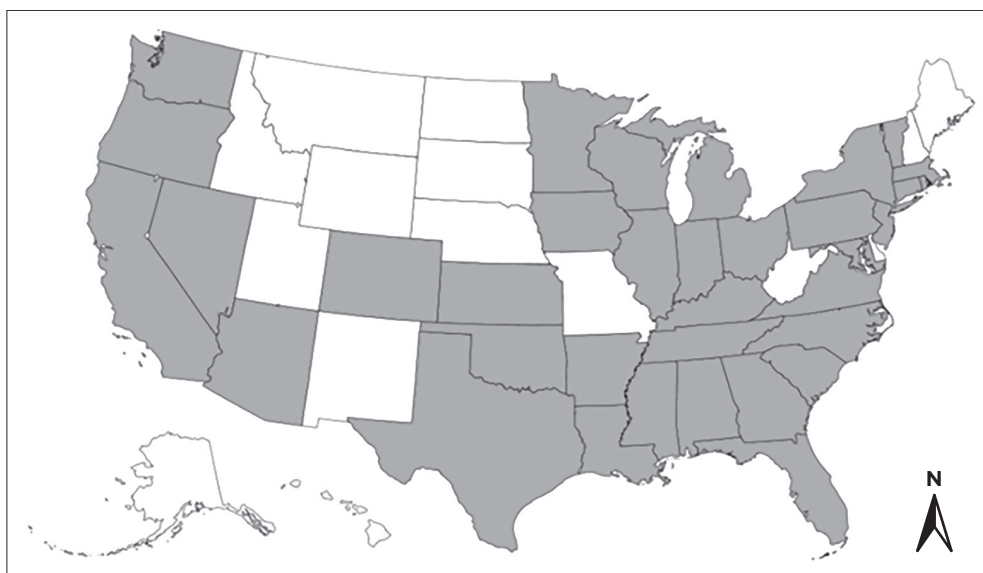
criteria to be in the Google Trends data set in 2004; Free State, Limpopo, Mpumalanga and NC provinces did not make enough searches for either candidate. However, by 2008, all provinces had enough searches to register on the data set. In electoral cycles in which all provinces are represented, Hillary Clinton (at an average of 5.8%) had the highest proportion among the eventually unsuccessful candidates, followed by Mitt Romney (at an average of 2.4%) and lastly John McCain (at an average of 2%). This growth in search frequency and widening geographic scope within South Africa is because of Internet and mobile penetration. North American searches for Jacob Zuma continued to increase and reached their peak in the month of the election in May of 2009 before subsequently declining. No similar trend was observed for searches for Zille and no other candidate (successful or unsuccessful) in the USA in terms of worldwide and South African searches.

Overall, Mbeki in 2004 and Zuma, in 2009, received most of their searches in the USA than the rest of the world, while Zuma in 2014 and both Ramaphosa and Maimane in 2019 obtained more searches worldwide than within the USA, perhaps an indicator of either a declining interest in the USA (for Zuma in 2014), a lack of interest in both party leaders in 2019 in the USA, or Internet penetration in the rest of the world. There is likely a combination of the latter two. Whereas worldwide Internet usage, especially in Africa and Asia, is a real trend, there is also an evidence-based case to be made for the decreased interest in the USA in the 2019 election in South Africa. For example, there were not enough searches in fourteen states for

the 2019 electoral cycle, whereas Jacob Zuma had most frequently been searched in all 50 states in 2014.

Indeed, the 2019 leaders of the two major parties in South Africa only garnered enough interest in 36 out of the 50 states, with not enough frequency of searches in the states of Alaska, Colorado, Delaware, Hawaii, Idaho, Maine, Missouri, Montana, Nebraska, New Hampshire, New Mexico, North Dakota, South Dakota, Utah, West Virginia and Wyoming (see Figure 6.9). Noticeably, most of the southern states, with the exception of Missouri, New Mexico (a state that had elected Clinton with five Electoral College votes in 2016) and West Virginia (a state that had elected Trump with eight Electoral College votes in 2016), all obtained enough searches to be on the index. On the contrary, the Midwestern states did not get enough searches.

Similarly, neither did the northeast coast (i.e., New Hampshire and Maine, which had each given Clinton four Electoral College votes in 2016) and Hawaii (which had elected Clinton with four Electoral College votes in 2016). In a context of ostensible growth in USA isolationism, this complicates the narrative of USA isolationism being prevalent in Trump-voting states.



Source: Google Trends (2020).

Note: Shaded North American states indicate a high level of searches of South African party leaders in the 2019 General Elections.

FIGURE 6.9: North American states with significant Google searches for South African frontrunner party leaders.

■ Towards ‘global digital citizenship’

Global digital citizenship refers to the use of information and communication technologies (ICTs) on a global scale for political participation or social movement causes (Armfield & Blocher 2019; Buchholz, Dehart & Moorman 2020; Searson et al. 2015). Through global digital citizenship, the normal route of domestically situated participation by citizens in politics or foreign policy is disrupted, if not largely enhanced. In their analysis, Mossberger and Tolbert (2008) regard global digital citizenship as the ‘ability to participate in society online’. They further indicate that online participation is driven by ‘economic opportunity, Democratic participation, and inclusion in prevailing forms of communication’ (Mossberger & Tolbert 2008). In essence, global digital participation, supercharged by the Internet, allows for global interaction and business without the limits of the Westphalian state-centric system with the state’s borders in pursuance of bespoke goals and objectives. In spite of this, domestic socio-economic and human dynamics likely dictate the level of participation in the global digital participation agenda.

The Internet and its dependent private corporations, namely, Facebook, Twitter, YouTube, Baidu, Yandex and WhatsApp, remain at the forefront of ICT tools used to express political opinions and preferences on an international scale. The Arab Spring in 2011 in the Middle East and North Africa (MENA) saw citizens in Algeria, Tunisia, Egypt and Syria rely on global digital platforms such as Facebook and Twitter to spread information about domestic realities (Bennett & Segerberg 2012; Khondker 2011). Such revelations found an audience internationally, allowing outsiders to express opinions about domestic issues in the MENA region.

Spearheaded by globalisation and the Internet, global digital citizenship harnesses separate political views into a common global centre. Views held in the East about politics in the West find meaning and expressions through the Internet. The Internet is the great engine driving the global digital citizenship agenda. As Wilson and Corey (2012) put it:

As information and communication technologies approach ubiquity they also gain considerable social and political application and influence. At the same time, any technology that has enabled diverse views to be expressed has also been a target of control. (p. 343)

In the past, prior to the saturation of ICTs, foreign policy was the reserve of actors in the proximity of power and influence. For example, satellite TV news would invite known political analysts for analysis of political developments in foreign lands. In contrast, the omnipresent character of the Internet enables grassroots participation in foreign policy by enabling citizens to virtually demonstrate their political opinions through the Internet.

Through Google searches, both USA citizens and South Africans during the 2004–2016 period demonstrated mutual interest in each other's elections. Apart from its massive economic size and influence on popular culture, which ordinarily makes the USA a fascination of many around the world, USA citizens, using the Internet, showed an interest in South African politics. As a consequence, the interest in political fortunes finds expression in both the USA and South Africa. Although the interest is not one-sided, it is not equal in degree, due in part to ICT structural realities, such as the contrasting Internet penetration (see Figure 6.1) levels in the two countries.

Based on ICT instruments such as data costs, Internet penetration and ICT infrastructure, equality dynamics also drive the rate of global digital citizenship. The level of participation in global digital citizenship is dependent on domestic digital pragmatics, with other countries having to trade off Internet access for stubborn socio-economic ills like poverty and bucket toilet systems in South Africa (Oyedemi 2015). A country with increased Internet penetration and smartphone penetration enables its citizens to participate and even influence the trajectory of the global digital citizenship agenda.

■ Conclusion

This chapter has generated some insights in terms of the mutual search trends of South African and North American presidential frontrunners, using the worldwide search average as a control group. Nonetheless, there are some areas for further research. Given variations in searches across the two countries, questions arise as to the causes of these. Do searches by either side act as proxies for forms of asymmetry, for example? More precisely, can we read into them notions of cultural hegemony, digital inequality, soft power or diasporas on either side? Perhaps a combination of these may be at play. Perhaps none. Importantly, this need not coincide with traditional understandings of Western preponderance as in these online dimensions, the Global South can, as in no other sphere, exhibit patterns of some sovereignty. Yet, some scholars can read into the very ubiquity of Google as the preferred engine of the majority of the world as a sign of the USA's dominance. Nonetheless, the modulation of search results to local geographies indicates that the relationship between Google and the consumer base outside the USA is not unidirectional and its terms of operation are not dictated by the multinational corporation (Nahai 2012). At the same time, intra-country differences in search patterns in both countries also showcase the level of splintering of interest that challenges any notion of homogeneity. Are these outcomes coincidental, or could they be indicative of other factors, be they economic (i.e. access to international

media or differences in access to technologies and infrastructure) (Gartner 2016, p. 386), demographic (e.g. the presence of a diaspora), pedagogical (i.e. shaped by differential emphases by educational institutions on the external world) or political (i.e. brought about by waves of isolationism or, possibly, a convergence of views between one population and the political ideas of a political figure across national boundaries, as seen in the ten-person focus group of international journalists conducted by CNN in 2016)? Nevertheless, given the prevalence and ubiquity of online enquiry in both the countries studied here and in other parts of the world, especially in industrialised and industrialising societies, the findings show that there is a need for a conceptual model – incorporating mixed methodologies encompassing interviews, process tracing and quantitative indices – which can coalesce and communicate (as well as open for self-critique) the meanings of mutual online searches in a world that is arguably both globalised and yet occasionally exhibiting isolationist trends.

The methodology of depending solely on Google searches, with no reflection on searches on YouTube, Amazon, Facebook, Microsoft Bing, Baidu or Yandex, may produce a skewed image. YouTube is primarily a video-streaming platform; it cannot be, in the classic sense, compared with Google searches. Amazon, on the other hand, focuses mostly on online shopping searches. Although it is a social networking platform, Facebook (now trading under Meta) often expresses dualism by also being a news platform; however, its core business is in connecting people on a global scale for social networking purposes. Only about 25.7% of searches are done through Microsoft Bing (because of Yahoo's acquisition); however, most of the searches are limited to Microsoft-related products and services. Baidu, a Chinese search engine, is the most popular in China, accounting for nearly 69.55% of all searches in the country. Yandex, a Russian search engine that accounts for 42.35% of searches in Russia, may further distort the image since some Russians may have used Yandex instead of Google for searches, causing the global figures to be slanted (see Davies 2021).

However, Yandex remains a domestically rooted search engine, at best a regional platform, but not operational on a global scale. Nevertheless, with over 86% of the search market share and over 5.6 billion searches per day, Google remains the dominating search engine, making it a viable platform to gauge the level of global digital citizenship and political perspectives.

Part 3
Social and intellectual
potentialities

Humanising the Fourth Industrial Revolution: Graduate employability and the career paths of sociology postgraduate students at a South African higher education institution

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■ Introduction

Graduate unemployment is a pivotal and contentious issue in South Africa. In 2022, the overall unemployment rate increased to 35.3%, with youth unemployment at a staggering 65.5% (Dludla 2022; February 2022). Further evidence in 2021 shows that the latest graduate unemployment rate in the country is 23.2% (StatsSA 2021). Advanced nations in the

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northern hemisphere and emerging nations in the southern hemisphere experience graduate unemployment to varying degrees (Hwang 2017; Kraak 2010; Mncayi 2016; Van Broekhuizen 2018; Van de Rheede 2012, p. 11). Mainstream literature in South Africa details that the likelihood of unemployment is three times higher among young people (Allen & Inman 2013). A graduate is taken to refer to a person who has received and completed training at an institution of higher education, including a bachelor's (BA), honours (Hons), master's (MA) or Doctor of Philosophy (PhD) degree (Oluwajodu et al. 2015, p. 657; Van Broekhuizen & Van der Berg 2013, p. 1).

Despite the common belief that a positive correlation exists between academic success and postgraduate success (Mncayi 2016; Regier 2011), recent research in South Africa indicates that graduates often encounter challenges when transitioning into the workforce primarily because they lack the necessary skills demanded by the current labour market (Chisoro 2018; Mamaleka 2020; Mncayi 2021). This 'mismatch' between education, skills and employability contradicts assertions that possession of a tertiary education qualification promotes better workplace positions and opportunities to earn a higher salary than those without tertiary education (Regier 2011; Smuts 2010). Although earlier research by Hallak and Poisson (2007) emphasised the importance of tertiary education qualifications for better employment prospects, Kruger (2016) found that when students are not academically successful and do not attain skills required for the labour market, they are less likely to be employed.

Further research conducted in South Africa shows a gap between a skilled labour force and the requirements of employers, with 32% of employers reporting difficulties in filling job positions because of the scarcity of appropriately qualified candidates (Manpower Group 2018, p. 1). Individuals who graduate with an undergraduate degree enter into entry-level positions, whereas graduates with postgraduate training tend to be preferred candidates for senior and managerial positions (Smuts 2010, p. 113). This variance in the level of employment can be attributed to skills or a lack thereof. As postgraduates receive more professional academic training, employers favour them as being more skilled (Smuts 2010, p. 113). Individuals with an undergraduate degree begin at entry-level positions to acquire the skills that those individuals with postgraduate qualifications have already obtained (Smuts 2010).

The Fourth Industrial Revolution (4IR) is seen as a potential cause of job loss for individuals with soft skills, while those in high-skilled technical fields hold a more favourable perspective on it. The discussion for this chapter began when the Faculty of Humanities at the University of Johannesburg hosted a conference on the 4IR and humanities in 2019. Prior to these strategic developments, the Sociology Honours Programme

Coordinator felt the need to investigate how our honours students were coping with their curricula at Hons level. Another objective was to establish whether the sociology programme was preparing graduates for future employment inclusive of the 4IR, where forms of employment were yet to be designed. With this future thinking in mind, we designed a telephonic survey in 2018 to ask past graduates of the Hons programme from 2013–2017 about their current employment status.

This chapter offers valuable insights into the labour market experiences of individuals who have obtained a postgraduate sociology qualification, highlighting the wide range of career options and addressing the issue of unemployment. Labour studies tend towards capturing the phenomenon of graduate unemployment with statistics. As a result, the subjective experiences of graduates are often overlooked (Moerane 2016, p. 21). Therefore, this study aims to understand the employment prospects and labour experiences of former sociology students at a higher education institution (HEI). The dissemination of the employment experiences of former students has the potential to serve as a basis for interventions that will ultimately improve graduate employability in South Africa. This chapter aims to provide an overview of the career paths of former postgraduate sociology students who were either unemployed graduates or recently employed graduates. To date, there has been very little research conducted on the career paths of former sociology students (Smuts 2010). The study by Rabe and Rugunanan (2011) focused on academics in sociology exiting academia. This research aims to ascertain whether sociology as a discipline has proven to be beneficial for graduate employability. The focus of this research considers three broad themes. Firstly, the decision to pursue an honours qualification in sociology. Secondly, the value of sociology in the workplace, including the students' field and level of employment. Finally, which skills acquired through sociology have proven to be the most valuable in their current endeavours, with specific reference to the 4IR.

The 4IR is not without contestation (Hlatshwayo 2019). In trying to humanise the 4IR, the chapter contributes to Heinz's (2009) theorising of how 'pathways' to employment could be improved by acquiring a sociology degree. It further illuminates the transition to work for youth in developing countries against the confluence of persistent inequalities, poverty and unemployment. The next section elaborates with a review of relevant literature.

■ Literature review

Research on graduate employability is extensive (Okolie et al. 2019; Oliver 2015; Sato et al. 2021). Scholars have increasingly recognised the importance of human development, work-integrated learning and the need to equip

students and graduates with applicable and transferable skills for the 21st century (Huang et al. 2022; Walker & Fongwa 2017). The extent to which graduates are prepared for the 4IR has also been studied widely in recent years (Kamaruzaman et al. 2019; Rumund-Masingh & Reddy 2021). The need to develop graduates with new skills to match the requirements of the 4IR has been undertaken by academics in various disciplines such as science, technology, engineering and mathematics (STEM) (Fomunyam 2020; Kamaruzaman et al. 2019; Makgato 2019; Penphrase 2018), humanities (Altariva 2018) and accounting (Marx et al. 2020; Tsiligirisa & Bowyer 2021). Chaka (2020) undertook a cross-disciplinary perspective that considered information literacy as an under-cited skill that is particularly necessary for the 4IR. There has also been a large focus on preparing undergraduate students for the future world of work (Adegbite & Govender 2021; Ramraj & Marimuthu 2021), including university internship programmes (Menon & Castrillón 2019) and postgraduate students (Adeosun et al. 2022).

