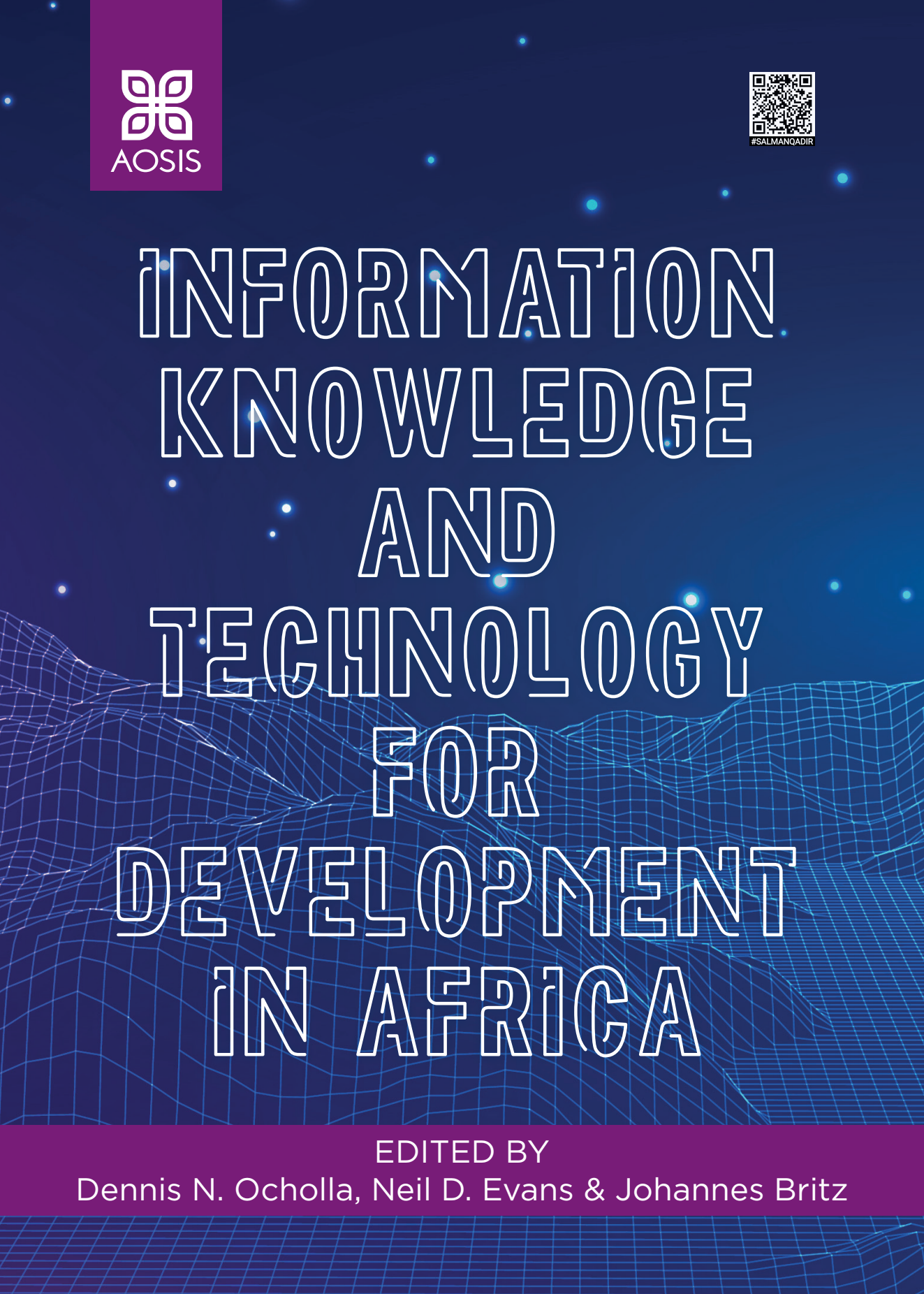
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INFORMATION KNOWLEDGE AND TECHNOLOGY FOR DEVELOPMENT IN AFRICA
EDITED BY
Dennis N. Ocholla, Neil D. Evans & Johannes Britz

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Editors
Dennis N. Ocholla
Neil D. Evans
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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 manuscript was subjected to rigorous two-step peer review prior to publication, with the identities of the reviewers not revealed to the authors. The reviewers were independent of the publisher and/or authors in question. The reviewers commented positively on the scholarly merits of the manuscript and recommended that the manuscript be published. Where the reviewers recommended revision and/or improvements to the manuscript, the authors responded adequately to such recommendations.

Research Justification

This scholarly book focuses on the relationship between information knowledge and technology with regard to the Fourth Industrial Revolution. The latter is understood to be a set of highly disruptive technologies blurring the lines between the physical, digital and biological spheres, collectively referred to as cyber–physical systems. Technologies such as cognitive computing, cloud computing, the Internet of Things, big data, augmented or virtual reality, 3D systems, artificial intelligence and power supply are transforming social, economic and political systems. Ultimately, we need to transform, be more creative and innovative to develop and sustain existing and emerging capabilities in the 'new normal', which has been accidentally accelerated by COVID-19 requirements. Technologies for digital transformation create the opportunity for Africa to bypass traditional phases of industrial development as the continent has done successfully in the past. Challenges addressed in the book are inequality, social justice, ethics, access and success, policy, infrastructure and cybersecurity.

The book contributes to the ongoing discourse among scholars in Africa. It consists of 10 chapters where conceptual and field research are combined. The first chapter, by Trywell Kalusopa from the University of Namibia, focuses on e-government, with an emphasis on digital government in the digital economy. The second chapter, by Kelvin J. Bwalya from the University of Johannesburg, focuses on e-government from an artificial intelligence perspective. The third chapter, by Tom Kwanya from the Technical University of Kenya, focuses on the perception of robots for information services. In the fourth chapter, Johannes Britz, from the University of Wisconsin, discusses information ethics in the digital economy. This is followed by the fifth chapter on information access and personal data by Mpho Ngoepe from the University of South Africa. The sixth chapter, by Neil D. Evans from the University of Zululand, is dedicated to e-teaching and e-learning from a Library and Information Education (LISE) perspective. In the seventh chapter, Dennis Ocholla, also from the University of Zululand, focuses on LISE in the Fourth Industrial Revolution. The eighth chapter presents Ocholla's questions on the dimensions and direction of information and knowledge management education. The ninth chapter by Omwoyo B. Onyancha, University of South Africa, Tom Kwanya, Technical University of Kenya and Jackson Too, Commission of Higher Education (Kenya), is dedicated to the development of scholarly journals. The tenth chapter by Mzwandile M. Shongwe, University of Cape Town, focuses on scholarly journals in knowledge management.

Most chapters in the book have applied a post-positivism and interpretive paradigm and epistemology by qualitative research and conceptual methods. The methodological approaches are sound and rigorous, as also noted by the reviewers.

The book is written by eminent professors (see Notes on Contributors) in Africa who have contributed substantially to research in at least one of the following areas: library and information science, records management, computer science, information systems, information and knowledge management, data science, e-learning and digital scholarship. The editors and publisher of the book have ensured the credibility and originality of each chapter through a peer review process as well as by using iThenticate similarity check. No part of this book was plagiarised from another publication or published elsewhere.

Dennis N. Ocholla, Department of Information Studies, Faculty of Arts, University of Zululand, Empangeni, South Africa.

Contents

Abbreviations, Boxes, Figures and Tables Appearing in the Text and Notes

List of Abbreviations

AI	Artificial Intelligence
ALISE	Association for Library and Information Science Educators
BI	Business Intelligence
CABI	Centre for Agriculture and Bioscience International
CARE	Consortium for Academic and Research
CoP	Communities of Practice
CPD	Continuing Professional Development
CUE	Commission for University Education
DGRA	Digital Government Readiness Assessment
DHET	Department of Higher Education and Training
EA	Enterprise Architecture
ECKM	European Conference on Knowledge Management
EFA	Exploratory Factor Analysis
EGDI	E-Government Development Index
ERA	Excellence in Research for Australia
FOI	Freedom of Information
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GNI	Gross National Income
HE	Higher Education
HEC	Higher Education Council
HEI	Higher Education Institution
HEMIS	Higher Education Management Information System
IAPP	Information Access and Protection of Privacy
ICT	Information and Communication Technologies
IFR	International Federation of Robotics
IKM	Information and Knowledge Management
IoT	Internet of Things
ISR	Information Searching and Retrieval
ISSN	International Standard Serial Number
IT	Information Technology
ITU	International Telecommunication Union

JCR	Journal Citation Reports
JIF	Journal Impact Factor
KM	Knowledge Management
LIASA	Library and Information Association of South Africa
LIS	Library and Information Science
LISE	Library and Information Science Education
LMS	Learning Management Systems
MOOCs	Massive Open Online Courses
NARSSA	National Archives and Records Services of South Africa Act
NBT	National Benchmark tests
NGO	Non-government Organisation
NRF	National Research Foundation
OJS	Open Journal Systems
PAIA	Promotions of Access to Information Act
PAPA	Privacy, Access, Property and Accuracy
PCK	Pedagogical Content Knowledge
PIPEDA	Personal Information Protection and Electronic Documents Act
PoP	Publish or Perish
POPI	Protection of Personal Information
RDMF	Readiness Diagnostic Model Framework
RE	Research Excellence
RPA	Robotic Process Automation
SA	Systems Architecture
SABINET	Southern African Bibliographic Network
SADC	Southern African Development Countries
SAHA	South African History Archives
SAHRC	South African Human Rights Commission
SAJIM	*South African Journal of Information Management*
SAJLIS	*South African Journal of Libraries and Information Science*
SALI	South African Library and Information
SARB	South African Reserve Bank
SARS	South African Revenue
SCESCSAL	Standing Conference of Eastern, Central and Southern African Library and Information Association
SciELO	Scientific Electronic Library Online
SDG	Sustainable Development Goals
SECI	Socialisation, Externalisation, Combination and Internalisation
SJR	SCImago Journal Rank

SL	Self-learning
SME	Small and Medium Enterprises
T&D	Theses and Dissertations
TK	Technology Knowledge
TPACK	Technology Pedagogical and Content Knowledge
TRC	Truth and Reconciliation Commission
UBT	University Benchmark Tests
UCTD	Union of Completed Thesis and Dissertation
UGC	University Grants Commission
UN	United Nations
UNDHR	Universal Declaration of Human Rights
UNISA	University of South Africa
URL	Uniform Resource Locator
WEF	World Economic Forum
WoS	Web of Science

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Preface

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The context of this book is pretty much shaped by the 'plague year' of 2020 since the final editing was done as the world was gripped by the COVID-19 pandemic and when the core sectors of the society such as universities, governments and businesses struggled to sustain operations. That they were, to a certain extent, able to do so was largely because of the transformations brought about by our digital age, which laid the platform for and enabled remote work. Within the context of this book, it must be noted that this came as no surprise. However, the capacity to engage in remote work and to maximise the benefits associated with digitisation were constrained by factors that preceded COVID-19: Inequality in access to and use of ICT, varying levels of economic development around the world and across Africa and the social challenges of balancing private life commitments with work responsibilities in an environment that blurs their boundaries.

It is these digital transformations associated with moral and other societal challenges that are the focus of this book. As authors we address not only the current but also the future issues in information sciences that appeal to research, teaching, learning and practice in the domain. In the 10 chapters that follow, my co-authors and I delve into *information knowledge and technology for development* (IKT4D) in Africa from several perspectives, including digital technology, artificial intelligence (AI), robotics, information ethics, the Fourth Industrial Revolution (4IR), higher education, knowledge management, research data management and scholarly publications.

Human development is interdependent on access to and use of quality information and knowledge. In this book, we argue that the demands of sustainable development goals and 4IR are quite compelling, putting IKT4D at the forefront of the progress of humankind. We are confronted with new and highly disruptive technologies that are blurring the lines between the physical, digital and biological spheres, all of which are collectively referred to as cyber–physical systems. Technologies, such as cognitive computing, cloud computing, Internet of Things, big data, augmented or virtual reality, 3D systems, AI and power supply are transforming social, economic and political systems and putting a huge pressure on world leaders and policymakers to

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respond and, most importantly, confront us with new and challenging ethical and legal questions. Addressing some of these challenges is making the theme of this book a reality in Africa.

Our intention has been to find a vantage point of critical distance to better situate and understand the fast pace of IKT4D in Africa and to predict and prepare for even greater disruptions in the near future. Towards that end, the chapters in this book offer not only theoretical and historical reflections but, more importantly, practical considerations that can guide governmental and educational actions in response to the different challenges associated with digital transformation on the African continent.

The first chapter questions the preparedness of the African government to deliver a digital government for development, asking whether African States are ready for the emerging digital economy. The second chapter argues that AI can boost e-government in 4IR. It provides a pragmatic blueprint for designing e-government services.

Chapter 3 addresses the human–robotic interface in Kenya, providing new findings on perceptions of the role of robotics in infosphere workspaces.

The fourth and fifth chapters approach 4IR from an ethical perspective. Chapter 4 surveys the intellectual history of information ethics, with insights into relevant issues of the digital age. Chapter 5 provides strategies to balance and reconcile the conflicting aims of providing access to data while protecting personal data, focusing on South Africa. Together, these chapters raise concerns about how new technological developments will disrupt ethics in general and ICT ethics in particular.

The sixth and seventh chapters focus on how 4IR will influence higher education and the field of library and information science (LIS). Chapter 6 explores the use of business intelligence tools to improve education. Chapter 7 proposes a theoretical framework for LIS education and research that can guide the field's response to the Fourth Industrial Revolution.

The eighth chapter argues that knowledge management (KM) education and research is at a crossroads and that KM curricula must make further use of knowledge generated in related disciplines. Ways to better systemise KM competencies are put forward.

Chapters 9 and 10 focus on the role of the scholarly journal in research support, with Chapter 9 addressing metrics that can be used to increase research excellence and Chapter 10 reviewing the ebb and flow of KM scholarship over 21 years.

We hope that the book *Information knowledge and technology for development in Africa* makes a significant contribution to our understanding of the challenges and opportunities of the Fourth Industrial Revolution as it relates to information-related research, education and practice. As is always the case, we pursue these studies not to perfect ICT, but rather in the spirit of Amartya Sen, who reminds us that 'the purpose of development is to enrich human lives'.

Chapter 1

Perspectives on digital government in Africa: Where do we go from here?

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Abstract

This chapter explores the extent to which a digital government can enable structural transformation and sustainable development in the emerging digital economy in Africa. Using the political economy analysis, this chapter describes how digital government can spur structural transformation and sustainable development in the context of the emerging digital economy. The chapter reveals that gaps and challenges still persist in the implementation of digital government initiatives and programmes for structural transformation and sustainable development in Africa. This is manifested through the lack of clarity of a development paradigm, leadership and governance weakness in the digital economy, glaring human resource and technical incapability, digital

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inclusivity gaps, labour market work pattern dislocations, incoherent national institutional policy frameworks and weak national statistics capabilities. The findings of this chapter provide a paradigm shift that should aid in the understanding that the success of digital government implementation in Africa should be seen in a political economy context whereby it is embedded in existing power relations where an active and ethical state is critical in realising structural transformation and sustainable development in the emerging digital economy.

Introduction

The current emerging digital revolution and the convergence of innovative technologies present great opportunities for Africa. Most African countries agree, in terms of policy orientation, that advancing digital government initiatives is a matter of necessity. However, as this book will demonstrate, constraints still persist. The authors argue that digital transformation does not only depend on technologies but also requires an all-inclusive policy approach that should be embedded in a developmental approach. It would seem that the national leadership, public and private sectors, in many African countries are ill-prepared for this digital transformation. Africa can respond by developing an alternative development paradigm that espouses the role of the state, with clarity on the policies, services and regulations; principles such as effectiveness, inclusiveness, accountability, trustworthiness and openness should direct the deployment of technologies. Such an overall developmental context should be anchored on a more defined state that plays a more active role and where political decisions anchor on real structural reforms in the national economies with well-coordinated public and private sector interventions. The digital government transformation should be anchored in the whole development agenda that is holistic rather than a non-scalable approach where technologically only an enabler of the active small dominant private capitalist sector drives foreign private capital interests. The UNDP expressed this view over two decades ago, which is still alive to this day when they pointed out that 'development must be by the people, not only for them' (UNDP 1995). This is because macroeconomic policies must ensure that economic growth is inclusive and does not result in increasing inequality. It is when countries make their growth inclusive that real human development can be sustained. Kanyenze, Kondo and Martens (2006) also acknowledged this some years ago when they underscored the fact that:

> [*O*]f critical importance is the political conscientisation and mobilisation of the people at the grassroots level so that within the proposed holistic approach they can create alternatives to the present neo-liberal development strategy at the local, national, regional and global levels. (p. 11)

They (Kanyenze et al., cited in Kalusopa 2009) further observed:

> [*T*]hat as the primary force for [*social*] change and development is that the people ought to be [*mobilised*] and [*organised*] to spearhead the required [*structural*] transformation through active developmental state. In this regard, through sustained advocacy and participation in national affairs, the state needs to be transformed and reconstructed from one serving the interests of global capital to one whose motive is advancing the interests of the people in strategic, ethical and accountable manner. (p. 3)

The digital transformation agenda must therefore be seen in this context.

The above proposition entails that while digital government initiatives are in earnest whereby public services are being brought online, the future will be about how the power of digital government can leverage societal innovation and resilience and transform governance to better achieve structural transformation and sustainable development. The future of Africa requires that the implementation of a digital government agenda requires deeper reflection on how the historical and structural rigidities of the integration of capital, labour, technology and trade in the global political economy have played out and how perceived benefits can stem inequalities, unemployment and poverty in Africa. In this book, we agree that advancing better education, reskilling and changing national cultures are necessary, but these are not sufficient if countries do not reconfigure their developmental agenda where digital transformation is embraced as part of a radical, indigenous and endogenous socio-economic transformational agenda. The African digital transformation response must be integrative, scalable and comprehensive, involving all stakeholders who pursue social transformation and sustainable development.

The authors also note that although digital developments can bring progress and improve the well-being of African populations, it is important that regulatory frameworks are put in place. The global standard for the governance of digital platform businesses, for instance, can guarantee a human-centred approach to technology. This is in itself the basis for progress in socio-economic and human development as espoused in Sustainable Development Goals (SDGs). At the same time, it is necessary to implement technological transitions with policies aimed at expanding universal access and promoting the acquisition of lifelong digital skills and competencies for all the citizens in the digital age.

Going forward, governments at the regional and national levels in Africa should work towards closing gaps in scientific cooperation and innovation – by encouraging knowledge sharing with developing countries and promoting cross-border R&D programmes, and by setting joint standards and safeguards on collaboration, data sharing and financing. Additionally, the implementation

of science and technology solutions needs to be governed by policy guidelines on data security, accountability and transparency, to minimise potential risks and misuse of STI solutions. To make economies more equitable and sustainable, building a sufficient infrastructure is a key starting point. Particularly, broadband coverage needs to be implemented and made accessible and affordable in developing countries (as committed to in the SDGs). Moreover, it will be important to make data sets and digital systems more interoperable and promote open source for greater participation in innovation. This goes hand in hand with increasing affordability by providing financial support, especially for countries, regions and individuals lagging behind. This can be achieved through financial support to low-income earners, rural populations and women, and therefore enabling them to afford digital technologies and taking time for education and training. To achieve those goals, it is important to note that the challenges of digital divides are not just a technical issue but are also connected to diverse and deep socio-economic issues that have to be closed with the participatory engagement of citizens. The United Nations (UN) 2020 e-government survey has provided nine key pillars for digital government transformation that are adopted and summarised to spur structural transformation, namely (UN E-Government Survey 2020:xxxii):

1. Visionary, transformational leadership in digital capacities.
2. Integrated and comprehensive institutional legal and regulatory framework and ecosystem.
3. Transformation of the organisational culture.
4. Integrated systems thinking and approaches to policy-making and service delivery.
5. Strategic and professional management for data-centric policy-making and promotion of open government data access and use.
6. Information and communication technologies (ICT) infrastructure affordability and accessibility to technology.
7. Public resources mobilisation, resources alignment, planning and budgeting, through public–private partnerships.
8. Capacity building of schools of public administration and other institutions.
9. Development of societal capacities to bridge the digital divide and leave no one behind.

The impetus and persistence of most African states in advancing digital government in the pursuit of realising structural transformation and sustainable development in the digital economy over the past decades now require a more sober and profound inquiry. Evidently, the Fourth Industrial Revolution (4IR) has ushered in the promises of ubiquitous ways in which people interact, function and make decisions. The trends in the digital economy are enormous, evident and progressive with marked examples of technological processes

such as cognitive process automation, advanced analytics and artificial intelligence (AI), thereby making modes of interaction between the citizenry and government quicker with increased and changing opportunities for quality, efficient and reliable public service delivery. Increasingly, the current dominant emerging narrative is that the 4IR has the potential to generate new scientific research and breakthroughs, creating new job opportunities, economic growth and improving the standard of living globally. However, as with every technological leap, there is a need to offer a cautionary but insightful opinion. This chapter is one such cautionary exposition based on the political economy discourse in view of realities on the African continent. In this chapter, it is argued that having missed the opportunities on the earlier preceding technological revolutions, it may be prudent for the African continent to undertake a deeper reflection on how the historical and structural rigidities of the integration of capital, labour, technology and trade in the global political economy tend to play out and continuously breed steep inequalities, unemployment and poverty, despite spectacular benefits elsewhere in the world. We should ask: why we are where we are? We must also ask to what extent the digital government initiatives could be a panacea to the real structural change that the continent values. The chapter posits that while 'therapies' of better education, reskilling and changing national cultures are necessary, they may not be sufficient if Africans do not reconfigure their developmental agenda to embrace a radical, indigenous and endogenous socio-economic transformational drive that marks the continent not as passengers, but real drivers in shaping their own destiny in the 4IR labyrinth. The chapter underscores the call for a development paradigm whose response must be integrative and comprehensive, involving all stakeholders of the national and global polity with 'progressive actors' in the public and private sectors, academia, labour and civil society. We conclude that to ignore this clarion call will be to endorse and entrench the dominance of a global digital capitalist architecture that will forever benefit a small enclave in our national economies while the rest of our masses are left behind in the digital 'race' resulting in poverty and a 4IR digital divide on the African continent.

Is e-government and digital government one and the same concept?

In most current literature, there appears to be a consensus that the terms e-government and digital government are inherently not different and are used interchangeably (Bwalya 2017, 2018; World Bank 2020; World Bank Group 2016b). Bwalya (2017:5), for example, noted that 'there are many variants of e-Government given the changing conceptualisations' and observed that owing to the 'higher penetration rate of Internet-enabled mobile phones, e-government has transformed into [for example] mobile

government (m-Government) to create ubiquitous or pervasive access of government information'. The World Bank also concurs that the concept of e-government has now evolved in conception, application and measurement (World Bank 2020; World Bank Group 2016b). They posit that the 'traditional paradigm of "e-Government" has been challenged by the "Digital Government" model that aims to create a holistic digital environment and infrastructure for active citizen and business participation' (World Bank 2020:6). In that regard, Gartner (2020:1) defined digital government as: '[...] government designed and operated to take advantage of digital data in optimizing, transforming and creating government services'. As attested by the World Bank (2020), this means that there is a transformation of government:

> [*F*]rom an organisation providing products and services supported by data, to an organisation that is primarily driven by its data, and uses its data not only to deliver existing products and services but also to create new ones. (p. 6)

In other words, it would seem in evolving literature that the concepts of *e-government* and *digital government* are not distinct per se. These concepts are seen more on an evolutionary plane or related phases. Earlier conceptual research by Janowski (2015:221) also advanced this evolutionary perspective that the 'concept of Digital Government evolves towards more complexity and greater contextualization and specialization, similar to evolution-like processes that lead to changes in cultures and societies'. Janowski (2015:222) proposed a 'Digital Government Evolution Model' with four increasingly complex phases in the evolution of the concept, namely: Digitisation (Technology in Government), Transformation (Electronic Government), Engagement (Electronic Governance) and Contextualisation (Policy-Driven Electronic Governance). Accordingly, the model also offers a classification of the 'phases depending upon three binary variables' as follows (Janowski 2015:n.p.):

1. Whether digitisation adds to internal working and structures of government but largely without affecting them, or it transforms the internal working and structures of government.
2. Whether the transformation is internal to the government but not affecting its customers, or it transforms the internal working and structure of government as well as its relationships with citizens, businesses and other stakeholders.
3. Whether the transformation depends on a particular application context, for example, of a country, location or sector, or is context-independent.

We, therefore, adduce that depending on the technological adoption and context, e-government is the basis of the discussions and implementation of digital government as a higher model of conceptualisation and application. A critical review of the literature indicates that the current

leaders in the implementation of digital government (as per UN e-government rankings in terms of capturing the scope and quality of online services, status of telecommunication infrastructure and existing human capacity), namely, Denmark, the Republic of Korea and Estonia, followed by Finland, Australia, Sweden, the United Kingdom, New Zealand, the United States of America, the Netherlands, Singapore, Iceland, Norway and Japan (UN Department of Economic and Social Affairs 2020:xxv), are now talking about data-driven governments and have elevated their discussions to include the concept of digital government (United Nations Department of Economic and Social Affairs 2020[1]; World Bank 2020). Then, there are those countries in the developing world in some parts of Eastern Europe, Asia, the Americas and Africa that can be said to be transitioning from 'old e-government models' to embrace newer digital government initiatives. Affirming this perception, writing in the context of the evolution of e-government and prospects for digital government in Russia in 2020 and beyond, the World Bank Expert Group (2016) seemed to agree and stated that:

> The idea that 'Government' and 'digital Government' are different things is increasing unacceptable to citizens and businesses, and can be a dangerous diversion. In an increasingly digital world, and with many governments increasingly enabled by data and digital technology, it is untenable to structure policy and administrative processes around a non-digital model with a digital veneer [...] [*and*] sometimes, for political reasons, the move to digital government has been presented as a 'revolution', and fundamentally different in nature to the 'e-government' structure that preceded it. However, it is notable that the leaders of the 'digital government' movement have also been seen as among the leaders of 'e-government'. This suggests that it has not been that 'e-government' has been a complete failure but that many e-government programs have fallen short of the initial vision, and that public expectations and technology capability has risen. (p. 7)

This suggests that we cannot discuss *digital government* as something different from *e-government*. We should endeavour, at least for now, to discuss it as a concept that is 'multi-dimensional and transformational' and that it is a 'dangerous diversion' to imply that these are two different concepts. In other words, it depends on the evolutionary level of adoption of ICT penetration and locality. The UN, in their 2020 e-government survey report, also affirmed that in their latest publication, they used 'e-government' and 'digital government' interchangeably because 'there is still no formal distinction made between the terms among academics, policymakers and practitioners' (UN 2020). The UN (2020) says that:

> In many countries, the term e-government is embedded and institutionalised in national policies and strategies, though in some cases reference is made to

1. For more details, see the 2020 United Nations E-Government Survey at https://www.un.org/development/desa/publications/publication/2020-united-nations-e-government-survey.

> digital government as the next phase of e-government. In one research database, the Digital Government Reference Library (formerly the Electronic Government Reference Library), there are 12 546 references to predominantly English-language peer-reviewed work in the study domains of e-government (or digital government), digital governance, and digital democracy. In this Library and others, a significant majority of the academic references are to e-government rather than digital government. (p. xxiv)

In that regard, in discussing how African governments are embracing digital government in the digital economy, acknowledgement of the existing corpus of literature on e-government was found useful. The literature tends to reinforce the thrust of the argument in this chapter that, based on historical and material global imbalances, the African continent remains a 'tech laggard' in building digital government initiatives in the emerging digital economy. The key characteristic underlying this continuum and evolutionary view in the conception from e-government to digital government is that, as the emerging disruptive digital economy evolves, 'governments and their services should increasingly become data-driven'. The World Bank Group (2016:8) guided that the emerging 'digital government initiatives have seen the emergence of a number of key design principles and elements', whose main 'characteristics of digital government' are summarised in Table 1.1.

TABLE 1.1: Key design principles and elements for digital government.

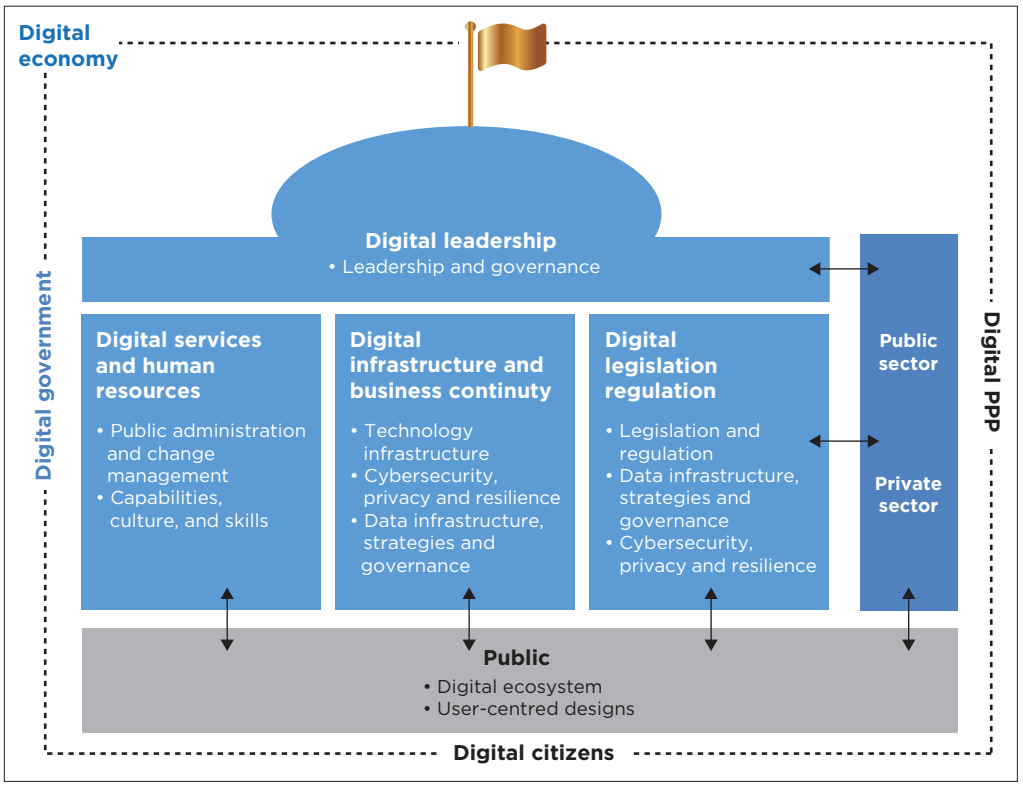
Key principles	Elements
Principles of digital government services	• Digital by default (business design – re-designing and re-engineering business processes so that they are services that are delivered through digital channels) • Device-agnostic and mobile-centric (e-government services are being designed to be accessed from smart-phones and from other digital devices) • User-centred service design (should reflect the needs of the wider variety of individualised services, with a high degree of personalisation of services and a granular understanding of customer need) • Digital from end to end • Government as a Platform
Building blocks of digital government	• A single portal • Unified data shared across the public sector • Cross-government shared services • Shared government infrastructure • Improved sensor networks and analytics • Cybersecurity and privacy
Leadership and skills for digital government	• Leadership and governance • Innovation within government • Culture and skills
Measurement of digital government	• Measurement of digital government

Source: World Bank Group (2016).

Nexus of digital government, digital economy, structural transformation and sustainable development

As argued in this chapter, e-government and digital government are used interchangeably in the context of the digital economy, and structural transformation as a transformational and multi-dimensional concept. Literature affirms that most leading governments of the world have been embracing the new digital era, integrating into the contemporary digital economy. The OECD (2016:1) asserted that since the dawn of the Internet in the 1990s, most governments have pursued e-Government models that centred on using ICTs to improve operational and administrative efficiency. However, owing to the accelerated levels of consumerism in digital technology, citizens now expect better-quality digital services from governments. This implies that the current ideal model is one where there is an open government that is accessible to the citizenry and propelled by high-quality digital and communication public services. The implication is that most governments' digital transformation programmes will rely on how the digital economy is anchored on newer public expectations and global trends. Thus, it is important to note that when the concept of the digital economy was first introduced, it referred 'to a small sliver of the whole economy' that deployed digital technologies for business value (World Bank 2020:6). Nonetheless, owing to the eruption of disruptive technologies and consumer connectivity in the 4IR, its scope and range have expanded (World Bank 2020:6). The digital economy is now the agenda for the whole world. The World Economic Forum estimates that by 2022, about 60% of the global gross domestic product (GDP) will be digitised and that 70% of the new economic value will work on digital platforms (Gada 2016:1). As shown in Figure 1.1, the World Bank Digital Government Readiness Assessment (DGRA) (2020:9–10), in the development of their current assessment toolkit, aversed that the building blocks for a digital economy are centred on the following:

1. *Digital Leadership*, which implies a top-down configuration, whereby the top political and administrative leadership makes digital transformation a priority. Countries such as Estonia that rank as one of the top countries on the '2020 UN e-Government Readiness Index' have been cited as examples.
2. *Digital Services and Human Resources (Public Administration Reform and Culture),* whereby building a digital government would require substantial investments in administrative, technological utilities and human capital.
3. *Digital Infrastructure and Government Business Continuity (Technology, Data and Cybersecurity),* whereby there is a 'shared digital infrastructure' across public administration and operations with resilient 'cybersecurity to ensure government business continuity'.



Source: World Bank DGRA Team (2020).
FIGURE 1.1: Digital government ecosystem in digital economy.

4. *Digital Legislation and Regulation*, whereby there is a necessity for a sound legal and regulatory framework with 'laws for data privacy, consumer protection, digital identification, digital signature and cybersecurity mitigation'.
5. *Digital Public (User-Centric Design and Digital Ecosystem)* prioritises serving the needs of the citizens, regardless of class, gender, race, geographies, et cetera, through the adoption of a 'user-centric design principle to the national digital strategy'.

In Africa, most of the corpus of the leading literature, while acknowledging the transitioning of the concept, still discuss this in the context of e-government as in more or less the early transitioning phase (Bwalya 2018; Nengomasha & Uutoni 2015; Okonkwo & Islam 2013). In most of the literature reviewed on e-government in Africa, most research has concentrated on the old e-government model. Primarily, there has been an attempt to understand the adoption and use of ICT in government operations and the implications of transforming an old-fashioned government to e-government with the most

underlying implementation constraints (Bwalya 2018; Eliamani 2012; Gebba & Zakaria 2012; Monyepao & Weeks 2012; Mutula & Mostert 2010; Mzyece 2012; Nengomasha & Uutoni 2015; Nkomo 2012; Nkwe 2012; Okonkwo & Islam 2013). Others have examined the technical design capabilities for the successful implementation of e-government initiatives (Asogwe 2011; Karokola et al. 2012; Ochieng, Gichoya & Odini 2011). Many other studies have forwarded e-government models and frameworks for the effective delivery of e-government in African countries (Al-Khatib & Lee 2011; Asianzu & Maiga 2012; Bwalya 2010; Bwalya & Healy 2010; Mundy & Musa 2010; Ochara 2012).

In this chapter, while acknowledging this, the focus is largely on why the current developmental paradigm has had limited impact in ensuring that digital government is an enabler in the structural transformation and sustainable development in Africa. This is in light of the global consensus in looking at digital government as a key enabler to the accomplishing aspirations of the SDGs. The UN (2020) e-government survey report agreed with this view and affirmed that:

> The year 2020 also witnessed a transformational change in the global development agenda as United Nations Secretary-General António Guterres announced the launch of the Decade of Action for Sustainable Development to bolster efforts to achieve the SDGs by 2030. The Decade of Action is central to global efforts to eradicate poverty and to improve economic growth, social protection, health (including pandemic response), education, energy, water and sanitation, sustainable transport and infrastructure, and Internet access. Digital government supports the Decade of Action through sustainable, inclusive and equitable public service provision for all people everywhere, leaving no one behind – and more broadly through its growing role in driving innovation, strengthening efficacy, and generating solutions. (p. xxiii)

In the same vein, the same report (UN 2020:xxiv) further acknowledged that globally, many governments are implementing digital government approaches that are fundamentally dissimilar to the previous e-government initiatives. Some of the new strategies being undertaken in digital government transformation include the delivery of e-government as a platform, the integration of online and offline multichannel delivery, the responsive development of digital services that support government and society engagement and integration. The key focus is to expand participation and build partnerships. This also entails embracing data-centric approaches as well as enhancing digital capacities to deliver people-centric services. Currently, for example, some African countries are embracing state-of-the-art technologies in the development of smart cities.[2]

It is clear that even in countries that were thought to be underserved or financially excluded, digital government services have become a developmental equaliser. For example, it has been reported that least developed countries

2. For initiatives and examples of smart cities in Africa, South Africa (Cape Town), Kenya (Nairobi) and Rwanda (Kigali), see https://www.brookings.edu/blog/africa-in-focus/2017/11/01/smart-city-initiatives-in-africa/

such as Cambodia, Bangladesh and Bhutan have taken the lead in digital government development and have now advanced from the middle to the high E-Government Development Index (EGDI) group in 2020 (UN 2020:1). It, therefore, cannot be over-emphasised that digital government can now take services and democratic public participation via digital kiosks to communities that previously had glaring gaps in the digital divide. Digital government is a key to sustainable development because it plays a critical role in promoting digital literacy as per SDG Goal 4, 'digital inclusion (SDG Goals 5, 8 and 10)', 'digital connectivity (SDG Goal 9)' and 'digital identity (SDG Goal 16)' (UN 2020:xxiv).

Contextual analysis: The African challenge in driving the digital government for structural transformation and sustainable development

In the current development discourse, the terms *structural transformation* and *sustainable development* are seemingly two buzzwords. They tend to describe the desire for process and outcomes for structural change in society. Both terms focus on improving people's socio-economic well-being. Structural transformation has evolved from classical perspectives and has now been reignited given the ambition quest for economic development among many nations. For decades, the process of industrialisation and development has been associated with the multi-dimensional phenomenon of the structural transformation of economies (Nayyar 2019). Usually, in an economy, structural transformation can be seen in the changing shares of the primary, secondary and tertiary sectors in total employment and national income (Nayyar 2019). It is this steady progression of rationalisation of labour and other productive resources across economic activities accompanied by modern economic growth (UNTAD 2016). Sustainable development, on the other hand, 'is the idea that human societies must live and meet their needs without compromising the ability of future generations to meet their own needs' (Ramon & James 2021:48). The four main types of sustainability are human, social, economic and environmental. To make this more practical and operational, at a global level, the UN General Assembly adopted the 2030 Agenda for Sustainable Development in September 2015. This agenda espouses the principle of 'leaving no one behind' as reflected in 17 SDGs. This progressive agenda envisages and projects that by 2030, nations should universally work towards ending poverty, protecting the planet and guaranteeing that all people enjoy peace and prosperity. In Africa, a debate rages regarding how the continent must drive the goals of structural transformation and achieve sustainable development. There are varying opinions regarding what ingredients should drive this process. One such debate has been that digital transformation can be part of this complex process.