Ramund-Mansingh and Reddy (2021) draw attention to South Africa's unique political landscape, structural inequalities and influence on graduate employability. In a context where fewer employment opportunities exist together with the 4IR curriculum being considered of greater importance, the need for HEIs to provide work-integrated learning is vital for the personal development of graduates. For the humanities discipline, Hodge (2020) recommends several key skills, such as critical thinking, innovation, team leadership, collaboration and adaptability, among others, to match with the 4IR. These skills align with Penphrase's (2018) assertion that the swift progress of technology necessitates a more proactive approach from the education sector. It is anticipated that the 4IR will significantly impact the fundamental activities and functioning of universities, along with its implications for the future employment prospects of graduates (Xing & Marwala 2017).

In an article by Xing and Marwala (2017), they state that the contemporary graduate cohort need skills that were not required ten years ago. McGowan and Murray (2016) approach this differently, emphasising the importance of students having 'learning agility', which means being able to learn, adapt and act quickly to changing environments as technology changes the way we work. As such, employability can be understood as the intersection where universities and the workplace meet, and it involves the skills and qualities that help graduates secure job opportunities, leading to ongoing development and growth (Stokes 2015). In a knowledge-based economy, universities are directly linked to economic growth because of their particular abilities and efficiency (Preble 2017).

Various studies have shown the range of jobs undertaken by sociology graduates globally (American Sociological Association 1995; Morrison, Rudd & Nerad 2011; Smuts 2010). While this scope is broad, themes include finding employment in academia, social services, health care professions, criminal

justice, government and politics, law and private corporations (American Sociological Association 2007, p. 4). The underlying commonality among this diverse career scope is the understanding of people (American Sociological Association 1995, p. 5). Sociology allows for specialisation, and it is this specialisation that lends itself to a broad scope of possible careers for sociology graduates (American Sociological Association 1995). By incorporating sociology into a BA, sociology provides scholars with a liberal arts advantage. A liberal arts advantage refers to the notion that undergraduates are able to enrol in courses other than sociology, which they can then pursue as a career (American Sociological Association 1995, p. 7).

Graduate employability is often hindered as students are unable to implement concepts learned during their studies in a meaningful way in the workplace. Transferable skills, also referred to as professional skills, denote skills acquired through graduate training that are particularly useful for graduates in the workplace (Morrison et al. 2011, p. 7). A qualitative study conducted by Morrison et al. (2011, pp. 6-29) in the United States of America (USA) reported that sociology graduates felt that their academic training was insufficient in equipping them with the necessary transferable skills required in the workplace. One such transferable skill reported as severely insufficient by participants was the ability to work successfully with and manage diverse others (Morrison et al. 2011, p. 18). Contrary to this view, Smuts (2010, p. 114) purports that sociology graduates in South Africa were equipped to deal with diverse others as their academic training sensitised them to race, gender and cultural issues. Presentation skills were also of great importance in both academic and non-academic careers; conversely, participants again reported training in this skill to be insufficient (Morrison et al. 2011, p. 22). Sociology students in the Global North and Global South outline several commonalities in the skills acquired through their training deemed useful in the workplace. Invaluable in the workplace are critical thinking, data analysis, synthesis and writing skills (Morrison et al. 2011, p. 20; Rabe & Rugunanan 2011, p. 60; Smuts 2010, p. 112).

Internships undertaken during tertiary studies prove invaluable, as they allow students to gain experience. In this regard, internships improve a graduate's chance of employment (American Sociological Association 1995, p. 9). University training should incorporate theoretical and practical training to improve graduates' employability. The incorporation of internships in higher education contributes to the successful employment of graduates. Internships allow students to develop their practical skills. They are a means for cultivating greater self-management, including time-management skills, discipline and organisation (Baron-Puda 2017, p. 113).

According to research conducted in South Africa, graduates hailing primarily from rural regions face double the unemployment rate compared to their urban counterparts (Moerane 2016, p. 12). Several factors adversely

affect the employability of graduates from rural areas. Firstly, there are fewer employment opportunities in rural areas. Secondly, rural areas are physically isolated from the job market in urbanised areas and have inefficient public transport systems with poor road infrastructure, as well as private transport being costly. Finally, because of a lack of resources, they are not able to access job advertisements through newspapers and the Internet (Moerane 2016, p. 33). Graduate unemployment is not only relegated to graduates in the humanities fields. South African students who hold qualifications in the fields of commerce and science also confront challenges in securing employment (Dunga & Mncayi 2016).

While graduate unemployment is a cause for concern, researchers caution against emphasising this group. Walker (2015, p. 2) contends that graduate unemployment in South Africa is less severe compared to other African countries and not nearly as high as for those with no qualifications. Youth unemployment, however, is of a greater concern. Van Broekhuizen (2018) points out that the unemployment rate is significantly higher for those who completed their secondary school compared to those who have a degree. Higher education institutions are also witnessing a clear shift in demographics among students entering HEIs (CHE 2016). Students from previously disadvantaged groups and marginalised communities enter HEIs with women predominating over men (Morrow, Panday & Richter 2005). Despite the increase in people entering higher education and graduates entering the labour force, there is a concerning relationship between graduate and youth unemployment (StatsSA 2021). Researchers (Oosthuizen 2005; Oluwajodu et al. 2015) lament the negative connotations of graduate unemployment, given that we have a skills shortage in the country and the loss of human capital on the graduates and the economy will have a negative ripple effect on the economy (Pauw et al. 2006). This reiterates the need to investigate humanities students' and graduates' experiences at a 4IR-driven HEI and how students can be better prepared and equipped for the current labour market.

Heinz's (2009) theorising offers a relevant conceptual framework for understanding graduates' pathways to employment. The framework highlights how employment opportunities are often hindered, indirect and more demanding for young people (Heinz 2009). One of Heinz's main assertions is that young people's pathways and experiences to employment opportunities are context-specific. He makes specific reference to developing countries that are considered more disadvantaged than developed countries. This is attributed to persistent inequalities, skill mismatches, high levels of unemployment and precarious employment opportunities, specifically in a context of great uncertainty (Heinz 2009). The term 'pathways' is primarily used to refer to 'formal and informal expectations and opportunities that exist for youth to navigate towards a

goal' (International Labour Organization [ILO] 2020, p. 15). As such, access to opportunities is seen as the key determinant of youth employment pathways, which subsequently encourage independence, skills-building, confidence and leadership for positive outcomes (Graham & Perold 2013). Conversely, where access is denied, discharged or prolonged, the likelihood that young people will succeed on a pathway to resilience is considerably less (Graham & Perold 2013). This line of thinking provides a useful approach to understanding the career pathways of graduate students at a South African HEI, specifically during a time when additional technological transformations are rapidly approaching. The need to produce graduates who are 'relevant' in this context is now more important, and examining their current career paths is a starting point. The next section details the methodology for this chapter.

■ Methodology

The chapter provides a unique vantage point in that it presents information from students about to embark on their postgraduate qualification in sociology and employed students who have completed a postgraduate qualification in sociology. This study is predominantly qualitative in nature and underpinned by an interpretivist paradigm, which allows data to be collected pertaining to students' subjective experiences (Lavrakas 2008, p. 621). The first set of information was drawn from a biographical data set of students entering a sociology Hons programme for the years 2019 and 2020. The second data set comes from questionnaires comprising mainly open-ended questions from past Hons graduates between 2013 and 2017. This research aimed to discern whether obtaining an Hons qualification in sociology was beneficial in securing employment. Data collection occurred in two stages.

To begin, a Microsoft Excel spreadsheet was set up consisting of contact details based on all Hons students, including graduates who have completed the course in sociology. Next, participants in this study were conveniently sampled using the Microsoft Excel spreadsheet, and out of those contacted through email-based questionnaires and contacted telephonically, 28 and ten responses were received from postgraduate students and employed graduates, respectively. Regular telephonic reminders were performed to encourage students who have not yet participated to do so. Once data were collected in 2018, it was thematically organised and colour-coded. The biographical information was collected in 2019 and 2020, respectively. Ethical issues were outlined at the outset of the questionnaire and were repeated during telephonic interviews. Importantly, participation in this research was voluntary, and there are no benefits associated with participation and withdrawal would not result in any negative repercussions.

To ensure anonymity, there was no space on the questionnaire for the participants to provide their names; rather, each questionnaire was assigned a case number.

The results hold significant implications for both educational institutions and companies, highlighting the need to explore potential solutions for addressing persistent factors contributing to graduate unemployment. There is a dearth of research pertaining to the working experiences of those who have graduated with an honours degree in sociology, hence the need for this research. Moreover, students can use these findings to gain insight into possible career paths using the discipline of sociology. A detailed representation of the results is outlined in the next section.

■ Results

The next section describes the themes that emerged from the study primarily based on the biographical data set of students (2019–2020), as well as the questionnaires comprising open-ended questions (2013–2017). The decision to pursue an Hons qualification in sociology, the value of the degree and the level of preparedness for the 4IR are discussed next.

■ Decision to pursue an honours degree in sociology

The sociology Hons programme has evolved significantly over the fourteen years to adapt to the changing needs of its student population. This change was necessary to better understand the changing dynamics of students coming into the university and to facilitate the transition from undergraduate to postgraduate studies. In 2012, we implemented an orientation programme for the Hons students to acquaint them with the programme's requirements and the intensive nature of the Hons degree. Students are ill-prepared for the transition from undergraduate to postgraduate studies and the mindset change required for more independent work at the postgraduate level. Our Hons programme entails a year-long quantitative research report with a statistical component. Many of the students who enter our programme have not been exposed to quantitative research or even basic statistics. Essential reading and writing academic assignments for the postgraduate level are a necessary part of this orientation. Part of preparing for the programme involves completing a biographical form that incorporates two pertinent questions: 'Why did you choose to do an Hons degree in sociology?' and 'What are your future career aspirations?'

Based on the responses of 22 female participants and three male participants (from the 2019–2020 cohort), it emerged that passion was a key instigator in pursuing an Hons qualification in sociology. For many

students, studying sociology was an opportunity to gain insight into lived human experiences, perceptions, social issues and interactions and to help contribute to solutions that affect society, such as gender-based violence (GBV), poverty and unemployment in South Africa. Others felt particularly passionate about working with people while observing human behaviours in the workplace, at home and in other social institutions. One female student highlighted: 'Sociology allows us to have opinions and a say [about] the inequalities we have in society'. Being able to have a voice was thus important for many honours students as they envisioned a better and reformed country and continent at large. Alongside this, there was also a strong desire to play an active role in society, specifically in communities and the country's socioeconomic development, focusing on underprivileged and marginalised groups.

Many of the students in this study highlighted that the structure ultimately persuaded them of the Hons course and its focus on providing work exposure in the form of a year-long internship programme. The Hons students valued the opportunity to gain practical experience while having the flexibility to choose from a variety of research topics as their year-long project component. As one of the male students enthusiastically recounted:

'I love the way the programme is organised at [*the institution*] [...] the fact that we can choose our specialization, [...] and that students can get up to 120 hours of internship where we [*can*] practice our skills in the field.' (Honours student participant, male, 2019)

He desires to be a professional industrial researcher. Besides the internship opportunity and exposure to a year-long research project offered by the institution, the choice to pursue an Hons in sociology was linked to the specific modules offered in the department. For instance, a female participant said:

'I chose to do an honours degree in sociology because it provides the best possible training in social theory, research as well as specialist courses on a range of important and interesting social issues.' (Honours student participant, female, 2019)

Some decisions were influenced by the vision that many of the students had to pursue a career in human resources after obtaining an Hons, and this choice was strategically chosen based on the module called 'sociology of work and labour markets' offered at the department. Not all students undertook the course out of passion. Instead, quite a few students were induced by their research about the field and the institution. Based on the interviews, it was clear that there was a direct relationship between the career path, choice of study and the choice of institution. These factors were all considered when the decisions were undertaken. The students regarded their choice of an institution as one of the leading universities, best described as the 'top-ranked' in South Africa and globally. A female

participant who completed her undergraduate degree in sociology at the university felt that there was no need to pursue postgraduate studies elsewhere because 'the institution was already perceived as the best in the country'. A participant highlighted that the field of sociology was well recognised within the institution, and this was a key influencer in their decision. A male participant added that the institution 'offers one of the best sociology honours programmes in the country, studying here was the most practical decision'. The stature of the sociology department was undoubtedly one of the main reasons why many students opted to complete their Hons in the department.

As a result of the institution's position in the country, several students wanted to align their future careers with the discipline. It is evident that the Hons students had clear career paths planned for themselves and envisioned sociology as a roadmap to becoming lecturers, clinical sociologists, human resource managers, data analysts, graduate counsellors, social policy planners, researchers and even working within the United Nations (UN). Many Hons students also aspired to use their postgraduate qualifications obtained in sociology to pursue a career in labour law, employment relations and work-related issues. Others regarded the Hons programme as the basis to eventually complete a PhD. Although reasons varied among the students, it was heartening to realise that each student possessed some idea about their future and had a vision of their future work aspirations. There was some recognition of the 4IR and its potential influence on the workplace by students. A female participant contended that her desire was to 'be exposed about work and industries, especially with exposure to the 4IR'. She believed that her exposure to the labour market would enable her to become a successful researcher.

Despite all the aspirations, dreams and hopes for their futures, a few students highlighted the challenges they faced when embarking on the course. These students mentioned how they were inadequately prepared for the transition from undergraduate to postgraduate studies in sociology. One student said that she felt 'inadequately prepared, rushed, uncomfortable and overwhelmed' at the start of her Hons. This view was echoed by another student who believed that postgraduate studies were 'completely different from undergraduate studies' and wished to have been better prepared for this transition. The next section explains graduates' experiences regarding the value of sociology.

■ Value of sociology in the workplace

The overall feedback on the value of a sociology degree was primarily based on the alumni participants who had already entered the workplace. Graduates who had completed an Hons in the sociology department were asked to share their experiences if the discipline of sociology has been

beneficial in their current employment. The majority of the participants felt very positive about the Hons programme. One alumnus recounted how impressed her employer was to discover that she had completed a sociology qualification when she first went for her interview to become a recruitment agent. She said:

‘He immediately looked impressed and asked me if I think the subject would be able to help me in this job. I got the job, [and] have been working there for three years, so I believe sociology is a valuable asset!’ (Alumnus participant, female, 2017)

The excerpt above was not a unique response based on the email-based questionnaires. Another graduate shared that it prepared her to cope with conflict, problem resolution, diversity and leadership issues in the workplace. She said:

‘[...] if I was the employer I would hire a sociology graduate, and my boss has said that he can see that sociology has been helpful to me in my current position at work.’ (Alumnus participant, female, 2017)

Some alumni made specific references to the modules taught in the degree programme. For instance, modules such as group dynamics and sociology of work were considered relevant for challenges and situations faced in the workplace and many graduates felt that industrial sociology assisted in grooming and preparing them for their current roles. Not only was the subject key to preparing graduates to enter the world of work, but it was also relevant in their everyday lives. One male participant highlighted:

‘I have and am still using most of the knowledge I have acquired at the university, particularly what I acquired while doing the practical part of research. First, I design and survey questionnaires, [...] Second, conducting one-on-one interviews, focus groups and addressing the public meetings. I also work as a field work manager, whereby I am responsible for the co-ordination and supervision of all the field work activities [...] After every survey or consultation I also write reports.’ (Alumnus participant, male, 2017)

Scientific research and academic writing skills were particularly valuable to the honours graduates. Many felt that the sociology honours degree helped them engage in complex academic and social discourses and found that it fostered a solution-oriented mindset and approach in the workplace. The presentation opportunities afforded during the Hons programme were another valuable skill for graduates in their workplace. One participant pointed out that ‘I got to find my creativity and voice to present various ideas on a public space for instance after I have done research on early childhood development’. Other graduates also shared how their intellectual capacities, critical thinking skills and overall abilities to express themselves improved considerably after completion of the programme. A final remark from one of the employed graduates was being able to start a non-profit organisation using the knowledge gained from the social science

undergraduate programme. This was explicitly valuable towards applying emotional intelligence, communication skills and diversity while working in various retail outlets and libraries.

While the overall value of sociology is evident in the responses of employed graduates, one alumnus felt that the curriculum overemphasised sociological theories and the need to obtain good grades while neglecting the aspect of how the content can be applied in the workplace. The next section considers the extent to which graduate employees felt adequately prepared for the technological aspects required in their current workplaces.

■ Preparing for a new technological future

With the 4IR approaching rapidly, it became increasingly necessary to establish whether the department's sociology honours degree adequately prepared graduate employees in their current workplaces. Graduates who had already entered the labour market were approached through email-based questionnaires to describe if and how they felt prepared. Not only was this an interesting way to learn and gain insight into the career paths of former sociology Hons graduates, but it was also important to align with the overall vision of a 4IR-driven institution.

The findings revealed that students generally considered the training in Statistical Packages of Social Sciences (SPSS) beneficial in their workplaces. Statistical Packages of Social Sciences forms a large part of the Hons programme in sociology and is intended to equip students with knowledge on how to use and analyse a range of outputs in quantitative research. One sociology Hons graduate employee expressed: 'I can say SPSS groomed me a lot. Currently, I am using different software and SPSS humbled me to always play around with any software'. Another recent graduate added:

'Understanding the concept of the Fourth Industrial Revolution was marvellous, we were able to use SPSS for data analysis which was very good as most companies will hire researchers to do marketing on their behalf, so [to be] able to use technology was a good step going towards industrial revolution.' (Alumnus participant, 2017)

Most students regarded SPSS as one way they felt prepared for technological aspects in their workplaces. As many mentioned in their questionnaires, these are skills highly applauded by employers in the labour market, specifically in research careers. One male sociology Hons graduate, however, shared a different perspective. He said:

'I do not feel as though my degree adequately prepared me, as the field I am currently working in is vastly different from that stuff that was present during my honours.' (Alumnus participant, male, 2017)

The discipline of sociology is very broad, and graduates tend to follow a variety of career paths. Therefore, it became particularly important to

rethink the curriculum to ultimately produce graduates that are 'relevant' for the current and future of the world of work. The next section summarises the findings and presents a discussion in relation to the existing literature.

■ Conclusion

This chapter considers the exploratory findings from two data sets of research on postgraduate students either entering an Hons programme in sociology or those who have graduated from the programme. The purpose of the research was to examine students' level of preparedness as they embark on postgraduate studies and their reasons for choosing the postgraduate programme they did. We endeavoured to understand the fit of their area of study with their possible career choices. The next reason was to understand how sociology as a discipline has benefitted those students who are gainfully employed.

All of the students' decision to pursue an Hons in sociology was driven by a desire to better understand the structural inequalities of society and the communities they have come from, as well as the triple oppression of unemployment, poverty and GBV that continue to destabilise those communities. The skills acquired in sociology provide the platform through which they can understand the systemic problems and actively contribute to society through the workplace and non-governmental organisations. The skills and knowledge acquired in the sociology programme provide the graduates with the necessary people-management skills, critical thinking skills and emotional and cultural intelligence, similar to the findings by Hodge (2020) and Stokes (2015). Most of the students felt particularly passionate about working with people and uplifting their communities.

The reputation of the institution and the choice of the department were instrumental in the decision-making for many of the students. The fact that the university is recognised as one of the top HEIs in the country was a decisive factor for many students. Studies by Badat (2010), Case et al. (2018) and Allais (2017) debate the issue of university rankings and argue that they serve to widen the inequalities in higher educational institutions in South Africa. Students make informed and conscious decisions in choosing to pursue a HE degree at this institution knowing that as a graduate from a highly ranked institution they would be more employable in the labour market. The structured programme of the honours degree was a strong motivating factor for students to choose to study here. In addition, the internationally accredited internship programme was another decisive factor for many students as the exposure to workplace programmes and skills provided an entry for many students into possible employment. This finding coheres with Baron-Puda's (2017) research, which points out that internships allow students to develop necessary workplace skills

like time-management, discipline and self-awareness, besides providing a foothold into workplace employment.

The value of sociology in the workplace is documented by Smuts (2010) and Rabe and Rugunanan (2011, 2012). Overall, the students felt very positive about the subject, and it was well-received in the workplace as a discipline that prepares graduates for the workplace. The varied skills that the programme offers, such as conflict resolution, diversity in the workplace, people-management, research design and management skills, scientific research and writing skills, presentation skills and the development of critical thinking skills allude to the importance of the curriculum of sociology to be current and relevant. These findings align with Penphrase's (2018) argument that the rapid advancement of technology necessitates a change in the educational sector to be more responsive to the needs of the 4IR.

Heinz (2009) makes the important assertion of how students' pathways to employment are context-driven. This is especially relevant to sociology graduates who come from predominantly disadvantaged environments, and part of their passion for sociology is that it allows them to understand better the epistemic injustices of their communities and how to begin addressing these inequalities. Heinz's (2009) framing of students' pathways to employment is particularly relevant for this study, as it is defined by the ILO (2020, p. 15) as 'opportunities that exist for youth to navigate towards a goal'. Many of the students who chose to embark on this degree did so with a clear goal in mind. They specifically chose the study programme and institution because of its reputation as one of the country's best programmes and top departments at one of the top institutions. They made strategic choices to fulfil their long-term goal. The structured programme encourages independence and builds confidence through its strong theoretical foundations underpinning the programme, developing previously unknown statistical and presentation skills and is leadership-oriented in its structure and approach, supporting the work of Graham and Perold (2013). In this way, we argue that sociology as a discipline begins to humanise the 4IR by the active development of the cognitive and soft skills of the graduate to lead in a 4IR workplace. It supports Hodge's (2020) recommendations of enhancing other skills, such as analytical thinking, innovation and adaptability, among others, to build on the overt technical skills necessitated for the 4IR.

Extraditing the oral-based knowledge of indigenous games to the computational-based approach of the Fourth Industrial Revolution⁸

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■ Introduction

This chapter was framed within the socio-cultural milieu of the VhaVenda tradition in the Vhembe district of Limpopo province in South Africa. Just

8. This chapter is based on Madima, TJ 2021, 'Exploring cultural heritage preservation through digitisation: A case study of traditional children's games in Vhembe District, South Africa', PhD in African Studies, under supervision of Adv. Dr PE Matshidze and as co-promoter Prof. Dr VO Netshandama, University of Venda.

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like most traditional societies, VhaVenda preserved their culture, traditions, beliefs, values, norms and other cultural practices orally. From time immemorial, the custodians of culture in the VhaVenda society have been the elders. Because of a lack of durable and sustainable indigenous knowledge preservation mechanisms, considerable sections of the elderly population are passing on, taking their wealth of knowledge with them while leaving younger generations culturally deprived and without a reference point or an absolute sense of indigenous consciousness, awareness and self-identity. Through various forms of intangible and tangible cultural values and activities, VhaVenda traditional practices have been instrumental in teaching, raising and developing their children. Their fundamental belief is that a well-raised generation of children today forms and shapes the heritage custodians of tomorrow. This premise places society at the centre of child upbringing. This was framed within the purview of the Traditional African Cultural Learning and Development. This paradigm is a thrust towards the preservation, distinguishing and upholding of the unique cultural identity within the broader context and galaxies of various alternative cultures.

Several studies show that children are moulded by society's beliefs and value systems through interactions with their peers in activities such as plays, artistic pursuits, routines and games (Corsaro & Eder 1990). However, this notion is contested by behaviourists who postulate that child development and socialisation require modelling and reinforcement by adults, who are the key agents of human learning (Gray 2012). Although Piaget argued that children interpret, organise and use information from the environment, I agree with Gray's idea that children's socialisation processes occur more in public spaces than in private environs.

The emphasis on foregrounding African thought and philosophy is not necessarily mere advocacy for a return to a romanticised pre-colonial past to rediscover old knowledge practices. The main trajectory centres around engaging with concepts rooted in Africa while considering present and future situations and contexts (Oelofsen 2015). Hence, it is envisaged that the digitisation of African indigenous games may result in sustainable preservation, wider dissemination and adoption in school curricula. It is not the objective of this study to overhype digitisation as a sacrosanct and perfect model. The moment one speaks of digitisation, inherently implied in the same term are issues of affordability, electricity, technical know-how and other imperatives that are needed for its implementation to be effective, and yet, they are scarce in marginalised segments of society, a fact which cannot be wished away or glossed over. The socio-politico-economic challenges and limitations around digitisation are a subject of scrutiny in scholarship, as will be seen in the ensuing chapters. This study is a scholarly contribution to those conundrums and that debate, and

beyond that, optimistically envisaging a practicable Afrocentric framework for rediscovering, preserving, reviving and shaping culturally responsive discourses and praxes in the arena of children's indigenous games for current and future generations.

In technical terms, digitisation means to transform non-digital objects (e.g. books or pictures) into digital forms (Preuss 2016). The term can be traced back to the 1950s in relation to computers as the action or process of converting analogue data (esp. in later use images, video and text) into digital form. In this study, digitisation is the creation of digital forms of indigenous games to represent the original games with the intention to preserve and disseminate the knowledge and values that reside in these games through technological gadgets. The significance of this study is not to delve deep into the sophisticated computer or technical aspects and practices of the term but rather to also explore the social implications of increased digital usage and technological platforms for the economy, society and culture and how this can be beneficially applied in the context of indigenous games.

As an African researcher in the 21st century, I observed with concern how the advent and advancement of the digital era has strongly caused a shift not only in general lifestyles but also in the socialisation, learning practices and upbringing of children. The children's socio-cultural world of play is increasingly being confined to domesticity because of the easy availability of entertainment at home. Whereas the frolicking of children was a common sight in village open spaces, the physical participation of children in indigenous games is no longer a common sight in modern times. That places a demand on African scholarship on how best to develop models that embrace such technological change without doing away with rich cultural games. Considering the foregoing, this study sought to document and store the knowledge shared by the knowledge holders about the VhaVenda traditional children's games on technological platforms through the process of digitisation.

As has already been indicated earlier about the elderly, who are the corpus institutional repositories of knowledge, they are not adequately leaving a body of knowledge from which to draw. While the progressive invasion of digitisation can be viewed as a threat to African systems, it can also be harnessed to advance the preservation of indigenous games. This is not without its challenges and controversies, for inherently embedded in digitisation are socioeconomic implications of which the digital divide is the foremost. The storage of documented knowledge of traditional children's games on technological platforms is defined as digitisation. To the best of the researcher's knowledge and investigation, there are hardly any studies that explore the digitisation of indigenous games in the South African context. The pertinence of this study lies in

the assumption and prospect that designing, storing and preserving traditional games on digital platforms will assist in ensuring that children will learn about these games within the medium that they can currently access and easily connect with.

Given the multidisciplinary nature of the study, the research team consisted of computer science students and the study became part of their experiential learning. The idea of working alongside students was to foster a symbiotic relationship wherein while they would apply their skills as innovators in this study, I would also use that expertise to conceptualise and actualise the digitisation of indigenous games. The games that were of focus for digitisation were *ndode*, khadi, *muravharavha* and *mufuvha*. Some of these games are also present in varied forms in other cultures other than the VhaVenda one.

The main theory guiding the study is the Sankofa theory. The Sankofa theory provides the basis upon which African people should go back to their indigenous forms of knowledge and apply them in their current contexts to forge a sustainable developmental path ahead (Dei 2012). In this study context, the dominant notion is that indigenous games are disappearing, but it is up to African scholars and communities to revive these games to benefit the current and future generations, as propounded by Sankofaism.

■ Sankofaism

Sankofaism is a philosophical paradigm that focuses on promoting African and indigenous ways of knowledge and skill development (Dei 2022). The African concept of Sankofa emphasises building bridges between the past and present to offer a formidable future. It provides a renaissance launching pad for the preservation of a treasured positive past, which seeks to provide the foundations that promote methodologies that are consistent with realities in Africa (Eshun 2011). It is a pivotal theme in Afrocentric education, philosophy and cultural milieus as it presents platforms for confronting mischaracterisations of African creative and pedagogical spaces (Bastos 2009). The philosophy derives from the West African symbol of the 'Sankofa' bird, which flies forward with its head facing backwards. The Adinka symbol for Sankofa is typically depicted as a bird flying forward with its head turned backwards. The egg in its mouth represents the 'gems', or knowledge of the past upon which wisdom is based. It also signifies the generations that are to come in which they stand to benefit from that wisdom. The Sankofa bird's stance is interpreted to mean that it is not shameful for people to revert to something that they had previously forgotten or even neglected. The Akan people of Ghana reckon that the past lightens the present and that the quest for knowledge is a continuing

process (Beale 2013). Slater (2019) provides graphic and vivid imagery about the Sankofa bird and Sankofaism:

This bird has its feet planted firmly on the ground, and the head is turned backwards. The symbol and the word, when translated together, literally mean it is not taboo to fetch what is at risk of being left behind. This symbol has been interpreted and re-interpreted in several different ways, but what it symbolises is that the Akan people's search for knowledge is based on critical reasoning, as well as intelligent and patient investigation of the past. The Akan people believe the past serves as a guide when planning and obtaining the wisdom of the past enables planning for a strong future. Visually and symbolically, Sankofa is expressed as a mythic bird that flies forward while looking back with an egg (symbolising the future) in its mouth, or sometimes portrayed as a stylised heart. (n.p.)

Slater (2019) also states that:

[...] to map out the future; or where a mistake has been made, the wrong can be rectified and lessons can be learnt from the experience. In this sense the Sankofa symbol alludes to a historic past that is uniquely African and it is remembered when building a better future. The idea is of looking to the past with the understanding that both the good and the bad have formed the present situation. That is to reach back and touch base with the past and assemble the best of what our past must offer us, so that we can achieve our full potential as we move forward. Whatever we have lost, forgotten, sacrificed or been deprived of, can be reclaimed, revived, preserved and perpetuated. The egg off the bird's back indicates that we extract what is valuable from the past, and export it into the present to make positive and benevolent use of historical knowledge. It is precisely this wisdom of learning from the past, which ensures a strong future. (pp. 2-3)

The Sankofa paradigm aims to counter the domination of prevailing Western cultural paradigms that are viewed as universal frames of reference even in postcolonial societies. One of the key aspects of the Sankofa paradigm is to forge mechanisms for preserving, promoting and propagating African heritages. The recovery and renewal of dwindling African creative heritages should be steered by Africans and must holistically address the identity crisis that seems to plague even African societies, especially in the physical activity domain of indigenous games (Tondi 2017). Sankofaism is a reminder that as African societies face and march on towards the future, they must turn, reach back to the past and retrieve all that is positive from the rich repositories of their cultural heritage and worldviews (Bastos 2009).

Indigenous games are a form of Afrocentric knowledge production that can entrench the cherishment of traditional modes of recreation in African societies. Indigenous games can help build pride and a Pan-Africanist consciousness by deconstructing notions of Western epistemological superiority that are reflected in the high incidences of children who participate in games such as soccer, rugby and related modern games while shunning or even being oblivious of indigenous games (Odora-Hoppers 2017). Indigenous African epistemologies have been misconstrued as mere socialisation processes meant to prepare children for work in the home.

However, the richness of African heritage as expressed in ceremonies, rituals, recitations, sports, poetry, riddles, songs, proverbs, folktales, word games, puzzles, tongue-twisters and dance warrants that African ways of knowing should take centre stage in academic discourse and everyday life (Zulu 2006). Indigenous children's games represent an important area within the pedagogical and socio-cultural fabric of every ethnic group in Africa. Therefore, the preservation of children's indigenous games should be explored within a framework that is rooted in the mostly overlooked positive aspects of African indigenous thinking and philosophy, hence this study's orientation and grounding within the Sankofa paradigm (Telda 1995).

■ Application of the theory in various studies

Various studies have adopted perspectives of Sankofaism to explore various socio-cultural phenomena. Martin and West (2018) explore the historicity of Afro-American genealogy to dispel the narrative that the ancestry of the enslaved black people in the United States of America (USA) and their descendants is largely unknowable. However, in the 21st century, the descendants of the enslaved are truly able to 'go back and fetch' the origins of their past in tangible ways for them to understand the present and to step confidently into the future.

Felder (2019) explores the representation of marginalised doctoral student experiences to raise questions about participation and contributions within the dialogue on doctoral education research and practice in the USA and South Africa. By premising their study on Sankofa, they went back to previous trends in the literature on Doctor of Philosophy degree (PhD) completion to identify opportunities for exploring doctoral experiences. The findings recommended the application of cultural approaches in the development of scholarship that supports historically marginalised doctoral students. Tondi (2017) endeavours to identify challenges confronting the postcolonial Africa in the 21st century and the context of globalisation processes and to locate the role of the African organic intelligentsia in the reclamation and revitalisation processes of the African culture, values and practices against the domination of the European perspective and mindset. By deploying Sankofa, Tondi (2017) opines that African intelligentsia should redefine and consolidate African concepts, terms and philosophies such as *ubuntu* and *ujima* to renew African heritages and address the social, economic and intellectual plight of many African communities.

Dei (2012) invokes the West African symbol of the 'Sankofa' bird to respond to questions on how to pioneer new analytical systems for understanding our local and indigenous communities. Dei concludes that African learners should develop theoretical prisms and perspectives that can account for our lived experiences and our relationality with other

learners, prisms rooted in our cultures, histories and heritage. Talpade and Talpade (2014) explore the need for culturally responsive pedagogy among students within the Sankofa framework. The analysis for culturally relevant pedagogy revealed the emergence of technologically related strategies intertwined with those of the traditional past. Eshun (2011) adopts the Sankofa philosophy to propose a postcolonial methodology for eco-tourism research in Africa. The same study by Dei concludes by expressing the need for the development of research methodologies and methods that take holistic approaches to researching tourism in Africa. The common narrative in all these studies is the need to foreground the importance of indigenous knowledge in various fields to solve practical problems and deepen scholastic thought. However, studies that have deployed the Sankofa paradigm in the arena of indigenous games are scant.