In most academic and policy discourse, issues of digital transformation are systemic and inherently a socio-economic and political process in many respects (Kalusopa 2019). Nayyar (2019) provided useful lessons on Asia's transformational journey towards industrialisation and underscored the need for continual technological competency and technological learning culture. In that regard, the role of the state as a front-runner, facilitator and enabler of economic development is also identified as a key ingredient for this success. In the same vein, Oqubay (2020) agreed that the quest by most African countries to industrialise and ascend the development pecking order might not be achieved without sustained state support for technological competency and learning. Oqubay also recognised the African leadership to spur sustained structural transformation such that the state intervention should be guided as a workable strategic industrial policy framework. Therefore, in order to understand how African countries are dealing with emerging 4IR and what holds for the future, the political economy analytical framework was found to be useful. The political economy analysis involves looking at the dynamic interaction between structures, institutions and actors (stakeholders) to understand how decisions are made. It examines the power and class relations within a polity at local, national and international levels and how such power leverages and enhances an 'inclusive and firm political settlement'. This could include actions to encourage 'political reform, reinforce the fundamental functions of the state, or improve the delivery of services that build state acceptability and answer to public expectations' (DFAT 2016:1). In literature, there is no distinct conceptual framework for the 'political economy analysis'. However, there is a consensus that political economy analysis is concerned with the distribution of power and wealth between different groups and individuals and the processes that create, sustain and transform these interactions over time (DFAT 2016:1). This definition underscores the existence of *politics*, viewed in the context of 'contestation and brokering between interest groups with contending claims over rights and resources' (DFAT 2016:1). It is similarly 'concerned with the *economic processes* that generate wealth, and that influence how political choices are made' (DFAT 2016:1). One of the earliest and most central perceptions in scholarly work on economic development is that development entails structural change. The argument that has been sustained in literature and modified depending on the epoch has been one of the methods to deal with perennial poverty in society in order to develop diversity in agriculture and create forward and backward linkages that can spur sustainable growth. This means that the pace at which this structural transformation and sustainable development take place, driven by technological advances, is the key denominator for national development. In other words, sustained economic growth buttressed by incessant technological advancement is closely linked to the Industrial Revolution (UNTAD 2016). The empirical literature has consistently shown that the current advanced

economies have been able to diversify from agriculture, natural resources and the production of traditional manufactured goods for decades. There has also been a marked increase in the overall productivity and incomes arising from the progressive productivity shift in agriculture, labour and capital to manufacturing and services (UNTAD 2016). This is in sharp contrast to the less advanced countries that have been unsuccessful in attaining a similar transformation of their productive structures and have been stuck at low productive levels (UNTAD 2016).

Clearly, technological innovation is usually embedded in such structural change and transformation. As has been espoused in this chapter, digital government, as an enabler of structural transformation and sustainable development, is embedded in combinations of economic, political, cultural and scientific conditions. In modern times, the organisational changes designed to support and drive insightful transformation in government service delivery hinge on digital exploits. Therefore, the focus on the implementation of digital government as an enhancement of public service delivery is core to the acceleration of the well-being of citizens. Consequently, it would be useful to discuss how the African States can deliver a digital government for structural transformation in the emerging digital disruptive world in the context of a political economy analysis. The proceeding sections discuss this contextual analysis in much more detail.

Leadership and governance in the digital economy to advance digital government

As established earlier, in any political economy analysis, the question of power relations is critical in advancing structural transformation and sustainable development. One interesting analysis advanced by Khan (2010:4) is the question of 'political settlement' in a polity where power is usually held by different groups and organisations contesting the distribution of resources. The 'evolution of their political settlements is shown to be closely related to changes in their formal growth-enhancing institutions and the performance' of these institutions in the development discourse (Khan 2010:4). We use this to assist us in identifying governance changes that can be appropriately enforced to ensure that development is achieved in most African countries. According to Khan, the 'political settlement also defines the growth-stability trade-off facing particular institutional changes: institutional changes cannot be implemented if their implementation pushes political stability below the tolerance limit of that society' (Khan 2010:4). Khan further argued that the Weberian state model of formal power distribution advocated for in the Western world cannot be sustained in developing countries such as Africa, where 'the distribution of power [...] draws significantly on organisational abilities based in non-capitalist sectors, such as the civil society, labour and

political parties'. We, therefore, infer that these actors are useful in ensuring developing and sustaining the success of a digital government agenda in structural transformation and sustainable development. Literature on digital government affirms that most of the leading countries in advancing digital government have shown clarity in such political leadership to achieve a 'political settlement' in advancing the digital government for structural transformation and sustainable development. The World Bank (2020), in its latest digital government assessment of tools, emphasised why leadership and governance are requisite for successful digital government deployment:

> The leadership and governance assessment [...] requires the broadest and most diverse number of participants mainly from the whole of government stakeholders, core agencies such as finance and public administration who are drivers and authorizers of government performance improvements and reforms [...] privacy issues would require participation by civil society organizations, media, legal, etc. data-driven assessment category would involve the ministry of planning, finance, economy, statistical offices, researchers, and NGOs, among others. It is also recommended to engage with stakeholders from the private sector, civil society, parliament and academia to enrich the information and collect diverse perspectives. (p. 10)

Clearly, in Africa, this leadership trait is glaringly absent. Bwalya (2018:51), in an assessment of the e-government drive in Africa, also observed that leading countries on the continent such as Mauritius have shown and 'enjoy relatively mature democracy with strong leadership dedicated to empowering the country with a competitive edge'. Admittedly, countries such as South Africa, Ghana, Uganda and Rwanda that have shown some promise on the continent have also exhibited leadership that mobilises several knowledge power blocks within their stakeholders such as academia, civil society and labour, among others, to drive a participative agenda for socio-economic transformation. Many others initiating digital government agendas are simply 'jumping on the bandwagon' without clarity of the mission.

Human resource and technical capability challenge for digital government in Africa

Literature affirms that building an effective digital government capability would involve substantial investments in administrative, technological and human capital (Bwalya 2018; World Bank 2020). It is acknowledged that digital technologies can swiftly 'improve administrative operations and capabilities such as licensing and registration services, it usually does not substitute all the government operations' (World Bank Group 2016). Practice shows that several services that involve decision-making for close monitoring require real human intervention (World Bank Group 2016). In Africa, organisations that identify and adopt new technologies would obviously need high-level skilled human resources. In the emerging 4IR, cognitive skills and

technological skills seem to be currently deficient in Africa. For example, according to the UNECA (2019), the:

> [*T*]ertiary enrolment rates averaged 7.5% percent over the period 2003 to 2012, the lowest of any region in the world and only 25 percent of these are in the science, technology, engineering and mathematics (STEM) disciplines. (p. 9)

Yet, these are critical and indispensable skills for the 4IR. The percentage of companies or 'firms that indicate facing a skills shortage, and a shortage of "digital skills" have tended to increase in many African countries' (Banga & te Velde 2018, cited in Naudé 2018:7).

In terms of global digital knowledge production, countries in Africa are performing badly and contribute 'less than 1 per cent' (Graham et al. 2017). However, Deloitte (2018) has estimated that if African countries can increase Internet use to the same rate as developed countries, they could actually generate '140 million new jobs and add $2.2 trillion to GDP'.

There is also the promise that by 2030, Africa's budding labour force will be among the world's largest, and so, balanced with the requisite infrastructure and skills for innovation and technology, the 4IR signifies a gigantic break for growth (Nsengimana 2018). Currently, Africa's employed populace is becoming better educated and equipped to seize the opportunities provided by the 4IR. For instance, according to the World Economic Forum, it is estimated that 'workers with at least a secondary education is envisaged to rise from 36 percent in 2010 to 52 percent in 2030' (World Economic Forum 2017). The recent UN (2020) e-government survey also supported this:

> In Africa, even though countries continue to lag other regions, there are positive signs of accelerated advancement. Africa has the largest share of countries that have moved to a higher EGDI group (15 countries, or 28 per cent). However, persistent gaps in infrastructure and human capital development have prevented many countries in this region from moving to the higher EGDI levels. (p. xxiv)

Clearly, the human resource and technical capability challenge for digital government in the drive for structural transformation and sustainable development in Africa is real.

Challenges of digital inclusion for digital government

Evidence in Africa points to the fact that digital technologies present an incredible potential for achieving SDGs; nonetheless, policies should be in tune to fast-track progress, address digital exclusion and risks of discrimination and ensure that society benefits. In Africa, the current most encouraging developments in the 'ICT sector have been mainly driven by the growing mobile digital financial services' (GSM 2019:1). It is estimated that the region had 'approximately half of global mobile money accounts in 2018 and that this

set in growth exponentially by 2025' (GSM 2019:1). Nonetheless, AI and blockchain are also drawing interest in Africa, as they have the potential to successfully address socio-economic challenges (GSM 2019). In the previous years, the (GSM 2019):

> ICT sector in Africa has grown with mobile technologies and services alone creating about 1.7 million both formal and informal direct jobs, contributed to $144 billion of economic value (8.5 percent of the GDP of sub-Saharan Africa), and $15.6 billion in taxes to the public sector. (p. 1)

Clearly, it is indisputable that digital technologies can actually empower the poor with job opportunities, information and services that raise their living standards. For instance, AI, Internet of Things (IoT) and blockchain can improve prospects for data gathering and analysis for targeted poverty reduction programmes. In the same vein, we have observed how mobile phones such as M-Pesa in East Africa empowered and transformed the marginalised who are key drivers for poverty eradication (GSM 2019). These financial services allow households to save safely and broaden their financial asset base, which can ease poverty in most rural parts of Africa. Digitisation has enabled the marginalised and unbanked to enter formal retail electronic payment systems and virtual savings and credit supply technological platforms. This has, in the long run, impacted positively on inclusive economic growth (GSM 2019).

According to the UN Broadband Commission for Sustainable Development target for 2025, the entry-level broadband services will be made more inexpensive in developing countries at a level corresponding to less than 2% of monthly gross national income GNI per capita (International Telecommunication Union [ITU] 2020:iii). However, challenges in Africa still persist. The ITU report, based on the key benchmark of the 2% target set by the Broadband Commission for Sustainable Development for mobile data, says (ITU 2020):

> In Africa, the most affordable baskets are available in Mauritius and Gabon, the only two countries with a basket below the Broadband Commission target of 2 per cent. In the next three countries, Seychelles, Nigeria and Botswana, prices accounted for between 2 and 3 per cent of GNI p.c., suggesting that there is a good chance that the Broadband Commission target may be reached in these countries by 2023. In many African countries however, mobile data baskets are still out of reach for a large part of the population, costing more than 10 per cent of GNI p.c., in situations where incomes are already limited. In eight out of 10 African countries, the data allowance included in the cheapest price (with at least 1.5 GB) did not exceed 2 GB. The highest allowance for this price is observed in Botswana and the Democratic Republic of the Congo, amounting to 5 GB. (p. 47)

In terms of Internet use in Africa, the gap is still substantial at '22 individuals per 100 inhabitants compared to about a quarter for Europe; the same applies to active mobile-broadband subscriptions, which is at 26 individuals per 100 inhabitants' (Naudé 2018:6). According to the World Bank, Internet

penetration in Africa is estimated 'at 21.8% of the population, leaving the majority of the continent's population offline' (World Bank Group 2016). Africa's limited Internet access, low purchasing power and high levels of illiteracy coupled with poor infrastructure, among others, have affected the growth of these platforms. The World Bank Group's (2016b) World Development Report on digital dividends showed that:

> [*O*]n average Internet access costs $ 206.6 per Mbit/s per month in coastal countries in Africa, compared to $ 438.82 per Mbit/s per month in landlocked countries. Chad, Cameroon, Equatorial Guinea, Lesotho, Mali and Niger are said to have some of the highest access costs. (p. 9)

According to the Alliance for Affordable Internet (A4AI), very few countries in Africa met the target for affordable Internet where '1GB of mobile data should not cost more than 2% of the average citizen's monthly income' (World Wide Web Foundation 2017:1). Presently, it is estimated that most people in many 'African countries would need to spend up to 9.3% of their average income to access broadband data' (World Wide Web Foundation 2017:1). Further, the paucity of data in the ICT sector, for example, e-commerce statistics, makes it difficult for most countries to make informed policy decisions. There is also the constant practice of Internet disruption that negatively affects the digital economy in Africa. The lack and poor implementation of laws, such as those on cybersecurity, data protection and privacy, may also slow down the digital economy growth of Africa. There is also the failure to integrate a gender perspective in the 'mainstream women empowerment in strategies, policies, and budgets' (Pharatlhatlhe 2018).

Mobile penetration is growing and varied in most African countries. For example, in the Southern African Development Countries (SADC) region, Internet penetration is lower than the continental average (Abrahams 2017:6). However, a few countries such as Mauritius, The Seychelles and South Africa stand out (Abrahams 2017:6). In Botswana, Namibia, Swaziland, Zambia and Zimbabwe, it is reported as significant; in the Democratic Republic of Congo, Madagascar and Malawi, Internet penetration is less than 10% (Abrahams 2017:6; Internet World Stats 2017).

Coherent institutional and financing policy framework for digital government in Africa

Information and communication technologies are also essential tools to increase the coverage and delivery of public services to the citizenry. This is a key principle of the 2030 Agenda. This agenda together with other approaches and digital platforms can facilitate the fashioning of public service delivery solutions in a way that explicitly targets marginalised groups such as those identified in the 2030 Agenda. The major obstacle lies in the fact that the speed with which technology is evolving surpasses the speed with which

governments can respond and use ICTs to the benefit of the citizenry. Accordingly, in most African countries, it can be argued that coherence and synergies in policy actions and trade-offs are critical ingredients if the digital government is to spur structural transformation and promote sustainable development. There is a need for comprehensive and integrative measures that focus on redistributive policies driven by the state. Accordingly, for many African countries, financing remains the biggest bottleneck with the implementation of SDGs' capacity (UNECA 2017:ix). The overall developmental context in which the state plays a more active role and where political decisions anchor on structural reform 'enablers' can include the following coordinated financing of public and private sector interventions.

Further, it is important to note that the 2030 agenda on sustainable development underscores data-driven governance and highlights the challenge in Africa to 'increase significantly the availability of high-quality, timely, reliable and disaggregated data by 2030'. However, this may require an active developmental state that can allocate adequate budgetary funding to foster the growth of digital infrastructure. This may entail putting in place adequate budgetary arrangements and resources for institutional arrangements that streamline public administration practices, mechanisms and capacities that enable digital transformation.

National statistics capability challenge in the drive to digital government

In the quest for building the digital government infrastructure, one of the gaps lies in the inability and incapacity of the national statistical system in enhancing the collection of quality data for socio-economic development. In its assessment of the continent's performance, the '2017 Africa regional report on Agenda 2063 and the SDGs' avers that owing to austere data limitations, approximately six out of every 10 SDG indicators cannot be tracked in Africa (UNECA 2017:ix). The report emphasises the fact that Africa must strengthen its national statistical systems in order to achieve success in the implementation of the SDGs and Agenda 2063. This is because tracking and monitoring reinforce evidence-based policy-making (UNECA 2017:ix). This is to ensure that governments are well-informed based on 'disaggregated data (by age, gender, income and geographical location)'. This is necessary to provide better-targeted support to populations 'at risk of being left behind as per Agenda 2030 mantra'. Therefore, capitalising on national statistical systems may lead to better-informed policies, quicker response, improved civic engagement, improved transparency and accountability (UNECA 2017:ix).

Evidence also points to the gaps in socio-economic indicators because of the poorly resourced and fragile infrastructure of the national information systems in Africa. This implies the need for the deploying of common

methodologies in the data collection and analysis of socio-economic development indicators and targets. Multi-stakeholder coordination mechanisms at the national and regional levels need to be established to share practices of developing information infrastructure compliant with the current digital environment.

Conclusion

Africa still holds potential and promise in rolling out digital government initiatives in the emerging digital economy. This chapter argues that such digital transformation must be an integral part of the whole structural socio-economic development agenda that African countries should pursue. It is argued that the 'structural features of African economies (enclave and dual economies)' are historically entrenched in a vicious circle of underdevelopment. The current state also reflects the failure of current neo-liberal policies to deal with this structural rigidity. In that regard, this structural rigidity of the economy implies that the momentum of economic growth has not been structurally uneven to promote real structural transformation and sustainable development. This structural distortion, therefore, implies that most of the digital transformation initiatives in Africa tend to be restrictive, piecemeal, ad hoc and unsustainably geared to a small enclave, leaving the rest of the urban poor and rural populations marginalised and behind. As a result, digital government agendas have not been able to spur real structural transformation and sustainable development in its entirety. We assert that while the therapies of better education, reskilling, changing national cultures are essential, African countries can achieve success if digital government initiatives are well-located in well-articulated radical and endogenous development paradigms. In that regard, the African government must embed digital government in structural transformative frameworks that have a normative approach (of equality and solidarity) propelled by an ethical state with a broader developmental agenda.

Chapter 2

Automating public business processes: Towards an AI-augmented government

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Abstract

Rapid technology advancements have culminated in the revitalisation of the public sector. The originally conceptualised e-government is now transforming into Government 4.0, which is known as AI-augmented government or logarithmic government. Many countries, even in the developing world contexts, have jumped on the bandwagon of automating public services and introducing some level of intelligence. This chapter explores some fundamental principles surrounding AI-augmented e-government and proposes a framework that can be used as a reference high-level technology stack for achieving automation and intelligence in the realm of Government 4.0. The research uses concurrent mixed methods to investigate the different aspects of the research from two vantage points. This research employed a longitudinal paradigm with two parts of the study: The first part is an empirical part that

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collected qualitative data from three towns in Zambia to understand the level of development of e-government from both the individual and local government levels. The second one uses descriptive bibliometrics to understand the development trajectory of Government 4.0. This research has shown that traditional e-government is not much desired in Zambia as anticipated benefits are limited. However, the more progressive AI-enabled augmented e-government model is desired by both businesses and individuals. Therefore, this chapter presents both the results of the empirical study and explores the AI-enabled e-government, especially from the point of view of utilising robotic process automation as a precursor to advancing a more progressive e-government model with increased intelligence and automation. It is expected that this chapter will be used as a blueprint for designing AI-enabled e-government paradigms.

Introduction

To improve the efficiency and accountability levels in the public service delivery value chains and to reduce the cost of public service in service provision, governments all over the world have a transformative agenda. Because of rapid technological developments, there have been increased calls for the automatisation of mundane tasks to amass the complete array of benefits that e-government, in its variant forms, has to follow. As a result, the data science revolution has kicked in the concept of algorithmic government that refers to the massive use of cognitive technologies in the public sector delivery value chains (Engin & Treleaven 2019). These developments collectively usher in the Government 4.0 paradigm that promises to completely revitalise public service delivery (Engin & Treleaven 2019).

Among the different innovations driving transformation in the public service, AI presents the greatest potential to revitalise government business processes (Desouza 2019). If used well, AI has a huge potential to impact on several industries and developmental core sectors in Africa such as healthcare (accessible, better-quality healthcare involving remote case analysis and dispensary done by intelligible machines), agriculture, public services and financial services (Access Partnership 2018). The use of AI in public service business processes is not new. There are a sizeable number of government agencies in the United States using AI to make heterogeneous data-centric decisions, programmes and citizens' interactions. In many countries, the algorithmic government has been used to come up with revenue service predictive models in facial recognition systems for security administration (Engstrom et al. 2020). Another technology that has shown a lot of potential is robotic process automation (RPA). Robotic process automation does not necessarily make use of a robot, but rather its applications that strengthen a company's existing information technology (IT) infrastructure by pulling data,

performing algorithms and creating reports. Robotic process automation provides an opportunity for e-government applications to complete the same process steps, follow the business rules and use the same systems that a human does today. There is no doubt that the thrust provided by data science in the form of AI, big data and predictive analytics and algorithmic decision-making has increased the levels of efficiency and effectiveness of public services. That being the case, there are still challenges brought about by increased automation and intelligence in the public service business processes surrounding accountability, autonomy and privacy (Thapa 2019).

Although the anticipated benefits for AI-augmented government are clear, governments around the world have been slow in incorporating AI and RPA in their business processes. Trailing behind the private sector, it is now time for the public sector to catch up. Especially in Africa, the public sector has shockingly lagged behind the private sector and incurred huge costs to harness the key benefits of AI and thereby effortlessly achieve their mandates, reduce the cost of public service delivery, increase accountability (and ultimately mitigate corruption) and generally increase the level of efficiencies in the public sector (Berryhill et al. 2019). It is clear that Africa and other developing countries need to build the capacity to develop context-aware AI applications. Given the foregoing, this chapter explores the design aspects of the high-level technology needed to achieve automation and intelligence in the public sector business processes.

Public service transformation

Just like practice, e-government research has now moved from simply taking a census of people adopting and using e-government to understand contemporary designs with improved technologies in different contextual settings towards enhanced intelligence and automation. The use of technologies in public service business processes was realised decades ago. Although not adequately developed as a field of study and a science, e-government has been investigated by heterogeneous researchers for a long time.

Traditional government systems operated on what is known as the ‘sneaker system’. This system demanded people and businesses to actually visit government departments to access public services. Information flow and communication are usually one-sided. With the emergence of technologies, there was a rapid transformation in the public service delivery modes. The use of technologies in government business processes has gone through different stages of development. Government 1.0 is a government-oriented mode where the motivation to use technologies was essentially to obtain benefits on the part of the government. These benefits include reduction in

the cost of the public services, increasing efficiencies and generally improving the quality of services delivered. Government 1.0 is the original conceptualisation of e-government. Government 2.0 aims to provide citizen-oriented services with increased participation and bidirectional communication. This government mode uses Web 2.0 (social media) technologies to increase the participation of citizens and businesses in governments' decision- and policy-making processes. Government 2.0 focuses on achieving increased e-inclusion where citizens can participate in government discourse without reference to their social or economic standing. Mashups (Web 2.0 technology) gathers information from different websites to form new consolidated content to help ease the sharing and utilisation of government data and services. Government 3.0 is enshrined upon the semantic Web technologies and Web 3.0 (semantic web) where computers can analyse information and understand its meaning. This type of government is demand-centric, thereby providing customised services to e-government consumers. Government 4.0 is the emerging mode of AI-enabled e-government that is focused on improved automation and intelligence in the governance business processes. The attainment of e-Government 4.0 with the help of a ubiquitous smart infrastructure enables personalised, easy access to government systems and data (Barcevičius et al. 2019).

Contemporary e-government designs are going to be ruled out all the way in incorporating AI-based technologies. To vie for increased efficiencies in the public sector, robo-advisors based on AI are used to provide advice to civil servants as they execute their duties, and public records are designed upon distributed ledgers of blockchains to ensure that they are secure, eavesdropping on them is minimised and that public information is encoded and coded using smart contracts (Engin & Treleaven 2019). Designs directed towards increased automation and intelligence are going to differ given differences in resource capacities in the area in which AI-augmented e-government is desired. It is therefore clear that a majority of developing countries stand to miss out on the AI-augmented e-government if design frameworks and models are not conceptualised as blueprints. At the moment, it can be posited that e-government is slowly lagging behind technological advancements. It is therefore important to explore design models and frameworks that can be used as blueprints in the development and deployment of e-government systems.

In deploying innovative technologies in public service delivery platforms, Herbert (2019) described the Haldrup's six-step decision-making process that needs to be followed regardless of the context in which the technology is to be deployed: (1) Clarification of the problems and evaluating the solutions – a clear understanding of the problem and need is the first step in determining whether a digital solution is needed or not. If the need is clearly established, the different potential solutions are evaluated given the context in which they

are to be applied and an optimal solution is chosen. (2) Need to gauge the overall interest in innovation – key stakeholders need to be adequately consulted to understand whether they are looking forward to having disruptive technologies deployed to improve the efficiency of the business processes in the organisation. If acceptable, buy-in is achieved, then the likelihood that the innovation will succeed is increased. (3) Clearly determine what needs to be digitised – right at the onset, there is a need to clearly determine what needs to be digitised. A phased and stepwise approach is usually followed when digitisation is being introduced. A wholesale approach where there is a mistaken approach of digitising all the services and business processes in the organisation will more likely culminate in failure. (4) Account for the existing institutions – failure to take into account the existing institutional risks may be a big oversight in as far as transitioning towards techno-savvy business processes is concerned. The gradual approach to dismantling the institutional structures is usually encouraged. If this is not done, ignored risks can culminate into huge negative costs for the company. (5) Analyse the political economy constraints – there is a need to consider the different dimensions of political economy such as legal framework and income to determine affordability for the usually costly AI infrastructure that needs to be erected to support AI aspirations. (6) Consider technical feasibility – by comparing the cost and anticipated benefits for deploying the desired technology innovation, one could get an overall picture of whether the investment is worthwhile. The technology solutions need to be evaluated based on the needed resources and their technical capabilities.

Artificial intelligence-augmented government

Artificial intelligence enables machines to sense information from different sources, make sense of the situation and context and act by choosing an optimal variant among many alternatives given earlier data used to train their line of reasoning (Alfred 2018). Artificial intelligence enables machines to learn using supervised, unsupervised or deep learning. Artificial intelligence allows the use of chat-bots as digital representatives in place of public officials as the ending point of public services. The degree to which machines mimic the behaviour of human beings in the public service delivery value chains demonstrates how well AI has been deployed in business processes (Engin & Treleaven 2019). Although many governments have pronounced their desire to transcend towards AI-augmented government, many countries still fall far behind with regard to realising the full potential of utilising AI in e-government systems.

Thanks to AI, machines can now collaborate with human beings and share work that was traditionally only performed by humans (Eggers, Schatsky &

Viechnicki 2019). Over the years, AI has advanced to such a point that AI-enabled algorithmic operations can help to play games, recognise faces, recognise and mimic speeches, learn and make informed decisions given the data they are subjected to (Eggers et al. 2019). There is no doubt that AI has continued to grow in terms of its adoption and use (Mehr 2017). Actualisation of AI-enabled government business processes is going to ameliorate major structural inefficiencies in public services. Although AI undergoes a great deal in mitigating corruption occurrences, it is not a panacea for rampant corruption problems in the public sector, no matter how well it might be developed (Mehr 2017).

Artificial intelligence is no longer in its nascent stage of development as it has been explored for more than five decades. However, its innovations and applications in different sectors of the economy are emerging only now (Berryhill et al. 2019). There is undoubted maturity in the field of AI, given that a lot of researchers and practitioners have been actively engaged in AI research producing critical knowledge, programming languages and models for the design and deployment of AI-specific applications (Engin & Treleaven 2019). In the past decade, there has been a huge intellectual capital of Free and Open Source Software, enabling a large segment of the developing world community to collaborate and share code innovations.

The design of AI-enabled government (AI-augmented government) needs to follow fundamental principles in the context in which AI-augmented government is desired. Some of these are as follows: ensure that citizen's input, even at the grassroots level, is considered to demystify unpalatable misconceptions of AI in government; ensure that the privacy dimensions of data and storage or sharing aspects are taken care of; instead of reinventing the wheel, the AI e-government system needs to be incrementally embedded or integrated onto the already-existing e-government system; mitigate catastrophic decision-making that can emanate from under-training of data for AI operations and ensure that the employees are not replaced from the different public service values chains but augmented (no wonder the term 'AI-augmented government'). Principally, AI-augmented government is achieved when there is increased automation and intelligence. For intelligence to be attained, machines need to learn by exposing them to different possible scenarios, mostly using rule-based algorithms (Wirtz & Weyerer 2019). Learning is driven by data and facilitated by machine learning and AI. Automation is driven by machines understanding the different processes that are involved in public services using RPA.

There are different AI scenarios and applications that can be customised according to e-government, including the following: large cloud-based network databases (creating an information repository that can be accessed ubiquitously), procedural (stepwise interlinked processes),

predictable scenarios (using historical data to model possible future scenarios) and big data (diverse and multi-dimensional data in large quantities) (Thapa 2019). For an AI innovation, the first step is data. Quality data are the key fuel for achieving excellence in AI. Effective machine learning happens when machines are trained using the right data inputs. Automation relies on good data and an effective ICT infrastructure. Putting in place a good ICT infrastructure may require a significant investment in support channels and platforms that would be able to sustain diverse technology applications and processes (Herbert 2019). Integration of heterogeneous data sources is cardinal for AI-based systems to achieve appropriate big data interoperability to make correct decisions (Mahmoud, Omar & Ouksel 2019). The data for training machines in the e-government realm need to come from the environment in which AI-enabled e-government is going to be implemented. This context-aware data need to depict the governance systems and data or information flow in the environment where process automation will take place. The government data value circle can help in understanding how public value can be obtained from government data and used in training AI applications (Van Ooijen, Ubaldi & Welby 2019).

Artificial intelligence in governance value chains has been used in facial recognition systems to identify the potential problematic behaviour among crowds (Basu & Hicko 2018). Currently, many governments around the world are employing AI in their public business processes. For example, Basu and Hicko (2018) investigated the practical penetration of AI-enabled e-government in India and found that most of the technology infrastructure investments are propagated by the private sector. Therefore, the private sector has greatly contributed to India's technological capability providing opportunities for citizens and businesses to readily and effectively access improved public services. Notwithstanding, India is busy developing technology capability by deploying speech or face recognition systems, robo cops and predictive analytics in different socio-economic sectors such as law enforcement, education and decision-making (Thapa 2019). Artificial intelligence was used in 2020 by Chinese officials to monitor the administration of the COVID-19 lockdown. Cameras were placed in geographically dispersed environments to understand the movement of areas and thereby enforce lockdown regulations. In the case of India, Predpol has been used to enforce predictive policing by employing advanced spatial analysis algorithms to identify upcoming hotspots for crime scenes (Basu & Hicko 2018). In order for India to jump onto the bandwagon of correctly designing AI-enabled e-government given its unique contextual setting, it has to understand the legal, ethical, bureaucratic hurdles, and the technological terrain in which it operates. In some of the Latin American countries, AI has been embedded into e-government systems to help uncover and combat corruption (Mehr 2017). Blockchain modules have been developed to track the management of different resources in the

government departments both at the unit or individual level (Thapa 2019). Therefore, AI has been used to detect fraud and misuse of financial resources or different government capabilities. In Mexico, the 'Towards AI Strategy' report provides the different strategic thrusts that pinpoint the commitment and desire for Mexico to combat corruption in different business processes. Some countries on the African continent have also jumped onto the bandwagon in as far as the use of AI in public service is concerned. For example, the South African Revenue Authority intends to use AI to track tax-compliance behaviour.

In order to effectively harness the opportunities brought about by increased usage of AI in core sectors of the economy, Africa needs to have a responsive and adaptive education system that can produce graduates endowed with key skills required to advance the developmental agenda, rapidly invest in broadband towards universal connectivity, explore the ethical dimensions of AI in service delivery to protect the indigenous culture and identity and facilitate data availability to researchers and developers so that they can develop AI applications commensurate with the local contextual settings (Access Partnership 2018). The aforementioned are some of the preliminary issues that need to be considered. There are still other embedded issues in Africa, which are context-specific and need to be investigated and incorporated into the design and implementation of AI applications. One such issue is the need to recalibrate the legal and regulatory frameworks to accommodate the emerging AI-enabled applications in different sectors of the economy.

Researchers and practitioners have proposed different frameworks to guide the development of an AI-augmented e-government (Wirtz & Weyerer 2019). Musha (2019) proposed an AI-based framework that can be used to automate e-government services. They also proposed a smart e-government platform architecture that is to be used as a blueprint for the design and implementation of contemporary e-government solutions motivated by advances in AI. The smart e-government platform architecture was based on the semantic web, autonomic computing (including a smart graphical user interface [GUI]) citizen's service layer, security layer and a functional layer), multi-agent systems and an array of AI techniques. Terzi et al. (2019) explored how the entry of blockchain and AI disrupted the traditional understanding of e-government. Designed using distributed ledger technology, blockchain allows the design of smart contracts providing automation and control flow logic (Thapa 2019). This enables multiple people to access the log files of the same file enabling public or private monitoring of trails on the actions performed. This enables accountability and transparency to be enforced. In government management systems, permissioned blockchains are desired where participants are controlled by a central authority (Terzi et al. 2019). The central authority ensures that there is security and sanity in the distributed system, especially with regard to private records.

Robotic process automation

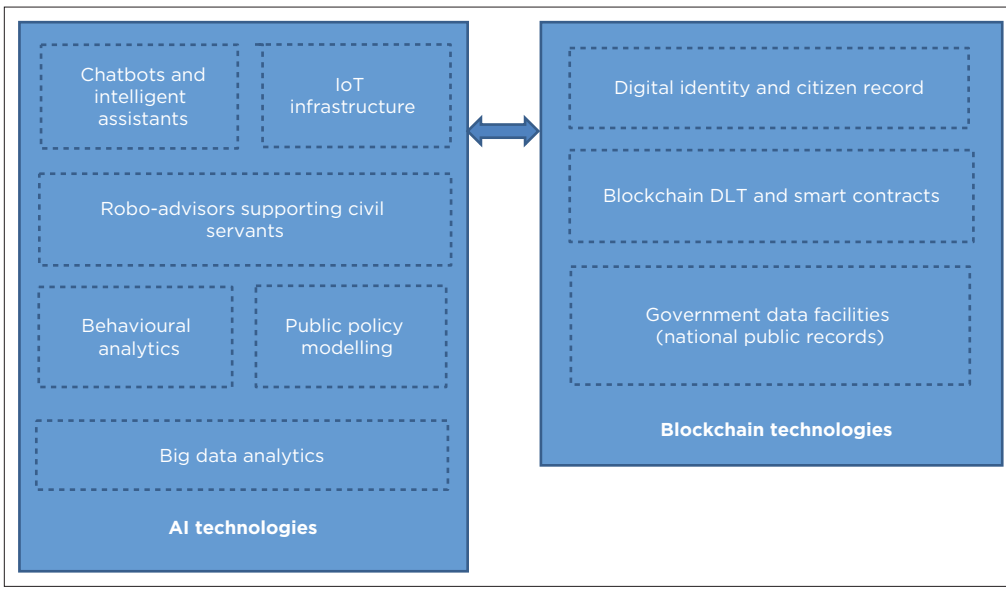
Robotic process automation is configurable software that is implemented to augment the existing IT infrastructure pulling data together, making important decisions and acting as an integration force for the existing applications. The RPA emerges from the understanding of a middle in distributed computing which is a software abstraction acting as a platform for the different applications in the network to execute different processes (Eggers et al. 2019). Robotic process automation brings in board automation and intelligence in different government business processes. In the distributed systems environment, RPA is designed and configured in such a way that it automatically executes public business processes following the set process steps and business rules and follows the same or enhanced cognitive intelligence that a human being follows. As espoused in the conceptual outlay of AI-augmented e-government, RPA is implemented to facilitate intelligence and automation in processes prone to higher human error rates, especially in repetitive processes (Engin & Treleaven 2019).

Robotic process automation is a technology innovation that allows the integration of automation in public business processes. Automation has progressed through different stages: The first was the era where machines replaced humans in doing manual tasks such as in factories and in farms when using farm machinery such as combine harvesters. The second was in routine and repetitive (mundane) tasks such as in clerical and knowledge-related work. The third delves towards replacing human beings in tasks that require human judgement and a high degree of intelligence. Robotic process automation is implemented in environments where processes are mundane and repetitive, involve repeated entering of data and are generally rules-based. Robotic process automation combines both hardware and software to create intelligible applications that can be used in the realm of e-government. Because of the promise that RPA brings onboard, it is now critical that organisations consider this technology to design context-specific applications (Madakam, Holmukhe & Jaiswal 2019). The focus of RPA is on the processes rather than on the data. Robotic process automation increases compliance to the set rules in the public sector business processes.

Currently, there are no standard operational models to guide the design and development of RP-based applications (Eggers et al. 2019). RPA innovations need to be designed and conceptualised based on the given context in which they are to be implemented (Madakam et al. 2019). The lack of a global automation model or framework helps in designing unique context-specific automatic processes. Thus, four options with overlapping characteristics exist: relieve – not necessarily resulting in retrenchments, some of the mundane and repetitive tasks are taken up by machines, thereby leaving

some time for workers to concentrate on some other aspects of their work; split up – this involves separation of work into two or more components where machines and humans make partnerships to execute the given work; replace – this involves full automation where the services of a human being are not necessarily needed because of the established automatic processes (Thapa 2019). The human being loses on the work as he or she outgrows his or her relevance – and augment – the automatic process adds to the overall capability of the e-government system where the capabilities of humans are complemented (Eggers et al. 2019).

In order to appropriately support the integration of AI into e-government, a requisite national physical IT infrastructure is desired (Wirtz & Weyerer 2019). A basic ICT infrastructure stack as proposed by Engin and Treleaven (2019) has been shown in Figure 2.1. Although this is not a comprehensive technology stack to achieve automation and intelligence in the e-government environment, it does articulate important aspects of some of the desired technologies. Artificial intelligence technologies enable machines to mimic the behaviour of human beings in the e-government environment. The key technologies and their corresponding high-level attributes are presented. The newer blockchain technologies are also included. Therefore, Figure 2.1 gives the basic technology attributes needed to achieve basic intelligence and ensure that there is accountability in the e-government environment. The proposed technological stack (Figure 2.2) gives a more comprehensive



Source: Engin and Treleaven (2019).

FIGURE 2.1: Technology stack for an algorithmic government.

technology stack to help achieve both intelligence and automation in the e-government environment. Figure 2.1 does not present technologies, such as RPA, needed to achieve automation in the e-government environment.

Wirtz and Weyerer (2019) explored the challenges that have slowed the integration of AI into e-government systems. The four key challenges that cannot be ignored when designing AI-enabled e-government systems include the following: AI technology implementation – this involves ensuring that all the different dimensions of AI implementation are met in an acceptable manner. This may include ensuring that AI safety is achieved; that is, AI-enabled applications are as safe as possible and provide a high level of reliability and availability (Eggers et al. 2019; Wirtz & Weyerer 2019). The AI application needs to be provided with the right data so that training can be properly conducted, thereby reducing the risk of making wrong decisions in critical situations where higher service quality levels are expected; AI law and regulations – it is not a hidden fact that as technologies evolve so should the legal and regulatory frameworks and policies that guide their integration into the different business processes. Implementation of AI-enabled e-government requires that issues such as privacy, safety, responsibility and accountability are addressed; AI ethics – involves the designing of AI-enabled applications and machines, artificial moral agents, that can think morally and be held responsible if the application does not behave ethically and AI society – careful consideration of what changes machines will bring about in the human society and should we deal with these changes.

It is clear that achieving the desired layer of automation cannot be done by one government unit alone. There is a need for a collaborative effort to ensure that all the competencies and AI investments are used to the full, to the benefit of the whole community (Eggers et al. 2019). The success of any automation programme requires that there is buy-in from the majority of the stakeholders. Each of the stakeholders needs to understand why the project is important and what benefits can be amassed if the programme were successful (Herbert 2019). If buy-in is achieved, the implementation of change management will not be difficult as is usually perceived. If the RPA processes are not designed in conformance with the existing rules, their implementation becomes problematic in any given environment. If possible, new rules and regulations can be put in place to accommodate an AI-augmented government (Alpers et al. 2019).

Literature has not clearly defined methodologies or frameworks for emerging models of e-government (Osman et al. 2019). Therefore, contemporary research needs to contribute to that discourse.

Methodology

This chapter is part of a larger study that was conducted to ascertain the readiness of e-government implementation in Zambia, looking at the multi-dimensional aspects of e-government development using multivariate analysis. The chapter explores one aspect of the larger study focusing on the future aspects of participants' responses. The larger part of the study acted as a point of departure for this particular chapter.