■ Implications for this study

In this study, indigenous games are explored from the perspective of being a culturally specific and responsive approach to recreation among children (Dei 2012). This study involves 'going back' to ancient traditional forms of physical activity and relating them to present technology so that African children may march into the future grounded in Afrocentric expressions of physical activity while maintaining flexibility to accommodate the elastic nature of culture by embracing technology. The values inherent in indigenous games are explored, and the pearly gems of knowledge from the elderly as corporeal institutional holders are invoked as a way of looking back and bringing into the present the socio-cultural significance of indigenous games. Among most African children, Sankofaism can be a buffer against both subliminal and apparent negative images of Africa that have led some of Africa's children to devalue the traditional African way of life. While Sankofaism accommodates the borrowing of ideas and technologies from other peoples of the world, its cornerstone attributes rest upon African cultural heritage, the transcending of ethnic and national blinders to appreciate the relatedness of the African world community experience, the placement of Africa and African values at the centre of investigation, the preparation of learners to contribute to society and the cultural and academic excellence, spiritual development, community building and physical fitness and health (Dei 2012).

■ Childhood, physical activity and movement practices

Movement is one of the central and universal expressions of humanity's physical existence (Van Deventer 2015). This study has children as its focus. It is, therefore, critical from the outset to highlight some key issues in

children's physical and movement activities. The development of a child is multifaceted and characterised by several dimensions, including the physical, affective and cognitive domains. This development is strongly shaped by one's socio-cultural context. It is impossible to separate one's culture and context in fully explaining their development (Nsamenang 2015). Movement is thus a socio-cultural product that is transferred and created through processes of socialisation, enculturation and acculturation (Roux 2009). Article 31 of the United Nations Convention on the Rights of the Child (UNCRC 2011) states that:

Children reproduce, transform, create and transmit culture through their own imaginative play, songs, dance, animation, stories, painting, games, street theatre, puppetry, festivals, and so on. As they gain understanding of the cultural and artistic life around them from adult and peer relationships, they translate and adapt its meaning through their own generational experience. Through engagement with their peers, children create and transmit their own language, games, secret worlds, fantasies and other cultural knowledge. (p. 13)

In African societies, movement activities are worth more than just pastimes. The activities are an important part of childhood development and cultural tools of socialisation. Childhood development practices must be informed by cultural expectations to strengthen the relationship between childhood development and context (Kalinde 2016). They are also a repository of native education that enhances cultural construction and perpetuation of societal values that shape the total being of the youth as they grow into maturity (Amlor 2016). This section will briefly explain the concepts of play and games.

■ Play

Playing plays an important role in orienting children to the core values, beliefs and practices of their societies (Diale et al. 2019). African peer cultures allow for free-spirited play settings that foster self-education, generative learning, peer mentoring, extensive child-to-child interactions and inter-stimulation (Nsamenang 2004). Play is a childhood instinct that is intrinsic to the processes of childhood learning and development (Gleave & Cole-Hamilton 2012). Play is the medium of expressing their experiences as well as their feelings. Play patterns are part of a cultural heritage that is socially constructed to symbolically reflect and communicate lived realities as both cause and consequence of the socialisation process (Roux 2009). Children's play is behaviour, activity or process that is initiated, controlled and structured by children themselves, and it takes place whenever and wherever opportunities arise. Play is distinctive in that it is culturally moulded and varies from one society to another based on a set of cultural variables that include social organisation, attitudes and values (Ahmadi & Sharbatian 2017). The key characteristics of play, as highlighted by Honeybourne (2006), are that play is freely engaged in, it is an end within

and of itself, consists of informal rules as participants can agree on them and even change them during an activity and that play is uncertain as it has no formal ending.

Parten (1932) classified play into the following categories:

- **Solitary play:** This is when a child plays alone with toys or props.
- **Parallel play:** This is when children play side by side with little interaction but are pleased and aware of the company of others.
- **Associative play:** This is when pairs and groups of children play together and share materials, but co-operation and negotiation are rare.
- **Cooperative play:** This is when children engage in sustained play episodes in which they plan, negotiate and share responsibility and leadership.

Alternatively, Piaget (1995) categorised play as follows:

- **Functional play:** This is when children engage in sensory and motor exploration of toys and materials in order to learn about them.
- **Constructive play:** This is when children manipulate objects to create something else.
- **Games with rules:** This is when children recognise and follow rules that conform to the expectations and goals of the game to sustain play.

■ Games

Games are recreational contests among rivals or teammates operating under constraints (rules and resources) for an objective that might involve winning, victory, prestige or status. A game activity usually involves competition or co-operation between individuals or teams who are competing against each other or together while jointly conquering circumstances or fighting the odds (Klabbers 2006). Games are usually characterised by playful competition whose outcome is determined by physical skill, strategy or chance employed singly or in combination. Games are artificially created situations, defined by rules that are freely accepted, binding and comprehended in such a way as to make the attainment of ends where luck often determines the outcome (Vossen 2004). Callois (2019) devised four categories of classifying games. These are *agon* (competitive games), *alea* (games of chance), *mimicry* (games of simulation) and *ilinx* (pursuit of vertigo). Within the framework of these categories, Callois (2019) placed games along a continuum from *paidia* (spontaneous, exuberant play) to *ludus* (refined, disciplined activity).

■ Synopsis on indigenous games

Indigenous games are native recreational activities originating in the characteristics of an area, people and domain (Department of Sport and Recreation 2018). This means that they are developed and exist around

specific conditions of populations and communities indigenous to geographic locations (Mawere 2012). As has been iterated in this review, a common phenomenon that characterised pre-colonial Africa was the predominance of indigenous games of varying types and every hue. These activities diffused among various African tribes at different times, and each of them signified a unique ideal to an ideal at the time. With the passage of time, most of these games became scarce, and if no effort is made to preserve them, they are in danger of extinction (Wanderi & Gathua 2009). With the disappearance of these games, indigenous knowledge and humanistic values are also disappearing, and there is a real risk that they will be replaced entirely by commercial, violent games and values (Goslin & Goslin 2009). There should be efforts to trace the fast-disappearing African indigenous games with the hope of developing them for contemporary use (Wanderi 2009). The sustainable revival of these games is dependent on their successful integration into the daily social fabric of communities. According to Goslin and Goslin (2009), any revival campaign of indigenous games must involve:

- Systematic mapping and analysis across ethnic and geographic borders.

- Active participation which should be facilitated on a regular basis.

- Infrastructure and skill development.

- Incorporation into local economic structures. (n.p.)

Indigenous games evolve as a reaction to the environment along the patterning of culture through processes of enculturation and acculturation. It is to be expected that their content may change in reaction to the context and changed social relations. In their preservation, the key challenge is to capture their evolving heritage and convey it with an in-depth understanding of the original creators who metaphorically reflected on their social worlds while at the same time seeking enjoyment, challenge and an escape in the paradoxical seriousness of gaming (Burnett 2009). Hence, despite the changing global dynamics in socio-cultural milieus, the preservation of indigenous games is paramount and should go beyond mere rhetoric. The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2017) Concept Note on Traditional Sports and Games highlights that:

Safeguarding and promoting traditional sport and games (TSG) requires developing knowledge, sharing information and raising awareness on its intangible heritage. Traditional sports and games have, for decades, faced a paradox: there is a renewed interest in TSG at national, regional and international levels but this is not concordant with its apparent marginalization. The increased professionalization and commercialization of sports, the corresponding shift in values that they encompass the global preponderance of certain sporting activities and the neglect of physical education systems are important challenges contrasting with the status quo on the development of traditional sports and games. UNESCO's work focuses on advocacy aiming to safeguard, promote and develop TSG, and to ensure that they form an integral part of national and international cultural development. (p. 1)

■ Digitising children's indigenous games: Prospects, complexities and controversies

Digitisation is the conversion of the physical format of a material into an electronic format. It involves the conversion of analogue information in any form (text, photographs, voice, etc.) into a digital form with suitable electronic devices (such as scanners or specialised computer chips) so that the information can be processed, stored and transmitted through digital circuits, equipment and networks (Enhuber 2015). The rapid loss of indigenous knowledge within communities, particularly in Africa, is a cause for concern and calls for interventions to safeguard such knowledge (Sraku-Lartey et al. 2017). In modern times, from the moment modern children are born, they are greeted by a torrent of digital entertainment platforms (UNICEF 2017). In the 2003 Convention for the Safeguarding of Intangible Heritage, UNESCO (2003) defined safeguarding as:

[...] measures aimed at ensuring the viability of intangible heritage, including the identification, documentation, research, preservation, protection, promotion, enhancement, transmission, particularly through formal and informal education and revitalisation of the various aspects of such heritage. (n.p.)

Alivizatou-Barakou et al. (2017) argue that:

[...] new technologies can play an important part in areas of identification, documentation, preservation, promotion and education [...] Audio-visual documentation, digital and multimedia resources from the areas of information and communication technologies can provide useful tools for recording and collecting information about expressions of intangible heritage. further advances in technologies for digitization (i.e. audio, visual and motion capture), e-documentation (3D modelling enriched with multimedia metadata and ontologies), e-preservation (standards), visualisation (virtual/augmented reality and gamification technologies) and re-use (e.g. applications for research and application) of intangible heritage are expected to exploit the full potential of intangible heritage and offer multiple benefits to the different stakeholders involved. So, technology is no longer a threat to the survival of customs and traditions, but a tool for their sustained development in an increasingly global 21st century. (p. 152)

Games that are in digital form have occupied a significant chunk of the entertainment space. They are presented in desktop computers, laptops, tablets, smartphones and even in cheap, basic cellular phones (Walton & Pallitt 2012). Digital technologies have thus ushered in new opportunities and threats to the cultural fabric of most societies. The cultural sector is presented with a challenge to find appropriate ways to navigate in this new reality as digital technology involves rendering certain practices obsolete while certain practices that were deemed impracticable and unviable have become the new normal (Uzelac 2010). Lenzerini (2011) laments that not only are certain diverse expressions of culture going extinct, but also the rich cultural variety of humanity is heading towards uniformity. In cultural

terms, uniformity means not only the loss of cultural diversity in terms of heritage but also the standardisation of the different peoples of the world and of their social and cultural identity into a few stereotyped ways of life, of thinking and of perceiving the world. This is particularly true for modern sporting and play culture, wherein Western modes of physical activity seem to be the key yardstick for ideal movement practices among children in Africa at the expense of indigenous games. Digitisation opens opportunities for long-term preservation of the games, much easier access and wider dissemination (Sraku-Lartey et al. 2017). Tufekčić (2016) says, on the digitalisation and virtualisation of various traditional children's games:

[...] we must think about ways to introduce structures, shapes and appearances, game modes and props of various traditional games through computers to children in class, as children cannot see traditional children's games in their natural environment in the contemporary society. The second aim, without which the first would not be sufficient, is related to motivating and encouraging children for 'transmission' of traditional games from virtual world into real life. The idea of popularising traditional children's games through the information-communication technology is based on the intention of an intertwining of tradition and modernity. (p. 39)

The rise of digital media in its multifaceted forms, such as blogs, podcasts, virtual reality and online games, presents new possibilities for the preservation of indigenous knowledge and heritage interactions (Pietrobruno 2014). In modern societies, digital games have emerged from being a fringe spare-time activity of a small societal group to occupying a central space in the recreation, leisure, entertainment and information technology discourse (Quandt et al. 2015); indigenous games fall under the category of intangible heritage. Intangible heritage comprises the non-material aspects of culture, such as tales, narratives, games, songs, music and all the knowledge usually transmitted by oral or sound means. This intangible heritage is transmitted from generation to generation and is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and it provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity (Quandt et al. 2015). It forms part of the traits that are peculiar to people and marks them out from other peoples or societies. These traits include language, dressing, music, arts, religion and dancing. They also include people's social norms, taboos and values. Indigenous games are a key expression of culture and embedded within them are lessons that are beneficial to the fabric of society (Idang 2015). Civallero (2007) presents a strong case for the preservation of intangible heritage by arguing that:

This heritage is the basis where a human group finds its identity, its projects for the future, its memory, its history, its fears, its desires [...] When peoples lose this untouchable, fragile fragment of their culture - as it daily happens to

aboriginal societies all around the world- they lose their reason for living, their past and their future [...] Cultural heritage is not just limited to expressions of material nature. Non-palpable aspects of life – such as sounds, words, feelings, sensations, thoughts and beliefs- are considered to form the intangible cultural heritage, a group of manifestations belonging to the very spirit of a people. (p. 1)

Economou (2016) further highlights that as part of intangible heritage:

[...] interactive games can help diverse user groups, often with little or no prior knowledge of the subject, understand the interpretations of specialists. The combination of different digital media – from moving images to sound, graphic diagrams, and maps and programming tools – which place the user in an active role, can be very powerful in the learning process when used appropriately. By providing different types of interaction with heritage material, it is hoped that digital applications promote an understanding of heritage, as well as encouraging users to value and appreciate heritage. This is ultimately the best long-term investment for the preservation of heritage. In many cases, it is hoped that by using the power of the medium, you can attract users to the message, particularly younger ones. Thus, providing attractive digital heritage applications that encourage understanding and appreciation of heritage will hopefully create citizens who will help preserve heritage and fight against its destruction. (p. 222)

■ Synopsis of challenges associated with digitising indigenous games

The positioning of technological challenges such as digitisation in Africa stems from the diametric difference between African indigenous and Western paradigms, as well as the realities in African contexts:

- **Affordability:** Most people in rural areas cannot afford the digital devices and gadgets that come with digitisation. Most digital initiatives are expensive and beyond the reach of most rural people. The costs of potentially subscribing to electronic databases that offer digital content can also be high, and this can transfer indigenous games from the communal cheap spirit of society to the inaccessible, expensive technosphere of those with money and means. A digital enterprise can produce an elitist culture where games that should be available to all are now only accessible to those who can afford the gadgets that go with them (Taylor & Gibson 2018).
- **Skill sets:** People might need training in using the gadgets or contraptions that come with digitisation.
- **Obsolescence:** Digital software and hardware can become obsolete. There might be a need for updates and upgrades, which might mean more costs for the users.
- **Short lifespan of digital media:** Most digital gadgets do not have a long lifespan. They require replacement within a few years, which might mean new purchases or even loss of information.

- **Loss of creativity:** In actual indigenous games, children use their ingenuity by using clay, stones and nature to create equipment. In the case of digitisation, such imaginative ingenuity might be lost as the games come in a pre-packaged form. Machine dependency may result in children losing their agency in determining their play sphere. Additionally, the socialisation element can be lost, particularly when digital games promote individualism.
- **De-contextualisation of movement:** The role of society, especially elders and peers, in teaching cultural practices to children is vital. It forms a key part of the social fabric of African societies. The sense of individuality that technology brings may go against the communal spirit of African people. The connection and sensitivity to nature are fostered in real games more than in the digital sphere. Digitisation might mean 'putting a knife' to the ethos as children might be mentored by technology (Taylor & Gibson 2018). Certain traditions are tied to specific roles within a community, so questions of sensitivity, privacy and ownership must be addressed. There can even be fears of killing the tradition through its levelling into disconnected media (Robbins 2010). De-contextualisation also means that participants miss the real meaning of those games. Some of the psychomotor, affective and cognitive benefits associated with actual participation in indigenous games as opposed to virtual participation may be lost to digitisation. The rise in cases of obesity in South Africa because of the sedentary lifestyles promoted by video games is a classic example.
- **The digital divide:** This refers to digital inequality wherein there is a socioeconomic gap between those with and without access to digital technology. This gap also includes awareness, adoption, knowledge, skill and ability to use digital technology. While the digital revolution continues to forge new ways to generate and preserve knowledge, educate people and disseminate information, it is also characterised by the growing gap between those who are information-rich and those who are information-poor (Borrero 2016). South Africa is one of the most unequal countries in the world, and therefore, the digitisation of games can also reflect such inequalities as some people groups may not be able to access or use technology (Rice & Pearce 2015). The output of digitisation projects, by their very nature, will be more accessible to technologically developed societies than to the underserved areas often producing the content (Rice & Pearce 2015).
- **Intellectual property:** Indigenous games belong to the community. Legal issues might arise in ownership and copyrights when the games are digitised.
- **Commercialisation:** When digitisation occurs, games might be sold as companies recoup the expenses. Communities might have to buy activities and experiences that are free.

■ Possible tools for digital sharing indigenous games

■ Music

Music is closely connected with traditional children's games. Since time immemorial, indigenous people have used music to entertain their babies. There were some rhymes that were sung when a baby was crying. When a baby heard a song, it stopped crying. The type of rhymes can be rehearsed and recorded. Through iPods, recorded music can be preserved and easily disseminated to the public. One can enjoy the music through headsets or connect the iPod to the speakers for volume. Music can also be preserved through an application called iTunes. iTunes can possibly link traditional children's music with games. An application can be downloaded anywhere by anyone who likes to listen to the cultural music that goes with traditional children's games.

■ Roleplay

Traditional children's games can also be digitally preserved as a roleplay. These games, if roleplayed, can be filmed. Films can be watched in theatres through big screens. They can also be watched on television and on computers. Traditional children's games can also be video recorded and played as video games. Videos are accessed on all social media platforms that are popular as well as those that are not popular.

■ Graphics

Graphic design is another way of art that can be used to digitally preserve traditional children's games. Graphic design involves narrating stories through graphics. Regarding the digital preservation of traditional children's games, the graphics can be uploaded and watched online and in videos. Graphic design is an art that involves drawings.

■ Photography

Photography is another form of art that was suggested by the participants as a way of digitally preserving traditional children's games. Traditional children's games can be captured and scanned for preservation. They can be kept in digital museums and digital archives. Indigenous games strongly promote the sense of working together but focus on having fun as well. Participation in various types of indigenous games may result in the holistic development of children. Holistic development is all-round and balanced growth involving the combination of acting (physical), feeling (affective),

interactive (social) and thinking (intellectual) facets of a child's growth (Stolz 2013).

Now that we have entered the Fourth Industrial Revolution (4IR) globally, many things are changing, including the indigenous games that are no longer the central core of most African people because of colonialism. It then came to a stage of questioning where and how we could still make these games relevant. As in this era, digitisation is the most popular concept and it is in fashion to go about sending messages, interacting and making life easier.

This can be done by video-recording these games. Scholarly knowledge researchers can engage with indigenous communities in procuring knowledge about indigenous games, and video records or voice recordings can be used as ways of making these games relevant in our time. By video-recording these games, people will be recorded while playing the games; this will make it easy for the games to be transferred to media platforms that will be viewed by many users globally; this will also be an ideal way of preserving traditional children's games. Preservation is a very strong key to indigenous knowledge systems. Every form of knowledge can be preserved and utilised for the sustainability of the people as well as by future generations.

Tape-recordings can be used as a way of digitising traditional children's games. Scholars can use voice recordings as a tool for collecting data. In such cases, information might be broadcast through voice recordings in museums or libraries as audio education programmes. In this, audio people might be able to demonstrate and utilise the information in their very own indigenous communities. By doing this, we will be practising Afrocentricity theory in the 4IR era. The integration of modern technologies with ancient indigenous knowledge systems will bring recognition and high relevance to the indigenous communities along with their culturally distinctive ways of doing things. Future generations will be able to learn through the media platforms about their various cultural identities. Having thorough observations on the possibilities of digital preservation of traditional children's games, as researchers we have discovered that digital preservation can be carried out in different art forms. It can be done through fine arts or creative arts. Possible different formats of string and sharing traditional children's games knowledge were also discovered. The rapid loss of indigenous knowledge within communities, particularly in Africa, is a cause for concern and calls for interventions to safeguard such knowledge (Stolz 2013).

■ Conclusion

The study reveals that digitising traditional children's games would make them exciting and fit within the current revolution (the 4IR). It was also

revealed that the current generation is immersed in the use of electronic gadgets, and extraditing the orally-based knowledge of traditional children's games would assist the children to know their cultural values and norms. However, the findings in this study do not imply that oral tradition, books and print works should be totally discarded. Books should still be relevant for those who want to improve their reading and writing skills even though those books could be scanned and digitised for online access (ebooks). For the digital preservation process, it was identified that, following the inter-, multi- and trans-disciplinary nature of traditional children's games, there should be collaboration between various stakeholders. Organic knowledge of arts and culture from community elders, formal school education, ICT and engineering in computer scientists are needed for the digital preservation projects. The journey of merging these ideas was not an easy one. In some practical cases, some of the software needed money, and for us to explore the process, we had to buy that software.

The holism of *ubuntu*: The missing link in Fourth Industrial Revolution-led environmental justice solutions

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■ Introduction

During a 2019 South African Sociology Association Conference, titled *Work, Life & Society: Meanings, Manifestations and Trajectories of the Fourth Industrial Revolution in Africa*, workers from the steel industry narrated their experiences working alongside the new innovations taking over. They likened the new machines to *izimpimpi* [snitches/informants] who track their every move, even their frequent trips to the bathroom when they are feeling unwell. Eventually, the machines ‘snitch’ to their employers and they risk losing their jobs for underperformance, sometimes being replaced by another machine that monitors the remaining employees’ movements and labour even more intensely. They suggest that they work for the machine and have to figure out ways to keep up with it so they do

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not lose their jobs. These experiences of the steelworkers form just one illustration of what happens when we unquestioningly embrace external Western inventions and ideals. We risk welcoming a different kind of imperialism. The environmental justice space in South Africa, often led by non-governmental organisations (NGOs), is one space that should be cautious towards blind faith in Western solutions to climate change. This is because so many of their ideologies are rooted in social justice, empowerment and grassroots engagement, and the solutions they champion do not represent their ideologies. But the reality has been an aggressive push towards solar energy and wind turbines as clean, renewable solutions. Very little consideration is given to indigenous knowledge and community-owned strategies like the production of biogas using materials like cow dung and food waste. These methods are not only important as renewable energy solutions, but they have the potential to address other challenges faced by the community, like generating income and creating community-led collaborations across different sectors and institutions. The intersectional sustainability rooted in community-led strategies like the production of biogas is one that I will discuss by pulling from Mogobe Ramose (2005) and Puleng LenkaBula's (2008b) discussion on *ubuntu* and ecology. They both go beyond discussing *ubuntu* as just a humanist theory centred around people. They show the ontological origins of *ubuntu* that go beyond humanity and encourage respect and harmony not just between people but also with spirituality, ecology and all elements of social life. It will unpack the production of indigenous strategies like biogas production as important multifaceted solutions rooted in *ubuntu*. These strategies address pluralistic social issues rather than having a single solution for each social ill. When coupled with Fourth Industrial Revolution (4IR) strategies that are empowering and compatible with these African-led solutions, the potential can be remarkable and easily leveraged in the global context.

■ Fourth Industrial Revolution and the South African context

The global lockdown aimed at slowing the spread of COVID-19 infections saw many countries embrace various 4IR solutions to keep the economy going and to ensure people still had access to important goods and services. While various 4IR strategies assisted locally and globally in navigating the public health care crisis caused by the pandemic, they also contributed to deepening the divide between people. Most South Africans could not just have their groceries delivered to their homes with just the click of a button. Many educational institutions struggled to migrate to online learning and to ensure that no students are left behind. In 2020, crowdfunding platform Feenix sampled 362 participants across 26 universities in a study to find out how students are coping during the lockdown. Half of those sampled lacked

the critical resources needed to be able to study from home; these include laptops, data, food and money (Jappie 2020, p. 28; Jordaan 2020). The missing middle students were the most vulnerable; these are the students who are often not considered poor enough to receive funding from the institutions or government but are usually too poor to pay for certain services that the more disadvantaged or poorer students receive for free; in this case, it was digital tools needed for online learning. These and many other challenges, including fears that machines are here to replace people's jobs, push one to question the country's readiness to adopt this new transition.

The South African public is already feeling the adverse effects of 4IR. Standard Bank moved to close nearly 100 of its branches all over South Africa between 2018 and 2019, and over 1,200 jobs were lost (Khumalo 2019). The bank reported to Business Day that this move was because of a change in consumer patterns, as fewer people are using the branches. They also said that those who require bank services should rely on digital self-service platforms (Khumalo 2019). A few challenges arise from this Standard Bank case study. The first is 4IR strategies and practices rely heavily on the availability of constant and reliable energy and data, services that South Africa is struggling to provide. Access to electricity characterised the Second Industrial Revolution (2IR) in Europe in the late 1800s to the early 1900s. For many poor South Africans, even the 2IR has not taken place for them, as they rely on burning toxic and hazardous coal in their homes for energy. More recently, even the middle class has been affected by South Africa's inability to provide electricity. Many small businesses, places of work and families are impacted by load shedding. These are scheduled power cuts that help lessen the load on an overwhelmed electricity grid. Eskom, the state-owned energy supplier, schedules these power cuts for a few hours, often rotating from place to place. If 4IR requires steady electricity to function and thrive, how would it work in South Africa when we have not even mastered 2IR? Data costs are another challenge that Standard Bank did not consider when closing its branches. South Africa is one of the countries with the highest data costs in Africa and has even higher data costs than more developed countries like South Korea. A 2019 *Eyewitness News* article shows that South Africans on the MTN network will pay US\$7.19 for 1GB of data, while Nigerians pay US\$2.22 and Rwandans pay \$0.56 (Healing 2019). For many South Africans, this cost is just simply too high. Challenges with poor network coverage in some areas were also not considered. Even when one can afford the high data costs, load shedding often has a negative impact on the network, and people in rural areas consistently have poor coverage. So, when bank branches close around them, people have limited options for navigating their banking needs. Standard Bank's move also cost many jobs in a country where unemployment is already high. Digital services are offered in English, which

alienates a black majority whose first language is the various African languages. The apps also require tech literacy that many South Africans do not have, thus making them inaccessible and complicated. Standard Bank's move was profit-driven, and it overlooked the needs and lives of their mostly poor black clients. This move also heightened fears that the emergence of 4IR will reduce already scarce jobs.

■ Fourth Industrial Revolution and ecology

One space that has been quick to accept these new technologies and push for their rapid adoption has been environmental justice NGOs, both locally and globally. This is concerning because ecological degradation has already gone past the point of no return, and the main solution is a drastic shift in consumption culture, production and waste disposal practices across every space, from mining, food production and infrastructure to families, communities and every conceivable social structure. Technology would play an important support role, but technology alone cannot reverse the damage done to the planet. The environmental justice space is also full of examples of the dangers of allowing market-driven technological strategies to lead the solutions to social and ecological problems. One example is the belief that genetically modified foods would address food insecurity and environmental factors like droughts that affect our food production systems. But the challenge to this 'solution' is that the countries and regions that need it most are the underdeveloped countries that lack the labs, technology and resources needed to create seeds that will produce pest-resistant seeds and grow even under drought conditions. Additionally, genetically modified organism (GMO) companies oversell the benefits of their seeds and use capitalistic tactics to attract farmers. Genetically modified organism companies often sell the seeds at a lower cost at first and strike deals with governments to encourage farmers to use their seeds. Over time, their seeds become more and more expensive, and farmers also start to realise that seeds have a suicide gene, meaning the seeds from this year's harvest cannot be used for new crops next year, making the farmers more reliant on GMO companies like Monsanto (Scoones 2008, p. 318). The claims that the seeds are superior are often called into question by the farmers, and the seeds often do not grow under drought conditions. The seeds also create more environmental changes, and pesticides like *Bacillus thuringiensis* (Bt) are 'built into' the seed. Genetically modified organism companies claim Bt is not toxic for non-targeted wildlife like honey bees, butterflies and other animals that play an important role in the agricultural process, but farmers have reported the opposite. There are also growing concerns that these pesticides and various other GMO products are even dangerous for human health and have been alleged to cause cancer. Academic and environmental justice activist Vandana Shiva

has written extensively on how GMOs negatively affected cotton farmers and the economy in the mid-1990s in India. Many of the smaller farmers even turned to suicide when they could no longer afford Monsanto's seeds and had low harvests, making it difficult for them to support their families and pushing them further into debt (Shiva 2004).

There is a lot we can learn from the GMO case study, and it can help us make the more difficult reflections we have to make about the 4IR. The Indian government's intention in bringing Monsanto in was to help small farmers who were struggling, address food insecurity and gradually grow the economy as a whole. Monsanto's goal was profit. These two goals clashed with each other and India found itself dealing with a suicide pandemic, a failing agricultural sector and increased poverty by the late 1990s. The blind acceptance and championing of solar renewable energy by South African NGOs is concerning because it could see a similar repetition of history. Just like the Monsanto case, renewable energy like solar and wind turbines are not as sustainable as they seem. They require steel compositions for their manufacturing, and the manufacturing process is expensive and highly technical, which would mean heavy reliance on Western countries for the production of renewables. This might mean a rise in jobs globally, but not necessarily in local contexts where countries do not have the capabilities to manufacture their own solar panels and wind turbines. They are largely a technology-driven solution and part of a recent local technology boom; the popularisation of the cellular phone and other mobile telecommunication devices led to a huge spike in cobalt mining in the Democratic Republic of the Congo (DRC). This tech boom contributed to political tensions, corruption, violence and poverty in the already struggling state. It led to a rise in child labour and some of the worst human rights violations. Environmental justice NGOs must be careful not to create other social challenges; while considering climate mitigation strategies, they must consider history, geopolitical relations and local challenges, especially of states where the raw material might come from in cases where it has to be mined. Mining is also responsible for much of the climate degradation we see today. Technology-driven climate mitigation solutions that rely on mining still negatively impact the environment and run the risk of potentially creating unintended outcomes like the cobalt crisis in the DRC (Sovacool 2019, pp. 921, 936). Because, just like Monsanto, the external actors creating and improving this new technology have profit in mind, the social, ecological, economic well-being of other countries is not a priority for them. When NGOs overlook this important history, they push a dangerous neoliberalism globalisation paradigm (Shivji 2006, p. 23). This paradigm is enforced by their international funders at the expense of local discourse, which has the potential to solve the ecological problems communities face while empowering them and their capabilities. Instead,

the solutions that NGOs use are almost always driven by the funders' agenda rather than the local needs. The funders are themselves often funded by or made up of states, corporations and intergovernmental organisations who give funding preference to NGOs that align with their agendas. These agendas often require Western citizens to be hired in the implementation of certain initiatives, usually with justifications like high expertise and technical knowledge being needed that Africans might not have. But this means the money NGOs get as funding is used to hire expensive service providers abroad instead of creating more jobs locally. The agenda includes NGOs pushing for certain Western goods and technology like solar renewables, meaning they stand to make far more in profit than what they gave to the NGOs in funding. The 1980s neoliberal agenda demonised the state, presenting it as corrupt. Non-governmental organisations, on the contrary, were presented as being led by or fighting for civil society against a corrupt state. The anti-state funders led to the rapid rise in NGOs, particularly in Africa (Shivji 2006, p. 23). This idea still prevails today, as there is often more conflict rather than collaboration between the state and NGOs. Non-governmental organisations, though presented as civil society, are seldom ever led or run by local communities; instead, they are run by the educated elite; often in urban areas, and they are usually more concerned with careers, materialism and securing donor funding rather than altruistic activist motives. Manji and O'Coill (2002, pp. 567–568) compare the emergence of NGOs in Africa to the emergence of missionaries, which eventually laid the foundation for colonialism. They suggest that while NGOs only marginally contribute to poverty alleviation, they ultimately undermine Africans' ability to politically, socially, economically and, in this case, environmentally emancipate themselves. They add that for NGOs to be truly revolutionary structures, they would have to give us the almost paternalistic development agenda that disempowers and further pushes Africans to the margins.

South Africa's environmental justice NGO structures have been more focused on advocacy and lobbying around coal divestment which often plays itself out in the media, in government structures like parliament and in court cases. Sometimes, they have victories, like the 2022 court ruling that clean air is a constitutional right.⁹ This is significant for the Mpumalanga Highveld Priority Area (HPA), which has poor air quality and is surrounded by coal mines, steel industry, coal-fired power stations and many other polluting industries.¹⁰ While this is a huge win for the NGOs, HPA and South Africans at large, it has taken years, arguably decades of lobbying and campaigning. The burden to prove, especially on a case-by-case basis, that

9. For further reading please refer to Ncube (2022) and CER (2022, 2023).

10. For further reading please refer to Millar et al. (2022).

industries are polluting and making communities close to them sick will still remain on the individuals or community. They would have to go through similar long, drawn out legal processes to prove industry pollution is making them sick. The government still remains committed to coal despite this ruling. This ruling also does not address the pluralistic challenges caused by industry in places like HPA; some of these include limited jobs, municipalities more interested in serving industry and a lack of access to electricity or clean water for people, their crops or livestock. Moreover, while this kind of advocacy is important, more intersectional solutions that address different social issues are crucial for supporting these court victories. This court victory, though monumental, will not have immediate short-term implications; it will not bring people electricity or water, and the long-term benefits are arguably still a long way away and will not address the current ecological and socioeconomic challenges the HPA is faced with now.