Methodological nuances of this study were hinged on longitudinal studies comprising two main parts: The first part of the study utilised sequential mixed methods allowing the research to take advantage of both intrepretivist and positivist research paradigms. To be included in the study, it was required that a participant has a basic understanding of what e-government entails, is at least 18 years old and is able to read and write. Participants were drawn from businesses and local individuals in Zambia. Out of a total of 720 questionnaires sent out, a total of 406 were returned for analysis. In addition, a total of 42 individuals working in government departments were interviewed in three towns of Zambia to principally obtain qualitative data to investigate the contextual nuances of e-government development and use in Zambia in depth. As a result, empirical data were obtained from both the demand and supply sides of e-government. The principal question aimed to probe the awareness of e-government and the challenges that influence adoption. The questionnaire, with both closed and open-ended questions, used to collect data was translated from English to two other main languages spoken in Zambia: Bemba and Nyanja. Many parts of the data collected were aggregated against the quantitative data obtained from publications and other publicly available documents in order to understand the whole story with regard to different aspects of the study.

To observe expected reliability and validity, the bivariate data were subjected to normality testing using multiple methods: Gaussian normal distribution, the Kolmogorov–Smirnov test and the Shapiro–Wilk test. The original data showed some skewness and negative values, and therefore, data transformation was performed using the natural logarithmic transformation method $\log_{10}(6-x)$ to remove the negative skewness. After transformation, normality was observed as a precursor for data reliability. To achieve validity of the data, sample adequacy was measured using the Kaiser–Meyer–Olkin test showing $\chi^2(66) = 2701.097$, $p < 0.001$ (level of significance at 0.005) with a value of 0.919. As shown in Table 2.1, the sample was adequate for achieving statistical validity.

Arranged in a correlation matrix ($\sum$) in correspondence with the covariance matrix, eigenvalues and eigenvectors were calculated to obtain the *j*th principal component. The eigenvectors account for the component factors determinable by the communalities to ascertain the factors that influence

TABLE 2.1: The Kaiser–Meyer–Olkin test and Bartlett's test.

Test item	Result
Kaiser–Meyer–Olkin measure of sampling adequacy	0.919
Bartlett's test of sphericity	–
Approximate chi-square	2701.097
Degrees of freedom	66
Significance	0.000

e-government development in Zambia. In order to obtain these factors, exploratory factor analysis (EFA) at a 0.005 level of significance with principal component analysis was performed using Promax with Kaiser normalisation. The EFA was performed iteratively: the first round with 15 factors extracted after 13 iterations using principal axis factoring as the extraction methodology; the second round, excluding two cases with low communalities (<0.3) and convergence after 19 iterations, 9 factors were extracted and the last round, 7 factors were extracted. Variance from the extracted communalities was not final as an additional statistical procedure was executed to obtain the R^2 values that give a more reliable degree of variance in the measured variables.

The second part of the study employed descriptive informetrics as a philosophical orientation enabling the possibility of bibliographically analysing publications from key researchers in the field as well as practitioners of note. A detailed thematic and descriptive bibliometric study was employed with searches conducted using Emerald, Scopus and Elsevier databases. Journals on the first and second tier of the Scimago list were particularly targeted as data sources. The search criteria were premised upon finding information on the implementation of different forms of e-government in developing countries paying particular attention to AI and augmented government. This was important to explore the development trajectory of this e-government given the emergence of AI utilisation in public business processes. The findings from this exploration were mapped against the earlier findings on the state of e-government development in Zambia to come up with a conceptual framework providing high-level non-functional requirements for robust AI-enabled e-government development.[3]

Analysis and implications

From the first part of the study, it is clear that e-government has not been developed to an appreciable extent in Zambia. The results of the multi-thronged study have shown that the ICT infrastructure has not been developed to support contemporary applications, thereby limiting the potential that

3. A comprehensive presentation of results from the first part of the study can be found at https://www.goodreads.com/book/show/18844110-e-government.

e-government has. For a long time, the national backbone ICT infrastructure has been underdeveloped because Zambia did not follow a multi-stakeholder approach to allow the private sector to be included in the development of the ICT infrastructure. The respondents also pointed to the fact that the implementation of e-government was done using a coordinated approach resulting in citizens and businesses not being aware that e-government is actually being implemented in Zambia. Although Zambia has enacted the *Computer misuse ad crimes Act of 2004*, people still feel unsafe to transact or access public services using online platforms. This has resulted in a significantly low number of people, including both government workers and potential e-government consumers, accessing e-government applications.

Other key findings from the first part of the study include the following: (1) A majority of respondents (72%) indicated that they have the requisite skills to thrive in the e-government environment and looked forward to accessing public service through online gadgets. About half of the respondents (49%) indicated that they have not heard of e-government being implemented in Zambia, although they are aware that the government has implemented ICTs to bring some level of efficiency in the internal business processes. (2) A significant number of respondents (84%) indicated that because of the lack of security policies in a few e-government platforms, they could not be comfortable sharing their personal information through e-government websites. (3) Over half of the respondents (50%) agreed that the lack of adequately developed ICT infrastructure has negatively affected the potential of e-government development in Zambia. A majority of the respondents agreed that there are some pockets of motivation for the government to utilise ICTs to improve its internal business processes and increase the time it takes to provide a service.

The above paints a clear picture that Zambia is still grappling with Government 1.0 and has an opportunity to innovate so as to subsequently move using a phased approach until Government 4.0 is achieved. The key advantage is that there is no need for radical institutional restructuring, but progressively developing ICT infrastructure and other prerequisites for advancement through the subsequent stages of e-government development would suffice. Technology innovation has advanced, providing opportunities to amass key benefits if applied in the public sector domain.

Figure 2.2 shows the proposed technology stack that will act as a blueprint in the design of AI-enabled e-government applications (Government 4.0). The figure was conceptualised upon the synthesis of information from the empirical study conducted and other sources identified in the second part of this study. It shows the key modules that need to be considered as high-level technology requirements. Six key modules have been proposed: robotic process modules

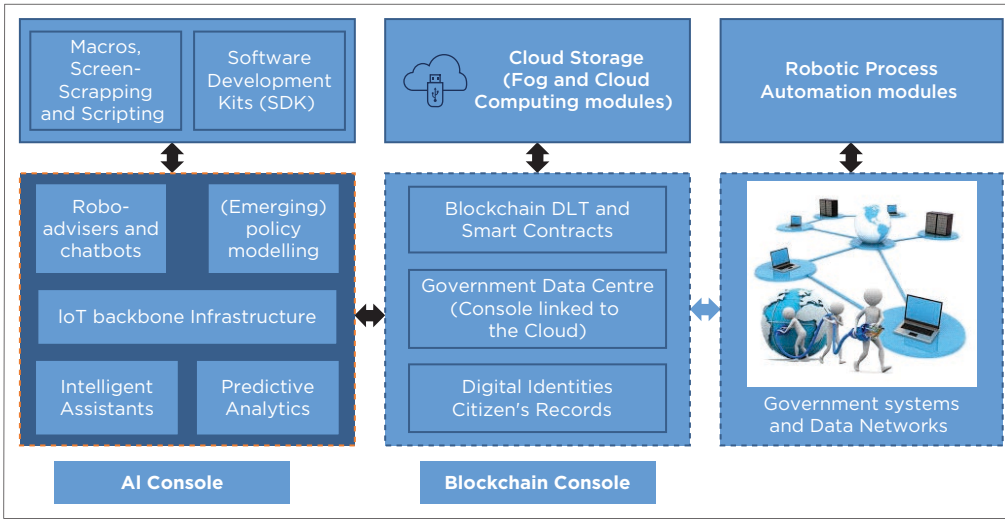


FIGURE 2.2: Proposed technology stack for designing artificial intelligence-augmented e-government.

are technology innovations that allow the automatic dispensation of public services; the cloud storage console allows heterogeneous applications to access the same data simultaneously in order for government departments to provide an instantaneous service; the AI console provides articulation of key technologies needed to achieve a good degree of intelligence in the e-government services; the blockchain module enables the e-government applications to work using open systems so that there is enforced accountability in the system and the Software Development Kit providing sharable application development modules for programmers and developers to develop and include the contextual characteristics.

The proposed framework enables developers of e-government solutions in Government 4.0 to consider the key technologies that need to be in place to amass the key benefits from e-government.

Conclusion

This chapter has explored the e-government development projectile given the rapid technology development and innovations. This research, employing a longitudinal paradigm, involves two phases, with the first phase involving the empirical orientation and the second phase involving the conceptual orientation after a detailed exploratory study. The results of the study have shown that there is immense potential in the emerging models of e-government which incorporate automation and intelligence as far as improving government business processes is concerned. It can thus be posited that developing world countries should consider implementing augmented government models.

This study has shown that a majority of people and businesses in Zambia are not aware of e-government being implemented in that country, and as a result, miss out on harnessing the benefits of e-government. Many respondents agree that if e-government were to be developed in Zambia to an appreciable extent, individual inclusion in governance processes would be achieved. The study further shows that there are not many e-government solutions deployed in public business processes, and therefore, Zambia misses out on anticipated e-government benefits. Many of the government systems are not integrated, and therefore, it is very difficult to maintain integrity in data. System integration is the first step to achieving intelligence and automation in governance systems.

There is still a long way to go for machines to be used in critical decision-making in the public sector because AI-enabled e-government is still in its nascent stage. A lot of work bordering on the design of e-government systems needs to be done to harness the whole range of benefits associated with e-government implementation. The design modules have been shown in Figure 2.2. This is the time for countries to conceptualise Government 4.0, given their contextual settings.

Chapter 3

Perception of robots in Kenya's infosphere: Tools or colleagues?

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Abstract

For many years, robots have worked autonomously in highly controlled environments away from human beings. With increasing advancements in robotics, there is a notable effort to transfer robots from isolation to workspaces shared with human beings. This has the potential to revolutionise the concept of work in the information sphere as we know it today. As engineers and programmers take care of technological and software issues, one overarching concern relates to how robots and human beings will relate to each other in the shared workspaces in the infosphere. This chapter explores attitudes and perceptions of information workers in Kenya towards robots in the information workspace. Two major questions are addressed in the chapter: Are robots considered as machines or

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colleagues by information professionals in Kenya? Are they pieces of equipment, or would they function as co-workers? This chapter is anchored on primary data obtained through key informant interviews with 20 information professionals in Kenya and secondary data from the literature review. The findings indicate that whereas information professionals in Kenya acknowledge the potential role of robots in handling the dirty, dangerous and dull elements of work in the infosphere, they consider them as machines incapable of relating to human workers as colleagues. Given that there are currently no collaborative robots in Kenya's infosphere, the views of the professionals interviewed are not based on practical or actual perceptions. Nonetheless, these views are strengthened through literature from situations where collaborative robots exist. This chapter prepares information professionals to accept and collaboratively work with robots.

Introduction

Robots are programmable and self-controlled machines that perform specific tasks. Historically, robots have worked largely in industrial settings, performing repetitive tasks that were considered unsafe or unbearable for human beings (Puigbò, Moulin-Frier & Verschure 2016). The idea of developing the first industrial robot was proposed by John Devol, an American scientist, in 1954. It was not until 1961 when Devol, teaming up with an engineer called Joseph Engelberger, advanced the idea and built the first robot called *Unimate* (Gasparetto & Scalera 2019). *Unimate*'s first installation was done at the General Motors factory in Trenton, United States, where it was used to extract parts from a die-casting machine. Since then, robots have grown in number, variety and sophistication. According to estimates by the International Federation of Robotics (IFR), about 3 053 000 robotic units are expected to be operational globally by 2020. Of these, about 1.9 million are expected to be in Asia and 611 700 units in Europe. About 74% of the world's robots are expected to be installed in five countries, namely, China, Japan, the United States, South Korea and Germany (IFR 2020). According to Chutel (2017), Africa is lagging behind the rest of the world in shipments of industrial robots. It is estimated that shipment to the continent accounted for only 1976 out of the 1153 160 units shipped worldwide between 2014 and 2019. Although the current number of robots in Africa is low, it is increasing and will inevitably grow in the future.

Historically, robots worked with speed and precision in controlled industrial environments away from human beings (Hayes & Scassellati 2013). Sarkar, Araiza-Illan and Eder (2017) explained that industrial robots worked in

isolation to ensure the safety of people in those spaces. The emerging trend, however, is to transfer robots from isolation to workspaces shared with human beings. Consequently, robots are lately finding their way into normal working spaces (Nikolaidis & Shah 2012; Sarkar et al. 2017; Sherwani, Asad & Ibrahim 2020). This category of robots that work in close proximity with human beings is generally described as collaborative robots. They work alongside human beings and share their workspaces. These robots are in constant and close physical contact with human beings on a day-to-day basis. It is estimated that about 4 million workers worldwide are already collaborating with robots as co-workers, and the number is bound to increase as more robots find their way into the human workspaces (Moniz 2013). Steil and Maier (2017) estimated that the number of robots used in the human workspaces would grow by 400 000 robots a year. Europe currently hosts 47% of collaborative robots globally (Sherwani et al. 2020). Kaplan (2015) argued that robots would soon have a dominant presence in the world of knowledge work, doing white-collar jobs. Robots are being increasingly moved away from performing mechanical tasks and are executing more cognitive assignments. Sherwani et al. (2020) opined that the number of collaborative robots has increased to meet the needs of the Fourth Industrial Revolution.

It is evident from the foregoing that collaborative robots, also known as co-bots, are a recent development. Therefore, there are several issues surrounding them which are still under research and innovation. Sherwani et al. (2020) argued that the focus of the majority of research initiatives on collaborative robots is the safety of their human colleagues. As more robots move away from confined to normal workspaces, humans are experiencing robotics technology at a new and different level. The new cyber–physical interactions have triggered new concerns, fears and questions in the workspace. How should human workers treat co-bots? Are they tools or colleagues? Are co-bots trustworthy? What would make co-bots more acceptable as colleagues? Would human co-workers feel safe working with co-bots? What makes co-bots likeable or unlikeable by their human colleagues? There is a need to think these issues through as more robots enter the workspaces. Given that it is unlikely that robots can no longer be kept away from the workspaces, it is prudent that conversations about these issues are conducted promptly, transparently and comprehensively. This chapter focuses on the perception of co-bots, as either tools or colleagues, by information professions. It is part of the ongoing conversations on how to improve the acceptability of co-bots in the information workspaces. A future is visualised where robots and humans will be inseparable in a concept known as symbiotic autonomy, where bots and humans cannot do without each other (Bollegala 2016; Brandom 2016).

Methodology

The study anchoring this chapter was qualitative. This research approach was considered suitable for this study because it enabled the author to understand the perception of co-bots from the perspectives of the respondents (Kahlke 2014). It also enabled the collection of more points of view than would be possible through other means. The research design used was an exploratory survey. This design was preferred because co-bots involve new technologies (Saunders, Lewis and Thornhill 2009). Similarly, it was also suitable because the purpose of this chapter was not to make concrete conclusions about co-bots in the workplace but to stimulate further conversations about the subject (Brown & Brown 2006).

The population of the study consisted of professional librarians and records managers in Kenya. The actual 20 participants were selected through information-oriented purposive sampling. Primary data were collected through telephonic interviews guided by a semi-structured interview schedule. The interviews sought answers for the following questions:

1. Are there any co-bots operating in the information workspaces in Kenya?
2. What is the perception of co-bots by information professionals in Kenya; are they tools or colleagues?
3. What are the potential roles of co-bots in Kenya's information workspaces?
4. What would it feel like for information professionals to work with a co-bot as a colleague?
5. What would be the potential reporting relationship between human information professionals and co-bots in their workspaces?
6. Would co-bots have any stakes and/or loyalties to the information profession or society?

Secondary data were obtained through documentary analysis. The data were analysed thematically.

Benefits of co-bots in the post-modern workspace

Murashov, Hearl and Howard (2016) explained that the distinguishing attribute of collaborative robots is that they are designed to work in close physical proximity to humans. Therefore, collaborative robots are much smaller compared to their industrial counterparts. They are more flexible and can move easily in ordinary workspaces performing a wide variety of tasks. According to Sherwani et al. (2020), one of the features that have been introduced to enhance the safety of co-bots is safety-rated stop monitoring. This feature enables a co-bot to instantly stop movement when it encounters a human in its line of duty or operational workspace. This is achieved through

a combination of sensors and detectors. Other safety features in co-bots include the use of gestures to reduce physical contact with people as well as restrictions on the amount of force and speed a co-bot can use in respect to the location of the human co-workers.

According to Sherwani et al. (2020:2), co-bots are needed in human workspaces 'because the strengths of humans are the weaknesses of robots and the other way around'. Thus, when humans are working with co-bots, they complement each other and produce better results than when working independently. Oistad et al. (2016) argued that as opposed to industrial robots that were perceived as replacing human labour, co-bots complement and leverage human labour. This is largely because co-bots assist their human co-workers by performing the dirty, dangerous or dull (3D) jobs. Beetz et al. (2015) concurred that co-bots can support their human colleagues by performing mundane and health-threatening tasks and producing superior results. Moniz (2013) also explained that human job profiles will improve when co-bots take up the dull, dirty and dangerous jobs from their human counterparts. Thus, working with co-bots facilitates the realisation of better health and increased safety of the human workforce, reduced operating costs, faster production cycles and reduced downtimes (Sherwani et al. 2020). Tingley (2017) further explained that co-bots have great potential because they are designed to be collaborative. This means that they do not take away anyone's job but work alongside them, performing shared duties to increase productivity and financial gain.

Flacco and DeLuca (2013) explained that society can get more benefits from the collaboration between robots and human beings in situations where the physical distance between the two is eliminated or reduced. Indeed, and as stated earlier, Sauppé and Mutlu (2015) asserted that collaborative robots are designed to work alongside humans. Eder, Harper and Leonards (2014:1) argued that co-bots have skills that complement those of their human counterparts, thereby making it easier for them to accomplish tasks that are 'frequently changing, varied or imprecise tasks, with strength, precision, endurance and limitless capacity for repetition'. Andersen, Solund and Hallam (2014) explained that one way of integrating robots in the human workspaces is designing them in such a way that instructing them will not require expert robotics skills. The need for expert skills in programming or reprogramming robots has limited their use in normal working spaces, including small and medium enterprises (SMEs). Agility in robotics can be achieved by shifting from robot programming (done by experts) to robot instruction (done by non-expert co-workers).

Collaborative robots offer increased productivity, flexibility, versatility and safety (Sherwani et al. 2020). According to Tingley (2017), co-bots have the potential to remove the boundaries between occupations for the genders.

For instance, female workers can collaborate with co-bots to perform tasks that generally require the muscle power of the male gender. Through this, even the most tedious of manufacturing jobs do not have to be sweaty and greasy.

Collaborative robots are already being used in myriad fields of work. They help in providing better medical services by supporting doctors to perform complex surgeries. In manufacturing, they perform innumerable tedious tasks such as picking, packing, welding, assembling and handling materials with precision (Sherwani et al. 2020). In homes, they perform tasks such as teaching children, giving company to the old, cooking and cleaning (Oistad et al. 2016). By performing these tasks alongside their human counterparts, collaborative robots fit well in the context of the Fourth Industrial Revolution (Industry 4.0), which is anchored on seamless cyber–physical interactions of people and things to ensure superior performance and productivity. Therefore, the growing ubiquity of connected things in the context of the IoT, for instance, is a significant driving force towards the realisation of Industry 4.0.

In spite of the benefits of co-bots, there are concerns about safety in the human–robot co-working environment (Hayes & Scassellati 2013; Sherwani et al. 2020). According to Solaiman (2017), there are some cases where robots have caused harm to humans. In fact, robots are known to have caused the deaths of many people worldwide. Alemzadeh et al. (2016) reported that between 2000 and 2013, at least 144 deaths and 1391 injuries were caused by robots in the United States alone. Although statistics from other countries are unclear, human deaths and injuries from robots are bound to increase with the growing ubiquity of robots in workspaces and homes. Eder et al. (2014) argued that one of the concerns hampering the realisation of appropriate safety measures in human–robot collaborative working is the lack of standards for safety assurance. Other concerns include fear of job losses (Burke et al. 2006; Holder 2018; Sherwani et al. 2020), augmented psycho-social stress levels for humans working in close proximity with robots (Romero et al. 2018), increased environmental degradation emanating from a growing number of machines and technological clutter in workspaces (Mercier-Laurent & Monsone 2019), potential errors and inaccuracies arising from the possible malfunctioning of robots as machines (Maggi et al. 2017) and intrusion of the privacy of humans by co-bots working in their spaces (Jain et al. 2018).

Co-bots in the infosphere

The infosphere is the world of data, information and knowledge, as well as the systems through which they are created, shared, used, stored and perpetuated. The term 'infosphere' was coined by Boulding (1970), who viewed it as one of the six spheres in his environment. The other spheres were the sociosphere, biosphere, hydrosphere, lithosphere and atmosphere. He claimed that each individual is a node connected to a network of 'inputs and outputs of

information' (Boulding 1970), symbols and language. He argued that the infosphere then consisted of 'inputs and outputs of conversation, books, television, radio, speeches, church services, classes, and lectures as well as information received from the physical world by personal observation' (Boulding 1970).

Floridi (1999:8) explained that the infosphere consists of a 'macrocosm of data, information, ideas, knowledge, beliefs, codified experiences, memories, images, artistic interpretations, and other mental creations'. Uschold et al. (2003:882) argued that the infosphere is 'a platform of protocols, processes and core services that permit stand-alone or web-based applications to submit, discover and share information over a network'. Floridi (2001) argued that the infosphere is not a geographical, social, political or linguistic space. Conversely, it is borderless and cuts across nations, cultures, religions or generations. Floridi (2008) argued that the infosphere provides access to the foundational information reality in the universe. People's access to the infosphere is mediated by their capacity to explore and discover it. Therefore, the infosphere may be perceived as unsettling or empowering depending on the individual's information-seeking behaviour and information-processing capacity. Ellis (2016) explained that the infosphere is a convergence of the traditional and emerging media. O'Hara (2012) argued that it is the complete information universe. This view echoes that of Vlahos (1998), who argued that the infosphere is a blend of culture and technology to create an information ecology in which people can meet and access information anywhere, anytime, much more than they do *in situ*. Floridi (2012) explained that the infosphere is a complex information environment consisting of both natural and artificial agents. The ideal infosphere should be safe, accessible and equitable to enhance information welfare (Kwanya, Stilwell & Underwood 2013). From the foregoing descriptions, the infosphere is created and sustained by dynamic, versatile and complex interactions between technology, people and objects in the physical world. The infosphere is the arena of Industry 4.0 in which the boundaries between the physical and cyber worlds are blurred. Co-bots are one exemplification of this complex interaction between things and people in the modern infosphere.

There is already a wide array of robots in the infosphere. In libraries, for instance, Phillips (2017) explained that robots are being used to unpack, sort and shelve books. Other tasks performed by robots in libraries include security, user support, conducting library tours, reading stories for children, cleaning library premises, assisting persons with disabilities and training of new users. Cotera (2018) argued that libraries are already using technologies such as augmented reality, virtual reality, immersive reality, sensory immersion, gesture recognition, humanoid robots, mobile app and gamification to transform the delivery and user experience with their services. According to Graham (2019), libraries can employ shelf-reading robots, telepresence robots, humanoid

robots and chat-bots. Examples of robots already being used in libraries include Apple's Siri, Amazon's Alexa, IBM's Watson, G4S's Bob and Aberystwyth University's Hugh, among many others. There are also several chat-bots supporting libraries globally to provide reference services, respond to user queries or provide user orientation. Tella (2020) explained that robots ease space constraints and make library materials easily accessible. The bulk of co-bots in the infosphere is likely to be used in libraries. Indeed, Frey and Osborne (2017) classified librarianship as one of the jobs at high risk of being automated through robots. This implies that in future more library jobs may be done by machines, including robots. However, Phillips (2017) pointed out that robots will not be the only technology that would threaten library jobs. Nearly all technologies through the generations have impacted library work. Librarians have always coped with these and found new ways to fit the emerging technologies into their work. Therefore, Tella (2020) observed that the use of robots in libraries will not necessarily lead to job losses because the machines will only complement the work of human librarians. Omame and Alex-Nmecha (2020) added that the use of AI in libraries would help the institutions to do more rather than taking away the jobs of human librarians. Chemulwo and Sirorei (2020) asserted that 'acceptance and integration of AI into library services is indeed possible and beneficial' (Chemulwo & Sirorei 2020).

The other function in the infosphere which is likely to host many co-bots is records management. Here, the use of robots is encapsulated in the concept of intelligent records management. According to Kim, An and Rieh (2017), intelligent records management involves the use of AI to enhance the identification, classification and general management of records. Dieden (2019) argued that AI can naturally pair with records management officers to enhance efficiency, speed, accuracy and streamlined processes involved in registries and at records centres. Robots can work as messengers delivering memos, scan paper documents, perform filing tasks with precision, attend to people seeking, retrieving or returning files from registries and generally move documents around records centres and offices. Robots can also lift bulky documents in records centres or warehouses and can withstand the health challenges associated with working in dusty spaces. This will enable organisations to reduce risks, improve productivity and maximise compliance. Intelligent records management functions may include automated classification of records, metadata management, use of machine learning to build relationships between records or documents, use of natural language processing in requesting for documents from machines or automating the capture of records and developing rules to automate repetitive tasks. Wilkins (2019) argued that intelligent records management has shifted the focus of the function from facilitating compliance to more strategic business roles, thereby bringing records managers to the 'table' of decision-making in organisations. Recognising the fact that seats at the decision-making table

are reserved for persons involved in driving the strategic mission and vision of the organisation, records managers can only find their way there by performing strategic rather than operational (routine) roles. In the emerging infosphere, therefore, co-bots are likely to take the routine and tedious tasks from records managers and thus free them so that they can be involved in strategic roles. Quackenbush (2019) predicted that records management will no longer be about controlled file rooms and registries. Conversely, it will be about asset management and value preservation. This will be achieved by using intelligent systems to enhance the usability of records. Quackenbush further explained that there is a lot of data which people are unable to identify, find or use. He asserted that the next generation of records managers must address this challenge using intelligent processes and tools.

The number of co-bots in the sub-Saharan infosphere is unknown, but it is generally perceived to be low. For instance, Odeyemi (2017) stated that libraries in Nigeria were yet to harness the potential of robotics in delivering services. This situation was attributed to poor funding, intermittent power supply and weak telecommunication infrastructure which constrain the use of advanced automation systems in academic libraries in the country. The Nigerian situation mirrors the scenario in many other sub-Saharan African countries, including Kenya, where no robots have been deployed in the infosphere. In sub-Saharan Africa, University of Pretoria's robot employee, known as Libby, seems to be the only and most prominent co-bot. Indeed, Thekiso (2019) argued that this was the first and only robot deployed in a university library in sub-Saharan Africa. Doyle (2019) explained that Libby gives answers to basic questions about the library; markets library services, products and events; and conducts user surveys, for instance, about the level of satisfaction of the users with the library services. In spite of the low number of known co-bots in sub-Saharan Africa's infosphere, there is great potential for these machines. It is therefore the right time to discuss issues around perceptions of co-bots and how they are likely to impact professional information work in the not so far future.

Robots in Kenya

Kenya is one of the countries in sub-Saharan Africa which are seeking to transform their economic sectors through innovative use of emerging technologies. After the hotly contested general and presidential elections in 2017, the government summarised its development targets in the 'Big 4' agenda. According to Kenya's Office of the President, the 'Big 4' agenda are development targets aimed at improving the national socio-economic status and well-being of the citizens by enhancing manufacturing, improving food security and nutrition, attaining universal healthcare coverage and providing affordable housing to the citizens (GOK 2017). The government is seeking to

mainstream the use of AI, machine learning and robotics in achieving the 'Big 4' agenda (Wasonga 2019). To this end, diverse efforts are being made by different government agencies to identify, acquire or develop and deploy various technologies to improve national productivity and service delivery.

Theuri (2020) reported that in the wake of the inadequacies in Kenya's health sector exposed by the COVID-19 pandemic, Mission Excellence Global Service Limited, a Kenyan firm, has partnered with an Indian company to develop a medical co-bot known as Robodoc which is capable of scanning temperature and pulse levels, as well as asking pre-programmed questions. The robot will use facial recognition so that once information is captured, it gets stored in the hospital management system for future reference. Theuri (2020) further reported that the robot will also be able to virtually connect to a doctor for patient consultation and printing of prescriptions. Robodoc will help in keeping front line doctors and nurses safe as they deal with COVID-19 infections. As of 11 July 2020, three health workers had succumbed to the pandemic.[4] Efforts to launch robots in the delivery of health services are likely to gather momentum in the wake of growing risk levels occasioned by infectious diseases such as COVID-19.

Little is known about the use of industrial and other robots in Kenya (Magachi, Gichunge & Senaji 2017). Nonetheless, anecdotal evidence points to basic robot use in the country. Examples are few, but the most recent was in October 2019 when robots were deployed by the Kenya Navy to help locate a car that had plunged into the ocean with a mother and her daughter. The Likoni channel in Mombasa, Kenya, which the car plunged into, proved too dangerous for divers to work unaided. Because of secrecy of defence matters, the type of robot or how it was actually used in this case remain unclear to the public. It is because of the lack of such information that authors like Wambugu (2019) opined that Kenya, just like many countries in sub-Saharan Africa, is far behind in embracing robots in its economic sectors. Currently, it seems the majority of robotic solutions lie in basic machines such as automated teller machines, traffic lights, smart security cameras and drones.

Magachi et al. (2017) investigated the likely contribution of industrial robots to the competitiveness of listed manufacturing companies in Kenya. They concluded that industrial robots are not economically viable and do not provide a realistic solution to securing the immediate competitiveness of manufacturing firms in Kenya. This conclusion was based on the understanding that Kenya's economy is characterised by low wages and a youthful population, unlike the case in developed countries. From the predictions by this study, it is unlikely that many manufacturing organisations will deploy robots in the short term. In spite of the low use of robotics in Kenya, there are already fears

4. See https//www.the-star.co.ke/news/world/2020-07-11-2-more-health-workers-succumb-to-virus-kmpdu/

that the increased use of these machines may lead to unprecedented job losses. This fear is based on the understanding that the price of robots is falling while labour costs are rising every year. Therefore, more companies are likely to resort to using more robotic than human labour in the long term. The challenges in the use of robots in Kenya are not limited to labour issues only. There are also consumer-related concerns. According to Koigi (2019), Kenyan bank customers prefer traditional services offered by humans to those offered by robots. Koigi reported that about 80% of bank customers in Kenya have not warmed up to the idea of robots handling their banking needs.

In spite of the challenges, Kenya stands a great chance of adopting emergent technologies like robots. Many developments in the country's technological landscape point to a higher potential uptake of advanced technologies. Already, Kenya is leading in digitalisation and is producing technological innovations which are creating an environment that is conducive for increased integration of co-bots (Root 2020). Kenya's capital, Nairobi, is considered the 'Silicon Savannah' because it is the home of globally celebrated technological innovations such as a mobile money transfer platform, M-pesa, among others. The ICT sector in the country is also well-developed. For instance, the country is reputed for having one of the best Internet connections in Africa because of the number of undersea cables which land in it. Kenya also boasts of the latest technologies in its economy. There is a dominant presence of multinational ICT companies, implying access to the latest technologies, a growing population of young people amenable to technological developments, a relatively well-educated population (adult literacy is about 78%) and a history of innovation. Nonetheless, digital connectivity is concentrated in the capital, Nairobi, and a host of other urban centres. Rural areas, where the majority of the populace lives, do not have adequate access to digital technologies.

Kwanya (2014) argued that the technological environment in Kenya is improving rapidly. The latest statistics from the Communication Authority of Kenya (CAK) (2020) indicate remarkable digital growth. The statistics from CAK (2020) show that as of 31 March 2020:

> [*T*]he number of active mobile subscriptions in the country stood at 55.2 million translating to mobile penetration of 116.1 percent. Similarly, the number of active registered mobile money subscriptions stood at 29.1 million while the number of active mobile money agents stood at 202,102. Total undersea bandwidth capacity leased in the country increased by 14.1 percent to stand at 7,123.36 Gbps from 6,241.84 Gbps recorded in quarter two. EASSy cable lit capacity by 5x100G + 38x10G activations, hence the increase in total lit capacity. (p. 22)

Nitsche (2019) argued that Kenya has one of the best innovation ecosystems in sub-Saharan Africa, with home-grown success stories driving the adoption of emergent technologies. She further explained that increased access to e-citizenship services, super-fast Internet speeds and home-grown digital

innovations have made Kenya a digital first society. Mputhia (2019) explained that the selection of Kenya to host the World AI Show in 2019 was an indication that the country is likely to be a major robotics destination in the near future.

Tools or colleagues?

Borrowing from the words of Ezer (2008), this chapter addresses pressing questions regarding the nature of co-bot and human relationships in the workplace. Can co-bots be considered as colleagues, teammates, friends or merely as appliances and tools? According to Sauppé and Mutlu (2015), co-bots are more than physical machines because they are also considered as social entities to which attributes such as personality, feelings and gender are ascribed. In fact, Solaiman (2017) suggested that co-bots should be accorded the status of legal persons capable of suing or being sued. It is therefore not surprising that, as reported by Mputhia (2019), a humanoid known as Sophia was given Saudi Arabian citizenship in 2017. Beck (2016) also argued that giving co-bots the status of a legal resident would enable them to be held responsible for their actions and decisions. Furthermore, as legal residents, it may be possible to implement what Bartneck, Reichenbach and Carpenter (2006) suggested earlier, that co-bots should be paid wages for work done. Mputhia (2019) argued that one of the issues being discussed is whether co-bots, as legal residents, can also enjoy intellectual property rights such as patents. Can co-bots be recognised as inventors and awarded patent certificates? If co-bots can be recognised as creators of original works, can they also infringe intellectual property rights? Opinions on these questions and concerns from Kenyan information professionals are presented and discussed further.

Co-bots in Kenya's infosphere

From interviews conducted with information professionals in Kenya, it emerged that there were no co-bots in information and knowledge centres in Kenya. Asked about when co-bots, including co-bots, may be expected in Kenyan information spaces, the information professionals had varied opinions on the timelines. However, there was consensus among them that there are unlikely to be any co-bots in information workspaces in Kenya in the next five years because no institution is known to have included the purchase of such machines in their current strategic plans, which ordinarily run for a minimum of three years and a maximum of five years. Knowing the adventurous spirit of Kenyan innovators, as reported earlier, it is possible that there may be some provisions for co-bots in librarianship or records management roles in the next cycle of the strategic planning process. One respondent stated:

> 'It is not possible to accurately predict when we will have co-bots in our workspaces. Think about the past ten years. Is there anything so remarkable that has happened since then? Since 2010, what life changing occurrences have come to pass in information management professional practice? There may be few basic co-bots in the next five to ten years.' (IP20, age undisclosed, 2020)

Perception of co-bots by information professionals in Kenya

On matters related to perception, information professionals in Kenya hold the view that co-bots are machines and therefore cannot be treated as legal or artificial persons. They explained that there is a clear distinction between the co-bots and the human information workers. In their view, this distinction is so clear that co-bots can only be considered as tools that human information professionals use to perform selected tasks. As tools, co-bots do not and cannot enjoy any rights reserved for humans. For instance, tools cannot innovate and therefore cannot be rewarded or recognised for performing what they are programmed to do. The information professionals in Kenya wondered how a co-bot that is patented to an innovator can also claim intellectual property rights, including patents. They concluded that this is illogical and impractical. They also explained that co-bots, as artificial entities with no personal needs, do not need wealth or favour. They are tools purchased by owners to perform specific tasks; they have no needs in and of themselves. For instance, they have no families to take care of or children to take to school. They do not need housing, food or clothing as human workers do. Similarly, they have no descendants to save inheritance for. Therefore, they do not need and are unlikely to appreciate any form of remuneration.

The perceptions of co-bots by Kenyan information professionals concur with those found in the literature. Hug (2019) argued that the perception of co-bots as artificial companions as opposed to automated tools plays a significant role in increasing the acceptance of co-bots as work colleagues. Dautenhahn et al. (2005) conducted a study on the acceptance of co-bots and found that many people would hesitate to accept co-bots as colleagues. They explained that co-bots cannot be relied on to perform tasks alongside human beings because they are perceived as dangerous and unpredictable. Khan (1998) conducted a study in Sweden to identify the roles people were willing to assign to collaborative co-bots. Most of the participants in the study stated that they would assign mechanical duties such as cleaning or moving heavy things to co-bots. However, they would not trust a co-bot to watch over a baby (or pet), read aloud, cook food or take care of kitchen goods. Dautenhahn (2007) explained that these reservations about the roles humans are willing to assign to co-bots emerge from the perception that regardless of their level of intelligence, co-bots are not people.

Given that the use of co-bots is inevitable in the infosphere in Kenya and other developing countries, there is a need for strategies to increase their acceptance by human professionals. While promoting co-bots, there is a need to understand the factors that influence humans to accept them. Ezer (2008) explained that younger people are likely to view co-bots as colleagues, while the older people are likely to view them merely as machines regardless of the functions they perform. Ezer suggested that the level of experience with technology also pre-disposes people to perceive co-bots positively. Therefore, tech-savvy individuals are likely to accept co-bots as colleagues compared to those who are less tech-savvy. There is also a gender angle to co-bot acceptance. Bartneck et al. (2007) argued that women with appropriate exposure to co-bots typically have a very accepting attitude towards co-bots as compared to men. It seems, therefore, that introducing co-bots successfully in human information workspaces in Kenya will be easier if young and tech-savvy women are involved as frontrunners in their organisations. Recognising the fact that most information workers in Kenya, particularly librarians, are women (Kwanya, Kibe & Owiti 2016), it is likely that the negative perception regarding co-bots will change positively in the future as more human workers deal with them practically.

Perceptions of job roles of co-bots

Information professionals in Kenya acknowledge the need for co-bots to enhance their productivity and efficiency in service delivery. They, however, asserted that co-bots in the information workspace are supposed to take up the dirty and dangerous tasks from human professionals so as to free them to concentrate on more strategic roles. They explained that they (humans) do not expect to sit down with co-bots to develop strategic plans, resource mobilisation strategies or budgets for their functional units. They argued that however intelligent a co-bot is, it cannot demonstrate the human thought process and discretion in handling work apart from routine assignments. This upholds the perception of co-bots as machines operated by humans, albeit in varying degrees, to make the work assigned to the latter easier. They reasoned that co-bots are expected to help humans and not vice versa. They also said that now the priority in Kenya is not to concentrate on complicated co-bots but opt for basic co-bots to help human workers with labour-intensive tasks. This opinion from one respondent is summarised in the following verbatim statement from one respondent:

> 'What we need now in Kenya are not co-bots which will require us to consider them as colleagues entitled to human and other rights. We need basic machines which we can use to make our work easier and efficient.' (IP9, age undisclosed, 2020)

Asked about whether they would be comfortable interacting with co-bots in their workspaces, information professionals in Kenya explained that they

would be comfortable as long as their safety is assured. They added, however, that they would not trust a co-bot completely. These views mirror those prevalent in literature. For instance, Nomura, Kanda and Suzuki (2006) investigated the feelings of Japanese university students towards co-bots. They found that all the students expressed anxiety, nervousness, helplessness and fear when they imagined having co-bots in their everyday life. The anxiety revolved around the perceived unpredictability of co-bots in their interactions with humans. Other causes of anxiety included the perceived extent of trouble or damage co-bots can cause, lack of complete reliability in the practical aspects of human life and their inadequacies in the social realms of human interaction. This level of anxiety determines the degree to which individuals would welcome co-bots to their personal, social or work spaces. Some verbatim responses from the information professionals in Kenya in this regard are hereunder:

> 'Can you imagine what would happen if the co-bot "runs mad" and fails to take instructions? The damage can be enormous.' (IP19, age undisclosed, 2020)

> 'As long as my safety is assured, I would not mind working closely with a co-bot. The only concern is that, unlike human colleagues, they have no moral judgment and can hurt people unintentionally.' (IP11, age undisclosed, 2020)

> 'Co-bots in the office cannot keep secrets as human colleagues do. I would not feel free with them knowing that co-bots can report all the secret happenings in the office and thereby put my job at risk.' (IP13, age undisclosed, 2020)

Kaplan (2004) explained that some people fear working with co-bots because they exist in the blurred distinguishing line between nature and culture. He opined that co-bots that resemble humans too closely might be terrifying. In fact, DiSalvo et al. (2002) suggested that as co-bots become more humanlike, their acceptance increases up to a critical point – also known as an uncanny valley – beyond which they instil fear, discomfort and uncertainty around them. This view is supported in a study by Dautenhahn et al. (2005), who found that many people would like to communicate with co-bots in a humanlike manner, but they do not want co-bots that look like them. Tingley (2017) explained that people's affinity for co-bots increases as they become more humanlike. However, the affinity plunges when the human-likeness becomes similar enough to fool the eye. Once this illusion is discovered, affinity plunges and is replaced with unease. Tingley argued that this unease is likely to affect the future use of co-bots in ordinary workspaces.