■ Holism of *ubuntu*

The holism of *ubuntu* will be discussed in this section. To understand this *ubuntu* holism, I turn to LenkaBula's and Ramose's discussions on *ubuntu* and ecology. John Bhengu (1996, p. 3) and Nkonko Kamwangamalu (1999, pp. 24–25) both define *ubuntu* as a communalism philosophy that shows the interdependence between individuals and their communities. Bhengu adds that people exist in a social cluster and cannot exist by themselves; even once the individual dies, they still live in the community in spirit or as ancestors [*idlozi*]. The concept of *ubuntu* is multifaceted and represents the core African ontology, which prioritises respect for all people, cultures, ancestors, God and the environment. Ramose's (2005, p. 56) discussion of *ubuntu* pulls from the African ontological discourse; he starts by defining the self, person or individual in relation to their community, then moves outwards to consider religion, healing, ecology and different parts of African social life. Personhood in African thought is about 'completeness' or 'wholeness'. He argues that the community is given primacy in discussions on self. The individual can only come to know themselves and reach full personhood through engaging and serving their community in ways that encourage individual and collective self-improvement. This encourages a kind of equality and unity where individuals are always in service to each other and the community at large. They support each other in their continuous journey to achieve personhood. Taking care of each other also requires that people take care of the natural ecology they rely on for material, social and spiritual needs. Ramose's analysis is based on the main *ubuntu* tenet that says, *umuntu ngumuntu ngabantu*, loosely translated to 'I am because we are' or 'I am because you are' (Ramose 2005, p. 88). He went beyond the discourse on personhood in his definition of *ubuntu*; he sees it as a philosophy of ecological harmony. He suggests that humanness

or personhood sees being and the universe as a complex wholeness, a continuous multi-layered interaction of all entities. These entities, like individuals and communities, mutually caring for each other, have significance and should also be cared for. Mutual care for another person or for important entities like ecology should not be trumped by the accumulation or safeguarding of wealth. What is interesting with the case study above is how it encompasses the holism of *ubuntu* often lacking in NGO strategies and that can be seen in Ramose's theorising of *ubuntu*. For example, one sees the mutual care Ramose attaches to *ubuntu* in the communities' suggestion that a group of people be taken to the Eastern Cape to learn traditional biogas-making techniques. It is embedded even in the way they go on to suggest a train-the-trainer pedagogy when it comes to sharing the knowledge learned. Slowly, individuals start to teach each other the process, empowering themselves by constantly instilling their personhood through their act of service, which empowers others by not letting their humanity and dignity be reduced by poverty. Ramose (2005, p. 88) went on further to add that no person or group should see themselves as being more important than the interdependent parts that make up the universe, nor should they see themselves as the centre of these connected entities. The strong and important interdependence Ramose theorises about is evident even in the way Africans believe ancestors and Gods reside in ecology. Ancestors are often referred to as *abaphansi*, which translates to those 'who live on the ground'. Many cultural and religious rituals involve engaging with the ground or soil as a way of connecting with the ancestors or awakening them. During ceremonies, traditional beer is poured first on the ground because the ancestors must 'eat and drink' first before the living guests and family. Similarly, Zulu cosmology has a rain goddess, uNomkhubulwane. She is linked to fertility and is believed to live in the mountain. She brings fertility to women struggling to conceive children and to nature; when there is drought, sacrifices are made to ask her to intervene (Muller 1999, p. 161; Shange 2013, p. 51). uNomkhubulwane is linked to ecology in almost indistinguishable ways. Anything that weakens the link that these entities have with each other violates or weakens *ubuntu* and makes way for a culture of the self. This leads to the kind of ecological degradation that humanity is now living through, characterised by climate change, wars over resources, mass pollution and waste, food insecurity, animals going extinct and many other social and ecological issues.

LenkaBula has similar discussions on ecological justice, breaking many of the methodological rules that guide how scholars should create knowledge. Knowledge is controlled by disciplines in which the academy and society as a whole place social events. This is concerning because social challenges that require knowledge production to resolve do not happen in the predetermined categories and disciplines created by society. Ecological

degradation does not care that society has confined it to the natural sciences, and over time, it starts to impact the economy, it starts to perpetuate existing social ills around race and gender, and it affects our health, infrastructure and many other things. It is because of this realisation that LenkaBula engages multiple disciplines in her discourse, and by doing this, she encourages a holistic *ubuntu* approach similar to that of Ramoses. Just like Ramose, she sees the interdependence and connectedness of the universe and of history and the social structures that come together to create poverty, ecological challenges and racial and gender discrimination, especially in the Global South. One of LenkaBula's (2008b) contributions that does this is 'Beyond Anthropocentricity - *Botho/Ubuntu* and the Quest for Economic and Ecological Justice in Africa'. In this piece, she practises *ubuntu* holism in several ways. The first is that she draws from African solutions to address modern-day challenges around economic and ecological justice, while many others draw from technology and Western solutions that still try to protect or even draw from capitalism. This is the same system that created our current environmental degradation by prioritising profit over social well-being and the environment (Bond 2012, p. 42). By doing this, she encourages sustainability integrated into *ubuntu* while elevating *ubuntu* ideals and Africans who have been pushed to the margins by capitalist exploitation, slavery, colonialism, apartheid and so on. Even across her other scholarship, she encourages those working in social emancipatory spaces, be it religious institutions, educational spaces, communities, NGOs, etc., to consider the interconnectedness of the social illness they seek to address. Equally, they must come up with holistic solutions that can be far wider-reaching rather than being narrow and exploring singular solutions in isolated ways that do not consider the connectedness of challenges. She argues (LenkaBula 2007) that society should:

[...] engage in socio-ethical analyses of the interconnectedness and relatedness of poverty, wealth, ecology, economy and injustices in Africa, particularly South Africa. Poverty and wealth cannot be understood in isolation from the socio-political, ecological, economic, historical and geo-spatial contexts in which they exist and are encountered. (p. 1)

LenkaBula also goes a step further by observing the role that environmental degradation plays in the oppression of women. Women in the family are often the ones with a closer link to the natural environment. Farming is how much of rural sub-Saharan Africans survive, food insecurity is one of their biggest threats and women are often the central role players in addressing this challenge (Womin 2013, p. 1). For many African families, women are responsible for food production and preparation. This means that threats to the environment have more damaging impacts on women, children and other marginalised members of society. LenkaBula taps into an unlikely solution for the challenge that women face because of ecological degradation. Inspired by the works of Mercy Amba Oduyoye, she looks to

the church for solutions (LenkaBula 2008a, p. 2; Oduyoye 1995, pp. 77–80). In doing so, she performs *ubuntu* holism, considering different entities of society for solutions, even those that might have grown to be ‘unpopular’ such as the church. She turns to the church for solutions for feminists’ questioning or for addressing the various intersecting layers of oppression women face from different social ills, including gender-based violence, environmental degradation, abuses in the workplace, etc. LenkaBula sees the important role the church plays for African women spiritually, socially and even financially. It is a space that women use to gather and deal with individual and societal challenges (LenkaBula 2007, p. 1). Being a familiar space of comfort, mutual caring and support for many African women, it is not inconceivable to even consider the church for dealing with ecological challenges that overwhelmingly affect black women the most.

Communities often propose solutions to their problems around African solutions that are more sustainable, cheap and accessible. This is reminiscent of LenkaBula’s discourse which also centres around developing African indigenous knowledge. The interesting and important thing about African indigenous knowledge is that it often carries *ubuntu* holism in that it is versatile and sustainable. Beyond its sustainability and accessibility, it has the potential to restore African identity which has been desecrated by colonialism. When people start to see their cultural knowledge elevated to important sciences used to solve historical and contemporary challenges like poverty or environmental degradation, these knowledge systems that have constantly been disregarded can start to be a source of pride that can gradually restore African identity (Shange 2021, p. 19). When Africans start to see solutions like biogas based on their indigenous knowledge leveraged globally and led by Africans, it can instil a sense of pride while making remarkable strides in sustainability. When these solutions are merged with emerging technology, it could see Africans driving the agenda in the ecological space while creating an Africanised industrialisation rooted in mutual care and support as envisioned by Ramose.

African solutions like biogas created through organic waste like food waste, animal waste and cow dung in particular are sustainable. While creating clean energy solutions, Africans and other indigenous groups like Indians simultaneously address organic waste disposal, decreasing its likelihood of being disposed of in harmful ways. They also ensure that nothing goes to waste, not even food waste. When creating the biogas, women in the village will usually dig a pit and build a structure, wherein they throw all the waste. The idea is to allow the waste to rot, and the smell is captured to create gas. Pipes are sometimes attached to the external compost structure and lead to the house where people use it for cooking and heat (Nes & Nhethe 2007, p. 58). When done on a smaller scale, the waste is stored in a container, and a small amount is released through a

pipe that might be attached to a gas stove when cooking. The remains are also important for soil fertiliser (Raj, Jhariya & Toppo 2014, p. 201). Cow dung, the main ingredient in biogas production, is another example of how *ubuntu* holism is used by African communities to address multiple issues. Its sustainable versatility is in how it can be used in cultural religious practices, health care, architecture, agriculture, waste management and energy solutions. Cow dung is used by Zulus for various spiritual and cultural purposes, like cleansings. Culturally, after a funeral, people wash their hands with water mixed with herbs and cow dung before entering their home or anyone's home. The belief is that this concoction would cleanse people who went to the grave site of the sorrow and general negative energy they might have picked up. Beyond the spiritual functions, cow dung is also important for treating wounds and can be a mosquito repellent. It is also used for insulation, and it was used by hunters who would rub it on their bodies to keep warm while hunting. Cow dung has many other functions, including being important for traditional architecture, and it is usually smeared on the floors and walls of traditional Zulu and Xhosa houses or huts. This helps with insulation, trapping heat in the winter and keeping the cold out. Simultaneously, in summer, it helps with cooling and keeping the heat out.

■ Mirroring sustainable traditional solutions supported by modern technology

Africans can mirror the sustainable traditions of like-minded cultural groups who have, throughout history, coupled their solutions to emerging technology to create more ease and accessibility. One such cultural group is Koreans, who have merged their traditional heating and cooking solutions with newer technologies. Traditional Korean homes use what is called *ondol* for cooking and heating. The *ondol* was built under the house or beside it. The *ondol* was a structure almost resembling a fireplace, built with stone. There would be a structure where the fire for cooking and heating water would be built underground, and this fire area would connect to small ridges that would run under the house and were also created with stone. The patterns of the ridges differed depending on the size of the house, where certain rooms were positioned and other important functions (Lee 2019, p. 84). The smoke from the fire travels under the house and fills all the ridges, warming the house. The chimney is built low. This allows the smoke to escape quickly. Because the *ondol* structure was built with stone, it meant the house was heated very quickly and stayed warm long after the cooking was completed or the fire was put out. Furthermore, because the ridges allow the heat to travel, it meant multiple parts of the house stayed warm, unlike modern-day heating solutions like air conditioners and heaters

that often heat a single point or room. The building of the structure under the house is also important because heat rises, which means the whole house stays warm rather than just certain points. The design and functioning of the *ondol* also means less energy is used as one simultaneously heats the house while cooking. These functions are not segregated like we often find in most modern-day homes. The use of materials like stone is also important, and the fact that it is underground is also significant because the stone gets very hot and the heat lasts for long periods of time because it is underground and insulated. This means that having the fire consistently burning is not necessary. In summer, when extra heating was not needed, the connection between the fireplace(s) and the ridges under the house could be closed off or disconnected. This stopped the smoke that warms the house from travelling into the underground ridges.

Modern-day *ondols* have evolved, and instead of being linked to the cooking system, they are now linked to geysers, but the idea is still the same. While heating the water, the hot pipes running under the floor warm up the house. The heat from the pipes rises, even warming up the walls. Traditional Korean flooring, which is soft and padded, helps with heat retention, making the house stay warm long after the geyser is switched off. Most of the time, the geysers use gas, and when renewable, clean gas is used, the system causes little to no pollution and ecological harm. Moreover, because gas heats faster, in modern-day Korean houses, just a flick of a button leads to an instantly warm house and geyser. Minimal energy is used because of how quickly the geyser and home are heated up. Koreans have fundamentally kept the traditional *ondol* system and have just introduced modern-day technology to enhance their sustainable traditional practices. This is a practice that Africans could also mirror when developing ecological, energy or other traditional solutions. And because gas is cheap in most countries, including South Korea, families do not have to struggle financially in colder seasons because the heating and cooking systems that require a lot of energy are powered by gas. The electric grid is only used for lighting and appliances. These functions do not require a lot of energy in the way that cooking and heating do, especially in winter. The electricity grid does not become overburdened in winter, and citizens do not have to pay more to stay warm. This is just one illustration of what is possible if Africans follow similar examples in building their own solutions rooted in sustainable African traditions like biogas-making practices. This, just like the Korean *ondol*, simultaneously solves multiple problems. It also allows solutions to be built around the African context, which Africans are more knowledgeable about, rather than outsiders who build solutions for their own vastly different contexts. Because Africa's challenges are many, there is a need to build multipurpose solutions that come at a low cost and can be easily accessible to all, similar to what the *ondol* is for Koreans.

Collaboration and various kinds of technology could play a role in turning biogas production practiced by rural African women into a solution for energy sovereignty in the continent and beyond. Lessons can be learned from the Korean *ondol* modernisation.¹¹ Just like the traditional *ondol*, this requires the massification of this traditional biogas-making process. Collaboration with research and funding bodies and higher education institutions (HEIs) is of utmost importance. It is important, in part, for ensuring the communal ownership of such efforts and ensuring that rural women are still the main stakeholders and beneficiaries. This collaboration is also important for bringing in different staff and student expertise, social sciences, engineering, ecology, natural science, technology and various other divisions. These collaborations are crucial for determining the most socially and environmentally just ways of bringing this kind of development to life. The gradual massification of smaller-scale traditional African biogas production processes would also require some modernising and the speeding up of certain processes to ensure the demand is met. The modernisation and upscaling of such ideas also need more technological involvement to ensure safety because this is still a volatile and potentially dangerous process. Modern-day biogas plants are not very different from traditional ones, but the scale is much bigger. It is not uncommon for modern biogas digestors to be built into the ground, similar to how traditional ones are built. The Animal Manure Resource Utilization Project in Zhaodong, Heilongjiang, China, is one such example of the scale of modern-day biogas plants; it uses 300 tonnes of corn straw and cow manure a day. The plant uses industrial-scale anaerobic digestion, which feeds solid waste to produce biogas (JADE Energy Environmental Protection Technology 2023). Technology would also be important for the continuous environmental monitoring of this effort to ensure environmental protection and limit the pollution of water, air and other important resources. Similar pollution monitoring to that seen in the Unmask My City campaign would be important. The earlier failures discussed in relation to this campaign were social and were not linked to the technology itself, which is important for creating engaged citizens who can keep leaders and industry accountable.

■ Conclusion

The point of this discussion is not to advise that Africans reject 4IR technologies, as this change is already among us. It would be a mistake to leave ourselves outside of 4IR and to accept it without questioning its intentions or without tailoring it to our context. We need to stop only

11. For a discussion, please see Seo (2022).

relying on external actors and players to come up with solutions for the challenges our country and continent are facing. Between slavery, colonialism, neo-colonialism and apartheid, much of those problems we struggle with were capitalist driven and created by the same external forces we rely on for solutions. We need to create African-driven and African-centred solutions. This discussion instead encourages the adoption of various 4IR technologies, which happens in a way that strengthens the South African economy, people and state. It encourages us to caution ourselves against blindly embracing even well-intentioned 4IR strategies that can end up deepening the divide between the rich and poor in South Africa while also increasing the gap between the Global North and the Global South. The risk of unquestioningly adopting foreign 4IR innovations that are not built for the African context could see us welcoming more challenges rather than fixing the already existing ones. And, most importantly, this discussion shows the importance of centring African indigenous knowledge in everything we do, be it climate mitigation strategies or solutions to the many developmental challenges. Doing this, coupled with the adoption of emerging technologies that support African sciences, has the potential to make meaningful contributions to the fight against climate change and ecological degradation while empowering African knowledge systems and the often marginalised true custodians of these practices. The reality is that even the West is not ready for 4IR and the speed at which it is coming in. The West also experiences similar challenges to the ones mentioned above when it comes to dealing with unreliable self-service systems that are easily affected by power cuts. Energy shortages are a risk for everyone, thanks to the looming threat of ecological degradation. The world at large is not prepared for the massive cybercrime pandemic that is threatening individuals, states, businesses and many other social institutions. Much of the reaction to cybercrime is reactionary and not pre-emptive because no one really knows what to expect or how to fight it until it happens. So, many of the decisions that have to be made by South Africa and Africa at large also have to be made by the global community. Africa has the potential to lead this discussion by using emerging technology to popularise African centre solutions like the holism of *ubuntu* that I have suggested. The case study discussed, like the sustainable production of biogas, is a holistic kind of *ubuntu* that goes beyond people-centredness embedded in profit-driven solutions coming from the West. I have shown through pulling from LenkaBula's and Ramose's discussions how a simple solution envisioned by a community during an environmental justice gathering can potentially create solutions for a host of social issues. Some include unemployment, social cohesion, climate mitigation, access to services like electricity, food security and many others. In one solution, the community encouraged *ubuntu* among themselves in

the collectivist approach where they propose a sharing of knowledge with each other. Simultaneously, they thread an important kind of *ubuntu* between the social structures and challenges they face, seeing the interconnectedness of the challenges and the need for pluralistic solutions.

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Collaborative efforts between universities and industries in South Africa amid the Fourth Industrial Revolution

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■ Introduction

As the world enters the Fourth Industrial Revolution (4IR), various governments, including South Africa's, have noted the need to stay ahead of this trend and to lead in domestic technological development by creating conducive environments (ecosystems). Patent filings are a viable proxy for measurement in this regard, while coordination is widely regarded as a critical factor.

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This chapter quantitatively tracks trends in South African patent development against targets set by the government over the preceding eight-year period (2011–2019). This chapter utilises three World Economic Forum (WEF) Global Competitiveness Index scores over this period as scored by various role players, notably institutions of higher education, business and government funding against the country's overall trend in the innovation score. In WEF reports, these are scored as 'university–industry collaboration in research and development (R&D)', 'Patent Cooperation Treaty (PCT) patents, applications per million' and 'Capacity for innovation'.

Findings have indicated a lack of covariation among these variables. This helps identify gaps in collaboration in South Africa's patent development, the role players tasked with it and the general direction the country is taking. Interviews with role players (higher education, the scientific community, government officials and businesses) and literature reviewed have spoken to general dissatisfaction over the level of collaboration. The government sees the private sector as not playing as much of a role as possible. On the contrary, the private sector perceives the government's own investment in R&D as lacklustre (Majozi & Marwala, 2020; Marwala, 2020).

These indicators are understood by the role players in their pursuit of the commercialisation of more patents. However, a consistent measure is not kept or used for policy direction. Indeed, most patents filed internationally and domestically were by universities and government agencies, with few inputs by the private sector or jointly filed.

The first section provides an overview of the South African 'national system of innovation' (NSI), which is the government's framework for managing, incentivising and ultimately commercialising scientific and technological ingenuity for socio-economic development. It also reviews the literature on patenting in South Africa and the role of higher education institutions (HEIs) in this regard. The second section provides the methodological overview. The third section conducts the analysis, looking at key insights from the data and providing recommendations from the findings. Finally, the fourth section concludes the chapter with a brief overview of areas for future research.

■ Literature

According to a report by the African Development Bank, digital technologies have the potential to transform, increase productivity and enhance global trade within Africa's economies. Africa has had its fair share of improvements in the 4IR and information and communications technology (ICT) sector (African Development Bank 2020). The result would be because of many factors, such as mobile digital financial services. Artificial intelligence and

mobile digital financial services have proliferated across the continent, addressing socio-economic challenges, among others (Ndung'u & Signé 2020). Specifically, mobile technologies and services have produced more than 1 million jobs, amounting to 8.5% of Africa's gross domestic product (GDP) and US\$144 billion economic value. In addition, digitalisation has assisted in increasing accessible information that is efficient, effective and secure for economic growth and job creation. Furthermore, digitalisation has specifically played an innovative role in entrepreneurship and revealed the significant digital divide of businesses in developing economies. Furthermore, digital technologies are believed to reduce poverty and inequality (Ndung'u & Signé 2020).

Digitalisation has also contributed to the educational sector, advancing innovation and more broadly cultivating skills and capabilities necessary for African enterprises and automation. Despite all these innovations and additions in various sectors, Africa faces particular challenges with digital technologies. Currently, Africa cannot be regarded as ICT innovators but as adapters of existing models established by developed economies. As a result, the continent still struggles to benefit and capitalise on the full potential and opportunities of the 4IR, confining Africa's relations with international competitors (Ndung'u & Signé 2020). The Southern African Development Community (SADC) has also played several roles in promoting innovation to its member countries. The experts and policymakers in member states have organised workshops and training in science and innovation for its citizens. The importance of science, technology and innovation on any economic development in attaining sustainable development goals (SDGs) and AU Agenda 2063 led to the SADC secretariat, Department of Science and Innovation (DSI) South Africa and other technical experts to join United Nations Educational, Scientific and Cultural Organization (UNESCO). The collaboration created the SADC Regional Indicative Strategic Development Plan (RISDP) (2020-2030). The aim is to achieve a regional industrial economy based on a competitive and conducive environment, including infrastructure and skills. In addition, the plan aims to exploit natural resources sustainably by leveraging science, technology and innovation. To achieve the goals, SADC governments are expected to develop appropriate legal frameworks, policy instruments and governing bodies to effectively implement national science, technology and innovation policies in Africa.

Patent filing is an innovative activity contributing to Africa's economic development, facilitating new knowledge production and value creation (Graff & Pardey 2020). The emergence and growth of patent filings have increased at different rates and within other African regions, depending on the economic development of each country. The patent activity presented by African and foreign inventors is like the global economies when conditioned on economic size (Graff & Pardey 2020). Several technologies

patented in Africa have remained stable in different disciplines, such as pharmaceuticals, chemistry, biotechnology and engineering, among others. The majority of the patent filings in Africa are from Europe, the United States and other developed economies. Africa only has a small share of inventions globally, with foreign filings made worldwide (Graff & Pardey 2020).

In Africa, there are three representative patent offices in charge of the continent's economic development. The first one is in Pretoria, South Africa. The other two patent offices are the African Regional Intellectual Property (ARIPO) situated in Harare, Zimbabwe, and the Organisation Africaine de la Propriete Intellectuelle (OAPI) situated in Yaounde Cameroon (ARIPO 2016; OAPI 2015). The three offices shared the responsibilities of most patent filings in Africa. It is estimated that African countries with independent national patent offices have 37% of Africa's GDP of which Nigeria and Angola have the most conspicuous gaps in Africa's patent system. In addition, the two countries house 20% of Africa's population and one-third of the continent's GDP, yet the national offices for the patent in the two countries give slimy reports, making them ineffective (ARIPO 2016; OAPI 2015).

Based on *the South African Patents Act 57 of 1978*, the repository of all patents and patent applications filed in South Africa is the Companies and Intellectual Property Commission (CIPC). Although an individual inventor may privately file a provisional patent application, filing a non-provisional patent application can only be done through a patent attorney. In turn, three conditions need to be met by an invention for a patent to be filed (Smit & Van Wyk Attorneys 2020):

Under the Patent Law, the invention must be completely new. As such, the patent lawyers will conduct a novelty search in trade magazines, online, through databases, and newspapers around the world to establish whether any reporting was done on the invention before filing for patent rights. (n.p.)

These are novelty, usefulness and inventiveness. In South Africa, a non-patent is granted for 20 years after being filed.

■ The South African system of innovation

The context of the NSI has become a predominant framework among policy theorists and policymakers. Aside from industries being expected to be the main actors of innovation, each government has sole responsibility for establishing and developing nationwide networks critical for technological learning (Manzini 2012b). As a result, the state remains the research niche to present the nature and performance of innovation globally. Apart from product design innovation, manufacturing innovation and the establishment of new product development relying

on industry-level innovation, other supporting contexts of institutions, such as policies, knowledge production and technology, among many others, provide a foundation for innovation to take place (Manzini 2012b). Therefore, a national perspective on innovation provides an inclusive horizon for understanding the nature and evaluating the performance of a country's knowledge-based production machinery. For this reason, it could be assumed that promoting innovation in any country can only be driven by relevant stakeholders and policymakers who are capable of effecting change.

The government of South Africa's guiding framework for science- and technology-based development is couched within the NSI. This system, introduced in the 1996 *White Paper on Science and Technology*, is tasked with creating, acquiring, diffusing and putting into practice new knowledge that will help the state and the populace 'achieve their individual and collective goals'. In its original genesis – in a 1982 contribution by Christopher Freeman at an Organization for Economic Co-operation and Development (OECD) expert group on science, technology and competitiveness – the term emphasises the critical role to be played by a state's government in fostering a favourable technology infrastructure (Manzini 2012a, pp. 1–2). The term is related to a concept published in 1841 in Friedrich List's book *Das Nationale System der Politischen Ökonomie* ('The National System of Political Economy'), in which he criticised what is regarded as Adam Smith's advocacy of a laissez-faire approach. Instead, he made a case for a holistic view of national actors in the economy: knowledge-producing institutions, the productive sectors, technology and infrastructure.

South Africa's own NSI consists of universities, technical universities, science councils, private sector research laboratories and market intelligence divisions (Agricultural Research Council 2016, p. 23). In his 2003 work ('The dynamics of catching up: The relevance of an innovation system approach in Africa'), Mytelka (2003) characterises the NSI as:

[A]n evolutionary system in which enterprises in interaction with each other and supported by institutions and organisations such as industry associations, R&D, innovation and productivity centres, standard-setting bodies, universities and vocational training centres, information gathering and analysis services, and banking and other financing mechanisms play a key role in bringing new products, new processes and new forms of organisation into economic use. (p. 30)

Evaluating the NSI, Manzini (2012a, p. 6) determines that it has exhibited three particular strengths worth mentioning: (1) it explicated the causal association between scientific outputs and economic growth; (2) it has sharpened focus on the need for a coherent, integrated functioning by the country's various institutions; (3) it has placed innovation at the core of scientific and technological endeavours.

■ Higher education and patents in South Africa

Higher education has significantly shifted since the emergence of a new democratic era in 1994. The transition in South African history explains the perceptions and background of policy development and implementation complexities. According to the Department of Higher Education and Training (DHET) (2008), higher education produces and transmits knowledge fostering an epistemological transformation agenda. Currently, South Africa has more than 26 public universities with more than a million students (BusinessTech 2015). The universities are divided into different categories; nine universities of technology that focus on vocationally-oriented education, six comprehensive universities and various academic and vocational degree and diploma programmes. The remaining eleven are traditional universities that offer theoretical degrees that bring invention.

Given the significance of good higher education (HE) outcomes for the country, it is essential to analyse what innovations can be introduced to improve them. This is a complex topic, but the salient points of a patent perspective can be outlined here. As a result, HE faces accepting the status quo, which is inevitable for the foreseeable future. Unless South Africa can devise and implement an education and research policy that better responds to South African development needs, its universities run the risk of seeing their research capacities being weakened.

The invention process in South Africa is deeply tied to its history, which cannot be comprehensively covered in this brief chapter. Additionally, the lack of a domestic market for technology (because of widespread poverty from the exclusionary economy of the Apartheid era [Freund 2019; Hirsch 2005]), combined with international isolation, depressed the country's viability for commercialisation and scale in technological industries. Furthermore, there was a recognition by the post-apartheid government (1994 to present) that the patenting process was dominated mainly by white, older men (Hirsch 2005). Therefore, the government needed to foster more innovation by other sectors in society while also expanding its R&D expenditure (which had declined as a proportion of GDP from over 1% in 1991 to only 0.76% in 2001 [Hirsch 2005, p. 149]). Thus, in 2002, through its then Department of Science and Technology (DST), the South African government issued the National R&D Strategy, which captured its focus areas for the country's competitiveness and growth. The document emphasised the need for increased patents by publicly funded research institutions: HE and research councils (Sibanda 2007, p. 1).

Universities are only one cog in the R&D plan; the other is industry. The term which refers to the commercialisation (i.e. development) of inventions made in the university is technology transfer (or 'public research and

private development’ as defined by Eisenberg [1996]). The foregoing analyses provide the rationale of the research question for this chapter: determining the extent to which all hands are ‘on deck’. In this sense, each of the partners can take advantage of each other’s comparative advantages: universities’ research capacities on the one hand and the private sector’s capacity for marketplace knowledge and scale on the other. Most South African universities have invested in technological transfer offices since the late 1990s (Bezuidenhout 2018; Wolson 2007). The task of these is to carry inventions by staff members to commercialisation. But, this process can be challenged by the lack of internal communication within universities. Waruru (2019, p. 1; see also Van Dusen 2013) observed that ‘even in universities that have IP [intellectual property] structures in place, faculty members were often unaware of existence of IP policies due to lack of dissemination of such information’.

A year after the publication of the *National Research and Development Strategy*, Wangwe (2003) emphasised the integrative aspect and role of the NSI, noting that ‘a set of interrelated institutions the core being those which generate, diffuse and adapt new technological knowledge’ and that these institutions may be firms, R&D institutes, universities and government agencies. More recently, the country’s Presidential Commission on the Fourth Industrial Revolution (PC4IR) has highlighted the role of partnerships, underlined by a social contract between private business and the government (Republic of South Africa [RSA] 2020, p. 140). Therefore, this research is fundamental and germane to the moment as the country seeks to position itself as a crucial player in the 4IR.

■ Methods

This chapter quantitatively tracks South African patent development trends against targets set by the government over the preceding eight-year period (2009–2019). The chapter utilises three WEF GCI scores over this period as scored by various role players, notably HEIs, business and government funding against the country’s overall trend in the innovation score. In WEF reports, these are scored as ‘university–Industry Collaboration in R&D’ (given as an averaged score from appraisals given by stakeholders between 1 and 7 by stakeholders to WEF analysts), ‘PCT patents’ (measured as applications per 1 million) and ‘Capacity for Innovation’ (similarly given as an averaged score from appraisals given by stakeholders between 1 and 7 by stakeholders to WEF analysts). These metrics are germane to the analysis given the South African government’s adoption of the WEF’s index in its terms of reference for the 4IR Commission. Moreover, in April 2019, the South African government established a joint 4IR Centre with the Davos-based institution (Mandaha 2019). The chapter also consists of an

analysis of informant interviews with some role players in business, government and HE, as well as a documentary analysis.

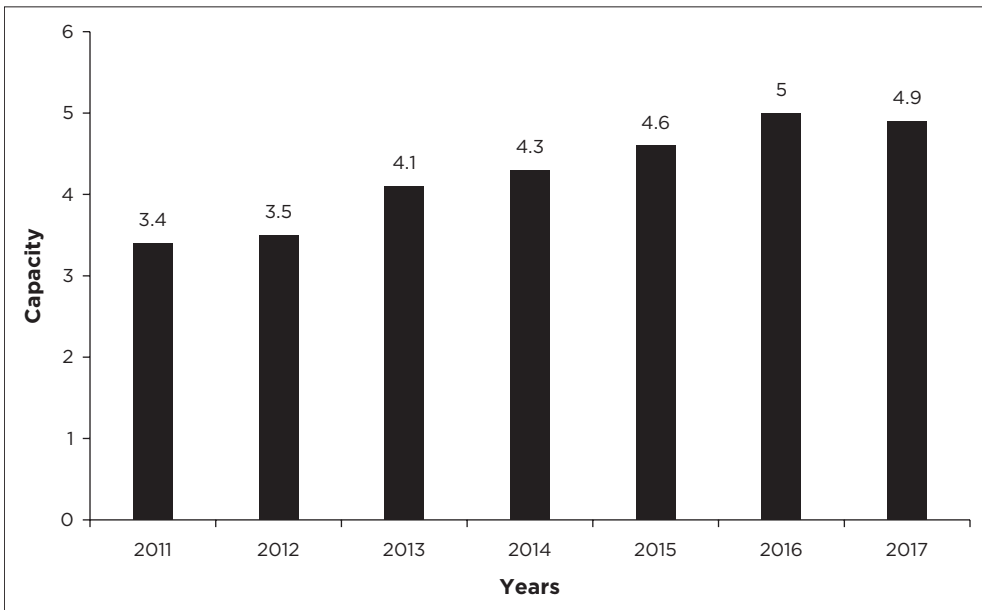
Two findings stand to be made through these particular variables. Firstly, we can determine the direction of patents and capacity for innovation as the country prepares for the 4IR. Secondly, we can determine the relationship between these first two variables on the one hand and university-business collaboration on the other. That is, we should ideally see upward movement in patents and capacity for innovation correlate with upward movement in new patents and capacity for innovation.

■ Analysis of findings

In terms of averaged capacity for innovation, we note that the country has been steadily growing over the period between 2011 and 2017 (see Figure 10.1).

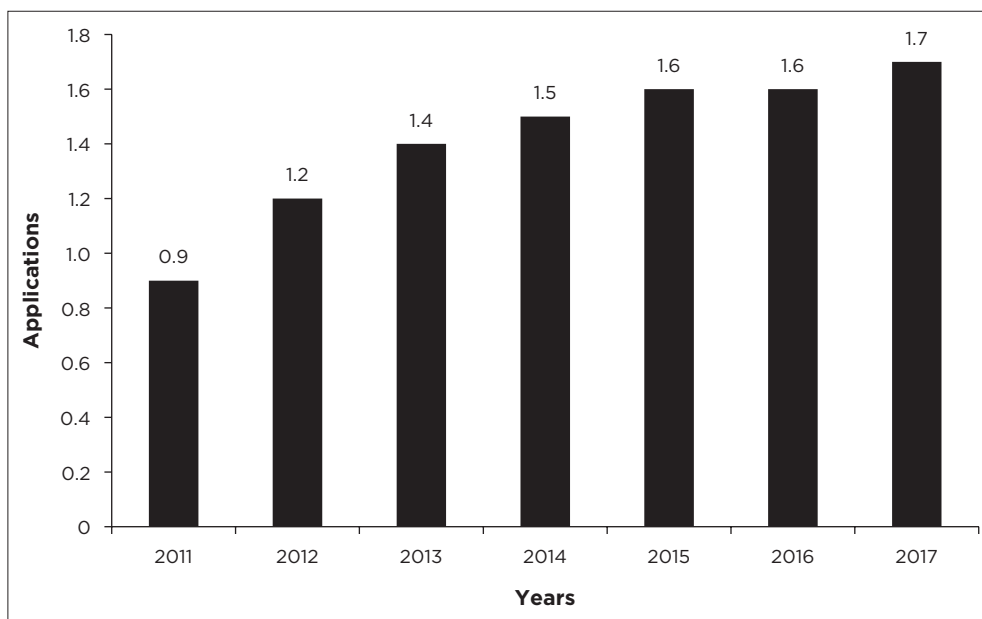
Data on patents over the 2011–2017 period demonstrates a clear upward trajectory (see Figure 10.2).