Another concern about the deployment of co-bots in ordinary workspaces is the fear of job losses. Information professionals in Kenya share this fear and explain that the use of co-bots will reduce job opportunities for human professionals. This view is in tandem with that of Acemoglu and Restrepo (2020), who explained that increased use of co-bots may reduce employability and wages of human workers. Furthermore, Phillips (2017) claimed that people

fear that co-bots may increase in number and knowledge to the extent that they may overtake and destroy humanity.

Co-bots are cold and dull to work with

Information professionals in Kenya also raised a concern about the possible impact of co-bots on the personality and behaviour of their human colleagues. They said that humans working with co-bots are likely to become as 'cold' as co-bots themselves. This view concurs with that of Savela, Turja and Oksanen (2018), who argued that increasing the deployment of co-bots in the workplace may lead to reduced interactions between human workers. According to Sauppé and Mutlu (2015), collaborative co-bots may be disruptive to the social environment in which humans work. They are aliens with no capacity to feel like humans. It is difficult to relate to them beyond job-related tasks. Workspaces are more than the spaces in which work happens. They are also spaces where co-workers interact and relate socially. A co-bot cannot crack jokes or carry lunch to share in the departmental potluck. It is just a piece of cold metal, plastics and wires. Their participation in the making of conducive work environments is limited. For instance, colleagues sometimes tell stories as they work. Many co-bots cannot multitask in this manner and are therefore dull to work with.

Information professionals in Kenya are also worried that they may not know what to do if something goes wrong with their co-bot. There are also fears that the co-bot may make mistakes when not being watched. Therefore, having a co-bot in the workplace is an additional responsibility for their human colleagues who have to keep checking on them as if they were little children. It is in this perspective that Solaiman (2017) argued that the risks associated with an increased presence of co-bots in the workspace call for careful consideration of the vulnerabilities of their human companions. Hereunder are some verbatim statements of the interviewed information professionals in Kenya about having to work closely with co-bots:

> 'Having a co-bot in the workspace is like working on two jobs at the same time since watching on the co-bot is another fulltime job besides your own. You take your eyes off it and you end up with myriad mistakes which may require repeating jobs or staring at life-threatening safety issues.' (IP12, age undisclosed, 2020)

> 'How can a co-bot be a colleague yet it cannot borrow your car, contribute in a fundraising, help you to mourn a family member or share a social drink after work?' (IP7, age undisclosed, 2020)

> 'The office workspace is more social than technological. There is more to being a colleague than mere physical proximity. It will be difficult for a co-bot, which is a machine without emotional intelligence, to fit in.' (IP3, age undisclosed, 2020)

> 'Working with co-bots will change our personality. We will become as cold as they are aster working constantly with them in our offices. This is not something we can look forward to.' (IP5, age undisclosed, 2020)

Job responsibilities and reporting structures between co-bots and human workers

Opinions in literature converge on the understanding that co-bots work with some degree of independence. Therefore, they do not necessarily require to be operated by humans. Consequently, in a work environment, both co-bots and humans are ideally assigned roles and responsibilities that they perform alongside each other. To this extent, they are not mere products or appliances. Conversely, they are employees in their own rights. The only difference between them and their human counterparts is the fact that they are intelligent machines. Thus, as Bartneck, Reichenbach and Carpenter (2006) argue, co-bots, just like their human counterparts, should be praised or punished depending on their performance. Working independently of each other mirrors the normal human working associations where employees consider each other as co-workers or colleagues. Co-bots are engaged in workspaces as employees and not just as tools. Under these circumstances, humans can reasonably consider them as colleagues. Information professionals in Kenya concurred with most of the views above. However, they argued that co-bots cannot work independently without human involvement. A human being will still need to switch them on, change or charge their batteries, give them instructions and otherwise maintain them. The fact that co-bots are not equal to humans in intelligence and problem-solving means that there is a very rare possibility that they will meaningfully be considered as colleagues by human workers.

Asked whether they would accept a co-bot supervisor, the information professionals responded with an emphatic no. They explained that given the fact that co-bots are machines, there is no way they can be considered superior to human workers to the extent that they can supervise them. Although Oistad et al. (2016) argued that hierarchy might disappear when humans and co-bots work together as colleagues, Ezer (2008) was of the view that human beings often consider co-bots as playing a supportive role. Therefore, Ezer further argued that co-bots cannot be considered to be at par with their human counterparts, leave alone supervising them. Co-bots are only helping humans to perform tasks that are arguably not their own; they are essentially assistants to human workers. Some verbatim responses in this regard from the information professionals interviewed are as follows:

> ‘Co-bots will expose inefficiencies of human workers. I will most likely make more mistakes than they do while performing the same or similar tasks. I don’t think my job will be safe in the presence of a co-bot.’ (IP15, age undisclosed, 2020)

> ‘Human beings are superior intellectually to machines. Therefore, it is illogical to think of having a co-bot to supervise a human being. If the co-bot and the human being have to be at par, then the co-bot should be given its own assignments while the human beings also do theirs. The results can be integrated into one process

> in such a way that neither the co-bot or human takes instructions from the other.' (IP11, age undisclosed, 2020)
>
> 'The reporting structure between co-bots and human workers should be pretty obvious. The human being is definitely the boss. Co-bots cannot work at the same level with human beings leave alone supervising them.' (IP17, age undisclosed, 2020)

Co-bots have no stake or loyalty to employing institutions and society

Data from interviews with information professionals in Kenya as well as from literature point to an apparent reluctance by humans to accept co-bots as colleagues in information workspaces. They do not foresee a future in which co-bots can be treated as legal residents with obligations, needs and rights similar to human beings. This is partly because co-bots have no stake in the institutions they 'work' in. They do not care whether the company is making losses or profits. In fact, they have no clue about such issues. Thus, they do not depend on the employer or the job for their survival or well-being. They can be purchased by another employer any time and would owe nothing to their original owners. Similarly, they cannot share in the needs, concerns or fears of the people who work with them. They have no feelings of friendships, loyalty or hate. They have no ambition, dreams or fears. While these attributes may be the same ones that make co-bots perform better and consistently, the same make human workers unwelcoming to them. Therefore, the end of the debate on whether humans ought to treat co-bots the same way they treat their human colleagues is not in sight. As has been explained, there are advantages and disadvantages in either approach.

Conclusion

It is evident from the foregoing discussion that co-bots are increasingly being introduced in the normal workspaces. The infosphere, just like the other spheres, will soon witness a dominant presence of co-bots. Many people are still uneasy about working with robots as colleagues. The factors influencing this unease include fear of job losses, safety concerns about working in close physical proximity with robotic machines, lack of trust in co-bots to perform duties alongside humans without having to be operated and ethical issues about 'who' robots are or can be. As Kenya makes progress towards the Fourth Industrial Revolution, it cannot avoid conversations about opening up the workspaces for robots to increase the productivity of its economic sectors. Therefore, there is a need for research and evidence-based discussions regarding the place of robots in the modern workplace.

There is a need to sensitise information professionals in Kenya about co-bots and how they can be used in the infosphere to transform service delivery. There is also a need to assure information professionals that the main objective of introducing co-bots in the infosphere is not to replace human labour. As already explained, co-bots augment human labour to create better results and productivity. It is in the interest of human workers to embrace co-bots and work together with them to enhance their individual and corporate performance. The socio-economic environment in the Fourth Industrial Revolution will be so complex and competitive that human labour alone will not be sustainable. This sensitisation may be done in terms of research, awareness creation and demonstrations of what co-bots can do as well as what it means for the human information professionals to work with them.

For co-bots to be accepted as colleagues by information professionals, there is also a need to assure the human workers that robots can be team members. As suggested by Nikolaidis and Shah (2012), co-bots and their collaborating human colleagues should execute tasks in the same way using a similar mental model of execution to work effectively as a team. Andersen et al. (2016) also suggested that both humans and their co-bots need training on how to collaborate effectively in performing their duties. Another issue that needs to be addressed, according to Alemzadeh et al. (2016), is difficulty in skills transfer between robots and human beings. Better collaboration will be achieved if there are mechanisms for robots and human colleagues to share skills that are essential for their collective work during task execution through social learning. Similarly, emotional intelligence is critical for robots to join and belong to work teams with humans. Other requisites include intention recognition (requires synchronised communication enabling the establishment of expectations); sharing of roles, responsibilities and tasks; defining how to handle unfulfilled commitments or varied delivery timelines and mechanisms to handle co-worker disengagement or poor performance (Hayes & Scassellati 2013).

Co-bots and their human counterparts also need to develop a working relationship to be able to operate together effectively. This relationship can be built and sustained by mutual trust between the co-bots and their human colleagues. Sarkar et al. (2017) explained that there is a need for trust between human workers and their co-bots for effective collaboration. The authors emphasised that achieving trust is one means of ensuring acceptance of robots as co-workers by humans. This will ultimately pave the way for their widespread adoption in workspaces of the future. Trust enhances collaboration, decision-making, dependability, credibility and general acceptance. Bollegala (2016) argued that technical possibilities should not be the only considerations in robot design and deployment. Ethical, moral and social issues must also be considered. Acceptance of technology is an important element

of technological feasibility. Oistad et al. (2016) suggested that workers would like co-bots to be anthropomorphic, social and interactive. Co-bots that look and behave like humans have the potential to be liked more and welcomed by human colleagues than mechanical robots. The more similar they look and behave like humans, the better the attitude of humans towards them in terms of cooperation, openness and interaction. Mechanical robots are more likely to be viewed as tools than as colleagues.

There are no co-bots in the Kenyan infosphere at the moment. Therefore, the primary data presented and discussed in this chapter are not entirely based on actual reality but on future possibilities. The perceptions of co-bots expressed here may change when the information professionals interact with them in real life. Again, relying on the views of only 20 information professionals, as key informants, may not be representative of the views of all the other workers in the Kenyan infosphere. In spite of these limitations, the views in this chapter have been strengthened by anchoring the same on literature from environments in which co-bots already exist. It is unlikely, therefore, that the views and experiences of Kenya's information professionals would be remarkably different from the others in different national environments. This chapter, therefore, provides arguments that can reliably shape discussions on the future perceptions of co-bots in Kenya's infosphere.

Chapter 4

Information ethics: From professional ethics to social ethics. How my thoughts evolved over the years – A narrative

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Abstract

This chapter offers a retrospective narrative of the author's evolving approach to information ethics, with particular emphasis on key moments, ideas and individuals who challenged his thinking and informed his approach throughout his career. The content of the chapter is based on the author's recollection of events that influenced his intellectual and professional framework as a scholar

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of information ethics. It discusses and analyses the ideas and concepts from a number of popular and scholarly publications that were especially impactful. The narrative recounts these moments in chronological order. The author confirms that while the basic foundation of his approach to information ethics is largely intact, he has been able to expand his understanding and acknowledges the role of intellectual contributions by individuals from within and outside of his discipline in this process. This chapter presents the first-person account of a noted international scholar and pioneer in the field of information ethics in South Africa. It offers a look into the intellectual evolution of an information professional and provides insight into relevant issues of the digital age.

Introduction

My teaching of information ethics at the University of Pretoria was initiated in 1990 when my then department head, Hans Boon, returned from a conference where information law was one of the topics discussed. I recall how he stopped by my office and suggested that, based on my background in theology, I should consider developing information ethics as an area of teaching and research in the department. Professor Boon's brief visit was fortuitous, and one might even argue that it introduced the field of study in information ethics as a discipline in South Africa. I enthusiastically embraced this new and exciting challenge and began with a literature review to gain a better understanding of ethics as a branch of philosophy (specifically professional ethics) and the main published contributions to the field of information ethics in relation to librarianship, media studies and computer science. What I discovered at the time was that it was a relatively new and evolving field that was just gaining momentum. Furthermore, it was mainly dominated by prominent European and North American scholars including Bob Hauptman, Rafael Capurro, Thomas Froehlich and Debra Johnson. Very little had been published in South Africa or Africa that I could lay my hands on. The only meaningful research I uncovered was Johan Bekker's 1976 doctoral thesis on library deontology. He later became the head of the Department of Library and Information Science (LIS) at the University of South Africa.

Initially, I approached information ethics as a form of professional ethics focusing on librarians and other related information professionals. I mainly emphasised ethical issues pertaining to the life cycle of information, in particular, the gathering, organising, storage and retrieval of information on behalf of an information user. Based on the Shannon and Weaver (1949) theory of communication, I purposefully excluded the generation of information (what is created), as well as its use (what an end-user does with the information). At the time, my thinking was that information ethics that is broadly defined would become the 'ethics of everything', which, looking back,

was indeed what happened as my thoughts and relevant technology evolved over time (I will explain this in more detail later in the narrative).

I further demarcated the field of study to ethical issues pertaining to the right of privacy of information users, access and accessibility of information, property rights and ownership and the accuracy and quality of information products and services delivered to end-users. In most literature, this is known as the Privacy, Access, Property and Accuracy (PAPA) model of information ethics (Mason 1986). As more of a pragmatist, I have always advocated for the rule-utilitarian approach in ethical reasoning, which is based on norms and values (the rules that guide action), but also allows for the consideration of situational context and possible outcomes in making ethical decisions. Professor Boon's knock on my door opened up the opportunity to explore, develop and establish the field of information ethics in South Africa based on this initial understanding. But a lot has changed since 1990, not only in terms of IT and the information-based professions but also in terms of my own thought processes.

Explaining the narrative

In the retrospective narrative that follows, I link several key moments from the past three decades when my thoughts about information ethics solidified, shifted and evolved. The following sections are mainly structured around influential readings and individuals that I encountered during this time. The chapter begins with an overview of how my thoughts about information were reshaped upon meeting Tertuis Geldenhuys in 1992; I more or less use the same information model that I developed around that time, even today. The next key moment was in 1997 when I was introduced to an article on the new information economy and the economics of information by Philip Evans and Thomas S. Wurster. Not only did I learn more about the global information economy from their article, but it also encouraged me to think about information ethics beyond professional considerations. Information ethics is also related to social issues, and this insight directly influenced my own work on information poverty and social justice.

The year 2003 brought another key moment when I encountered the work of the Dutch philosopher Jos De Mul. In particular, his argument on the impact of photography on our understanding and perception of reality and the truth made me rethink and expand my thoughts about the 'truth' (things as they are and how they are presented to us), 'fake truths' and a 'right to the truth'. The next key moment was in 2012 when I read *Makers: The New Industrial Revolution* by Chris Anderson. I came to understand more about the uses and ethical implications of 3D printing – specifically, how this technology redefines the notion of access to information. The final key moment recalls my introduction to big data and predictive analytics in 2013 upon reading *Big Data:*

A Revolution that Will Transform How We Live, Work, and Think by Viktor Mayer-Schonberger and Kenneth Cukier. Big data and predictive analytics bring up new and vexing ethical questions, especially around the issues of access, privacy and security. I conclude this narrative by looking ahead to what the next stages in my thought evolution might bring.

Moment 1: Everything *is* information

When I began developing my approach to information ethics in 1990, I did not pay much attention to the notion of information. I used a very traditional working definition that views information as processed data and knowledge as information that is put to use. This changed in 1992 when I met Tertuis Geldenhuys, at the time a lecturer at the University of South Africa's Faculty of Law. He was busy with his doctoral studies on the legal protection of information, and I was deeply impressed with his etymological approach to the study of information, which was mainly based on the works of Aristotle and Plato. Geldenhuys's work referenced the notions of *typo* [form] and *morphe* [to give form to], as well as Plato's well-known analogy of the cave, the fire and the shadows used to explain the limitations of our human senses and our inability to 'see' the real world [*eidea*]. One of my biggest takeaways at the time was that information cannot stand alone and always refers to something – be it a concrete object or an idea. We extract information from these 'somethings' by means of our senses, and once processed by our brain, we apply meaning to what we have perceived. This then becomes knowledge. Therefore, for most humans, the world only exists based on the means of information about the world. In other words, we live in an information-based world where everything *is* information.

These insights led me to the work of the German philosopher Karl Popper, which further influenced my view of an information-based world. He argued that the world consists of three parts: reality or objects in the world (the first world as the primary carrier of information), reality or objects in the world as experienced by a person (subjective idea and the source of human knowledge – the second world) and the presentation (objectification) of reality or objects in the world by means of human symbols, including language and artefacts such as paintings and manuscripts – the third world (Popper 1972). This understanding of information led me then, in accordance with Geldenhuys, to identify three main characteristics of information that have a direct bearing on the understanding of the ethical issues related to information and its use, which I continue to use to explain ever-evolving information ethics issues.

The first characteristic is what I called the *object-connectedness* of information. It corresponds to what Geldenhuys (1993) referenced as the subject-connectedness of information and is based on the view that information does not exist on its own and has no meaning in itself – it always

refers to something. This implies that even when information about an object is unbundled from the object to which it refers, the unbundled information will always have a bearing on the object from which it was unbundled. This characteristic of information has some important implications. The first is that information is inexhaustible. By this, I mean that it is, at least in theory, possible to unbundle unlimited amounts of information from a specific object without exhausting the object or the information that pertains to the object. For example, a thousand people can look ('look' in this context means the unbundling of information through the senses) at a tree (an object in reality) without depleting either the tree or the information about the tree. Secondly, information is not only inexhaustible, but, in a certain sense, it is indestructible. When an object is physically destroyed, it does not necessarily mean that the information about the object has also been destroyed. To use the same example, the tree can be destroyed, but the information unbundled from the tree by means of our senses (i.e. seeing the tree and then writing about it) can still be available for distribution and use. This means that information can exist independent of the object to which it pertains.

As I indicated, the *object-connectedness* of information has important implications for the ethical (and legal) understanding of information access, ownership, control, privacy and quality. By way of another example, if I look at the moon, I do not own the moon nor the information about the moon, but if I look at the moon and write a poem about it, I do own the information (the poem) about the moon but not the moon itself. However, when I write a poem about my house, I own both the information and the object (the house) to which it refers. Yet, it is nearly impossible to exclude others from abstracting (unbundling) information about my house, nor will I be able to prevent others from writing a poem about my house and claiming ownership of that information. For other objects I own – my wallet, for example – I might be able to control access to the physical object (where I keep my wallet) as well as information about it (not sharing where I keep my wallet). To complicate matters further, if it is an immaterial object – such as an idea for a patent – I can control both the information about it (my idea) by not sharing it with anyone, or if I decide to share it I can protect it by legal means.

Because information always refers to 'something', it is perhaps best understood in a categorical sense. There is, for example, information about the economy, politics, health, the private life of a person and confidential agreements, among various other distinct areas. This 'aboutness' of information has a direct bearing on how we understand and apply the right of access to the various types and categories of information, which can never be used in an unconditional way. To illustrate, one cannot assume a right of access to another person's private information or to certain other privileged information (i.e. trade secrets and classified records) without a legally mandated and socially compelling justification. Such reasoning is embodied in Section 32(1)

of the South African Constitution (Government of South Africa 1996), which provides that:

> [*E*]veryone has a right of access to records and information held by the state and any information held by another person and that is required *for the exercise or protection of any rights*. (p. 22; [*author's added emphasis*])

The second characteristic that I identified concerns the relationship between information (content) and its carrier (conduit). In line with Geldenhuys, I refer to this as the *conduit-connectedness* of information. This characteristic has some unique features with a direct bearing on the accessibility, control and ownership of information. The first is that the same content can be packaged and re-packaged in different formats allowing different ways of accessing the same information. This feature of information allows, at least in principle, universal access to content, whether through translations, reformatting text-based information into audio-visual formats or other means. This feature also underpins the ethical notion that access to information does not equate the accessibility thereof. Access to a text-based manuscript in the English language does not necessarily imply the accessibility of the content; it presupposes that the person is literate, can speak English and has the intellectual ability to understand the content. The *conduit-connectedness* of information explains in legal terms the control and ownership of information. In a previous writing on the topic, I made the argument that this feature of information underlies the legal basis for the protection of intellectual property rights and the defining of information as an immaterial legal object (Britz 1996). The primary criterion for information to be treated as an immaterial legal object is that it should be packaged in some tangible medium, which then must meet further criteria of controllability and exclusive use.

The third characteristic of information refers to our shared humanity, which I call the *human-connectedness* of information. With this characteristic I sought to capture the notion of knowledge (defined as the assigning of meaning) and its unique features that are relevant to information ethics. The first feature is that we have a limited and fragmented view of our surroundings because our senses are fallible. This has a direct bearing on the relationship between 'truth' (things as they are) and our sensory observations (things as they appear to be). This interaction has intrigued humans over the centuries and has resulted in endless philosophical debates on the epistemological relationship between what we perceive and the objective truth. The second feature focuses on our ability to assign meaning to what we perceive and to add value by means of our knowledge base. Knowledge, as an instrument of power, directly influences our ability to assign meaning to the outside world. For example, if through the knowledge we possess we decide the meaning of a tree is to be used as firewood, we have the power to make that a reality. In this regard, power lies in our ability to control reality.

Moment 2: From professional ethics to social ethics

Although my thoughts regarding information ethics have evolved over time, it remained firmly rooted in this information-based worldview, where everything *is* information. Then in 1997, one of my then graduate students, Shana Ponelis, shared with me a *Harvard Business Review* article titled 'Strategy and the New Economics of Information', by Philip Evans and Thomas S. Wurster. Although written from an economic perspective, it provided me with some new insights regarding information ethics; in particular, the broader social implications of information and that information ethics is much more than a professional ethics – it is a matter of social justice. Before I expand on the broader social dimension of information ethics, I first want to capture the essence of the article's argument.

Evans and Wurster suggested that new IT (at the time they referenced the Internet, intranet and extranet) introduced a fundamental shift towards the economics of information – in particular the value chain. Similar to the *conduit-connectedness* characteristics of information mentioned in my model, they explain this shift thusly (Evans & Wurster 1997):

> When information is carried by things – by a salesperson or by a piece of direct mail, for example – it goes where the things go and no further. It is constrained to follow the linear flow of the physical value chain. But once everyone is connected electronically, information can travel by itself. The traditional link between the product-related information and the flow of the product itself, between the economics of information and the economics of things, can be broken. (p. 73)

What is truly revolutionary about the explosion in connectivity is the possibility it offers to '*unbundle information from its physical carrier*' (Evans & Wurster 1997:76; [*author's added emphasis*]).

The authors further explain how this traditional link can be broken in terms of the trade-off between 'reach' and 'richness', and how these notions operate in the old and the new economics of information (Evans & Wurster 1997:73). Reach simply means the number of people that can be reached. Richness, on the contrary, relates to three features of information: bandwidth (the amount of information), customisation (the level of detail and the ability to customise information according to the customers' needs) and interactivity (the ability to support interactive dialogue such as emailing). In the traditional 'old' information economic model, there is an inverse relationship between reach and richness – the more customers you reach, the less richness you have. For example, an airline advertisement in a physical newspaper can reach millions of people, but there is limited ability to communicate detailed information (i.e. the number of available seats), to customise it (i.e. the price of a ticket) or to allow for interactive communication between the customer and the airline.

With the introduction of the Internet, this old model 'got blown up', and the new unbundled information economy allows for simultaneous reach and richness (Evans & Wurster 1997:78). Think of the same advertisement in an online newspaper that reaches millions of people, provides a link to the airline's website, facilitates booking and payment (bandwidth), enables the selection of a seat and meal (customisation) and forwards an email or text message instantly confirming the booking (interactivity). Evans and Wurster (Evans & Wurster 1997:76–78) explained how this new model radically deconstructs the value chain of traditional economic activity and systems, which has profound implications for all information intensive and consumer-driven industries around the globe, especially banking.

How did this article change my thinking about information ethics? There are three key areas. Firstly, it offered confirmation that my unpacking and understanding of information and its various characteristics made sense, because it aligned with how Evans and Wurster applied the various characteristics of information in an economic context, in particular my conception of the *conduit-* and *object-connectedness* of information. Secondly, my understanding expanded when I further realised that, based on this alignment, these identified characteristics of information are not only relevant to information ethics and information law but also have a definite socio-economic application in explaining the information economy and the economics of information. Thirdly, it opened the door to a wider interpretation and application of information ethics that cannot be confined to normative professional ethics, nor limited to the activities of an information professional.

Information ethics has much wider socio-economic dimensions and applications, especially in dealing with ethical questions pertaining to the creation and fair distribution of information products and services, the possible exclusion and marginalisation of individuals and societies from the information-based global economy and the appropriate or inappropriate usage of information products and services. Information ethics from this perspective is a matter of social justice. This realisation led me to continue my post-doctoral study on information poverty and social justice, research that was deeply influenced by John Rawls's (1973) theory of social justice and Amartya Sen's (1999) capability approach. I (Britz 2004) defined:

> [/]nformation poverty as that situation in which individuals and communities, within a given context, do not have the requisite skills, abilities or material means to obtain efficient access to information, interpret it and apply it appropriately. (p. 197)

To me, information poverty is further (Britz 2006):

> [*C*]haracterised by a lack of essential information and a poorly developed information infrastructure. Resources required to satisfy human needs are, in most cases, inaccessible because the information about these resources are not unbundled and therefore not available to humans to use to gain access to these resources. (p. 82)

In following Rawls's definition of social justice and Sen's views on justice and human capabilities, I linked social justice with human rights and freedom and identified a number of categories of justice – justice as recognition, reciprocity, participation, enablement, distribution, contribution and retribution – that I used to address the different ethical challenges facing those who live in conditions of information poverty.

Moment 3: Real or fake? Towards a right to the truth

In 2003, I again adjusted my thoughts about the *human-connectedness* of information and the idea that information *is* everything, specifically as these pertain to questions about truth and reality. This occurred as I was reading *Cyberspace Odyssee* by the Dutch philosopher Jos De Mul, who argued that the development of photography and the camera led to '*een informationistische wereldbeeld'* – an informationist worldview (De Mul 2002:158).[5] Influenced by Martin Heidegger (1957), De Mul made the argument that photography has become the most important IT that provided humans the ability to transform their worldview to an 'objective image' that has become a certainty in representation (De Mul 2002). Humans are now able to create an image of 'the thing that is' in a way that is truthful, objective and credible. As De Mul (2002:131) explained, the photograph allowed us to move away from arbitrary symbols like language and paintings and has become adjoined to the object photographed, similar to how a foot is adjoined to a footprint in the sand. This medium helps establish causal relationships, where if there is a picture of a person, then there must also be an actual person.

Most significant for me was De Mul explaining how the causality between 'what is and what is being presented' has changed, where the representation has taken the place of the presentation (De Mul 2002:161). A photo of a painting is not the same as the painting, but it matches the painting's status. The aura of the original has been lost. The copies of the world eventually become more important than the world itself. De Mul incorporates the work of Jean Baudrillard (1981) to further articulate the point that there is a loss of reality [*realiteitsverlies*]. We are living in Baudrillard's 'hyper-reality' characterised by the virtualisation of our worldview with no point of reference to the real world. According to De Mul (2002:162–164), a post-modern deconstruction of the photographic denotation [*photografische denotasie*] has occurred. By means of digitisation, the objectivity and fixed

5. De Mul (2002:158) uses the phrase '*dat we information moeten beschouwen als (en mischien is zij dat zelfs) een basiseigenschap van het universum, naast materie en energie*', which translates approximately to 'that we should consider information as (and perhaps it is) a basic property of the universe, in addition to matter and energy'.

character [*gefixeerde karakter*] of the world have now made room for virtuality and changeability. As a digital reconstruction of the original (the thing as it is), the new 'original' has become a second or third abstraction of the original, or has even become an original in itself with no reference to a predecessor – even though it might be able to make a 'photo-realistic impression' (De Mul 2002:164). Our worldview has become a copy without an original, a simulacrum that is open for permanent deconstruction and reconstruction.

This mounting ambiguity raises many ethical questions relating to access and ownership, but more so with regard to the quality and accuracy of information – specifically, the question about truth and a distorted worldview. One of the key ethical insights for me in reading De Mul was the realisation that the digital unbundling of our world has the potential to distort the world. 'Everything *is* information' can become 'everything *is* dis(torted)-information'. This has indeed materialised with today's 'deep-fake' technologies and our ability (or inability) to assign true meaning to what we perceive. We have, in so many ways, lost the ability to see and perceive. As we often cannot believe our senses anymore (seeing is not always believing), epistemological uncertainties have undermined our traditional social and cultural institutions. For me, this raises a fundamental ethical question: What is the truth and do we have a right to the truth?

Recently, my long-time friend and colleague Peter Lor stimulated my thinking on the topic of truth with an introduction to the concept of *alethic* rights – derived from the Greek word for truth – in the work of contemporary Italian philosopher Franca d'Agostini. In a 2017 article, d'Agostini defined truth in the Platonic sense of the word – 'things as they really are' – as both a legal and political good (6). She powerfully argued in favour of rights to truth to ensure individual and collective well-being and peace and noted how the lack of truth can cause personal and social harm. She further articulated how the systematic distortion and/or deleting of the truth will lead to the violation of other societal and individual rights. Prior to this introduction to d'Agostini's work, I did not think of the right to truth as a separate basic human right. In my opinion, this is an even more fundamental question than whether we have the right to know or the right to access information. In my ethical deliberations, I have always argued for a basic set of information-based rights that were limited to privacy, access, information and ownership, as well as the freedoms of the press, expression, opinion and communication. In my earlier writings, I linked these rights to social justice, freedom and well-being, but I did not include a basic human right to the truth.

In looking back at these writings, De Mul's contributions and my study of John Rawls, the link between truth, social justice and human rights becomes very clear. Rawls argued that 'justice is the first virtue of social institutions just

as truth is for systems of thoughts' (Rawls 1973:5; [*author's added emphasis*]). If truth is the core virtue of our systems of thought, then it can indeed be argued that knowing the world 'truthfully' (things as they really are) and allowing information about 'real things' to be communicated in a truthful way are indeed matters of social justice, freedom and well-being. In support of such a right to the truth, it is clear that social justice should be a normative instrument in the evaluation of the 'truthfulness' of a society. As the first virtue of social institutions (Rawls 1973):

> [*J*]ustice sets out important principles for the protection and promotion of truth as the first virtue of our systems of thought. Furthermore, a positive assertion of principles based on social justice should not only protect the truth, but also prevent its distortion. (p. 5)

Moment 4: Redefining the ethics of access to information

In earlier deliberations on the *conduit-connected* characteristic of information, I argued that 'access to information without access to the object can mean that such an object cannot in most cases be used' (Britz 2006:61). I also suggested that, from an ethical perspective, access to information alone – and by implication access to the Internet – should not be seen as the panacea for solving problems of individuals and communities who are living in poverty and/or in remote areas. I illustrated my point by using the example of mosquito nets in Africa. It is one thing to have access to information from the web on how to use a mosquito net to prevent getting malaria, but the problem will not be solved if one does not actually have access to the net itself. At the time of writing this in 2005–2006, I had not considered the possibility that physical printing processes would again revolutionise and disrupt the information world by allowing unbundled information to become once again bundled to a physical object (such as a mosquito net), thereby altering the ethical debate around the meaning of access to information.

The phenomenon that reshaped discussions on information and physicality was the explosion of 3D printing technology. Although 3D printing was first introduced in the late 1980s, it was popularised and commercialised around 2011, well into the present era of digital ubiquity. It was around that time that I read Chris Anderson's *Makers: The New Industrial Revolution,* which eloquently describes how the digital landscape has transformed the physical landscape – from the unbundled to the bundled – and 'allowed the web generation to move to the "real world"' (Anderson 2012:16). All these years later, it is worth revisiting Anderson's (2012) predictions about the future of 3D printing:

> Now fast-forward the clock a decade or two from today's early 3D printers. They will be fast, silent, and able to print a wide range of materials, from plastics, to wood

> pulp and even food. They will have multiple cartridges, just like your inkjet, and be able to print in as many color combinations. They will be able to print images on the surface of an object even finer than the best toy factories today. (p. 63)

3D technology is indeed disruptive by design and much of what Anderson predicted has materialised – from the printing of everyday functional objects like working firearms, coffee cups and camera lenses to the production of life enhancing organic and synthetic objects like food, hearing aids, limbs, joint replacements and vital organs.

It is clear that the notion of access to information has changed with the introduction of 3D printing and so has my ethical reasoning. My foundational ethical premise has always been that access to information is an instrumental human right because it allows an opportunity for people to know the thoughts and ideas of others, and it enables other basic human rights like that of education, health, safety and so on. The unbundling of information and the corresponding introduction of the dematerialised weightless economy introduced a further ethical dimension of access to information – namely, the ability 'to do'. Activities like online commerce and electronic voting are nothing more than an act of accessing information to enable certain activities. Access to information is no longer solely an instrumental right. Rather, with the introduction of 3D printing, it has extended the enabling action of information rights to include designing, creating and making. And what we create and make through digital information is not a virtual reality but a 'real' reality. As Anderson indicated, 'physical products are increasingly just digital information put in physical form', and these creations surface complicated ethical and legal questions about the ownership of the digital information and physical objects (Anderson 2012:72).

The digital-makers world relies on open web models that encourage information sharing within and across communities. Anderson noted that 'when you release your designs on the Web, licensed so that others can use them, you build trust, community and potentially a source of free development advice and labor' (Anderson 2012:109). But maintaining this system comes with some key legal and ethical challenges related to information – in particular, property or ownership and accuracy or quality. In the 3D printing world, it has become so easy to duplicate patented or otherwise protected information and objects, but it is extremely difficult for patent holders or others with ownership rights to track down and prove in court which individuals may have illicitly downloaded and used a particular source file. Once the design information is out there, the creators have little control over how it might be used or misused, bringing into question their responsibility for activity deriving from their design. Conversely, people seeking accurate designs to produce quality products are susceptible to obtaining information that might be flawed or contain errors that can eventually cause harm to others.

Moment 5: The ethics of big data and predictive analysis

My thoughts on information ethics developed further in 2013 when I was asked to present a paper on big data. The complementary notions of big data and predictive analytics became popular search terms around 2011, corresponding with efforts by the IT industry to make 'cloud computing' and 'the Internet of Things' household concepts. At that stage, these concepts were known to me, but I had not yet engulfed myself in understanding their ethical implications. The request for the paper presented this opportunity. I first became familiar with the topic through the work of Viktor Mayer-Schonberger and Kenneth Cukier in their 2013 book *Big Data: A Revolution that Will Transform How We Live, Work, and Think.* This was one of the first major publications on the topic, and in the years since I have expanded my reading and understanding as big data, technologies and applications have risen to prominence in so much of everyday life. However, this initial influence of *Big Data* on my conception of information ethics continues to this day, largely because it both echoed and challenged my previous thoughts and research.

For example, the application of big data discussed by Mayer-Schonberger and Cukier corresponds with my intellectual framework for information and its characteristics: that everything *is* information, that we live in an information-based world and that nothing exists without information about *something*. However, I gained a new insight on the role of data in this framework, namely that all the billions of technology-enabled unbundled data points previously thought to be meaningless indeed have tremendous meaning and value. Mayer-Schonberger and Cukier (2013) referred to this as 'datafication' and their formulation is worth quoting at length:

> It [*datafication*] refers to taking information about all things under the sun – including ones we have never use to think of as information at all, such as a person's location, the vibrations of an engine, or the stress of a bridge – and transforming it into data format to make it quantifiable. This allows us to use the information in new ways such as in predictive analysis: Detecting that an engine is prone to break-down based on the heat or vibrations that it produces. As a result, we can unlock the implicit, latent value of information. (p. 180)

Interestingly, the authors also argue that big data is a simulacrum of reality and that through datafication we have actually conquered the world in mastering the ability to measure it (Mayer-Schonberger & Cukier 2013:191). In a sense, big data and predictive analytics have made us like gods living in heaven (i.e. the 'cloud') from where we make decisions about the data-unbundled world. We are increasingly empowered with cloud-based computing and AI to predict with pinpoint accuracy when a bridge will collapse, when a car needs an oil change or how human beings will act. We are, perhaps for the first time, able to predict certain occurrences and eliminate

human error in areas that are crucial to human existence. Conquering the world in this way implies power, and power requires moral and ethical responsibility and accountability to mitigate against what Mayer-Schonberger and Cukier (2013:17) described as the 'dictatorship of data'.

Along these lines, Brad Smith (current president of Microsoft) and Carol Ann Brown argued that the biggest challenge for us today is of an ethical nature. They specifically list access, data security, fairness and privacy as the most relevant, and eloquently point out that cloud computing and big data are not only tools but also weapons (Smith & Brown 2019). Cathy O'Neill (2016) used a similar phrase when she discussed the potential of big data applications as 'weapons of math destruction' that can reinforce patterns of socio-economic discrimination with algorithm-driven decision-making. As such, big data holds serious ethical implications for human agency. The ability to unbundle and manipulate nearly every data point related to human activity profoundly impacts individual privacy and social fairness. In this setting, humans are exposed to an unencumbered brunt of collective fiat that calls into question our ability to make choices and exercise free will. There is indeed the possibility that big data predictions can be used to determine whether an individual is culpable for future acts before they happen. Will our moral conscience and compass be replaced by predictive analytics? I fully agree with Mayer-Schonberger and Cukier, when they state: 'If big data predictions were so perfect, if algorithms could foresee our future with flawless clarity, we would no longer have a choice to act in the future' (Mayer-Schonberger & Cukier 2013:161). They conclude that big data and predictive analytics threaten to imprison us in a post-Plato 'data-controlled cave', where long-standing views on ethics, rights and truth become even more tenuous.

Conclusion

The knock on my door in 1990 opened up a door that has become my passion for the last 30 years – information ethics. In this chapter, I put 'hand to paper' and 'mind to computer' in an effort to capture the key moments of my information ethics journey, starting with the PAPA model of ethics for information professionals, the discovery that everything *is* information, my introduction to the information economy and the accompanying realisation that information ethics is also a matter of social justice. I illustrated how new technologies and new philosophical insights introduced new thoughts specifically about access to information and our right to know the truth. I predict that big data and predictive analytics combined with cloud computing and AI will dominate the ethical discourse for the next three to five years.

Chapter 5

Balancing and reconciling the conflicting values of information access and personal data laws in South Africa

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Abstract

Information access and protection of privacy (IAPP) laws sound like a contradiction in terms. However, both are internationally and constitutionally recognised rights as neither is accorded greater importance than the other. This raises a number of questions: 'Does the right of access supersede the right to forget?'; 'Does the privacy of a person override access to information?'; and 'What if private information is in the public domain?' There are many more questions than answers that require the balancing and reconciliation of these conflicting values of IAPP. This chapter proposes mechanisms for

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balancing and reconciling IAPP with reference to laws in South Africa. The chapter analysed the IAPP laws in South Africa, that is, *the Promotion of Access to Information Act* (Act No. 2 of 2000) and *the Protection of Personal Information Act* (Act No of 2013) to identify the conflicting and complementary values. Literature was also reviewed on issues relating to IAPP. The chapter established the fact that although access to information has long been implemented in South Africa, IAPP laws have not yet fully grown. The privacy law was passed in 2013 but came into effect only on 01 July 2020. While the chapter acknowledges that both pieces of legislation embrace the writ 'habeas data', there is no outright answer to the challenge for balancing the two laws. However, some of the issues can be balanced through compatible definitions. Furthermore, there is complementary provision in the two laws as South Africa's right of access to information does make provision for refusal of information on the grounds of privacy. Furthermore, both laws make provision for access of one's own personal information held by public or private entities. The chapter provides ways in which implementing agencies and oversight mechanisms can balance the two rights to mitigate conflicting values. For example, the simple steps for organisations would be to identify relevant laws, identify records to which laws apply and ensure that records are created and handled in accordance with applicable laws. The study encourages proactive disclosure by implementing agencies to allow citizens to participate in decision-making in the public sector. This way the country will be considered advanced as citizens will be accessing information without lodging requests.

Introduction

Governments around the globe, including that of South Africa, have enacted freedom of information laws that allow access to organisations' records. In countries such as South Africa, this law is applicable to both private and public bodies. These laws include limited exceptions to withhold information contained in records and sometimes entire records from disclosure (Kozak 2015). A contradictory major legal consideration that governs access to information is the protection of privacy legislation. The intent of privacy legislation is to protect the privacy of individuals through the way in which data about those individuals are collected, used, managed, secured, stored, shared or destroyed. As Surtees (2010) would attest, public and private organisations that collect and use personal information have a responsibility to ensure privacy to the data subject. Privacy in this sense has to do with control over access to one's personal information (Pearce-Moses 2019). This, according to Surtees (2010), calls for the understanding of privacy issues that may arise from access to personal information and how to deal with the issues. Privacy in this regard relates to the right of a person and the relationship to society (Ngoepe, Mokoena & Ngulube 2010).

For a democratic society to thrive, the pieces of legislation governing the rights of IAPP need to be enacted. While the two laws sound like a contradiction in terms, both are internationally and constitutionally recognised rights as neither is accorded a greater right than the other. The two rights are taken seriously at an international level, for example, through 'Article 19 of the Universal Declaration of Human Rights' (UNDHR) and 'the International Covenant on Civil and Political Rights' (Mojapelo 2017). Furthermore, the rights are also implemented in most of the modern national constitutions as part of human rights. For Arko-Cobbah and Olivier (2016), the two rights, although conflicting, are a basis for other human rights. Despite the availability of laws worldwide for provisions allowing access in the form of records, there are still inconsistencies in privacy laws that make access difficult (Kozak 2015). However, the intention of passing privacy legislation was not to make access difficult. Examples of such laws include the European 'General Data Protection Regulation (GDPR)', Brazil's General Personal Data Protection Law, *Ireland's Data Protection Act*, the Canadian '*Personal Information Protection and Electronic Documents Act*' and South Africa's *Protection of Personal Information* (POPI) *Act* (Ngwenya 2020). These laws give people control over how businesses collect and process their information, although some commentators see it as an inhibiting factor for access to information. Other inhibiting factors to access to information, according to Ngulube (2006), include physical and intellectual control of information. In other words, put simply by Engvall (2019), access is limited if information cannot be retrieved when requested. As a result, as observed by Gafuik (2010), private citizens do not use the law to engage with government and hold governments accountable.

Whitman, McLeod and Hare (2001) posited that IAPP laws have brought about several challenges for many countries. The challenges include overlapping of rights, which could result in different solutions and conflicts, as well as decisions on requests. However, it should be noted that both rights are intended to help individuals to make public bodies and, in some instances, private organisations work transparently and accountably. Ngoepe et al. (2010) viewed the IAPP rights as complementing each other in holding public bodies accountable to taxpayers. Indeed, IAPP laws are focused on ensuring accountability, transparency and good governance by public bodies.

This chapter proposes mechanisms for balancing and reconciling IAPP laws in South Africa. Previous studies focused mainly on reviewing access to information since the legislation was enacted in 2000, as the *POPI Act* was only ratified in 2013 and came into effect on 01 July 2020. As a result, studies in South Africa have not been looking at the contradicting value of the two rights in legislation, as well as how the conflicting values can be balanced and reconciled. However, there have been studies conducted elsewhere such as those by Whitman et al. (2001), a working paper by Banisar (2011) for the World Bank, as well as a presentation by Beamish (2017), to mention just a

few, about 'protecting and balancing access and privacy rights'. Furthermore, in 2018, the student chapter of the Association of Canadian Archivists at the University of British Columbia presented its tenth annual international seminar and symposium on the issue of balancing access and privacy. In South Africa, a study by Kirkwood (2002) looked at the relationship between freedom of information legislation and archival law, while a study by Makhura and Ngoepe (2006) assessed compliance with both pieces of legislation by public bodies.

In this chapter, the background to IAPP will be provided first, followed by a discussion of IAPP legislation in South Africa, models of IAPP implementation, conflicting rights and how these can be balanced and reconciled. These laws are complex and adopted for a variety of reasons. The problem that is solved is that the two pieces of legislation can either complement or contradict one another, depending on the issue at hand. For example, in some instances, privacy laws can be used by public institutions when requesters demand access to records, which also include certain personal data. It happened in South Africa during the Zondo Commission on state capture when the records of the State Security Agency had to be used as evidence in the enquiry. There were opposing arguments on whether such records should be presented at the Commission. Therefore, this raises many questions: 'Does the right of access give way to the right to forget?', 'Does the privacy of a person override access to information?' and 'What if private information is in the public domain?' There are more questions than answers that require the balancing and reconciliation of these conflicting values of IAPP. There is a greater need for access to information for several reasons by individuals and civil society, including those with personal information. Requesters of information such as journalists, individuals and civil society would like to know why public bodies took certain decisions, while on the contrary, historians and academics seek information for research purposes (Banisar 2011).

Background to information access and protection of privacy

The issue of IAPP has been there and practised unconsciously since time immemorial. In ancient times, access to information was limited to the aristocracy and clergy as it was the exclusive purview of sovereigns or rulers (Onyancha & Ngoepe 2011). It was only during the enlightenment period (1685–1815) that access to records was extended to historical scholars. The idea of access to information was first conceived over 250 years ago in Sweden and today is recognised as the backbone of democracies. According to Ackerman and Sandoval-Ballesteros (2006), Sweden set the trend by passing the first Freedom of Information (FOI)URL legislation in 1766 which was titled the 'Freedom-of-Press and the Right-of-Access to Public Records Act'. This Swedish law allowed access to information to the public. It was only after the

French Revolution (1789–1799) that countries started to adopt archival and IAPP laws (Onyancha & Ngoepe 2011).

As indicated earlier, the concept of IAPP is catered for in many human rights instruments internationally by the UN, regionally and nationally (Nkwe 2020). In the African continent, Article 9(1) and (2) of 'the African Charter on Human and People's Rights' makes provision for an individual to have the right to receive and disseminate information. Furthermore, in 2004, the African Charter on Human and People's Rights adopted a resolution and created the position of the 'Special Rapporteur on Freedom of Expression and Access to Information in Africa' (Mojapelo 2017). Article 4 of SADC protocols against corruption compels the signatories to create a mechanism that promotes IAPP. In this regard, the SADC identifies access to information as one of the mechanisms that its member states can use to dismantle the acts of corruption.

Nationally, as already alluded to, many countries have adopted access to information legislation, for example, Australia, Canada, New Zealand and the United States, to mention just a few (Nkwe & Ngoepe 2021). In the 20th century, some European countries and the United States introduced freedom of information laws with the focus on access to records (Nkwe & Ngoepe 2021). For example, Lemieux and Trapnell (2016) indicated the adoption by 'Finland (1951), United States (1966), Denmark and Norway (1970), France and the Netherlands (1978), Australia and New Zealand (1982), Canada (1983) and Colombia (1985)', to mention just a few. This was followed by Eastern European countries such as Hungary, which implemented more rigorous versions of this legislation by reducing the period of compliance (Lemieux & Trapnell 2016). In Africa, South Africa took the lead by enacting the law in the year 2000. Adu (2018) argued that many African countries followed suit with 20 governments enacting such pieces of legislation. By 2018, over 100 laws throughout the world were ratified (Adu 2018). In Africa, some countries passed the legislation because of pressure from civil society. However, these laws are not without problems, as Adu (2018) identified a paradox in their implementation, such as lack of resources and government continuing to deny information.

In the digital era, the tide of access to information turned from openness amidst concerns of protection of personal information. The proliferation of technology has accentuated the growing need to collect and share personal information by the private sector. In this era, data on each of us are now constantly being collected and stored. This personal information is disseminated over networks such as social media platforms without the knowledge or consent of individuals. The government is perhaps the largest collector of data even though the private sector and, to some extent, individuals do collect personal data (Ngoepe et al. 2010). Billions of pieces of data exist on citizens. For example, when a person is born, enrols at the college, applies

for social grants or driver's licence, gets married or even visits family members or friends in an estate residence, data are generated and stored somewhere in a computer database or mobile applications. A difficult question to answer, according to Ngoepe et al. (2010), is, 'Who owns this information?' Is it the government or individuals whose details are captured? If such data were collected by a public or private entity, does such an entity own the data and can such an entity use the data in any way it wants? In South Africa, for example, many people have experienced a situation where they receive anonymous calls from insurance companies selling them their (insurance companies') products. One wonders how and where these companies got hold of the contact details. A perfect, widely publicised example is when the late King Goodwill Zwelithini (1948–2021), the Zulu Monarch, fell victim to a pesky telephone call by a MiWay Insurance sales agent on 10 February 2018 to sell him the insurance product.[6] If this can happen with such a high-profile individual, it could easily happen to anybody.

With today's technology, the right to privacy is becoming a challenge and therefore also hampers access to information. For example, mobile applications such as Glovisitor, which is available on Android and other software, allow for the invitation of visitors and the creation of a PIN to allow access to the estate. The danger with this application is that, once the visitor arrives, the licence or identity document of such a person is scanned into the app. Both the host of the visitor and the estate will then have the personal information of the visitor. Such information needs to be protected by the estate as the collector, bearing in mind that a resident has access to the personal information of his visitors. Ngwenya and Ngoepe (2020) maintained that there are no measures in place to prevent the host from distributing such information.

This is compounded by what is termed 'post-truth'. Because of the increased use of the term 'post-truth', particularly during the presidential campaigns of Donald Trump in the 2016 election, as well as the European Union Referendum and the Brexit vote in the United Kingdom, it was named English 'Oxford Dictionary word of the year 2016' (Calcutt 2016). It is defined in the Oxford Dictionary as 'conditions in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief'. A similar phenomenon to post-truth is disinformation, that is, the deliberate propagation of information that is spread to confuse and by providing deceitful alternative versions of the facts. In other words, reliance on sources seems hopelessly mired in partisanship, while it becomes increasingly unclear who is responsible for the truthfulness of news stories, marketing and profiling. This is related to fake news as best stated by Pope Francis (2018) in his tweet that:

6. The call audio can be listened to here: https://www.enca.com/south-africa/listen-zulu-king-scolds-blesses-miway-sales-agent

> The tragic history of human sin, is the first 'fake news' and it dates back to the book of Genesis, when the 'crafty serpent' lied to the woman. In present day, according to the Pope's message the fast digital world helps fuel the spread of 'fake news' – which he defines as 'the spreading of disinformation online or in the traditional media'. Disinformation thus thrives on the absence of healthy confrontation with other sources of information that could effectively challenge prejudices and generate constructive dialogue; instead, it risks turning people into unwilling accomplices in spreading biased and baseless ideas. (n.p.)

Information professionals such as archivists and librarians can play a role in raising awareness of the public by helping them to recognise misinformation by supporting the development of metaliteracy that helps people move beyond information literacy and digital literacy to understand how to interpret, evaluate and assess sources of information. The role can also be extended to the authentication of records. However, the technical infrastructures that gather and store data have become increasingly complex, often invisible and hidden. As a result, in the public space, archivists are at a loss to capture much, if any, provenance data about the information found there and, oftentimes, even to understand the scope and scale of these infrastructures and who controls them, which systems are overtly or covertly collecting their data or how to prevent them. For Duranti (2017), one of the means of authenticating such information is to use traditional archival principles such as diplomatics or digital records forensics. Mutula (2006) has rightly observed that governments often abuse privacy legislation to deny the public or individual access to information.

Information access and protection of privacy in South Africa

In South Africa, IAPP laws are provided for in the constitution, which was signed by the first president of democratic South Africa, Nelson Mandela (1994–1999) on 10 December 1996. This provision is stated in Chapter Two of the Constitution that contains the Bill of Rights listing a number (27) of rights. Among the listed rights is access to information that gives citizens 'access to any information held by the state for the protection of his or her rights, as well as the right to privacy', which is one of the fundamental rights. For example, Section 14 of the Constitution is about the right of privacy to everyone. Both privacy and access maintain that privacy is a valued right.

In South Africa, IAPP laws consist of the *Promotions of Access to Information Act* (PAIA) and *POPI Act*. The oversight mechanism for PAIA since enactment in 2000 has been the South African Human Rights Commission (SAHRC) until 2015, when the Information Regulator was established in terms of the *POPI Act* (Mojapelo & Ngoepe 2017). Around 2016, when the office of the Information Regulator became operational, the regulatory role of the IAPP laws was moved to this office from the SAHRC (Mojapelo 2017).

On the contrary, the *POPI Act* was passed in 2013 but came into effect only in 2020. The enforcement of the law was delayed to allow the establishment of the regulatory bodies (Ngwenya 2020). The passing of the law was done to align South Africa with international data protection best practices such as GDPR (Ngwenya 2020). The *POPI Act* was passed to promote the constitutional right to privacy by protecting personal information. In this regard, as observed by Ngwenya and Ngoepe (2020), POPI guarantees that all organisations in:

> South Africa behave responsibly when collecting, processing, storing, and sharing personal information by holding them accountable, should they abuse or compromise that entity's personal information in any way. (p. 8)

According to De Bruyn (2014), the *POPI Act* regulates:

> [*T*]he manner in which personal information may be processed by established principles, and provides persons with rights and remedies to protect their personal information from processing that is not in accordance with the Act. (p. 1316)

The following summarises the aim of the Act:

- When and how a person decides to share his or her data (requires individual permission).
- The degree to which a person elects to share data.
- Transparency, responsibility and accountability regarding how the person's information will be utilised (restricted to the purpose) and warning if or when the information is used for the wrong reasons.
- Providing the person access to their data and the right to have it deleted should the data subject wish to do so.
- Who can access the personal data?
- Storage of personal data (measures and controls have to be in place to shield private data).
- The authenticity of personal data (e.g. personal data must be captured correctly once collected and the institution must look after the personal information in a responsible manner).

Of interest are the provisions of the *National Archives and Records Services of South Africa Act* (NARSSA) (Act No. 43 of 1996) and PAIA regarding access to records contained in archives and public records. This Act provides unrestricted access to archives in the custody of archives repositories after 20 years, calculated from the end of the year in which a particular document was created. According to Kirkwood (2002), as the open period is extended annually, the closed period should never be longer than 21 years as per Section 12(1)(a) of NARSSA. The only ground for refusing access relates to the fragile condition of a record, and there is a right to appeal to the National Archives Advisory Council. It should be noted that the provisions of PAIA take precedence over NARSSA with regard to access to information contained in records, both in the closed and open periods and whether or not they are in archival custody.

Models of information access and protection of privacy implementation

There are different models of implementing IAPP laws in different countries in order to ensure synergy. In many countries, especially in the Caribbean, the IAPP laws are linked in the constitution through the concept of '*habeas data*', that is, 'a right that allows people to request access to their own information and to control its use can both complement and conflict with each other'. The models identified include single access to information and privacy law. For example, the Canadian law implemented in 1982, as well as the Hungarian law and Zimbabwean law. It is worth noting that with effect from 1 July 2020, the Zimbabwean government signed into law *the Freedom of Information Act* (No 1 of 2020), repealing the access to information and privacy law and thus dividing it into two. The Canadian IAPP legislation has been enacted as one Act. This model makes provision for shared definitions, ensures consistency, limits conflict and establishes balance from the start. Furthermore, in Canada, individual provinces have passed their IAPP legislation; for example, British Columbia province has its own legislation in the form of *Freedom of Information and Protection of Privacy Act* (Nkwe & Ngoepe 2021). The other model can be one law and few provisions for the other. Until 2017, in South Africa, the IAPP laws were disjointed and regulated by different regulatory bodies (Nkwe 2020). In this regard, PAIA was regulated by SAHRC, while the *POPI Act* was regulated by the Ministry of Intelligence (Mojapelo 2017; Nkwe 2020). PAIA has a concomitant imperative to protect legitimate needs for confidentiality and secrecy.

The third model separates access to information and privacy law. South Africa is currently using this model with two pieces of different legislation, which are PAIA and the *POPI Act*. To ensure harmony in this regard, the two laws use common definitions, there are privacy exemptions in access to information law, provision is made in both laws for subjects to access personal information and there is provision for an oversight mechanism from one regulator and appeal process. This is also the case in the United Kingdom, where access to information legislation (Shepherd, Stevenson & Flinn 2009):

> [*P*]rovides for the Information Commissioner to oversee the freedom of information (and the Data Protection Act), as well as acting as adjudicator if a request for access to information has been declined. (p. 229)

A key factor here is to balance both rights, and hence, perhaps Shepherd and Ennion (2007:34) argued that 'it explains the dual role of the Information Commissioner'. Furthermore, Shepherd and Ennion (2007) are of the view that although:

> [*F*]reedom of information in the United Kingdom was intended to make the machinery of government more accountable and transparent, many of the exemptions provisions put in place seem restrictive and fail to protect the privacy of individuals. (p. 34)

On the contrary, in the United States, privacy laws are spread across many laws and enforcement agencies, for example, medical records.

Conflicts of access to information and personal privacy rights

Because of their conflicting nature, privacy and right to information are often regarded as the head and tail of a coin. However, Surtees (2010) is of the view that privacy law should not just be seen as the 'B' side of access to information but instead as existing in a somewhat symbiotic relationship. As already discussed, PAIA, along with the *POPI Act*, has created new challenges for those responsible for implementing IAPP laws. The essence of PAIA is to simplify the provision of access to information in government and private bodies. Although the IAPP laws have been enacted to accommodate information access and privacy, and although they are supposed to complement one another, by their nature, there is a potential tension for them. The essence of the *POPI Act* is to protect the individual's privacy right. Resolving the conflict between information access and privacy is a daunting task.

One of the conflicts may arise from a lack of understanding of what needs to be protected. As observed by Nkwe and Ngoepe (2021), some:

> [*R*]ecords held by public entities contain information that identifies officials who were involved in the subject at some point such as the names of officials who wrote reports, attended meetings and endorsed decisions. (p. 3)

For example, in 2008, I was part of an interview panel for a candidate who was to report to me. The candidate who was appointed to the position was not the one I recommended. When the person resumed duty, as the records manager, she had access to the documentation of the selection process. She wanted to know why I did not recommend her, and this affected our working relationship. This can also happen with a student file. As much as universities claim that the examination for theses and dissertations is anonymous, if the student or supervisor requests access to the file, they will be able to establish who the examiners were. This is compounded by the lack of global consensus about the definition of personal information. However, in some instances, commentators argue that if it is done in an official capacity, it is not considered personal, as long as information regarding the life of an individual is not divulged. For elected officials, it is less restricted and personal information might even be divulged with the argument that public interests override all grounds for refusal of access to information. According to Donaldson and Lohr (1994), many governments took the position to not consider 'information relating to official capacities a personal information'. Although the information may be regarded as personal as it is about 'a particular identifiable person, generally, it is not related to his or her personal or family life and is less likely to be sensitive' (Donaldson & Lohr 1994). There is also consensus that

'information about elected or high-ranked public officials should be less restricted, even when it relates to their personal lives' (Donaldson & Lohr 1994). An example can be that of a confidential medical record of the late Minister of Health in South Africa, Dr Manto Tshabalala-Msimang (1999–2009), which was in the possession of the *Sunday Times* newspaper in 2007. Her lawyers used Section 17 of the *National Health Act* (Act No. 61 of 2003) to compel the *Sunday Times* to return the file. This may be because the *POPI Act* had not yet been enacted when the incident happened. According to Ngoepe et al. (2010), privacy should not be used as an obstacle for access to information where there is public interest. What needs to be a consideration is the extent to which access to a person's private information can be gained. Clearly, the right to privacy is not an absolute right, nor is it a comprehensive value. A person's right to claim privacy cannot be used as a defence to cover up or condone illicit acts. Both rights of access to information and privacy are important and relevant in a democratic society to contribute towards accountability, transparency and good governance.

A further conflict arises when government or institutions misuse privacy exemption or law to deny access to information. This was an issue in a case between the South African History Archives (SAHA) having to wait for six years to win a court battle against 'the central bank in South Africa to access records of foreign exchange fraud, Eskom bonds and gold smuggling during the apartheid years' (Independent Online Newspaper 2020). This came after the Supreme Court of Appeal found the decision of the South African Reserve Bank (SARB) to refuse access to the records of the late 'Brigadier Blaauw, Robert Hill and Vito Palazzolo in terms of PAIA application unlawful and in conflict with the provisions of the Act' (Independent Online Newspaper 2020). In the request by the SAHA, the SARB failed to respond within the prescribed time (30 days in terms of PAIA), but later refused access to records indicating that it was unable to retrieve records relating to the requests. In this regard, the refusal was because of a lack of physical and intellectual control of records, as well as a claim by the SARB that the records constituted personal information. In South Africa, the weaknesses in IAPP implementation have always been identified as the length of time being taken to process requests, that is, 30 days; access and request fees, which amount to R15 and R35, respectively, as well as ineffective means for resolving disputes under the Act, for example, the case of the SAHA having to pay about R5000 to access records of the Truth and Reconciliation Commission (TRC) in the custody of the NARSSA. The SAHA has tested the parameters of PAIA through a request of access to military records, nuclear records, TRC records and gay and lesbian records. In the process, the organisation also built up an archive of material released to the public in terms of PAIA. In this regard, the SAHA has a collection of records released under PAIA as they are in a public domain. These materials are scanned and digitised. One pundit argued that these records are exempted from copyright laws as they are in the public domain. The provenance of the

records is ensured through cataloguing and cross-reference to the originals. However, this raises an ethical question about personal information in such collections, especially with regard to restrictions in terms of the *POPI Act*. Access to these records is available to researchers free of charge. Of interest are British Columbia's FOI and privacy laws that indicate that it is no longer a privacy invasion to disclose personal data about a person who has passed on for 20 years or more or if the record has been in existence for 100 years or more (Kozak 2015). This also exists in the *UK FOI Act*, which indicates 30 years as historical.

Balancing and reconciling the values

According to Beamish (2017), 'the right of access to information and privacy laws are not always conflicting rights as they are both designed to ensure accountability'. It is therefore important how the oversight mechanism and implementing agencies balance the two. Despite the fact that FOI laws allow for a legal mechanism to access records, they also include limited exceptions to withhold information contained in records, and sometimes even entire records, from disclosure. Even though access under the FOI is defined as a legal right, there are provisions where government organisations can, or must, withhold records or information (Kozak 2015), for example, frivolous or vexatious requests and published information; however, in instances like these, the entity should 'direct the requester to the published source'. The IAPP legislation is supposed to make provision 'for strict time limits for the processing and finalisation of requests' (Banisar 2011). Where a request is refused, such refusal should be accompanied by comprehensive written reasons. If access is not granted, the requester can appeal through an internal appeals mechanism, which is referred to as a relevant authority. In South Africa, in the case of national departments, the relevant authority is the minister; in provincial departments, it is the member of the executive council; and for municipalities, it is the mayor. As it appears in Article 19 of UNDHR, 'all individual requests for information from public organisations should be met unless the entity can show that the information falls within the scope of the limited regime of exceptions'. To justify the refusal to grant access, the public entity is required by Article 19 of UNDHR to meet a 'strict three-part test' as follows:

- The information must relate to a legitimate aim listed in the law.
- Disclosure must threaten to cause substantial harm to that aim.
- The harm to the aim must be greater than the public interest in having the information'.

Sections 33–45 of PAIA provide 'grounds for refusal of access to information', which is divided into two categories, the first of which is mandatory grounds where access must be refused. An example of mandatory grounds for refusal

is if the requested records can affect a third party or the security of an organisation, an individual or a country. In that regard, access must be refused. The second ground for refusal is discretionary grounds where access can be refused, but it must not be refused. In this regard, the information officer should use his or her own discretion. Unlike FOI laws, which apply predominantly to government organisations, jurisdictions that have adopted privacy laws have made these laws applicable to both governmental and non-governmental organisations. These laws tend to rely on an individual's consent and reasonable actions taken given particular circumstances governing how personal information should be managed and accessed. An example includes *Personal Information Protection and Electronic Documents Act* (PIPEDA) in Canada and POPIA in South Africa.

Conclusion

Although the two rights seem to be opposing each other in nature, they are not always conflicting rights as there are some elements of compatibility. For example, PAIA, which is a freedom of information legislation, does, however, make provision for mandatory and discretionary grounds to deny access on the basis of privacy. There is a complementary provision in the two laws. Complementarity is achieved through ensuring accountability by the government to citizens. For example, both IAPP laws provide a person with the right of access to own personal information held by any organisation, as well as how personal information is handled. Information access and privacy protection are both constitutionally recognised rights. Therefore, neither is accorded a greater right than the other, although privacy may have a constitutional human right with a stronger position than access to information access. However, freedom of information law can be utilised to enhance privacy. When a state has both IAPP laws as in the case of South Africa, the approach is to use the privacy legislation to 'requests for personal information while requests for information that contains personal data about other parties could then be handled through the freedom of information legislation' (Beamish 2017). However, PAIA also provides that, 'in the absence of other legislation, public and private bodies must make reasonable efforts to establish internal measures to correct personal information held by the relevant bodies'.

From the discussion, this chapter reveals that PAIA has enabled organisations such as the SAHA to build up a substantial archive of released materials and make it accessible to the public. The question that needs further interrogation is 'can we build a public archive based on records requested in terms of PAIA?' If yes, how will the issue of copyright be addressed. Further questions and issues that need to be discussed include:

- The right to be forgotten versus the right of access.
- Does the right to forget overrides the public interest?

- Privacy versus historical research.
- Does public interest override or trump all grounds for refusal?
- What if private information is in the public domain?
- Can we use access to information to promote privacy?
- Can we use privacy law to obtain information?

As it can be seen from the discussion, the balancing of the two rights can be mitigated through clear compatible definitions and guidelines. It is important how implementing agencies and oversight bodies balance the two rights. Three simple steps to ensure implementation and harmony are: identify relevant laws and regulations relating to privacy and access to information; identify records to which laws or regulations apply and ensure records are created and handled in accordance with applicable laws or regulations. Otherwise, as Darch and Underwood (2010) have observed, the IAPP 'as an idea and culture has not yet taken root in South Africa because of a number of factors' such as awareness by citizens and poor management of information by the public sector. IAPP can be considered fully-fledged in South Africa when citizens can access information without lodging a request through the legislation. One of the limitations of this study is that it was undertaken when the privacy law in South Africa was not yet operational. An empirical study to explore the readiness of organisations in implementing privacy legislation is recommended.

Chapter 6

Nurturing the African higher education teaching and learning ecology using data, information and knowledge from our physical, digital and biological learning spaces

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Abstract

The purpose of this chapter is to explore and conceptualise a business intelligence (BI) model that can capture, monitor and analyse big and small data from the physical, digital and biological learning spaces of a higher education institution (HEI). Using enterprise architecture (EA), BI and the

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emerging domain of learning analytics, the platform and its users can potentially identify and predict the causes of both negative and positive effects or event triggers to enable the real-time monitoring and support of students, lecturers, administrators and alumni. If well-supported, this information and knowledge could significantly improve the quality of teaching and learning and the overall higher education (HE) experience. The chapter draws on the work of others, discussions, observations and reflections and proposes; firstly, a red cross early alert model for students enrolled in HE, and, secondly, a framework for a University BI system with key big and small data opportunities for four end-users. The chapter then poses analytical questions and answers on the past, present and future to provide information and insight into the best- and worst-case scenarios for different HE processes during the Fourth Industrial Revolution (4IR). This conceptual research study is the start of a continuous cycle of reflections, the assessment of challenges, the pragmatic planning of interventions and highlighting benchmark successes during the formal documentation of the findings.

Introduction

How do we learn from the past and present to improve the future? The previous three industrial revolutions, which have come and gone, have left many on the continent questioning whether their revolutionary status and the education that skilled the workforce were better or worse for their everyday reality? Especially the lower socio-economic population groups that still rely on natural resources for sustenance and income. We are now facing the dire consequences of the industrial scale of devastation, pollution and overpopulation of our planet. The diversity and strength of our natural heritage are essential to the health and real wealth of life. The recent load shedding debacle in South Africa has made most of our population suddenly aware of their constant dependency on electronically powered devices, which are used on a daily basis in almost every sector of our economy. However, like all problems, this dilemma now provides an opportunity to solve and evolve our power generation so that it has less impact on our biological environment. This is unlike the pioneering but unsustainable use of non-renewable fossil fuels that powered the industrial revolutions and, in almost a century, devoured much of our natural resources. While the First Industrial Revolution burned coal in heat boilers which created and stored steam power to mechanise our first commercial factory production lines of Henry Ford, the Second Industrial Revolution used the same energy sources to generate electric power, which drastically enhanced mass production. In the Third Industrial Revolution, electronics and IT were employed to automate production lines to run 24/7 (Schwab 2016). Now the Fourth Industrial Revolution (4IR) is building on the third, the digital revolution, and refers to a set of highly disruptive technologies that are obscuring the lines between

the physical, digital and biological domains, collectively known as cyber–physical systems (Schwab 2016).

It is in this setting that the chapter explores how HE students, academics and administrators entering the 4IR can use data, information and knowledge to mould the revolution to benefit the quality of their HE experience. Changing the conceptions of learning from the reproduction of information to seeking its meaning and conceptions of knowledge from dualism and multiplicity to relativism could produce graduates with all the attributes to solve the many wicked problems of the 21st century. The COVID-19 pandemic has created an urgency to rethink the value of life and re-align the unsustainable information and knowledge practices in HE that threaten it. Can our intellectuals and pragmatic designers mould the 4IR and our epistemological learning ecologies and bring about sustainable development and knowledge production in Africa? Can 4IR technologies, such as machine learning, and AI combined with robotics, do so sustainably (Schwab 2016)? Or will future generations be left pondering the shortsightedness of another pseudo revolution? Challenges inherent in the 4IR have already been highlighted, including the relevance of our education system, job losses and the potential for inequality and non-inclusive growth within communities and countries, which all have the potential to create social instability (Schwab 2016).

South Africa is rife with poverty and has one of the highest unemployment rates in the world. Historically, the obvious culprit was apartheid's answer to cheap labour, one which deprived the black and mixed-race populations of quality education together with the skills and literacies needed to acquire good jobs (Ranchhod 2019). Then, the situation was exacerbated when firstly, labour-intensive sectors of the economy, such as mining and agriculture, mechanised their processes, leading to large job losses; and secondly, investors became wary of doing business in South Africa because of various risks that included monopolised markets, labour disputes and social and political instability (Ranchhod 2019). Presently, the noticeable skills gap between the advanced skills required in the knowledge economy of the 4IR and the low skills of the unemployed has not offered any opportunities to remedy the situation. While new 4.0 industries will emerge and old 3.0 ones disappear, labour markets will be faced with large shortages of particular competencies, as well as large quantities of competencies that are no longer required (Lee et al. 2018).

Primary, secondary and HE thus all have a shared responsibility to help address this socio-economic crisis by providing lifelong education that will equip learners with the appropriate knowledge and skills to enable them to transform themselves through the education system into the 4IR that should sustain them and their communities. The pseudo basification of HE, biographical reform of student enrolments and staff, and the merger of the

old institutions of HE into new universities, universities of technology, and comprehensive institutions resulted in two major issues within HE and society (Cloete & Moja 2005). The first was equity versus social, economic and political development, and the second, equity versus efficiency of management, administration, academic staff, curricula and use of public funds (Cloete & Moja 2005). Another major problem is that many school children who successfully complete primary and secondary education remain unprepared for HE taught in the dominant language of our economy. How do we Africanise the learning artefacts in our African HE? Will it be sustainable if we just change the language when our learning events, knowledge, economy and clothes are still epistemically in opposition to the truth and reality of the majority of Africans. How do we forgive but not forget the mistakes of the past and allow all Africans irrespective of race, colour, religion, belief, political opinion, culture, language, health status, class, gender, marital status, age, nationality, ethnic origin and disability to feel inclusive and welcome at our universities so that we collectively create the knowledge that is for all, not just the dominant race, colour, religion, belief, political opinion, culture, language, status, class, nationality or ethnic origin? When will we recognise the true wealth and strength of a nation is its diversity, of thought, culture, epistemology and ontology found in a truly unique and rich African heritage?

Employment in HE demands academics to be masters or experts within their disciplines of study, but the academy has only recently recognised the need for pedagogic knowledge and digital literacies to teach effectively. This has become even more urgent as our blended teaching and learning model changed to that of multimodal distance learning during the COVID-19 pandemic. As the digital learning spaces become the preferred platform to interact with multimedia learning events, insufficient resources such as access to affordable data, network coverage and dated teaching and learning tools and ICTs will definitely compound the problem and standard of education. Looking back at the state of HE, already half of all students that get to register do not graduate and incur financial debt, while only half of the remaining students finish their education on time (CHE 2014). However, it can also be argued that increased access to HE needed more public funding and academic development initiatives to support unprepared students and academics and that the lack thereof is compromising the production of high-quality graduates (Badat 2010). The government initially advocated that students were not being supported enough academically and recommended that institutions cap their enrolments to deal with the high dropout rates and improve graduate throughputs (Cloete & Moja 2005). However, we better understand that a student's chances of success in HE are affected by various predictors, where background matters, context matters, support matters and teaching matters, and result in a very unequal playing field (Green 2018) both during HE and, later, when seeking employment (Baldry 2016).

The social well-being of the students and their families cannot be underestimated when predicting academic success or failure in HE, and these data need special ethical considerations before disclosure, analysis and action. It is envisaged that inferential data analysis from the predictive model together with the emerging domain of learning analytics can assist institutions in identifying and supporting risks that are compromising the production of HE graduates with the necessary knowledge, capabilities and skills to drive sustainable economic development in South Africa in the 4IR and beyond.

Literature review

For graduates of HE to be competitive in the knowledge economy of the 4IR, there are generic 21st-century attributes that are proposed (University of Botswana 2019):

- Information and communication technology knowledge and skills.
- Self-directed, lifelong learning skills.
- Critical and creative thinking skills.
- Problem-solving skills.
- Communication skills.
- Entrepreneurship and employability skills.
- Organisational and teamwork skills.
- Research skills and information literacy.
- Social responsibility and leadership skills.
- Interpersonal skills.
- Cross-cultural fluency.
- Accountability and ethical standards.

Gray (2016) predicted that in 2020, almost a third of the skills that were regarded as vital in the workforce towards the end of 2015 would have changed with the advancement of AI, machine learning, robotics, autonomous transport, IoT, advanced materials, 3D printing, nanotechnology, biotechnology and genomics. The World Economic Forum (WEF) report, entitled, 'The Future of Jobs', surveyed the employment, skills and labour force strategies from chief human resources officers of leading global employers, in order to know what skills will be sought after within Industry 4.0 companies (Gray 2016). The results showed that creativity will become one of the top three, and emotional intelligence one of the top 10 skills workers will require, so as to benefit from and optimise new 4IR technologies and Industry 4.0 ways of working. The result also revealed that negotiation, flexibility and active listening will drop out of the top 10 skills required by labour, as machine learning and Big Data start to make decisions for us (Gray 2016). Schwab (2016) believed that society needs to adjust and harness the inherent disruptions of the 4IR by nurturing and applying their minds (contextual intelligence), hearts (emotional intelligence), souls (inspired intelligence) and bodies (physical intelligence), in

order to understand how to apply knowledge contextually for the benefit, health, well-being and sustainable development of humanity.

Inspiring critical and creative thinking among HE students thus requires us to nurture their physical, digital and biological learning spaces. Ensuring the provision of safe, healthy, innovative learning spaces, appropriate teaching methods, relevant content and engaging technology-assisted learning opportunities will accommodate their multiple learning styles and the current information literacy needs. The latter will require our LIS curricula to dynamically include traditional language literacies and library instruction together with computer, network, media, visual and cultural literacies (Lapuz 2014) for our academics and students to be proficient in the communication and information models of the digital 21st century. Kampylis and Berki (2014) believed that creativity cannot be directly taught; however, good educational practices can potentially offer a fertile environment for creative minds to grow and flourish. In an ideal blended HE ecology, these learning spaces can include: face-to-face learning, e-learning, self-learning, informal learning, work-integrated or experiential learning, learning from mentorship or tutorship, community outreach and research (Evans 2013); however, in the current COVID-19 pandemic, many of these spaces will have to be deconstructed. Combing a balance of the eight learning events of creating, debating, receiving, exploring, experimenting, imitating, practicing and meta-learning (Leclercq & Poumay 2005) with technology-assisted learning events will help engage students (O'Brien & Toms 2008). This engagement and participation are essential in the remote access of curricula but also help to ensure that module and exit level outcomes of academic programmes are met. Without fully exploring the centrally placed meta-learning of learning events, students are often unable to contextualise how to apply foreign concepts and ideologies from the curriculum to their lives. Research data on our students' experiences in the HE ecology are therefore essential in establishing and supporting productive learning spaces and inspired students. The student engagement model is recommended to explore learners' satisfaction and engagement within these different learning spaces (Matthews, Adams & Gannaway 2010).

Institutions of HE are facing challenges of rapidly evolving technologies and segregated business environments and data sets when trying to use teaching and learning data dynamically (Pulkkinen 2006). Combining these data sets from across a variety of disconnected systems can be very difficult; however, combined data sets from various business processes across an institution will provide an enhanced foundation for making faster and smarter decisions (Daniel 2015). Thus, big data can help to support students' learning requirements (Daniel 2015). Data-driven decision-making and analysis of big data sets relating to both staff and students, and their engagement with teaching and learning, form the basis of learning analytics (Slade & Prinsloo 2013). This allows HEIs to increase their understanding of their faculty and

students' teaching and learning needs and to use this advanced understanding to positively influence student learning, progression and retention (Slade & Prinsloo 2013). In HE, big data concepts and analytics can also be applied to a large variety of administrative and instructional applications and processes, which include student access, such as financial planning, recruitment, admissions processing and student success through engagement and performance monitoring (Picciano 2014). Van Harmelen and Workman (2012) stressed that decision-making and consequent human actions are as important in any successful analytics solution as the technologies themselves. Davenport et al. in Van Harmelen and Workman (2012) broadly characterised analytics as answering questions that produce both information and insight (Table 6.1).