Figure 10.2 demonstrates the growth from 900 thousand new patent applications in 2011 to 1.7 million new patents in 2017. The only year that did not see growth in patents was 2015.



Source: WEF (2018).

FIGURE 10.1: Capacity for innovation.



Source: WEF (2018).

FIGURE 10.2: New patent applications in South Africa, 2011–2017.

Table 10.1 demonstrates, however, that the majority of the country's patents have been increasingly filed by non-residents and abroad, with the 'Resident' category being both the least populated and the one with a consistent decline over the 2011–2018 period. On the contrary, the metric for University–Industry Collaboration in R&D has shown a downward trend over these.

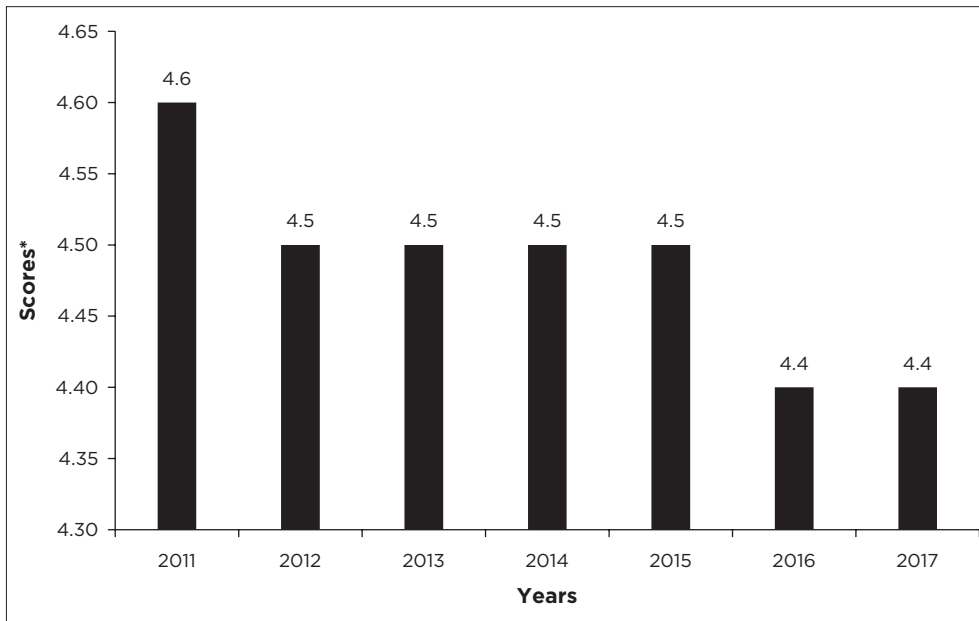
On all three indicators, the country has improved on two out of three indicators over this period in terms of global rankings (which is the ultimate focus of the reports). In 2011, South Africa was in 47th place for innovation, 43rd place for Patents and 24th place for University–Industry collaboration. By 2018, the country was in 30th and 29th place for Capacity for Innovation and University–Industry collaboration, respectively. However, the country has slid to 49th place for patents.

In terms of the correlation between university–industry collaboration and new patents, we note that the value of the Pearson r score is -0.314 , which indicates that there is no direct association between university–industry collaboration and new patent applications in South Africa – a positive relationship would have yielded a score of 1, while a score of -1 would have indicated an inverse relationship. Indeed, the key insight from the interviews conducted is that the HE sector is generally characterised by levels of mutual perceptions and poor collaboration, with the government

TABLE 10.1: South African patent applications.

Year	Resident	Non-resident	Abroad
2011	656	6,589	1,108
2012	608	6,836	1,080
2013	638	6,657	1,573
2014	802	6,750	1,515
2015	889	6,608	1,188
2016	704	6,506	1,314
2017	728	6,816	1,461
2018	657	6,258	1,204

Source: World Intellectual Property Organization (WIPO) (2019).

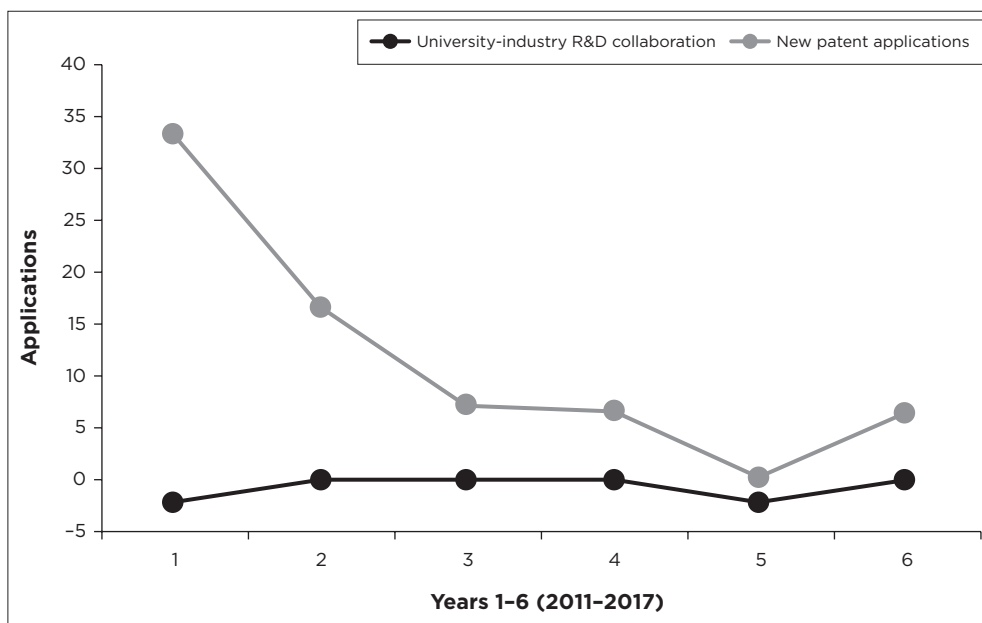


Source: WEF (2018).

Key: *, Scores in WEF GCI for Industry research and development in South Africa.

FIGURE 10.3: University-industry research and development collaboration in South Africa.

regarding the private sector as uninterested in investing in HE and in the economy generally, while the private sector regards itself as fiscally constrained. For its part, the government’s expenditure on R&D has never returned to over 1% despite continuous commitments to do so and despite the potential of doing so and reducing poverty at the same time (Freund 2019; Majozi & Marwala 2020). On the main, this trend is congruent with global trends (with generally low levels of collaboration with few exceptions such as the United States of America (USA) and China [Zingg & Fischer 2019, p. 7]) and is the most vibrant in Africa (followed by Kenya [Waruru 2019]). However, the changes ushered in by the 4IR will require all role



Source: Authors' own work using data from the WEF (2011-2018).

FIGURE 10.4: Correlation between university-industry collaboration and new patent applications: Scores in the WEF Index from 2011 to 2017.

players to exhibit greater collaboration for the country to remain viable in the 4IR and to regain competitiveness. Table 10.2 showcases the top six patent holders over the 2017-2019 timeline. The grouping demonstrates the overrepresentation of universities (University of Cape Town, Stellenbosch University, University of Pretoria and the University of the Witwatersrand) compared to government research agencies (Council for Scientific and Industrial Research [CSIR]) and the private sector (NCM Innovations). The NSI could play a greater catalytic role in ensuring university-industry collaboration in R&D.

Section 25 of the *Patent Act of 1978* defines what may not be patented in South Africa:

- computer programmes
- artistic works
- mathematical methods and other purely mental processes
- games
- plans, schemes, display of information
- business methods
- biological inventions
- methods for treatment of humans and animals.

TABLE 10.2: Top South African patent applicants, 2017–2019.

Applicant	2017	2018	2019
University of Cape Town	10	11	18
Stellenbosch University	10	2	17
CSIR	7	8	9
University of Pretoria	8	4	5
NCM Innovations (Pty) Ltd	8	13	4
University of the Witwatersrand	10	4	4

Source: WIPO (2019).

Key: CSIR, Council for Scientific and Industrial Research.

This list can be regarded as being too broad as it has the potential to discourage ingenuity in computer programming and mathematical modelling (one of the key requirements for artificial intelligence, the bedrock technology of the 4IR) and biological inventions (which also has relevance to the 4IR through biomedical engineering). Instead, however, these need to be part of other devices or systems to be patentable. For example, computer programming ‘is patentable as part of a technical solution, i.e. when it is used to operate a specific device or machine such as a winder, a crane or parking management’ (Smit & Van Wyk Attorneys 2020). A long-standing complaint has been made against the limited and incomplete electronic data offered by the CIPC Registration Office and its poor record-keeping, which renders the system informationally scarce (Gregory 2008):

A potential applicant is faced with the dilemma of whether or not to file an application, incurring the associated expenses, or to adopt a wait and see attitude in the hope that there are no existing patents covering the same inventive features. A patentee is often forced to abandon his/her R&D under the threat of patent infringement that cannot be defended without incurring significant search expense. (p. 13)

Another challenge has been the absence of opposition periods. These are windows in which individuals who hold potentially similar patents can oppose the new filing under guidance from panels composed of experts. The procedure reportedly contradicts the fostering of innovation as it makes the process of filing a patent unclear and ambiguous, with potential legal costs down the road. While a patent directory¹² was established, there is still general dissatisfaction with it. One possible solution that has been suggested has been that of outsourcing of examinations; the commitment of the Department of Trade, Industry, and Competition (dtic) in South Africa to this has not been forthcoming (Gregory 2008, p. 13).

12. See <http://patentsearch.cipc.co.za>.

It is therefore critical that the ease of doing business is improved, including such tasks as registering a patent, reducing the cost of 4IR businesses (customs and taxes) and enabling ease of global competitiveness and expansion. The state, as the largest and most potent purchaser in the country, has a significant role to play in the adoption of 4IR technologies across priority sectors; in line with this, the state also needs to ensure that appropriate regulation (and taxation) of foreign platforms and other businesses operating in South Africa is achieved (RSA 2020, p. 181).

In a survey conducted among five experts (with 130 years of experience between them) on barriers to commercialisation by South African universities, Frederick Bezuidenhout's research (2018, p. 1) showcased that the four key barriers identified by most of the interviewees to him were university–industry disconnect stemming from irrelevant research, lack of entrepreneurial spirit among academics,; red tape at universities and a lack of venture capital funding. Furthermore, a 2007 study found that universities are less inclined towards commercialisation (indeed some do not have commercialisation policies) because of low income from commercialisation, and there is a substantial time lag before the income can be realised. The stakeholders could do more to meet each other half-way: universities, by rationalising administration and being more commercially minded and entrepreneurial, and the government by leveraging its procurement abilities, and businesses could be more forthcoming and willing to invest in university ingenuity, which would also aid the internationalisation of such inventions (Bezuidenhout 2018, p. 109; Wolson 2007).

Additionally, some scholars have argued that current metrics of innovation in the country should be challenged. Manzini (2015, p. 1), for example, argues that the focus on patents excessively focuses on inputs instead of outputs, in addition to lacking regional and sectoral dimensions of collaboration and being susceptible to interpretations by respondents during periods of review (Manzini 2015). The method suggested is instead to measure the licensing of patents for industrial applications. This would isolate patents with industrial – and therefore economic – utility (Manzini 2015, p. 5). Such a database indeed stands to focus the analysis, as well as quantify the role of universities in industrial development. Its creation and dissemination remain to be seen at the time of writing this chapter.

■ Conclusion

This chapter has documented the trends in South Africa's patents, innovation and university–industry collaboration in R&D and explored the relationship between the two variables. This was accompanied by interviews with several role players in government, HE and the private sector. The findings show that the relationship is quite thin at the macro level and has

shown an increasingly divergent trend over the 2011–2018 period, with patents increasing but collaboration across sectors not keeping pace. Stakeholders interviewed and literature reviewed also expressed dissatisfaction with the low levels of collaboration, while also bemoaning the nature of the metrics used to measure innovation in the country. Encouragingly, the recently published PC4IR report makes the call for coherence and coordination in the country's innovation efforts.

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Index

A

alumni, 118–119
artificial intelligence, 4, 10–11, 19–22, 24, 26, 28, 30–32, 35–36, 38, 40, 42, 44, 46, 48, 50, 52, 56, 158, 168

B

big data, 4, 67, 69–71, 75, 81, 83, 85–87

C

career paths, 48, 109, 111, 115–116, 118, 120
clientelism, 75–77, 79–80, 83, 86
cybersecurity, 19–22, 24–26, 28, 30, 32

D

digital campaigns, 70–71, 74
digital divide, 10, 125, 136, 159
digital student protest, 21, 24–25, 32
digitization, 133

E

elections, 70, 72–73, 75, 77–80, 82–86, 88, 90–91, 93–95, 101, 103, 105
environmental justice, 141–142, 144–146, 154
extraditing, 123–124, 126, 128, 130, 132, 134, 136, 138–139

F

Fourth Industrial Revolution (4IR), 3–8, 10–19, 35, 55–69, 87, 109–112, 114, 116, 118, 120, 122–123, 138, 141–146, 148, 150, 152–154, 157–159, 163–164, 166–169
framing theory, 36, 39
future world of work, 112

G

gender-responsive budgeting, 3–4, 6, 8, 10–12, 14–16, 18
Google, 20, 28–30, 48, 63, 89–90, 94–103, 105–106
graduate employability, 109, 111–113

H

higher education, 16, 24, 26–27, 109–111, 113–114, 153, 158, 162
holism of *ubuntu*, 141–142, 144, 146–148, 150, 152, 154

I

indigenous knowledge, 64, 123–124, 129, 132–134, 138, 142, 150, 154
indigenous, 55–56, 58–69, 123–138, 142, 150, 154
information and communication technologies (ICT), 5–6, 10, 12, 25, 57–58, 62, 64, 67–68, 104–105, 133, 139, 158–159
intellectual property, 136, 160, 163, 166
Internet, 4, 6, 10–12, 21, 23, 25–26, 56–60, 65, 69, 71–73, 75, 84–86, 88, 93–94, 102, 104–105, 114

K

Kenyatta, 77, 79

L

linguistic inequality, 56, 58–60, 62–68

M

microtargeting, 70
modernity, 134
Museveni, 83–85

N

neopatrimonialism, 69–72, 74–78, 80, 82, 84–86
non-governmental organisations, 121, 142, 146

P

policy, 3–5, 8–9, 11, 13–14, 16–18, 23–26, 29, 64, 67, 72, 81, 90–91, 93, 104, 118, 158–160, 162
political campaigning, 70, 79
postgraduate students, 109, 112, 115, 121

Q

quality assurance, 19–20, 22, 26–29, 32

R

renewable energy, 13, 142, 145

S

Sall, 81-82

science, technology, engineering and
mathematics (STEM), 4-5, 7, 10, 12,
16-18, 36, 39, 42, 52, 112

sociology, 41, 109-113, 115-122, 141

South Africa, 3-20, 22-30, 32, 35-37, 39,
52, 55-60, 62-69, 87-88, 90, 92-106,
109-114, 117, 121, 123, 128, 136, 141-143,
146, 149, 154-155, 157-163, 165-169

South African indigenous languages, 55-56,
58-62, 64, 66-69

This book's leading treatise is that the Fourth Industrial Revolution (4IR) is not only a commercial development but also one with implications and impact on what the humanities and social sciences study and how they go about studying it. It argues that the 4IR is not a wholly negative phenomenon, as it represents the amalgamation of transformative tools reshaping society, facilitating its examination through humanities and social sciences methodologies.

In contrast to previous studies focusing solely on specific inquiries, this scholarly book offers a comprehensive exploration of the broader implications of the 4IR on entire academic disciplines. The rigorously collected empirical research sheds light on how the 4IR impacts anthropology, cultural studies, development studies, gender studies, media studies, political science, international relations, sociology, and social work. The chapters delve deep into the multifaceted effects of the 4IR on society, from uncovering the gender disparities perpetuated by the 4IR to examining the role of algorithms in cultural artefacts, from analysing the erosion of trust in digital news sources to exploring the evolving landscape of democratic politics. The authors underscore the urgent need for collaboration among academia, industry, and government to address global inequalities.

Furthermore, the book concludes by reflecting on the necessity for increased collaboration and partnership among universities, businesses and government entities in South Africa to reverse inequalities within and between countries globally.

The 4IR and the Humanities in South Africa: Perspectives on innovation, power and potentialities not only contributes methodologically to the understanding of big data and media trust in the 4IR era but also advances the scholarship of teaching and learning across various humanities and social science disciplines.



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