Providing the necessary best actions for students and staff via multiple support structures will be an essential part of any socio-technical system, and this is where small data, through the averaging out phenomenon, can uncover personal insights that are often missed in big data analytics (Kaseeram 2018). Lindstrom (2016) believed that to gain optimal insights into who we are as humans comes from understanding our online and offline selves, and from combining big data with small data. The author states that 90% of what people give off in oral conversation are nonverbal signals and body language (Lindstrom 2016). Thus, our students' identities, perspectives, ethics and beliefs need to be understood by researching who they are in their real lives, cultures and countries (Lindstrom 2016). Darries (2005) explained that the integration of information and the alignment of business processes across an HEI relies on the development of an EA model that focuses on the alignment of four knowledge domains: business architecture, information architecture, application architecture and technology architecture. These four dimensions to the EA can be defined as follows (Pulkkinen 2006):

1. Business Architecture portrays the business processes, service structures and organisation of activities.
2. Information Architecture covers the information dimension of EA such as the high-level structures of business information and the data architecture.
3. Systems Architecture (SA) contains the systems dimension and the information systems of the business. Some conventions call it the Applications Architecture.
4. Technology Architecture or the technology dimension covers the technologies used to build the information and communication systems in the business.

TABLE 6.1: Questions whose answers are sources of information and insight, which can be addressed using analytics.

Variable	Past	Present	Future
Information	What happened?	What is happening now?	What will happen?
Insight	How and why did it happen?	What's the next best action?	What's the best or worst that can happen?

Source: Davenport et al., cited in Van Harmelen and Workman (2012:5).

Darries (2005) proposed that the EA approach will provide holistic views and insights of people, processes and systems that are needed to achieve some of HEIs strategic objectives, such as:

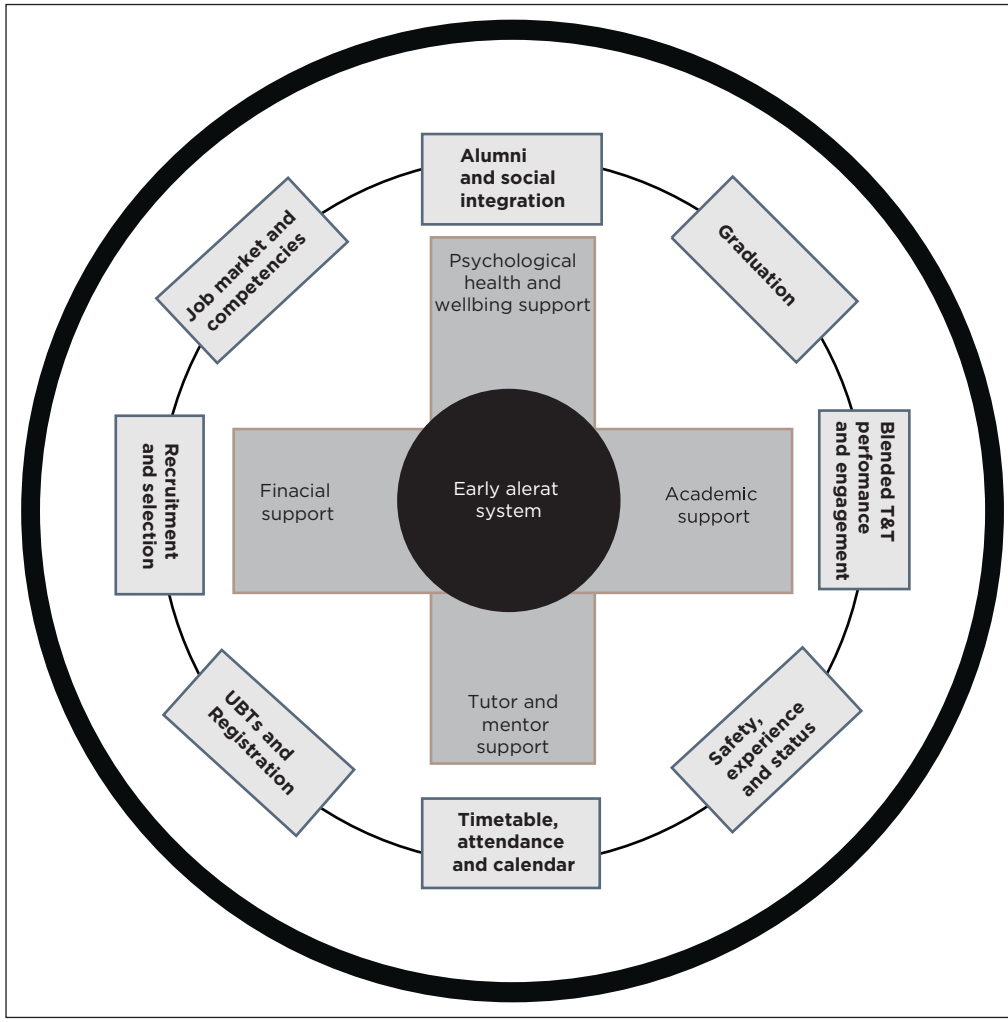
- Improve throughput rates, graduation and services for students.
- Provide a safe, supportive, dynamic and engaging learning environment that respects and values beliefs and opinions within student diversity and equity.
- Increased employability, graduate placement and students' onward progression into the working world.
- Build capacity and improved quality of student life by nurturing and supporting matters affecting students' health and well-being and success.
- Improved quality of student life supported by a holistic care, nurture and advocacy in matters affecting students' well-being.

Conceptual framework and hypothesis

The adapted red cross early alert system (Figure 6.1) draws on the work of Darries (2005) and identifies multiple big and small data set sources, from the recruitment and selection of students to their graduation and integration into society; including ensuring that potential job market competencies and opportunities are matched with graduate attributes and exit level outcomes of academic programmes. The framework for a university BI system and key Big Data opportunities for four end-users in HE (Figure 6.2) is adapted from Daniel (2015) and will allow for enhanced Big Data opportunities for administrators, faculty, students and alumni within the HE ecology.

Recruitment and selection

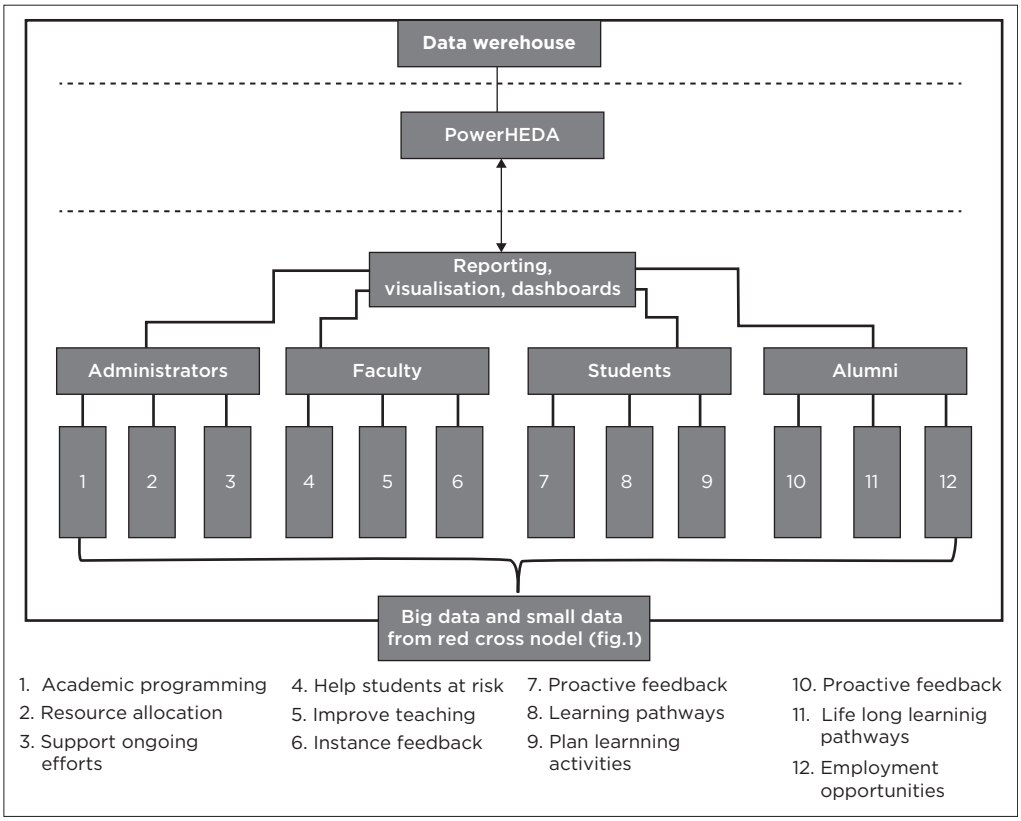
The first data category to be considered in Figure 6.1 is recruitment and selection. HE institutional recruitment software needs to be integrated into social media and other digital communication platforms, such as email and the world wide web, to market HE academic offerings to potential students. Once selected, students should be requested to stay connected from first year to graduation and beyond as alumni. HE needs diversity in our classrooms to promote different perspectives, beliefs and opinions; thus, targeting students from unique backgrounds should be considered in order to market and recruit a diverse student population. Some institutions of HE will try to recruit the 'cream of the crop' and often will administer National Benchmark tests (NBTs) to select and place students. Placement should rather be determined by the student, according to their backgrounds, choices and career aptitude tests, as well as counselling and guidance. Admissions data can predict the need for supporting at-risk first-year students, based on the



Source: Adapted from Darries (2005).

FIGURE 6.1: Red cross early alert model for students enrolled in higher education.

feeder schools they attended and the marks obtained in matric. The study by Lourens and Bleazard (2016) confirmed the importance of a variety of information on background (pre-university information) in the prediction of at-risk first-year students, who need support to prevent them from dropping out by their second year. Selection data can also help understand and manage whether or not first-year students get selected for academic programmes that were their first, second or last choice. If the latter is the case, there will be a risk that their interest in the programme, and their intent or motivation to achieve the exit level outcomes and generic 21st-century graduate attributes will be lower than if the programme was their first choice.



Source: Adapted from Daniel (2015).

FIGURE 6.2: Framework for a university business intelligence system and key big and small data opportunities for four end-users in higher education.

University benchmark tests and registration

The second proposed category of data would arise from NBTs that would measure first-year students' understanding of academic literacy, quantitative literacy and mathematics to support and ensure proficiency in the exit level outcomes of the academic programmes students' are registered in. NBT results can recommend internal support structures, online MOOCs and non-credit bearing courses to support underprepared students entering HE. Customising NBTs into university benchmark tests (UBTs) would allow better assessment of discipline-specific literacies offered within different programmes or faculties of the HEI. Once students are appropriately selected into academic programmes, based on the entry requirements and student's interest and choice on what to study, the registration data can provide rich biographic information, including a broad data set of the student's background, learning-enabling facilities at home and the secondary school where they complete their matriculation, as well as home information, such as financial status, family structure and also their parents and siblings' educational backgrounds.

TABLE 6.2: Recruitment and selection questions whose hypothesised answers are sources of information and insight.

Topic	Time	Question	Hypothesised answer
Information (Recruitment and selection)	Past	What happened?	Reactive recruitment based on applications and matric results. Development of HE from the Greek 'elite' to the medieval 'community' of scholars to the exclusive colonial colleges (Barnett 1990).
	Present	What is happening now?	Proactive recruitment based on reduced government funding and competition in the HE market (Beneke & Human 2010). Equal access but unequal success in HE.
	Future	What will happen?	Proactive national selection and recruitment will be based on HEI programmes and linked to student background, career choices, intent to learn, career aptitude tests and proper counselling and guidance.
Insight (Recruitment and selection)	Past	How and why did it happen?	Belief that a society or system should be led by an elite.
	Present	What's the next best action?	Egalitarianism, all people are equal and deserve equal rights and access to HE.
	Future	What's the best or worst that can happen?	The best that can happen is an open HE for access to anyone with an intent to learn to succeed. The worst that can happen is a haphazard approach to selecting students without proper career guidance and aptitude tests, then they drop out of programmes that do not interest them or are too advanced for their academic literacies.

Source: Davenport et al. in Van Harmelen and Workman (2012:5).
HEI, higher education institution; HE, higher education.

TABLE 6.3: Recruitment and selection questions whose hypothesised answers are sources of information and insight.

Topic	Time	Question	Hypothesised answer
Information (UBTs and registration)	Past	What happened?	NBTs used to take the cream of the crop and gatekeeper access to HE's ivory towers.
	Present	What is happening now?	NBTs designed to assess the academic ability of first-year students to succeed in HE (Cliff 2015).
	Future	What will happen?	NBT will be used to support success in HE (Cliff 2015). Assessment plays an important role in counselling relationship, that is, the more information counsellors have the more they are able to achieve a fruitful outcome.
Insight (UBTs and registration)	Past	How and why did it happen?	Encouraged and allowed elite access into HE.
	Present	What's the next best action?	Allow and support equal access and success in HE.
	Future	What's the best or worst that can happen?	The best that could happen is to allow greater engagement with students' academic literacy, deficiencies, and information and data aimed at the improvement of teaching and learning (Cliff 2015). The worst that could happen is that HE is seen as obsolete and the demand to enter traditional HE drops.

Source: Davenport et al. in Van Harmelen and Workman (2012:5).
HE, higher education; NBTs, national benchmark tests; UBTs, university benchmark tests.

TABLE 6.4: Timetable, attendance and calendar questions whose hypothesised answers are sources of information and insight.

Topic	Time	Question	Hypothesised answer
Information (Timetable, attendance and calendar)	Past	What happened?	Paper-based records was difficult to capture and analyse.
	Present	What is happening now?	Digital and online systems with limited data logging and reporting.
	Future	What will happen?	Integrated as one platform feeding data into EA and BI providing real-time feedback and support.
Insight (Timetable, attendance and security)	Past	How and why did it happen?	Diaries were kept for daily schedules and appointments. Security was not proactive.
	Present	What's the next best action?	Digital and manual versions of timetables and attendance registers. Security still reactive.
	Future	What's the best or worst that can happen?	The best that could happen would include an integrated online timetable, attendance and personal assistant to report and support students. The worst that could happen is an unsafe HE environment that prevents students from attending. Intelligence gathering would allow for proactive security.

Source: Davenport et al., cited in Van Harmelen and Workman (2012:5).
BI, business intelligence; EA, enterprise architecture; HE, higher education.

Timetable, attendance and calendar

The third important data set includes information on timetable, attendance and calendar events. HEIs need to verify student attendance, both at lecture and examination venues. Linking attendance monitoring with timetable and calendar data can validate the contact hours (credits) of academic programmes. Attendance data can also be linked to student and lecturer evaluations in order to have a better understanding of student engagement versus success.

Safety, experience and status

The fourth data set includes security surveillance and incident report data, which can track incidents, response times and actions of security staff. Students could be asked to comment on the resolution of incidents, to ensure that students' safety remains a priority within the HE ecology. A mobile application and portal could provide students and security officers with geo-location information. This can help in tracking student and staff movements with their permission, and also providing safety features for those who stay on campus or those moving to off-campus residences. Linking this platform to the protective services of the HEI would allow security to track potentially at-risk students and staff moving from one location to another, and ensure their safety before or soon after incidents occur. A panic button on the application would allow students, who urgently require assistance or who feel unsafe, to gain the attention of security officers. Linking the platform to an ambulance service can be of assistance when emergency medical services are needed with detailed and up-to-date medical records.

TABLE 6.5: Safety, experience and status questions whose hypothesised answers are sources of information and insight.

Topic	Time	Question	Hypothesised answer
Information (Safety, experience and status)	Past	What happened?	Institutional responsibility, reactive risk management and support.
	Present	What is happening now?	Student and institutional responsibility, reactive risk management and support.
	Future	What will happen?	Shared responsibility in reporting to EA–BI, which allows for reactive and proactive risk management and support.
Insight (Safety, experience and status)	Past	How and why did it happen?	In the past, there was limited attention to a student's experience and well-being.
	Present	What's the next best action?	Currently, there are yearly experience surveys to provide a reactive response.
	Future	What's the best or worst that can happen?	The best that could happen is real-time monitoring and support for proactive responses. The worst that could happen is that the privacy of students is compromised.

Source: Davenport et al. in Van Harmelen and Workman (2012:5).
BI, business intelligence; EA, enterprise architecture.

Higher education experience data can indicate the satisfaction of the student with their studies and HE learning and living environments, including the first-year experience data. The postgraduate survey data set will allow some insights into the satisfaction levels of senior students. Graduation data will provide the satisfaction levels and inputs of students exiting the institution. A centralised mobile application could ensure that students can update their status to monitor their real-time satisfaction levels, allow immediate access to updated information and track student engagement in class with crucial notifications and surveys.

Blended teaching and learning performance and engagement

The fifth important data set comes from a variety of sources within the blended teaching and learning ecology, including face-to-face interactions, informal learning space, research, work-integrated learning, community outreach and tutor mentor data sets. However, since the COVID-19 pandemic, e-learning data from learning management systems (LMSs) can provide a wealth of data on student attention, engagement and performance. Other sources could include smart classroom data from smartboards, CCTV recordings and mobile applications and data management systems. Linking a mobile application to the institutional LMS allows seamless student access to their registered course materials and support structures. This function would require both the Student Information Systems as well as the LMS to be updated, linked and integrated to ensure that students registered for a course

TABLE 6.6: Blended teaching and learning performance and engagement questions whose hypothesised answers are sources of information and insight.

Topic	Time	Question	Hypothesised answer
Information (Blended teaching and learning performance and engagement)	Past	What happened?	Brick and mortar, face-to-face and teacher-centred. Applied pedagogical approach to HE teaching and learning.
	Present	What is happening now?	Blended learning and student-centred, with data captured from information systems to EA for limited decisions and support. Andragogical approach to HE teaching and learning.
	Future	What will happen?	Seamless mobile learning (Wong 2015) and student-directed learning with data captured from information systems to EA for all decisions and support. Heutagogical approach to HE teaching and learning.
Insight (Blended teaching and learning performance and engagement)	Past	How and why did it happen?	When a HE process is standardised, it can be repeated at a lower cost (Brown-Martin 2017).
	Present	What's the next best action?	Having high standards does not mean that we all reach them in the same way.
	Future	What's the best or worst that can happen?	The best that could happen is to offer personalised education and lifelong learning to meet the societal challenges presented by the 4IR, climate change and population growth (Brown-Martin 2017). The worst that could happen is that HEI are seen to be obsolete.

Source: Davenport et al. in Van Harmelen and Workman (2012:5).
EA, enterprise architecture; HE, higher education; 4IR, Fourth Industrial Revolution.

would have direct access to the course content without needing to login to a separate application. Such access would allow academic staff the ability to instantly communicate with students through the LMS and push notifications for upcoming assignments, tests and examinations. Notices can be traced to view students' engagement with information, in order to enhance the effectiveness of student communication. Linking the mobile application to the department of communication and marketing would allow centralised communications to be sent to relevant students only.

Graduation

Graduation data, the sixth data set in the model, will provide statistics on the number of students completing their studies in programmes, the length of study and other statistics such as the number of distinctions, first classes and merits.

Alumni and social integration

The seventh data set data would provide information on employment levels and alumni's ability to integrate into society. Social networking within the world of work will allow alumni to get information regarding job opportunities, internships and work-integrated learning experience opportunities. HEIs need

TABLE 6.7: Graduation questions whose hypothesised answers are sources of information and insight.

Topic	Time	Question	Hypothesised
Information	Past	What happened?	Standardisation, centralisation and control. Once a year.
	Present	What is happening now?	Standardisation, centralisation and control. Twice a year.
	Future	What will happen?	Flexibility, continuous graduation process, providing certificates on demand after completion of an academic programme.
Insight (Graduation)	Past	How and why did it happen?	Programme registration and graduation are limited, because of yearly timetable, and the traditional ceremonial pomp and grandeur of the event.
	Present	What's the next best action?	Create flexible entry and exit points within a programme, which will increase the chances to graduate within an academic year.
	Future	What's the best or worst that can happen?	The best that could happen is for HE to offer seamless lifelong learning with unlimited chance to officially graduate. The worst that could happen is that graduates are delayed in getting employment because of certification delays.

Source: Davenport et al. in Van Harmelen and Workman (2012:5).
HE, higher education.

TABLE 6.8: Alumni and social integration questions whose hypothesised answers are sources of information and insight.

Topic	Time	Question	Hypothesised answer
Information (Alumni and social integration)	Past	What happened?	Limited contact and support, other than the prestige and name of the institution.
	Present	What is happening now?	Contact and support, to help graduates find employment and integrate successfully into society.
	Future	What will happen?	Lifelong contact and support in their integration into society through lifelong learning opportunities.
Insight (Alumni and social integration)	Past	How and why did it happen?	Recruitment through word of mouth and traditional media.
	Present	What's the next best action?	Recruitment through traditional media; however, today online recruiting is a whole new culture (Cappelli 2001). Online community portal can enhance, to a large extent, the networking of alumni (Barnard & Rensleigh 2008).
	Future	What's the best or worst that can happen?	The best that could happen is that students find work-integrated learning, recruiting and employment opportunities. The worst that could happen is that graduate unemployment rate increases and HE is seen as obsolete.

Source: Davenport et al. in Van Harmelen and Workman (2012:5).
HE, higher education.

to create and administer discipline-specific networks on platforms such as LinkedIn. Benefits for alumni would include:

1. Recruiters and human resources professionals are on LinkedIn.
2. LinkedIn has extensive job listings.

3. Alumni can receive endorsements and testimonials.
4. Make important business connections.
5. Reach out to the people who are interested in their profile.
6. Create and update their online CV.

Job market and competencies

The eighth data set should record stakeholder engagement on graduate attributes and competencies needed to perform within the job markets. These need to be benchmarked by professional bodies or sectors and strategically linked to learning and module outcomes within the curriculum.

Support structures

The early warning system should trigger an alert and schedule action from four support structures, namely: financial, tutor and mentor, academic and psychological, health and well-being support (Darries 2005) that would help minimise the risk of either the student or staff not performing or enjoying their HE experiences, or as an alumnus, not finding opportunities in the 4IR

TABLE 6.9: Job market and competencies questions whose hypothesised answers are sources of information and insight.

Topic	Time	Question	Hypothesised answer
Information (Job market and competencies)	Past	What happened?	First and second industrial revolutions, where the goal was to mechanise factory production lines and enhance mass production (Schwab 2016). Competencies required workers to be skilled in manufacturing techniques.
	Present	What is happening now?	Third Industrial Revolution used electronics and IT to automate production lines (Schwab 2016). Negotiation, flexibility and active listening.
	Future	What will happen?	Fourth industrial revolution, the digital revolution. Creativity and emotional intelligence.
Insight (Job market and competencies)	Past	How and why did it happen?	Students memorise and master the same core curriculum for industrialised economy of the early 20th century (Brown-Martin 2017).
	Present	What's the next best action?	Critical and creative students who can apply their curricula knowledge for contextual application in the digital knowledge economy.
	Future	What's the best or worst that can happen?	Best thing would be for students to demonstrate creativity, innovation, ingenuity, higher order and critical thinking to solve complex and abstract problems as well as how to integrate into civil society (Brown-Martin 2017) . The worst that could happen is that faculty pay little attention to what is externally required from graduates, and produces intellectuals who are narrow, technical specialists without ethics, morals and a sense of citizenship.

Source: Davenport et al. in Van Harmelen and Workman (2012:5).
IT, information technology.

job markets. Psychological, financial, health and well-being support for students and staff could be offered through online wellness programmes and campus-based feeding schemes and health clinics. The academic tutor and mentor programmes can combine face-to-face social and online interactions; the latter could occur on LMS platforms and mobile applications. Academic support could include face-to-face discussions and demonstrations, as well as synchronous and asynchronous online support, via email, chat rooms, video conferencing or feedback from the LMS, online MOOCs and non-credit bearing courses. Alumni struggling to integrate into society could also be mentored and registered in entrepreneurial and skills development courses to support them in finding a niche in society. Proper investments in the support structures of early warning systems are essential to improve the institutions' ecology. The nature of studying these systems requires multiple time periods for the measurement of data, including baseline and impact assessments that will both adopt longitudinal survey designs to increase the predictive capabilities of the model.

Conclusion

Institutions of HE need to adopt EA in order to embrace BI for better decisions and actions in their strategic and operational matters. This will result in increasing the institutional agility in the 4IR while reducing costs. An integrated system of data sets, which are aligned to HEI's needs, will allow for enhanced Big Data opportunities for administrators, faculty, students and alumni within the HE ecology. Aligning the business strategy and management of information provision will increase institutional efficiency by saving primary users' time and preventing the duplication of data. The BI will enhance the reporting, analysing, monitoring and predicting abilities of users within the HEI through visualisation dashboards that would allow for efficiency and transparency in the information management landscape. Administrators will be able to report accurate Higher Education Management Information System (HEMIS) data to obtain the correct government subsidy; analyse students' information and background before selection into academic programmes; monitor faculty time management and physical space requirements for drafting timetables and predict the financial viability of new academic programmes. Faculty will be able to monitor students' engagement and attention in the classroom, report undergraduate students' pass rates and performance data, as well as postgraduate students' progress in their studies. They will also be able to predict and support at-risk students or refer them to the necessary support structures. In addition, faculty will be able to analyse student retention trends at the different academic levels of a programme. Students and alumni would be able to give proactive feedback to both administrators and faculty, in order to improve their services, teaching and HE experience. Students and alumni

will also be able to receive online career guidance and counselling before registering and choosing their learning or life-long learning pathways. They will also, very importantly, be able to receive financial, psychological, health and well-being support from face-to-face and/or online counselling, depending on the level of support required.

In order to nurture creativity and critical thinking within HE education, institutions need to reinvent their physical and digital learning spaces that were originally designed for teacher-centred learning. The design of physical and virtual learning spaces has a major impact on the way students learn and socially construct knowledge. These spaces should be functional and learner-centred, so as to engage and empower learners' biological learning spaces (minds and bodies) in a safe and healthy environment. Faculty also needs to professionalise their practice to understand the art of teaching adults and their preferred learning styles. Adult learners should be encouraged to choose and direct their own learning pathways, based on their intent to learn. Faculty also needs to combine this heutagogical knowledge with technological knowledge and content knowledge, in order to actively capacitate and engage students in lifelong learning. Only then will HE remain relevant to students looking to find a niche in the innovative and disruptive world of the 4IR.

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Chapter 7

Responsiveness of library and information science research and education to the Fourth Industrial Revolution

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Abstract

It is argued that while there has been a response to the Fourth Industrial Revolution (4IR), an overlap between the third digital revolution and 4IR exists. Because of inequality, there will be variations, sometimes significant, within and between institutions, countries and regions. The purpose of this chapter is to determine how LIS research and education could respond to the 4IR by using conceptual analysis. Fundamentally, readiness diagnostic model framework (RDMF) drivers of production, such as the technology of production, human capital, institutional framework, demand (market needs)

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and technology pedagogical and content knowledge (TPACK), have major roles to play. As a conceptual study, the personal biases of the author are likely to be encountered. Nonetheless, the chapter provides a conceptual framework from which future LIS discourse, education and research development may occur. The chapter proposes a theoretical framework for LIS education and research that could make an important contribution to the future discourse and development of research and education in the domain.

Introduction

Evolutionists (Darwin 1859) and creationists maintain opposing viewpoints on human and societal transformation. The former maintains that societal transformation might have occurred in the shift from hunting and gathering for food, to an agrarian or agricultural society, to an industrial society, to the post-industrial or information and knowledge societies. The catalyst for the agricultural society is the production of raw materials and agricultural products. The industrial society is defined by the production of industrial products through manufacturing, while the information and knowledge societies are defined by the production of information and knowledge products, respectively. Innovation, networks and technology spearhead all these transformations.[7]

In the last millennium, the work of futurists, such as Manuel Castells' (1996) work on organisation theory and network society, Daniel Bell's (1973) interests in post-industrial society, Alfin Toffler's (1991) work on the 'third industry' or 'third wave' and Frederick Lancaster's (1978) work on the paperless society, among others, have been at the forefront of enviable debates and discussions on societal transformation and economic drivers in some publications. Daniel Bell conceived that the post-industrial society would include the information society[8] and the knowledge society[9] (Duff 1998; Moodley 2004) in the 1960s and refer to the 'post-industrial workforce', the computer and 'information revolution'. Manuel Castells (1996) referred to these societal transformations as the 'network society' in his seminal work 'The Information Age'. Ocholla and Ocholla (2020) recognised the manifestation of information and knowledge society in the contemporary society catalysed by extensive use of ICTs for global connectivity and seamless information flow to an overwhelming. The Fourth Industrial Revolution (4IR) builds on this previous, third digital revolution, as was

7. See www.slideshare.net/SD_Paul/science-and-technology-capacity-and-the-knowledge-society

8. See http://www.itu.int/net/wsis/

9. See http://unesdoc.unesco.org/ark:/48223/pf0000141843

pronounced in 2016 by another futurist, Klaus Schwab (2017), the founder and executive chairman of the WEF.

Library and Information Science education and research – and indeed human society – is forced to respond to the emerging technological revolution, such as 4IR, through curriculum review and revision; the review of research strategy, teaching and learning methods and resources (technology, human resources, funding and information and knowledge access); student admission requirements; continuing education; LIS education management and leadership and policy. This is done to strive to satisfy the new requirements of the LIS job market. Increasingly, albeit without any proper justification, employers of LIS graduates complain that LIS schools are not producing graduates who meet their employment needs. Thus, they require competent, industry-ready graduates.

In this chapter, I discuss how LIS education and research have or could respond to the 4IR in Africa, particularly in South Africa. I argue that while there has been a response to the revolution, the nature of the response is not readily known and cannot be uniform across all institutions, countries, regions and across the globe because of socio-economic and technological inequalities. The conceptual study is divided into four parts, beginning with unpacking the 4IR concept with regard to its theories and characteristics. The second part discusses the status of LIS research and education, and in the third section, I propose a theoretical framework for LIS education and research in 4IR. The last section provides concluding remarks.

The Fourth Industrial Revolution

At the WEF in Dover in 2016, the 4IR or Industry 4.0 concept was conceived by Klaus Schwab, with the following remarks. He recognised the contributions of the First (e.g. steam engine), Second (e.g. electric power) and the Third Industrial Revolution (e.g. electronics and IT-automation of production). He (Schwab 2015) noted that:

> Now a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterised by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres. (p. 1)[10]

From the foregoing, the 4IR would also mean the digital revolution. I maintain that because of inequality, not all societies have socially and/or economically transformed or responded to the three stages referred to by Schwab in readiness for the 4IR. In essence, there is an undisputed link and interdependence

10. See https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/.

between the fourth industrial technologies and the technologies that preceded it in the past second and third industrial revolutions, than can be imagined or ignored. Schwab and Davis summarised the connectivity as: 'A productive way to more deeply understand the 4IR is to take a two-pronged approach, which can be thought of as a "zoom-in, zoom-out" strategy'. They (Schwab & Davis 2018) advised that it is important to:

> [*G*]ain a minimum viable appreciation of a range of specific technologies and their capabilities, to better understand their potential and how they are being used; and [...] connect the dots through an understanding of the relationships between technologies and systemic changes that they help catalyse. (p. 27)

Thus, they affirmed that the 4IR technologies (Schwab & Davis 2018):

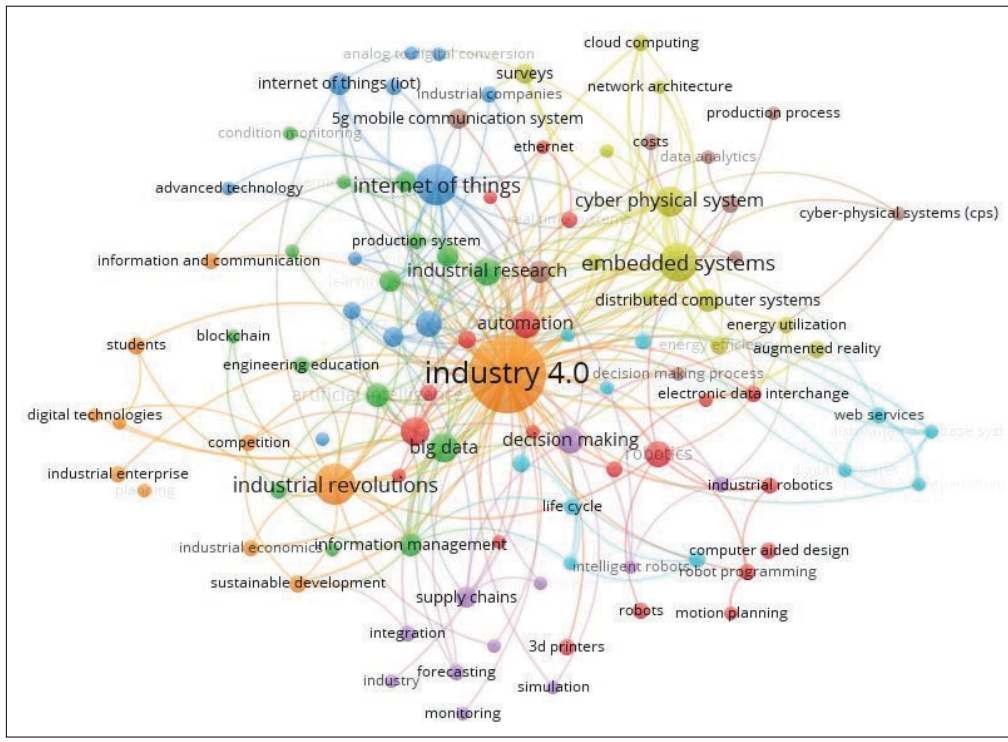
> [*E*]xtend and transform digital systems in significant ways: they scale exponentially, emerge physically and embed themselves in our lives; their disruptive power is amplified by how they combine and generate innovations, and they create similar benefits and challenges. (p. 27).

The term, 'Fourth Industrial Revolution' was preceded by the term 'Industrie 4.0.', which is linked to Germany's 10 'target items of high-tech strategy action plan of 2012 project' that was to produce factories that are '"smart," efficient and adaptable to new technological changes or demands' (Kamble, Gawankar & Gunasekaran 2018). Kamble et al. (2018) 'referred to Industry 4.0 technologies such as IoT, big data analytics, cloud computing, augmented reality and robotic systems, simulation prototypes, and 3D printing'.

We (Ocholla & Ocholla 2020) attempted to characterise 4IR by keyword analysis through Scopus (2014–2019) because of its indexing breadth and inclusivity of scholarly publications (Onyancha & Ocholla 2009) by using a Boolean search resulting in 5380 records and displayed the terms by VOSviewer for links as reflected in Figure 7.1 (based on 100 of the top terms). Most of the terms or technologies are not new as they reflect on the past (to some) industrial revolutions, particularly the Third Industrial Revolution or digital revolution. This must be recognised when referring to the 4IR.

Frameworks and theoretical perspectives

The response to 4IR requires theoretical or conceptual and conceptual backbone, as reported in related studies (Evans 2019; Kamble et al. 2018; Kearney 2018; Majanja 2020; Schwab 2017; Schwab & Davis 2018). It is also important to examine the theories and methodologies of the 4IR, such as in Moon and Seol's (2017) study on the response of Korea to Industry 4.0. Schwab's (2016) seminal work, including latter editions and variations (Schwab & Davis 2018), and the WEF's report in collaboration with Kearney (2018) provide a starting point for theorising and understanding the 4IR together with its complexities.



Source: Ocholla and Ocholla (2020:357).

Figure 7.1: A link analysis of keywords or terms of Industry 4.0 in Scopus from 2014 to 2019.

Theoretical perspective

Theoretically, 4IR can be approached from a number of points of view. I point out two possible perspectives. The first refers to WEF and Kearney's (2018) publication entitled, 'Readiness for the Future Production Report 2018', where the RDMF is discussed in greater detail. The model consists of two components: (1) Structuring production, referring to complexity and scale, and (2) Drivers of production, which is made up of six components, namely, technology and innovation (e.g. ICT availability, access and use, digital and data security, research and innovation); human capital (labour availability and capability); global trade and investment (e.g. open, facilitated, market access); institutional framework (largely government-driven, e.g. efficiency and effectiveness, suitable policy and legislation); sustainable resources (environment, energy, etc.) and finally, demand environment (e.g. market size and consumer sophistication). Within this framework, country readiness is determined by using a quadrant consisting of four components or 'country archetypes', such as leading (top right), high potential (top left), nascent (low left) and legacy (low right). Most developing countries, including South Africa, belong to the nascent archetype (low left quadrant).

The report (Kearney 2018:x–xi) found that: The assessment reveals that only 25% (25 developed countries of 100) countries can benefit from the changing nature of production as they already account for over 75% of global manufacturing value added. It was further noted that 'no country has reached the frontier of readiness, let alone harnessed the full potential of the Fourth Industrial Revolution in production'; 'new technological paradigms play a key role' investment into enablers will be important and many challenges to be addressed by both the private and public sector still exist. It does seem to me that the hypotheses in this chapter, that is, 'the most important drivers of future readiness are technology and innovation' and 'human capital, institutional framework and global trade and investment', are fundamental. This chapter affirms the importance of investing in people and technology for competitive advantage. The RDMF provides a strong foundation for establishing and understanding institutional, regional or a country's level of readiness.

TABLE 7.1: Twelve key emerging technologies.

Technology	Description
Artificial intelligence and robotics	Development of machines that can substitute for humans, increasingly in tasks associated with thinking, multitasking and fine motor skills
Ubiquitous linked sensors	Also known as the 'Internet of Things'. The use of networked sensors to remotely connect, track and manage products, systems and grids
Virtual and augmented realities	Next-step interfaces between humans and computers involving immersive environments, holographic readouts and digitally produced overlays for mixed-reality experiences
Additive manufacturing	Advances in additive manufacturing, using a widening range of materials and methods. Innovations include 3D bioprinting of organic tissues
Blockchain and distributed ledger technology	Distributed ledger technology based on cryptographic systems that manage, verify and publicly record transaction data; the basis of 'cryptocurrencies' such as bitcoin
Advanced materials and nanomaterials	Creation of new materials and nanostructures for the development of beneficial material properties, such as thermoelectric efficiency, shape retention and new functionality
Energy capture, storage and transmission	Breakthroughs in battery and fuel cell efficiency; renewable energy through solar, wind and tidal technologies; energy distribution through smart grid systems; wireless energy transfer and more
New computing technologies	New architectures for computing hardware, such as quantum computing, biological computing or neural network processing, as well as innovative expansion of current computing technologies
Biotechnologies	Innovations in genetic engineering, sequencing and therapeutics, as well as biological computational interfaces and synthetic biology
Geoengineering	Technological intervention in planetary systems, typically to mitigate effects of climate change by removing carbon dioxide or managing solar radiation
Neurotechnology	Innovations such as smart drugs, neuroimaging and bioelectronic interfaces that allow for reading, communicating and influencing human brain activity
Space technologies	Developments allowing for greater access to and exploration of space, including microsatellites, advanced telescopes, reusable rockets and integrated rocket-jet engines

Source: World Economic Forum (2017).
3D, three-dimensional.

The second perspective stems from TPACK. According to Koehler and Mishra (2009:60–64), and later Evans (2019), 'the TPACK framework was built on Lee Shulman's construct of pedagogical content knowledge (PCK) and includes technology knowledge (TK), which is considered vital for effective teaching with technology'. Based on Koehler and Mishra's view and clarification, TK requires self-determined learning (heutagogy) as technology evolves. They explained that pedagogical knowledge refers to a teacher's 'knowledge about the processes and practices or methods of teaching and learning' and involves heutagogy and andragogy (learner or student-directed or self-learning) and pedagogy (teacher-directed learning). They clarified that content knowledge is the teacher's or lecturer's knowledge about the subject matter that is to be learnt or taught. In contrast, PCK refers to the transformation of the subject matter for teaching by interpreting the subject matter, finding multiple ways to represent it and using relevant tools to deliver it. Additionally, technology content knowledge refers to using new technologies for content delivery. Technology pedagogical knowledge concerns the understanding of how 'teaching and learning can be changed and enhanced when specific technologies are used in different ways' (Koehler & Mishra 2009:60). Mabel Majanja (2020), referring to Kenyon and Hase, suggested that:

> [*S*]elf-determined learning may be viewed as a natural progression from earlier educational methodologies [*pedagogy and andragogy*], in particular from capability development- and may well provide the optimal approach to learning in the twenty-first century. (p. 1)

Majanja (2020) cited McAuliffe et al. on seven principles of heutagogy that include self-determined learning, knowing how to learn is a fundamental skill, educators focus on process rather than content, avoiding educator-centred learning and moving into the world of the learner. She used heutagogy to ground her concept of e-teaching and recognised its importance for explaining the role of self-education and self-learning in e-teaching. Thus, heutagogy enables an individual to learn anytime and anywhere, without a pedagogy, which fits extremely well within the 4IR learning environment. This has grown extremely evident during the COVID-19 lockdown when students and staff have been forced to understand and implement this learning mode.

Contextual perspectives

Contextualisation is also important (Ocholla & Ocholla 2020) for place considerations. Contextualisation refers to international (e.g. WIS, SDG and WEF) (Prisecaru 2016), national (see Moon & Seol 2017; policy and legislation)[11] and institutional (e.g. universities) responses. For example, Butler-Adam (2018) recognised and wrote about the role the education sector in South

11. See http: //www.polity.org.za/.

Africa could play regarding the job market, education and training, including curricula development, skills development. The issues related to the 17 SDGs and the role of the human factor in the revolution are also worth consideration. In other words, institutional response should be strongly embedded in the agenda of HEIs, where research by innovation, teaching and learning is poised to play a fundamental role, as reported from the University of Pretoria in 2019 when Professor Mashudu Tshifularo conducted a ground-breaking ear surgery by using 3D technology.[12]

Professional response in LIS is also essential at both global (e.g. IFLA), regional (e.g. the Standing Conference of Eastern, Central and Southern African Library and Information Association [SCECSAL]), national (e.g. the Library and Information Association of South Africa (LIASA) and other similar conferences and associations including those organised at institutional levels.

Research, teaching and learning responses are also required. Both RDMF and TPACK are poised to play leading roles as both research, teaching and learning are to be, and new competencies will be required (Raju 2017). The required skills include 'complex problem-solving, critical thinking, creativity or innovation, people management, coordinating with others, emotional intelligence, judgement and decision-making, service orientation, and negation and cognitive flexibility'.[13] Lindley Jones,[14] reporting on the skills needed in 2020 and referring to eminent scholars in the United States, identified adaptability, creativity, emotional intelligence, tech-savvy and personal brand or identity to be the leading skills in the last decade. While most of the 10 leading skills will be retained in the immediate future, the priority will change such that some will be dropped from the top 10, while others within the top 10 will move back and forth.

The employment and job market will also be affected (Butler-Adam 2018). The changing work environments, most of which have been confirmed by COVID-19 disruptions (Ocholla 2021), already cause fear of job losses at the start of the past industrial revolution with computers, electronics and digitisation. Job losses can also occur because of unknown disasters, such as the current COVID-19 pandemic, which also brings onboard innovative ways of living and working. We (Ocholla & Shongwe 2013) have reported the diversification in the LIS job market in a related study. Emerging disciplines have become increasingly attractive as ICT's influence on the LIS job market continues to grow (Shongwe 2015).

12. See https://www.up.ac.za/media/shared/1/ed-3d-printed-ear-bones-11.zp170070.jpg.

13. World Economic Forum, 016 – https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/)

14. https://www.ft.com/content/74d3c16a-1f35-11ea-92da-f0c92e957a96

Human capacity, reflected by WEF in RDMF (Kearney 2018) and heutagogy or lifelong learning (Koehler & Mishra 2009), seem to feature strongly in both RDMF and TPACK. Lifelong learning or self-learning and continuing professional development (CPD) are fundamental for keeping up with the current and future 4IR human capacity demands. For example, most of the knowledge I have gained in my social and academic life has not only come from formal education but also from self-learning and lifelong learning, which an individual can obtain anytime, anywhere.

Library and information science education

Library and information education in Africa has been covered in several studies. In the last two decades, Ocholla and Bothma (2007) and Otike (2017), citing some of these works, narrated and analysed the trends of LIS education in different regions in Africa. For instance, Ocholla and Bothma (2007) considered and concluded that there are more similarities than differences in LIS education in the region and pointed to ongoing curriculum reviews and revision, increased ICTs application for teaching and learning, mergers and re-orientations. At this moment, the number of LIS schools is increasing in most African countries, which is quite contradictory to the view that the LIS job market is shrinking. I doubt whether supply and demand regulate HE anymore as the number of unemployed graduates increases in every country, and library and information science education (LISE) is a culprit. Also noted in the study (Ocholla & Bothma 2007), the number of LIS schools in South Africa declined. LISE focuses beyond librarianship, as libraries alone cannot fulfil the employment needs of LIS graduates.

Similarly, the LISE target has shifted to the emerging or broader information market (see also Ocholla & Shongwe 2013) as reflected by LIS curricula and qualifications in the region and (Ocholla & Bothma 2007):

> [*M*]ost LIS schools in the region have integrated ICTs into their curricula and are implementing ICTs in teaching, learning [*cf. Majanja 2020*] and research processes. To make LIS education relevant and current and also for the viability of some LIS schools, there is a strong integration of new courses, such as knowledge management, information literacy, multimedia, media and publishing studies, records management and basic computer technology, into LIS curricula in general or as separate degree qualification programmes. (p. 75)

The two authors identified additional major challenges facing LIS education and training to include (Ocholla & Bothma 2007):

> [*T*]he regulation of student numbers; knowledge and diversification of LIS job markets; funding of LIS schools and the development of technology infrastructures, both in quantity and quality; allowing efficient access and development of continuing education and short courses for the provision of new knowledge, skills and attitudes for LIS workers. (p. 75)

The progress made by LIS schools to adapt to the emerging changes was eminent in the two studies, particularly in curriculum review and revision.

Otike's (2017:73–74) study shared some of the challenges highlighted in the previous section but emphasised change management in LISE, which will require innovations, new technology, curricula adaptation, support from stakeholders, the perception of LISE by the youth and the visibility of LIS profession. A recent article by Mabel Majanja (2020), focusing on e-teaching in LIS Schools in South Africa, found that:

> LIS academics in South Africa have not been left behind in the trends regarding e-teaching, and most of them feel quite confident about their self-efficacy in e-teaching. A variety of LMS and e-tools are available, and relevant policies and technical support are available. Most LIS academics do re/upskill themselves and employ diverse heutagogical strategies. However, the e-teaching support, in terms of resources and technical support, are inadequate because some universities are deficient in their provision of ICTs and e-learning guidelines. (n.p.)

Both Ocholla and Bothma and Otike's studies, with varying degrees of attention, cite trends relating to the growth and expansion of LIS schools and student numbers in most parts of Africa, including compromising quality; continuous curriculum review and revision to accommodate new changes; a transformation that leads to amalgamation, re-orientation, mergers and the demise of some schools; qualifications and the location of the schools affecting staffing and student intake and changes to government education policies affecting academic stability. We also note particular developments and challenges related to the LIS job market (Ocholla & Shongwe 2013; Shongwe 2015), where libraries still lead but increasingly compete with other rapidly growing information sectors such as KM and other forms of ICT application.

What was reported by Ocholla and Bothma (2007) seems to largely prevail today. For example, the number of LIS schools is increasing rapidly; the quantity of LIS education is challenging the quality of education as more LIS schools emerge; most LIS Schools are located within HEIs or universities, where better academic quality control is achievable regarding curriculum, staffing and students; a minimum number of credit and content requirements for LIS education exist; ICT integration into research, teaching and learning (e.g. Majanja 2020) is largely prevalent, but noticeable institutional and national or country disparities are common; LIS curricula are also increasingly diversified, for example, 'core courses or electives/auxiliaries in KM, multimedia, publishing, records management, information and communication technologies', along with librarianship; the name changes of LIS departments, programmes and courses are ongoing, although not as intensely as in the past and resource and infrastructural support varies. In terms of the LIS job market, diversification occurs (Ocholla & Shongwe 2013), with generic and personal competency (see Raju 2017) requirements cross-cutting or projecting

multidisciplinarity. However, professional competencies vary with the qualification (e.g. librarianship, records management, information and KM and information science), which is understandable.

Despite the progress made in LIS education in Africa, there are gaps to be filled. Some of these were articulated at the SCECSAL conference in Entebbe, Uganda, in 2018[15] and the 2019 LIASA conference in Durban, South Africa. Among the gaps are included insufficient or lack of experiential learning that brings the students and academics closer to information and library practice, and CPD and curriculum response to the job market. For example, a study by Ocholla and Shongwe (2013) demonstrated the diversification of the LIS job market, where data obtained from the *Sunday Times* and *Mail* and *Guardian* newspapers between 2009 and 2012 revealed the jobs being advertised (644 in total) by category as follows: Academic teaching positions – 19, Archives and Records Management – 70, Information – 161, Library – 315 and Knowledge Management – 74 jobs. The role of emerging professions as key employers was prevalent in related studies (Shongwe 2015; Shongwe & Ocholla 2011).

Other gaps relate to graduates' response (in terms of lifelong learning or self-education); educators' or faculty's response (in terms of scarcity or lifelong learning or self-education); employer's response (variations – government or private sector or NGOs or municipalities); institutional response (policies) and government's response (policies, legislation and making the involvement of stakeholders or advisory councils in curriculum development a norm). More importantly, the preparedness of LIS education for the 4IR is a major concern, understandable for Africa, with most countries classified under the archetype nascent (low left quadrant). COVID-19 disruptions have taught the lesson that things will not be the same again, and 4IR requirements and achievements can occur sooner than later (Ocholla 2021).

Library and information science research

LIS research in Africa has been reported in many studies in the last two decades. Association of Library and Information Educators(ALISE)[16] – which is considered to be the global leader in LIS education – research taxonomy includes the following nine clusters (each with several topics): Data management (e.g. KM), data science (e.g. informetrics and human–computer interaction) and design (e.g. AI and informatics), information organisation and retrieval (e.g. cataloguing and classification, metadata), information practice (e.g. academic libraries), education of information professionals (e.g. CPD),

15. https://www.scecsal.org/publications/proceedings.html

16. https://www.alise.org/alise-research-taxonomy

information services (e.g. information-seeking), information technologies (e.g. LMS) and socio-cultural perspectives (e.g. social justice).

Most comprehensive studies are reported by Ocholla and Ocholla (2007, 2017), focusing on LIS research in South Africa; Onyancha (2007) on LIS research in Africa; Ocholla, Ocholla and Onyancha (2012, 2013) focusing on research output by academic librarians in Eastern and Southern Africa, respectively and numerous authors on research collaboration (Maluleka & Onyancha 2016; Maluleka, Onyancha & Ajiferuke 2016; Onyancha 2018). Among the studies, Ocholla and Ocholla (2017) found a lot of similarities between their 2017 study with the past (Ocholla & Ocholla 2007) study. They observed in their sample that only 62 (47%) (Scopus) and 71 (53%) (LISTA) research publications by LIS academic staff were indexed in the databases, most of them publish in local LIS scholarly journals (currently five), most of these journals are not indexed in the international databases, the subject coverage of the research is diversifying and shifting slowly towards broader information domain driven by emerging technology-linked domains (e.g. research data management, digital curation, open access, institutional repositories, information and digital literacy).

It has also been determined that while most LIS researchers publish collaboratively by means of co-authorship, which is encouraged because of its benefits (Ductor 2015; Onyancha 2018), inter-institutional and international collaboration was minimal. Evidently, most collaborative research occurs regionally and internationally, with the latter being the most common (Onyancha 2018). Ocholla and Ocholla's (2017) study acknowledged challenges related to poor institutional websites affecting visibility and made recommendations related to developing and using such websites for marketing the LIS schools, encouraging staff to have a researcher ID (e.g. Orcid ID), indexing of South African scholarly journals in international databases, such as Scopus and Web of Science (WoS). Onyancha (2007) noted a similar pattern and made related recommendations and commended research collaboration through co-authorship (69%) largely between the research supervisor and postgraduate student. Both studies (Ocholla & Ocholla 2007; Onyancha 2007) acknowledged the leading role of South Africa in LIS research because of strong government support that can be exploited for maximum research development, collaboration and achievement beyond South African borders.

LIS research in the 4IR should be sensitive to the 4IR components, which consist of smart technologies and innovation within the context represented in Figure 7.1 and the ALISE taxonomy. Although the components will keep on shifting from the centre to the periphery and vice versa, attention should be given to major developments in the IoT, embedded systems (networks), automation, big data, distributed systems, cyber–physical systems, augmented reality, information (knowledge) management, sustainable development and

AI, among others. Within the context of SDG, sustainable development is featuring as a growing research area in which LIS research could invest, develop and thrive. In the next section, I propose considerations for the 4IR for LIS research and education.

Fourth Industrial Revolution considerations

The 4IR will require LIS education and research to focus on the elements proposed in Figures 7.2 and 7.3, as briefly discussed further. In Figure 7.2, the focus will be on smart research, which has to be innovative, creative and problem-solving, implying that research is not conducted for its own sake, but to benefit development. This will mean embedding SDGs in our research to be meaningful to society. Smart teaching and learning should transform and enable learning to occur anytime and anywhere by creating technologies that are sensitive to physical and virtual or digital teaching and learning spaces that would involve a lot of blended learning. Students have to also be smart. Most universities strive to recruit students with good academic grades with different variations of inclusivity and exclusivity, with the former enabling greater access and the latter (exclusive) offering limited access to HE. What all universities share in common is striving to admit competent (measured largely by previous academic achievement and competencies) students to their institutions. Based on the skills required in the 4IR,[17] where complex problem-solving, critical thinking and creativity [innovation] are at the top of the list of 10 skills in 2020, students need to be competent, creative and innovative, critical thinkers, adaptive, problem-solvers and self-learners who are self-driven and ethical.

The academics tasked with imparting knowledge to the students must be qualified in the areas of their academic and research competencies, adaptive, innovative, critical thinkers, problem-solvers, self-learners, with or without CPD, and ethical or morally sensitive. Technology pedagogic and content knowledge must be given serious consideration.

I refer to the smart curriculum in terms of its professionalism, enabling the production of competent graduates in the discipline that can provide professional services to the community or society. The curriculum has to be adaptive; this means that it should be accommodative, subject to change with time and responsive to the needs of the society or context where it is situated.

Smart libraries are essential for effective, inclusive and flexible information access and services. In a recent paper (Ocholla & Ocholla 2020), we discussed

17. World Economic Forum, https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/)

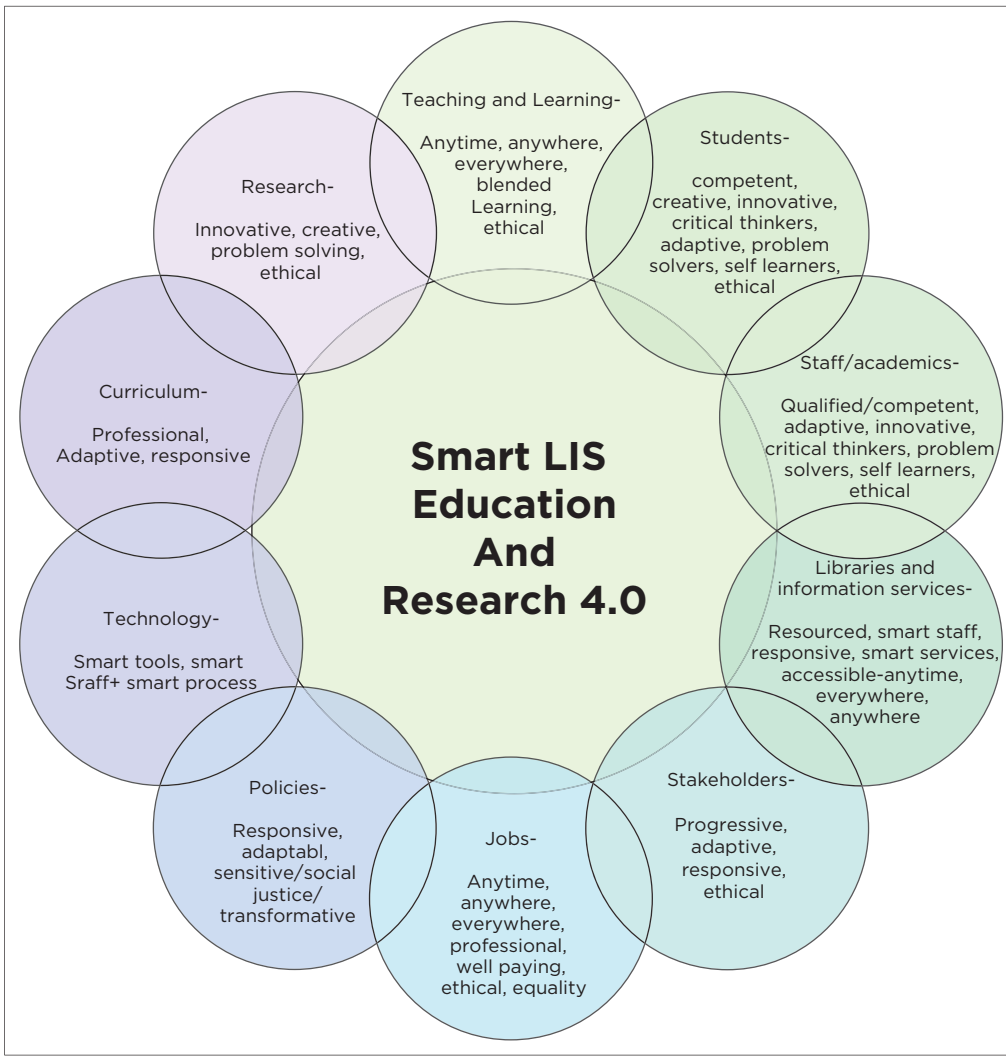


FIGURE 7.2: Smart LIS education and research 4.0 model.

the responsiveness of academic libraries to the 4IR and envisioned academic libraries in 4IR with smart staff, users, leadership, resources, spaces, technology and services. The study noted that (Ocholla & Ocholla 2020):

> [*T*]he 4IR concept does not often occur in literature in relation to academic libraries since its conception in 2016. However, its components [*Figure 7.1*], such as the IoT, embedded systems, cyber–physical systems, and big data, cloud computing, information management, data acquisition or handling, and network security, among others, are already accessed and variably applied in academic libraries. (n.p.)

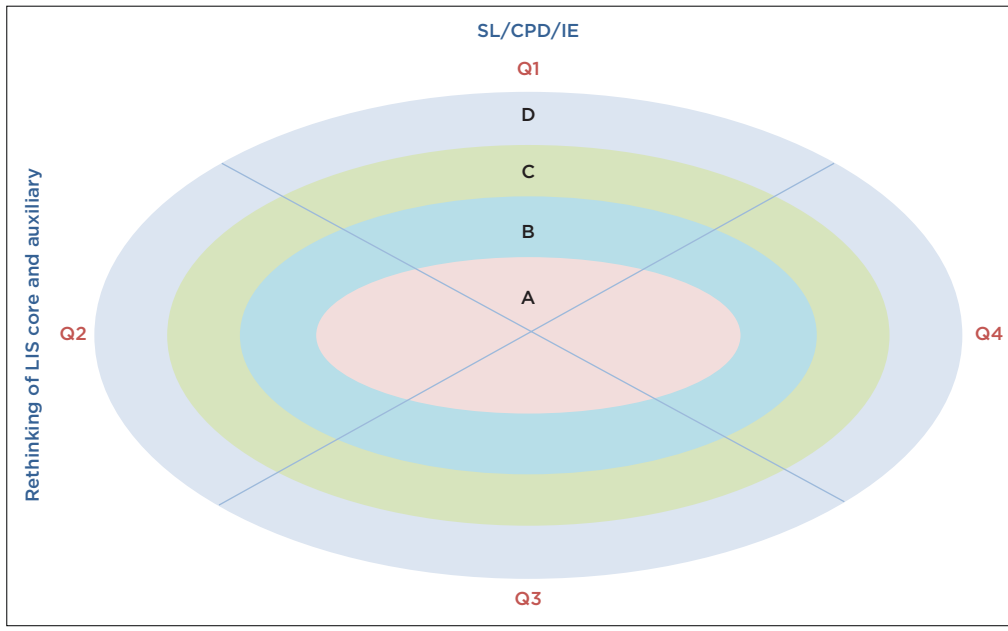


FIGURE 7.3: Rethinking of LIS core and auxiliary.

LIS education and research will require smart technologies, which are widely understood to include smart tools or facilities, staff, processes and smart culture. Again, the status, nature and quality of technologies available for university education and research as a whole, and for LIS education, in particular, vary significantly across institutions, countries and regions (e.g. Africa). But that does not stop our dream to be part of the 4IR by improving our technologies. There are indeed LIS schools in Africa – in South Africa, for example – with relatively well-developed technologies, particularly those located within engineering, technology, business-oriented faculties or schools or colleges, or top research universities in the country.

While we scramble for policies, smart policies are rare. Smart policies have to be visionary, responsive, adaptable, sensitive to context and culture and embrace social justice and transformation. We need to look at our policies and rid them of retrogressive elements that impede their usefulness in the 4IR.

The issue of smart jobs and job losses in the 4IR can be controversial, yet it is essential (Butler-Adam 2018). The COVID-19 lockdown in most countries in the world demonstrated how real job losses could occur. Working from home during the pandemic has confirmed that jobs can effectively be done virtually or remotely, without the traditional requirement of a physical office space;

that new technologies can be developed to sustain working from home (e.g. Webinars through ZOOM, TEAM, etc. are increasingly popular); that the safety of employees can be enhanced when they work from home and that both research, teaching and learning productivity can still be achieved. Ultimately, and increasingly, smart jobs will be done professionally, anytime and anywhere. The jobs are expected to be well-paying, ethical and sensitive to inequality. This enables staff to work flexibly and this could be the new norm, provided they produce the required results.

Stakeholders will also be expected to be smart. Therefore, they have to be progressive, adaptive, responsive and ethical in how they handle their collective responsibilities. In most cases, stakeholders play a key role in developing, implementing and evaluating policies. For example, 4IR should already be on the agenda of institutions and should shape development, such as those expressed as SDG.

In Figure 7.3, we recognise that there would be several LIS qualifications in a LIS school (Ocholla & Bothma 2007). Vertically, they would exit at bachelor's, Master's or doctoral levels. Horizontally, it is common to find several qualification programmes articulating librarianship, information science, LIS, multimedia, publishing, records management, information and knowledge management and informatics, depending on where they are located within a university, the job market, academic politics, national policy and requirements and the influence of professional associations (Ocholla et al. 2013a). So we end up with Q1, Q2, Q3, Q4, etc., representing different qualifications within LIS schools. A, B, C and D represent what would be core (A) or peripheral (B, C, D, E, etc.) in each qualification. What is core today may become peripheral in the future and vice versa, but a good and professional qualification programme must have core courses or competencies that do not easily shift to the periphery over time. Rethinking core and auxiliary in the 4IR requires an analysis of the courses to determine the shift from A to D or D to A to accommodate rapid changes in LIS education.

As all competencies that the job market requires cannot be offered by university education alone, a strong emphasis on heutagogy or self-learning (SL) (see Majanja 2020) and CPD has to be encouraged and developed. For example, I have – and guess others too – achieved most of my professional education outside my formal education through SL, which can be done anytime and anywhere. And that resonates with 4IR. Continuous professional development has the flexibility and ability to enable individuals' rapid acquisition of new knowledge than would be expected in formal learning environments in LIS. Therefore, SL, CPD and information ethics should be embraced in LIS education, particularly in these rapidly changing times.

Conclusion

The 4IR has become a global buzzword because it resonates with the current and future human development driven by creativity, innovation and smart technologies poised to transform the way we live, work and socialise overwhelmingly. Countries, businesses, governments, HEIs and sectors (such as the LIS sector) are expected to respond to the 4IR differently, albeit with their own limitations. Our investment and development in the 4IR, within HEIs and the LIS sector, should be informed by knowledge of the emerging technologies (Table 7.1); the WEF RDMF; TPACK; changes in the 4IR conceptual development (see Figure 7.1); smart LIS education 4.0 model (Figure 7.2) and the rethinking of LIS core and auxiliary (Figure 7.3), as they are quite interdependent. The proposed frameworks represented in Figures 7.2 and 7.3 should be conceptualised and contextualised to achieve the 4IR. An instrument for measuring the current status of LIS schools' readiness for the 4IR, as attempted by academic libraries (Ocholla & Ocholla 2020), should be explored. Fundamentally, RDMF drivers of production, such as the technology of production, human capital, institutional framework, demand (market needs) and TPACK, are to play major roles in shaping LIS education within 4IR. Also, the ALISE LIS research taxonomy should be explored and its usefulness considered for research focus and development.

This is largely a conceptual study that may reflect the author's personal biases and might, therefore, require strong and consistent academic reviews for refinement. Nonetheless, the chapter provides a conceptual framework from which future LIS education, research development and discourse may occur.

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Chapter 8

Which way for information and knowledge management education and research?

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Abstract

In this chapter, it is argued that knowledge management (KM) is at a crossroads in its growth as a discipline, influencing research and education in the domain. It, therefore, reviews KM concepts, discusses research and education issues and notes the multidisciplinary nature of KM that goes beyond information studies. This is an interpretive, qualitative, desk research based on document analysis and the author's experiential knowledge in the domain through research and teaching. It reveals that information and knowledge management (IKM) is multidisciplinary, and research and education in the domain are burgeoning but not entirely within LIS or IKM's disciplines or fields. Attempts at curriculum review also appear to be flourishing, and subject domains such as KM, information management, ICT and ISR, among others, have formed budding inter-linkages. Core competencies for IKM are still not sufficiently

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developed, which remains on the agenda for further work. Strong partnerships and/or collaboration with related disciplines are recommended to boost KM research and education. The chapter provides some thoughts for understanding where knowledge management is going, using subject analysis for KM education and research and suggesting a KM management competency checklist that can be used by KM students, faculty members and practitioners to consider the depth of KM knowledge and skills competencies during the learning process, when looking for a job, and at the workplace. This study has implications for IKM theory and practice, particularly curricula development, research, teaching and learning.

Introduction

Knowledge management appears to have reached a crossroads from its conceptualisation and contextualisation. Studies in the domain do not agree on a single definition, process or typology or taxonomy; whether it can be managed; whether it is a new discipline or part of an old one (i.e. its scope in relation to other disciplines); how it is distinct from information management or whether we call it KM or IKM. Worth noting is the Association for Library and Information Science Educators (ALISE) research taxonomy,[18] where KM is placed under data management, while 'information and records management' are combined instead of IKM. As a result, we have witnessed several approaches to KM, which can be tacit or explicit or both, that range from the typology of knowledge approach on the one hand, to orientation, such as techno-centric, social and general approaches, on the other hand. This chapter elucidates why KM has reached this crossroad. This conceptual chapter is divided into four parts: (1) Reviewing the concepts of knowledge and knowledge management, (2) Discussing the research issues, (3) Discussing KM education training issues, and (4) Concluding remarks.

Concept of knowledge and knowledge management

The conceptualisation of knowledge can occur in different ways. For example, the knowledge pyramid (Ackoff 1989) can explain the link between data, information, knowledge and wisdom. Ownership or property from Daniel Bell's (1973:176) links knowledge to intellectual property and copyright or 'some other form of social recognition (e.g. Publication)'. Furthermore, knowledge can be categorised by type, as expressed by Polanyi (1958) and Nonaka and Takeuchi (1995) in reference to tacit (intangible or personal) and explicit (tangible) knowledge. For Davenport and Prusak (1998):

18. https://www.alise.org/alise-research-taxonomy

> Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of the knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms. (p. 5)

We (Ocholla & Onyancha 2009) have also used the core-periphery analysis to determine the major components of KM.

Regarding KM conceptualisation and contextualisation (Ocholla 2011, 2016), the pioneering research and publications of Polanyi (1958) and the seminal works of Nonaka and Takeuchi (1995) and Choo (1998), among others, have been acknowledged for tacit and explicit knowledge conceptualisation. Ocholla (2011) recognised that 'knowledge is human-driven – what the knowledge holder knows, so to speak (knowingly or unknowingly)', or as Polanyi puts it, 'we know more than what we can tell' – while information is largely a product of knowledge. What knowledge society entails is discussed in detail in an authoritative book compiled by UNESCO, where the knowledge society is referred to as having the 'capabilities to identify, produce, process, transform, disseminate and use the information to build and apply knowledge for human development' (UNESCO 2005:27) and improve livelihood.

Darwin's theory of evolution (Darwin 1859) recognised human or societal transformation from homo sapiens (hominid) to current humans, who have also transformed economically from hunter-gatherer through agrarian, industrial to today's information and knowledge societies. While the human transformation from homo sapiens to the present human is not largely disputed (e.g. as creationists still do), not all societies have experienced economic transformation in a similar way (Jiyane et al. 2013) as the majority could still be living in the pre-knowledge society or 4IR stages. More privileged and economically sated societies or individuals, often associated with wealth, good education and access to all types of resources, tend to access and use knowledge products and services more easily because they have the means to do so.

The concept of KM is broad and viewed from different perspectives, some of which have been reported (Ndwandwe & Onyancha 2011:213; Ocholla 2011:27) in academic journals, including in a conference paper presented by this author in Crimea in 2016 (Ocholla 2016) and published by Gosudarstvennaya Publichnaya Nauchno Tehnicheskaya Biblioteka and highlighted in this and the next paragraph. Ocholla (2011:27) argued that many definitions of KM seem to converge rather than diverge. Among the many definitions he cited are that 'KM comprises: a range of strategies and practices used in an organisation to identify, create, represent, distribute, and enable adoption of insights and experiences'; 'the creation, storage and collaborative sharing of employee information within the business environment'; 'the way a company stores, organises and accesses internal and external information'; 'the process

of capturing, organising, and storing information and experiences of workers and groups within an organisation and making it available to others'; 'a system or framework for managing the organisational processes that create, store and distribute knowledge, as defined by its collective data, information, and body of experience' and 'managing tacit knowledge (held in an individual's brain in the form of know-how and experience) and explicit knowledge (recorded independently of humans)'.

Through the core-periphery analysis of knowledge management, Onyancha and Ocholla (2009) defined KM to be a discipline that focuses:

> [*O*]n IRM (Information Resource Management –also IM), its major functions are people and document/records management-oriented; and it largely involves IR (information retrieval) processes while the resources and systems managed are overwhelmingly IT (conduit, content, networks etc.) oriented. (p. 14)

In a related study (Gu 2004; Skyrme 2008), the authors referred to KM to include the management of explicit knowledge, processes or embedded knowledge; people or tacit knowledge, innovation or knowledge conversion, assets or intellectual capital. A process approach to knowledge management is further articulated succinctly in another study (Bouthillier & Shearer 2002) and those suggested by Choo (1998) and consolidated in the analysis of KM life cycle processes (Shongwe 2016).

Essentially, there are multiple definitions of knowledge and KM which largely depend on the purpose, approach and focus of the definition (e.g. ownership, relationship, hierarchies, classification or taxonomy or typology, practices, application, recording or documentation, processes, timeline, transformation or change each produce a different definition). Most definitions of KM converge rather than diverge, while most definitions of knowledge focus on tacit (intangible) and explicit (tangible) knowledge.

Theory and frameworks

Knowledge management cannot be discussed without looking at its foundation or theory[19] and frameworks. Such frameworks can be conceptualised and perhaps understood by, for example, referring to the pioneering work of Michael Polanyi on personal knowledge and tacit knowledge, covered in several of his books and scholarly publications.[20] In his book 'Personal Knowledge: Towards a Post-critical Philosophy' (Polanyi 2015), from which most of his later works seem to originate, he discusses the concept of knowing and tacit knowledge and provides justification of personal knowledge and knowing and being. This book may serve as a good starting point for KM

19. See www.is.theorize.org

20. https://www.amazon.com/Michael-Polanyi/e/B000APJ538

research and scholarship, particularly tacit or intangible and indigenous knowledge scholarship.

Likewise, the seminal work of Nonaka and Takeuchi (1995) reflected on 'what is behind the success of Japanese Companies in automotive and electronic industries', referring to the success of largely tacit and explicit KM. Several subsequent related studies and publications by the two authors are important points of departure for KM research. Their SECI (socialisation, externalisation, combination and internalisation) model has received worthwhile and profound recognition worldwide (Adesina & Ocholla 2019). This model reveals the components of knowledge creation in discussing the success of Japanese automobile and ICT industries, garnering both praise and critique (Adesina & Ocholla 2019; Bratianu 2010).

Peter Senge's 'Fifth Discipline: The Art and Practice of the Learning Organization' (Senge 1990) – which has grown increasingly popular – also provides a strong foundation for KM in organisations. Organisations can be government, business, HEIs, non-governmental institutions and civil society. There are also several KM theories and models, such as process models. Mzwandile Shongwe (2016) summarised these KM process models and proposed what he terms 'The knowledge transfer, storage, application, creation and acquisition (K-TSACA) framework' (Shongwe 2016:145). While recognising other processes, his study found knowledge creation and knowledge transfer processes to be the most popular KM processes. I represent selected KM models or theories in Table 8.1.

TABLE 8.1: Selected knowledge management theories and models.

Theory	Year	Emphasis	Source
The 7-Circle KM framework	2015	The 7-circle KM framework emphasis is on how organisational knowledge can be managed by applying the seven principles.	Ologbo and Nor (2015)
Holistic KM framework	2015	The emphasis here is on identification, creation, storage, sharing, usage, learning from and improvement of knowledge.	Evans, Dalkir and Bidian (2015)
Knowledge management life cycle framework	2013	This is concerned with knowledge identification, organisation, storage, sharing, application, evaluation and learning. This is a KM process model.	Evans and Ali (2013)
Integrated KM framework	2009	The focus here is on sharing, creating, using, storing, and identifying knowledge.	Heisig (2009)
The knowledge management process framework	2008	This is the KM process model.	Botha, Kourie and Snyman (2008)
Sagsan's five-process framework	2006	The focus is on knowledge creation, sharing, structuring, usage and auditing. This is the KM process model.	Sagsan (2006)

COP, communities of practice; ICT, information and communication technology; KM, knowledge management; K-TSACA, knowledge, transfer, storage, application, creation and acquisition.

Table 8.1 continues on the next page→

TABLE 8.1 (Continues...): Selected knowledge management theories and models.

Theory	Year	Emphasis	Source
Knowledge macroscope theory	2005	A conceptual tool on how to structure the knowledge capital of an organised system. Knowledge is described through the point of view of information, sense, context, on the one hand, and structure, function and evolution, on the other hand.	Ermine (2005:4)
The 360-degree KM framework	2005	The framework enables a knowledge repository that champions knowledge for the improvement of organisational performance.	Hariharan (2005)
Integrated KM life cycle framework	2005	This is a KM process model.	Dalkir (2005, 2011)
Awad and Ghaziri framework	2004	This is a KM process model.	Awad and Ghaziri (2004)
Becerra-Fernandez, Gonzalez and Sabherwal framework	2004	The focus is on KM process.	Becerra-Fernandez, Gonzalez and Sabherwal (2004)
Kakabadse KM framework	2003	This comprises five models that include philosophy, cognitive network, community of practice and quantum-based models.	Kakabadse et al. (2003).
Knowledge production and integration framework	2003	Individual and group learning, knowledge claim validation and information acquisition.	McElroy (2003)
O'Dell, Grayson and Essaides framework	2003	Knowledge organisation, sharing, adapting, usage, creation and collection.	O'Dell, Grayson and Essaides (2003)
Knowledge management process framework	2003	Thus, plan, create, integrate, organise, transfer, maintain and assess knowledge. This is a KM process model.	Rollet (2003)
Knowledge episodes framework	2002	How to acquire and select knowledge for use and internalisation.	Holsapple and Joshi (2002)
Four-stage KM life cycle framework	2002	Discusses the knowledge life cycle in four stages: creation, mobilisation, diffusion and commoditisation.	Birkinshaw and Sheehan (2002)
Information technologies support framework	2002	The emphasis is on the use of technology for knowledge capture, development, sharing and utilisation.	Lee and Hong (2002)
Knowledge management matrix	2001	The focus is on knowledge sharing.	Gamble and Blackwell (2001)
Stankosky and Baldanza's KM model	2001	The model focuses on four factors: organisational leadership, structure and culture, technology and infrastructure (very important) and learning.	Stankosky and Baldanza (2001)
Alavi and Leidner's framework	2001	The model focuses on KM process.	Alavi and Leidner (2001)
Knowledge management process framework	1999	The model focuses on KM process.	Bukowitz and Williams (1999)
Socially constructed model	1999	The model focuses on knowledge construction.	McAdam and McCreedy (1999:97)
Wenger's CoP model	1999	The model focuses on CoP.	Wenger (1999)
Sense-making KM model	1998	How is information developed in an organisation?	Sensuse et al. (2014)
Skyrme technological tools framework	1998	The model focuses on ICT application for KM.	Skyrme (1998)

COP, communities of practice; ICT, information and communication technology; KM, knowledge management; K-TSACA, knowledge, transfer, storage, application, creation and acquisition.

Table 8.1 continues on the next page→

TABLE 8.1 (Continues...): Selected knowledge management theories and models.

Theory	Year	Emphasis	Source
KM process model	1997	The focus of this theory is on the construction of knowledge within an organisation by using both explicit knowledge and the social interchange process.	Demerest (1997); Sensuse, Rohajawat and Anggia (2014); McAdam and McCreedy (1999)
Skandia intellectual capital model	1997	The model assumes KM can be segregated into human, customer, process and growth elements contained in two main categories of human capital and structural or organisation capital.	Chase (1997); Roos and Roos (1997); McAdam and McCreedy (1999)
Meyer and Zack's knowledge management cycle	1996	The model emphasises knowledge repository and refinery that includes acquisition, refinement, storage or retrieval, distribution and presentation of knowledge.	Meyer and Zack (1996)
Nickols' framework	1996	This model focuses on acquisition, organisation, specialisation, storage or access, retrieve distribution, conservation and disposal.	Shongwe (2010:142)
Model of organisational epistemology	1995	The emphasis of this model is on organisational structure, employees, the link between members, management of human resources and communication.	Krogh and Roos (1995) in Sensuse et al. (2014)
Knowledge creation theory	1995	How can tacit and explicit knowledge be converted into organisational knowledge?	Nonaka and Takeuchi (1995)
Weick's sense-making KM model	1995	How can uncertainties be unravelled in an organisation?	Weick (1995, 2001); Mohajan (2017)
The Von Krogh and Roos' KM model	1995	This model distinguishes between individual knowledge and social knowledge.	Von Krogh and Roos (1995)
Knowledge management process model	1993	How can knowledge be categorised?	Hedlund and Nonaka (1993); Haslinda and Sarinah (2009); McAdam and McCreedy (1999)
Degrees of internalisation KM model	1993	This model emphasises the organisation, synchronisation and internalisation of knowledge.	Wiig (1993); Haslinda and Sarina (2009)
Knowledge-based model	1992	The focus is on the creation and transfer of knowledge within the organisation.	Kogut and Zander (1992)
Organisational learning framework	1991	The emphasis is on knowledge acquisition, distribution, The model The model focuses on interpretation and organisational memory.	Huber (1991)
The Boisot I-Space KM model (knowledge category models)	1987	The model emphasises KM characteristics.	Boisot (1987); McAdam and McCreedy (1999); Arif, Egbu and Khalfan (2009)
K-TSACA framework	2016	Proposes, 'The knowledge transfer, storage, application, creation and acquisition (K-TSACA) framework'.	Shongwe (2016:145)

COP, communities of practice; ICT, information and communication technology; KM, knowledge management; K-TSACA, knowledge, transfer, storage, application, creation and acquisition.

An analysis of the models and theories in Table 8.1 reveals that common clusters focus on: process models, components or characteristics, techno-centric models, knowledge in the organisation, knowledge sharing (e.g. Community of Practice [CoP]), knowledge creation, knowledge structure and knowledge impact or influence.

Contextual frameworks – which should not be ignored – are largely found within international (e.g. WSIS), national and institutional KM legislation and policies. The point being made here is that KM research should be informed by a theoretical foundation and frameworks for grounding research in the domain. Table 8.1 provides examples of some of the common theories and models referred to for research in the domain.

Knowledge management research

Research plays an important role in the development and knowledge of a discipline. There is a significant amount of research on KM in South Africa (Fombad & Onyancha 2017). Knowledge of research methodology is fundamental for research success, as is the case with KM as well. Researchers, particularly emerging researchers, battle with a deeper understanding of the epistemology, ontology, methodology and axiology of KM research. There have been some bold attempts to unpack KM research concepts (Ngulube 2015, 2019; Ngulube et al. 2015) in Africa. In these studies, in-depth discussions focus on KM research philosophy and paradigms (e.g. positivism, interpretivism and pragmatism); approaches or methods (e.g. quantitative, qualitative and mixed); methods or designs (e.g. survey, experiment, case study, bibliometrics, content analysis and ethnographic); sampling and data collection; and analysis appropriate to the paradigm, approach and method. The use of pragmatism or mixed methods research (Ngulube 2010, 2015) is appropriate for research triangulation, yet is still unpopular and misunderstood.

The next section discusses research in IKM from three perspectives: subject representation and analysis, research collaboration and multidisciplinary perspectives.

Subject representation and analysis perspective

Subject analysis can produce useful data for determining the relationship between KM and other disciplines (Onyancha & Ocholla 2019), that is, its level of convergence and divergence with related disciplines. Such information is important for determining the dependence or independence of KM as a discipline.

In 2018 in preparation for a keynote presentation at the IKM conference in Kenya, this author tried to establish the occurrence of knowledge and

information management and ICT in the EBSCO Discovery from 1998 to 2017, to explain the 'crossroad' phenomenon. The analysis revealed that while the occurrence of publications on KM was substantial (over 40%), publications within this search referring to ICT and IKM was quite substantial (12%). This trend is also confirmed in how LIS output is represented by the subject domain in a study by Ocholla and Ocholla (2017). A strong presence of ICT in knowledge and information management searches and vice versa suggests a strong link between the two domains. Thus, KM projects a high level of dependence on ICT. But would this make ICT define KM?

Most recently, in an ISSI conference research paper (Onyancha & Ocholla 2019), the authors questioned whether the principles of Bradford's law could determine the core concepts of ICT research within IKM research. The procedures for conducting a Bradford analysis to determine the core ICT subject terms within IKM research published between 1998 and 2017 were followed. The results indicated that the core subjects varied from one study period to another; the multidisciplinary nature of subject terms was highly visible, and the dispersion of subject terms fitted Bradford's law of dispersion. Further analysis showed a significant presence of ICT in IKM, and that trend continues to grow (Onyancha & Ocholla 2019).

TABLE 8.2: Subject coverage of KM publications or records indexed in EBSCO discovery from 1998 to 2017.

Subject sets	Subjects	Value	%
Subject set 1	Knowledge Management	23 654	21.53
	Information and Communications Technology	11 677	10.63
	Information and Knowledge Management	8790	8.00
	Information Resources Management	6558	5.97
	Information Science	4684	4.26
	Information Management	4321	3.93
	Research Paper	3683	3.35
	Information Systems	3458	3.15
	Internet	2784	2.53
	Library and Information Science	2435	2.22
	Research Article	2263	2.06
	Management Information Systems	2040	1.86
	Information Behaviour and Retrieval	1806	1.64
	Articles	1787	1.63
	Business	1641	1.49
	Knowledge Sharing	1631	1.48
	Information Retrieval	1578	1.44
	Information Sharing	1550	1.41
	Data Mining	1501	1.37
	Information Management and Governance	1374	1.25
	Total	**89 215**	**81.20**

Table 8.2 continues on the next page→

TABLE 8.2 (Continues...): Subject coverage of KM publications or records indexed in EBSCO discovery from 1998 to 2017.

Subject sets	Subjects	Value	%
Subject set 2	Information Services Management	1355	1.23
	Intellectual Capital	1281	1.17
	Management	1245	1.13
	Information Services	1227	1.12
	Information Resources	1173	1.07
	Librarianship or Library Management	1162	1.06
	Library Technology	1142	1.04
	Economics	1124	1.02
	Applied Sciences	1121	1.02
	Organisational Learning	1113	1.01
	Industrial Management	1111	1.01
	Knowledge Workers	1076	0.98
	Behavioural Sciences	1014	0.92
	Corporate Culture	994	0.90
	Information Storage and Retrieval Systems	955	0.87
	Knowledge	923	0.84
	Supply Chain Management	907	0.83
	Databases	873	0.79
	Decision-Making	865	0.79
	Total	**20 661**	**18.80**

Research collaboration perspective

Research collaboration has several prevalent LIS publications in Africa (Fari & Ocholla 2015; Maluleka & Onyancha 2016; Maluleka, Onyancha & Ajiferuke 2016; Onyancha 2018). In general, based on a study by Ocholla and Ocholla (2017) – presented at the Crimea Conference in 2017 – the two authors referred to growing publications on LIS research in Africa largely coming from South African researchers and while observing that majority of the researchers co-publish, they also established that (Ocholla & Ocholla 2017):

> [*M*]ost collaboration occurs within the LIS department or inter-departmentally within the same institutions. This includes institutional collaboration (e.g. within a department, or with other departments like the library, computer science, etc.), national (with other SA universities), and international collaboration. (n.p.)

Institutional collaborations are the most prevalent, followed by national collaboration. It was further noted that 'inter-institutional and international collaboration is minimal', as was also reflected in some papers in the IKM conference proceedings (Kwanya et al. 2018). An analysis of the reported research collaboration, largely through co-authorship in KM, suggests minimal inter-institutional and international collaboration. Our challenge is to maximise the benefits of research collaboration in general and in KM in particular. More work is required to address the lacking collaboration trend to boost inter-institutional and international research partnerships.

Multidisciplinary nature of information and knowledge management perspective

More than a decade ago, Onyancha and Ocholla (2006) examined KM research in South Africa using bibliometrics through three Southern African Bibliographic Network (SABINET) hosted research databases from 1984 to 2005. In their conclusion, they noted an increase in KM publications, represented in over 60 journals focusing on management, business administration, computer science and information science. At the time, the University of Johannesburg and the University of Pretoria topped the list of research and publications on KM. The two institutions were still in the lead six years later (Ocholla 2011). The study (Ocholla 2011) confirmed the multidisciplinary nature of KM, linking it to Information Science, Business Administration, Computer Science, Public Administration, Library Science, Management and Technology. A related study (Onyancha & Ocholla 2009) focusing on the core-periphery analysis of KM in LIS identified:

> [*T*]he compound terms with which KM co-occurs most frequently: information resources management, information science, information technology, information services, information retrieval, library science, management information systems and libraries. The core single subject terms with which KM can be defined include resources, technology, libraries, systems, services, retrieval, storage, data and computers. The article concludes by offering the LIS professionals' general perception of KM based on their use of terms, through which KM can be defined within the context of LIS. (p. 1)

A related analysis conducted by this author in 2018 for the IKM conference and later updated in 2020 for this chapter focused on IKM theses and dissertations (T&Ds) by South African Universities that appeared in the Union of Completed Thesis and Dissertation (UCTD) database from 2010 to 2020. It was found that 11 universities in the list produced 140 T&D on IKM, led by the University of South Africa (UNISA), the University of Pretoria and the University of Johannesburg, with Masters and Doctoral qualifications largely in business and commerce, followed by information science-related qualifications. Although the IKM multidisciplinary reflected in a related study (Ocholla 2011) still prevailed in the latter study, quantitative growth was noted in terms of IKM institutional affiliations, variety of qualifications and subject coverage outside the LIS field. The multidisciplinary nature of IKM is again reflected in this case but with a greater inclination towards business management. More T&Ds seemed to be produced by UNISA and the University of Johannesburg in the seven-year (2014–2020) window of analysis. The multidisciplinary nature of IKM or KM is revealed in these qualifications and highlights the need to explore KM research and teaching partnerships and collaboration beyond a single discipline. In this analysis, business management seemed to link strongly with IKM. Does that mean IKM is at the crossroad, intersection or junction?

Knowledge management education

LIS education is a growing field of research and has attracted several African studies over the last two decades (Onyancha 2007, 2018, Ocholla & Bothma 2007). Attempts have been made to determine LIS and KM's knowledge, skills and attitude competency requirements, largely through the content analysis of popular newspaper advertisements and LIS employer and employee surveys in South Africa, Uganda, Kenya and Nigeria (Kwanya et al. 2015; Mthembu & Ocholla 2018; Ndlangamandla & Ocholla 2012; Ndwandwe & Onyancha 2011; Ocholla & Shongwe 2013). Similarly, research has been conducted to represent and analyse the level and nature of KM content in the LIS curriculum, specifically whether the courses: are autonomous; lead to specific KM qualifications; merged with other courses and are offered at undergraduate, postgraduate or both levels. As noted earlier with the South African case study, most IKM qualifications are in business management, suggesting that the qualifications are offered outside the LIS or IKM disciplines. For example, gleaning such education from an IKM or LIS perspective from a few examples from Southern and Eastern Africa, the University of South Africa, the University of Johannesburg and the Technical University of Kenya could be producing more graduates in IKM in the region.

Competency (knowledge, skills, attitude and values) appears to play a major role in determining an individual's qualifications in all fields. In South Africa, for example, such competencies are described in the 10 'Level Descriptors for the South African National Qualification Framework'[21] covering school, undergraduate and postgraduate qualifications. The framework focuses on purpose, coherence, assessment, comparability and the 10 categories of the applied competencies (e.g. scope, knowledge, method, problem-solving, ethics, IL, context, management of learning and accountability) (SAQA 2012:3).

While some studies in this domain focus on KM education in Kenya (Kwanya 2019) and on the LIS professional competency index in the HE sector (Raju 2017), the generic and personal competencies highlighted in Jaya Raju's study do apply to most disciplines or subject domains such as KM. However, the core competencies would significantly differ from discipline to discipline (such as KM) and constitute the niche area or professional or discipline's identity. This raises the question of whether KM's core competencies are distinct or significantly overlap with other disciplines, and if so, to what degree. Attempts have been made in at least two studies in Africa that are known to us in the last decade to identify KM competencies (Kwanya 2019; Ndwandwe & Onyancha 2011). Ndwandwe and Onyancha's (2011:218) study found common job descriptions to include knowledge management processes, analysis, KM

21. https://www.saqa.org.za/docs/misc/2012/level_descriptors.pdf

TABLE 8.3: IKM theses and dissertations by South African universities indexed in UCTD from 2010 to 2020, IKM.

University	Qualification	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total (106)
University of South Africa	D. Litt et Phil.					2		2	3				**7**
	M. Inf.					4	1	4	2				**11**
	MA					1	1						**2**
	M. Tech.						1						**1**
	MBL	1											**1**
	M. Sc.					1			1				**2**
	DBL	1											**1**
	M. Com.	1		1					2				**4**
	PhD					2			2	4	1		**9**
University of Johannesburg	M. Com.				1	1							**2**
	M. Com.					3	3	5	1				**12**
	PhD				1								**1**
	MPhil.			1		1		4	2				**8**
	M. Sc.	1											**1**
University of KwaZulu-Natal	DBA					1							**1**
	M. Arch.					1							**1**
	MA							1					**1**
	MBA						1	1					**2**
	MHRM				1								**1**
	PhD						3	2	1	1			**7**
	M. Com.				1	2	1						**4**
Tshwane University of Technology	M. Tech.	1	2		1	4	1	6		3			**18**
	D. Tech.					1							**1**
University of Pretoria	MBA	1	5										**6**
University of Witwatersrand	PhD									2			**2**

DBA, Doctor of Business Administration; DBL, Doctor of Business Leadership; D. Litt et Phil., Doctor of Literature and Philosophy; D. Tech., Doctor of Technology; MA, Master of Arts; M. Arch., Master of Architecture; MBL, Master of Business Leadership; M. Com., Master of Commerce; MHRM, Master of Human Resource Management; M. Inf., Master in Information Technology; M. Phil., Master of Philosophy; M. Sc., Master of Science; M. Tech., Master of Technology; PhD, Doctor of Philosophy.

audit, professional support, management of KM systems, staff support and development, tapping on best practices, consultancy and adversarial support, quality assurance, IP management and implementation of KM initiatives.

Kwanya's (2017) study focused on 'Knowledge Management Education and Training (KMRT) in Kenya', where it pointed to an increase in education in the domain in the country and identified the gaps in the scope, depth and delivery of the programmes. He recommended that (Kwanya 2017):

> [*T*]here is need [*sic*] to review the programmes to cover all the core skill areas besides using delivery models which build hands-on skills and that such interventions would enhance the potential of the courses in meeting the knowledge management capacity needs in Kenya. (n.p.)

These findings are reflected in Okemwa and Minishi-Majanja's (2008) study on the role of LIS schools in South African universities, which noted the multidisciplinary nature of KM, the changing KM Market, the importance of KM, the arguments for KM being LIS-based, the differences (scope, level, stages, breadth, depth, etc.) in KM offerings and the levels of KM education.

Conclusion

There seem to be more similarities than differences in the conceptualisation of IKM, particularly in relation to information life cycle or process. The concepts of tacit knowledge and explicit knowledge are already well-grounded and unlikely to raise major concerns in the future. The contextualisation of IKM within LIS disciplines (see ALISE category) is still problematic.

The burgeoning multidisciplinary nature of IKM research and education, although not necessarily within LIS and IKM disciplines or fields, is noted. Also noted are the flourishing attempts at curriculum review and the budding inter-linkages forming in the subject domain, such as KM, information management, ICT and ISR. While generic skills and personal attributes provided by Raju (2017) could be shared with those reported in the LIS sector, core IKM competency is still not sufficiently developed and remains on the IKM agenda for further work. Furthermore, it is noted that IKM shares theory, methodology and processes with other information disciplines; perhaps because of its multidisciplinary nature, the job market in the domain is growing (Kwanya 2019; Kwanya et al. 2015; Ocholla & Shongwe 2013; Okemwa & Majanja 2007; Shongwe 2015).

This chapter does not claim to respond fully to all the intended themes as more unanswered questions emerge. Knowledge management has not found for itself an acceptable home (see, e.g. ALISE taxonomy) and remains homeless (see Table 8.2 and Table 8.3) but thrives in multidisciplinarity (see Table 8.3). As a multidisciplinary area, its research focus remains amorphous or quite flexible. Its research areas are broad (see Table 8.2), with linkages to information life cycle or processes; information technologies in general; information systems; Internet, including IoT; library and information services; library technology; information organisation and retrieval; data science and business and commerce. The magnitude of its multidisciplinarity is reflected by IKM qualifications (Table 8.3), which include LIS, commerce and business, computer science, public administration and management. Determining the core competency of the domain is likely to be cumbersome but possible (Box 8A-1). The quality and relevance of IKM education require further interrogation by, for example, tracer studies, curriculum review and assessment (a review panel may be necessary to engage and IKM competency index, where a checklist [Box 8A-1] could also play an important role). Interrogating

existing LIS and related taxonomies is essential for a better understanding of the IKM context.

This study recommends an IKM competency checklist, one that could be supplemented by, among others, Jaya Raju's (2017) list of personal and generic skills for comprehensive KM competency skills. The IKM checklist – when revised with new data – could be used by KM practitioners (determining knowledge gap), educators (determining if competency has been achieved) and employers (for recruitment and CPD) to determine if the required IKM competency has been achieved. Further research and expert consultation are still required to produce a robust checklist of the core competencies in KM. The subject analyses of popular databases, such as EBSCO Host, Scopus and WoS with searches on KM and IKM (e.g. Onyancha & Ocholla 2009 and Table 8.2), are helpful in producing a list of subjects linked to IKM that could be useful in determining related domains to form the core or peripheral components of IKM education or curricula and research. Subject areas with high returns or retrieval of documents with KM or IKM would form parts of core KM curricula and research, while others with fewer returns go to the periphery or electives. For example, subject areas in Table 8.2 provide direction on possible research areas linking IKM to ICT. We (Onyancha & Ocholla 2019) have done further analysis on the subject representation of KM through Bradford law and confirm the multidisciplinarity of IKM and its important subject links.

Is KM at a crossroads? My answer would be yes. This chapter cannot claim to have solved the challenges of IKM identity as an emerging discipline but has brought to the fore the disciplinary status, issues and challenges worth considering for the theoretical and practical application of IKM in the African context, and perhaps elsewhere. The discussion provides some thoughts on understanding where knowledge management is headed to, using subject analysis for KM education and research, and producing a KM management competency checklist that can be used by KM students, faculty members and practitioners, to measure the depth of KM knowledge and skills or competencies during the learning process, when looking for a job, and at the workplace.

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Appendix

BOX 8A-1: Proposed IKM competency checklist.

A	Knowledge or professional competencies	1	2	3	4	5
	How do you measure or rate your knowledge on the items listed below					
	Electronic records management systems					
	Management information systems					
	ICT knowledge and skills (ICT principles, ICT infrastructure)					
	Software implementation					
	ICT policies					
	Knowledge of government policies and procedures					
	Electronic resources					
	Policy and diplomacy					
	Collection development					
	Abstracting and indexing, AACR2, LCSH, MARC21, Dspace					
	Library systems, teaching or training					
	Digital asset management system(s)					
	In-depth business knowledge					
	Millennium system and INNOPAC					
	IT knowledge and skills such as web development (HTML, PHP, JavaScript)					
	Data warehousing and multimedia					
	Microsoft Solutions					
	Databases (MySQL)					
	Electronic records management					
	Electronic content management systems					
	Metadata schema, SABINET, OCLC					
	Integrated library systems, USMARC					
	Bibliographic formats, UNICON, SACat, WorldCat, OPAC, RDA, Library Web 2.0					
	LC rule interpretation					
	Management information systems, and special software skills such as SAP					
B	**Attitude or personal competencies (see also Raju, 2017)**					
	How will you assess your attitude to information and knowledge management					
	Analytical thinking with attention to detail					
	Ability to work under pressure					
	Honesty and integrity					
	Willingness to learn and adapt					
	Drive for results					
	Logical reasoning					

BOX 8A-1 continues on the next page→

BOX 8A-1 (Continues...): Proposed IKM competency checklist.

	Persuasive negotiator					
	Proven ability to work independently					
	Self-driven, motivated individual					
	Client-focused attitude					
	Quality-oriented					
	Ability to work in a team					
	Willingness to learn and adapt					
	Credibility					
	Confidence					
	Diplomacy					
	The ability to work under pressure					
	Passion					
	Customer focus and oriented					
	Flexibility					
	Emotional intelligence					
	Proactive					
C	**Generic competencies or skills (see also Raju 2017)**					
	How will you evaluate the following about yourself					
	Project management skills					
	Financial management skills					
	Communication skills (written and verbal)					
	Administrative skills					
	Presentation skills					
	Strong communication (both oral and written)					
	Research and writing skills					
	Problem-solving skills					
	Teamwork and interpersonal skills					
	Computer skills					
	IT skills (MS Suite, Internet, webpage design and management, multimedia and databases)					
	Analytical and financial management skills					
	People management skills					
	Problem-solving and analytical skills					
	Change management skills					
	Leadership skills					
	Time management skills, with a clear sense of what is important to achieve each week and month					

ICT, information and communication technology; IT, information technology; MS, Microsoft;
Note: The question for this checklist was, 'Please respond to the following based on your IKM experience (1 – Poor, 2 –Fair, 3 – Good, 4 – Very good, 5 – Excellent)'.

Chapter 9

Accrediting scholarly journals as a contribution to advancing research excellence in Kenya: A multifaceted approach

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Abstract

Throughout the world, the scientific community and other stakeholders are paying increasing attention to research excellence. The demand for value for

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money and quality research and concern about the proliferation of unethical publishing practices have resulted in many countries re-examining their science, technology and innovation policies and strategies, with some countries focusing on the advancement of research excellence through accredited or approved journals. Kenya has not been left behind in this field. This chapter seeks to augment the efforts of the Commission for University Education (CUE) in advancing and nurturing research excellence in Kenya by highlighting the qualitative and quantitative indicators and approaches that can be considered in making journal accreditation related decisions. The chapter provides background information, a consideration of the role of journals in research excellence and a brief description of the journal quality indicators. In addition, the chapter assesses the status of journals published in Kenya using both qualitative and quantitative indicators. Finally, based on a review of the literature as well as the various national frameworks for approved journals and the findings on the status of Kenyan journals, the chapter proposes qualitative and quantitative indicators to be considered by the CUE and stakeholders in the development of a journal accreditation scorecard.

Introduction

Kenya, like most developing and, indeed, like most African countries, lacks a consolidated public policy to support scientific journals published within its jurisdiction. As a result, on 08 May 2019, Prof Mwenda Ntarangwi, the Secretary and CEO of the CUE in Kenya, asked administrators of all universities in Kenya to submit a copy of their most current running journals in either soft or hard format for review and subsequent accreditation by the Commission. Prof. Ntarangwi underscored the importance of high-quality journals as platforms for sharing and advancing knowledge. The proposal that Kenyan journals should be accredited was made in light of the proliferation of predatory and hijacked journals and the unprecedented publication of 'trash science' (Patwardhan 2019). In addition, as the Commission noted, researchers in the country lack clear guidance on where to publish their research outputs. They further lack the confidence to publish in high-impact factor journals. In line with the recommendation by Tijssen and Kraemer-Mbula (2017:392) that African needs and circumstances are best addressed when African research excellence (RE) is customised and contextualised, the Commission is currently drawing up guidelines and criteria for accrediting journals published in universities in Kenya. The purpose of this chapter is to augment the efforts of the CUE to advance and sustain RE in Kenya by highlighting the qualitative and quantitative indicators and approaches that can be considered in making journal accreditation decisions.

Research excellence and journals

Research and scientific communities throughout the world are paying increasing attention to RE (or excellence in research) (Onyancha 2020; Tijssen

& Kraemer-Mbula 2017). The research community, comprising scientists, government agencies, research institutions, institutions of higher learning, research funders, research publishers, curators and research evaluators, among others, in various countries has become increasingly vocal and active in advancing and sustaining RE within its jurisdictions. Members have demanded quality (rigorous, relevant and impactful) research from scientists for a variety of reasons. While universities consider RE to be crucial for the recruitment and promotion of their teaching staff and to advance their world ranking positions, funders place more emphasis on returns on their investment and the societal relevance of the research they fund. Governments and government agencies consider quality research to be a driver of economic development, among other motivations. The academic success of universities depends largely on their attaining excellence, which includes RE (Carli, Tagliaventi & Cutolo 2019). Any efforts directed towards improving the quality of research in different contexts and at different levels in any given country are therefore a step towards advancing and nurturing RE, defined as outstanding or extremely good research (Tijssen 2003; Tijssen & Kraemer-Mbula 2017; Tijssen, Visser & Van Leeuwen 2002). Elsewhere, RE is often used synonymously with high-quality research (Snyder, McLaughlin & Montgomery 1991) or world-class research (Bornmann, Wagner & Leydesdorff 2015).

There are many enablers for RE. Singh (2013) outlined 20 possible enablers for RE in HE; these include a learning society, industry–university collaboration, incentivising academics and researchers, professional academics, regular monitoring and evaluation, high pay for researchers, innovative research practices, mobilisation of resources, ICTs, public–private partnerships, international collaboration, a quality publication cum citation system, world-class education, research fellowships, increased number of universities and colleges, high-tech libraries and well-equipped laboratories. The EU-LIFE Strategy Working Group (2016) believed that excellence in research is supported by a stimulating environment and state-of-the-art resources, knowledge transfer, human resources and assessment and quality. Carli et al. (2019) divided the features that promote RE into individual-based and contextual factors. Individual-based factors include the gender and academic position of researchers, past publishing experience or RE, publishing in mainstream research and prestigious journals and international collaboration, while contextual factors include the presence of colleagues with past RE, and environments that emphasise RE and research quality.

Evidently, therefore, journals play an important role in the dissemination and consumption of research, thereby nurturing RE in a given geographic or institutional context. Journals are among the prerequisites for successful science and, therefore, RE, hence the consideration of journals as one of the pertinent resources at the highly competitive research front (Bornmann & Marx 2012:2037). Research excellence is therefore dependent on quality or prestigious journals, among other factors, because journals perform the role

of maintaining the quality and integrity of research through what they publish. Researchers hold quality journals in high regard, which explains the pressure to publish in high-impact factor journals, despite the many shortcomings associated with this indicator (i.e. Journal Impact Factor [JIF]). It has also been observed that some countries use ratings or rankings of journals as a factor of peer evaluation when evaluating research performance (cf. e.g. Cicero & Margarini 2019:1392). Barrere (2020) described the role of journals in research assessment systems to nurture RE and thus:

> [*Notwithstanding its limitations*], bibliometrics is a good methodology for measuring excellence within the scientific community, drawing on the need among researchers to publish and offering the quality assurance system through a strict peer review of submitted manuscripts. However, this assessment mechanism is only possible if journals meet the strict standards of editorial quality. In that sense, scientific journals which comply with editorial quality are valuable tools for the management and evaluation of S&T systems in developing countries. High-quality scientific journals help bring communities together and define agendas. (p. 225)

Measuring RE based on publication in journals is widely practiced, as is evident in numerous studies (e.g. Aksnes 2003; Bornmann & Leydesdorff 2018; Bornmann, Wohlrabe & Anegon 2017; Noorhidawati et al. 2017). These studies, among others, have used frequently cited papers in journals as proxy for excellent research. Incites® is a product developed by Clarivate Analytics which provides data about frequently cited papers as indicators of scientific excellence and top performance of individual authors, institutions and countries as well as scientific fields (Clarivate Analytics n.d.). The data relating to frequently cited papers as reflected in Incites® are obtained from the WoS's citation indexes.

Throughout the world, government efforts are increasingly being channelled towards streamlining scholarly publishing and nurturing RE through the establishment of quality control mechanisms, including the recognition and approval of scholarly journals in which researchers are encouraged to communicate their scientific findings. A scan of the published literature, as well as our own knowledge, reveals that countries such as Australia, China, Brazil, Russia, Iran, India, Jordan and South Africa have developed lists of approved journals to serve different purposes (Aminpour & Kabiri 2009; Patwardhan et al. 2018; Pouris & Richter 2000). Measures such as this have now become inevitable, especially in the current information age, which is characterised by a proliferation of ICTs that have facilitated increased production of online (or open access) journals, some of which are false, predatory, scum, pseudo and/or hijacked (Ojala, Reynolds & Johnson 2020) and compromise the quality of research and science communication. The existence of predatory journals has fostered malpractices in scholarly publishing (Balehegn 2017; Mouton & Valentine 2017; Sharma & Verma 2018). Although the precise number of predatory, hijacked, scum or pseudo journals is not known, it has been noted that they have proliferated in recent times.

Mouton and Valentine (2017) found the number of South African articles in predatory journals to have increased tremendously from just fewer than five articles in 2005 to close to 850 articles in 2014.

Journal quality indicators and metrics

There are many methods of assessing the quality of journals, and these can be categorised as quantitative and/or qualitative. Quantitative methods are largely reliant on journal citation metrics and publication patterns (see Tome & Lipu 2004), while qualitative methods include peer-analysis or review. These two broad categories of methods make use of what are commonly termed as indicators to assist in making informed decisions concerning the quality of a journal. These indicators can be obtained from various databases and journal indexing services. Traditionally, journal quality was measured using peer review lists such as that of the Association of Business Schools (UK) or the Journal Citation Reports (JCR) JIF. Many other information products have since emerged to provide data sets and quality indicators with which to assess and/or rank journals.

The quantitative indicators largely constitute citation-based metrics. They include the h-index, g-index, h5-index, eigenfactor score, CiteScore, SCImago Journal Rank (SJR) indicator and the Source Normalised Impact per Paper (Ahmad et al. 2017; Brown 2011). The SJR system uses bibliometric information obtainable from the Scopus bibliographic and citation database to rank journals. The SJR index is obtained using bibliometric information such as the h-index, total number of documents (current year), total number of documents (past three years), total citations (past three years), citable documents (past three years) and citations per document (past three years) (see also Hazelkorn 2015). On its part, Clarivate Analytics' JCR considers the following journal-associated key quantitative indicators: total cites, JIF, five-year impact factor, immediacy index, impact factor without self-citations, eigenfactor score, article influence score, normalised eigenfactor, citable items, percentage articles in citable items, average JIF percentile, cited half-life and citing half-life. Of late, alternative metrics (abbreviated as altmetrics) have been proposed as measures of quality of research in online platforms. The extent of the use of altmetrics to assess the quality of journals has, however, not been fully explored and determined (Onyancha 2016).

Qualitative indicators are journal characteristics and features that inform peer review analysis. These indicators include circulation and coverage in indexing or abstracting services (Tome & Lipu 2004). Some of the qualitative indicators with the capacity to reveal quality characteristics of a journal that can be extracted from Ulrich's Periodicals Directory include the availability of an International Standard Serial Number (ISSN), serial type (trade journal, scholarly or academic journal, etc.), format of publication, status, subject

category, publisher, start year, content type, editorial description, website (where applicable), language of publication, circulation, abstracting and indexing, frequency of publication and key features. We have, however, noted that some of the information that the Directory provides, for example, frequency of journal publication, to be erroneous, and therefore caution must be exercised when making decisions based on such information. A detailed description of the qualitative indicators is given in the next section, under qualitative indicators and characteristics of Kenyan journals. Other qualitative measures (although some are most often expressed quantitatively) that have become increasingly valuable in the assessment of the quality of journals include average publication lag, early publication policy, and reprint policy (Haynes 1983), manuscript acceptance rates (Lee, Schotland & Bacchetti 2002; Willens 2014), qualifications of peer review boards and editorial board index (Wu et al. 2018) and the editorial team scholarly index (Xie, Wu & Li 2019). The latter indicators (editorial board index and editorial team scholarly index) tend not to be readily available; rather, evaluators are supposed to generate them.

The quantitative indicators and methods, which are most commonly used to assess journal quality, are, however, not without shortcomings. Specifically, the citation-based indicators have been faulted on database biases and research field effects, while journal impact factors have shortcomings associated with biased calculations and the dependence of impact factors on research fields (Seglen 1997). Bence and Oppenheim (2004) have listed over 15 problems or shortcomings associated with citations, citation-based indicators and/or journal impact factors as measures of journal quality. On the contrary, the peer review process, too, is limited in many ways, as a number of scholars have argued (e.g. Eisenhart 2002; Geisler 2001; Moed 2007). Scholars have long debated their preferences for one approach over the other, but the realisation and acknowledgement of the shortcomings inherent in both approaches have witnessed a paradigm shift and call for the utilisation of both approaches in evaluating the quality of research performance, including the quality of journals. Hence, Moed (2007:575) argued that successful research evaluation will in the future rest on an intelligent combination of advanced metrics (quantitative measures and indicators) and transparent peer review (qualitative measures and indicators). Similarly, several manifestos (e.g. the Leiden Manifesto and San Francisco Declaration) have advocated for the use of multiple methods and indicators in assessing research performance. Indeed, recent practices have witnessed the use of both quantitative and qualitative methods and indicators in the evaluation of research quality, including the evaluation of journal quality. Many research evaluation frameworks around the world (e.g. the Research Excellence Framework [UK], Standard Evaluation Funding [Netherlands] and Performance-Based Funding [New Zealand]) are encouraging the use of quantitative measures and indicators to support

qualitative measures and indicators (i.e. peer review analyses) (Hicks & Wouters 2015; Mingers & Yang 2017; Wilsdon et al. 2015).

In view of the above and in order to develop an instrument to inform the journal accreditation process in Kenya, both qualitative and quantitative measures and indicators were utilised to assess the performance of journals published in that country. The next two sections provide qualitative indicators and characteristics and the quantitative indicators and metrics to support the accreditation of journals in Kenya.

Qualitative indicators and characteristics of Kenyan journals

This section reviews the criteria for accreditation of journals in selected countries and explores the Ulrich Directory's qualitative indicators that can be used to support decisions relating to the accreditation of journals in Kenya to nurture and advance RE in that country.

Established national criteria for the accreditation of journals

Establishing criteria for the accreditation of journals is one of the fundamental initiatives directed towards nurturing and promoting RE in a country. Countries such as Australia, Brazil, China, India, Iran, Jordan, Pakistan, Russia and South Africa (see Al-Zyoud 2001; Khan & Jabeen 2011; Pouris & Pouris 2015; Pouris & Richter 2000) have established criteria for the approval of journals in which their researchers are required to publish. The purposes of accrediting or approving journals vary from one country to another, but all converge on the need for high-quality research. For example, in South Africa, the Department of Higher Education and Training (DHET) established guidelines to establish a 'stable of high-quality scientific journals that will meet the needs of the South African science and technology community in the best possible way' (Pouris & Richter 2000:98). In Australia, the approved list of journals was developed for the 'sole purpose of supporting the ERA [Excellence in Research for Australia] 2018 evaluation'. Universities were supposed to use the list in their submission processes. Pakistan's Higher Education Council (HEC) accredits journals to enhance the academic and publication standards through financial support and capacity building (HEC 2019). The approach adopted in Pakistan is similar to the one followed in South Africa, and both countries provide financial support for the publication of national journals. The University Grants Commission (UGC) in India, through the Consortium for Academic and Research (CARE), accredits journals to improve the quality of research and safeguard publication ethics.

Regarding the criteria used to accredit journals, most national protocols require the following fundamental and mandatory information about the journal: title, broad and focus subject, name of publisher, country of origin and registered address, language of publication, publishing frequency, name of editor, editorial policy (including proof of peer review), editorial office and contact details, website (where available), format of publication (print, electronic, online, or all) and ISSN or eISSN. In view of these, the DHET (2015:9–10) in South Africa, for example, has established the following criteria for accrediting journals:

1. Title, including translations if not published in English.
2. The ISSN of the journal.
3. Publisher and publisher's address and contact details.
4. Frequency of publication.
5. Evidence that the journal has been published without interruption for a minimum of 3 years, as well as copies of the three most recent consecutive issues of the journal.
6. Editorial policy, including evidence of the peer review process.
7. Editorial board – the status of the members of the editorial board must be stated, together with their institutional affiliations.
8. In the case of electronic journals, the journal's uniform resource locator (URL).
9. Proof of the journal's library holdings and/or downloads for electronic publications.

All these requirements except the last constitute the qualitative indicators, while the last requires, in part, a journal's altmetrics data in the form of downloads. In Jordan, the accreditation of journals emphasises (1) the high reputation of the editorial boards, (2) the standard of the research published in the journals, and (3) the journal's subject focus, in that it must fall within a specific field of study (Al-Zyoud 2001). India uses the same criteria (labelled Protocol I: Basic information), but goes further and introduces two other protocols (labelled Protocol II: Primary criteria and Protocol III: Secondary criteria) which, the UGC states, are used for internal analysis and assessment purposes (CARE 2019). The evaluation process is intensive. The UGC's second and third protocols require information such as a journal's history, consistency, peer recognition, market reputation, academic credentials of editors, peer review process, indexing, citations, charges or fees and related financial matters. This information is obtained directly from the public domain and may lead to a journal's disqualification based on providing false or misleading or incorrect or insufficient information or unsubstantiated claims. The Indian criteria have led to the introduction of some quantitative and citation-based indicators. The Pakistani policy for approved journals relies largely on quantitative indicators. The protocol divides journals into three categories, namely, W, X and Z. Category W journals, besides meeting the basic

requirements, must be indexed in reputable international databases, preferably WoS and Scopus; must have citation information from diverse sources, including impact factor and should have the required weighted average score on all the above parameters. Category X journal requirements include: peer-reviewed articles by reputable international experts; indexing and abstracting in at least one international database; at least one-quarter of the articles must have international authorship; no self-institutional affiliations and articles must be processed through Open Journal Systems (OJS) or a similar journal management system. Finally, category Z journals must meet the following criteria: an academic editorial board comprising members with doctoral degrees in relevant fields and strong research and publications backgrounds; no publications by the editor or editorial team permitted and self-institutional authorship not exceeding one-fifth of total articles. The Pakistani criteria are aimed largely at assessing journals for financial support. A similar scenario is encountered in South Africa, which considers the following conditions necessary for a journal to qualify for accreditation within the country and subsequent subsidy, while maintaining quality (DHET 2015:9):

1. The purpose of the journal must be to disseminate research results, and the content must support high-level learning, teaching and research in the relevant subject area.
2. Articles accepted for publication in the journal must be peer-reviewed.
3. At least 75% of contributions published in the journal must emanate from multiple institutions.
4. The journal must have an ISSN.
5. The journal must be published at the frequency at which it is intended to be published, for instance, quarterly, biannually, annually or biennially.
6. The journal must have an editorial board reflective of expertise in the relevant subject area, with more than two-thirds of the editorial board members drawn from the same institution.
7. The journal must be distributed beyond a single institution.
8. Journals must include English abstracts if their language of publication is not English.

In tandem with the global trends, in terms of which quantitative indicators are used to assess the quality of research, in South Africa, the DHET, in its 2015 gazette notice, stated its intention to use quantitative quality measures to differentiate types of research outputs in its endeavour to subsidise research in the country. The DHET states: 'in future, however, the Department may consider introduction of such measures as "high" or "low" impact journals; citation indexes or other relevant and appropriate quality measurements after due and extensive consultative process with the sector' (DHET 2015:5).

From the foregoing national cases, it is evident that accreditation of journals is carried out for two main reasons: (1) to promote RE through the publication and dissemination of quality research output, and (2) to assess

journals for subsidy or financial support. It is also evident that the accreditation criteria in diverse jurisdictions are fairly similar. This is, perhaps, a consequence of the globalisation of research. National contexts and needs vary greatly, and therefore, it is not practical either to critique or recommend any of the frameworks without positioning them within specific scenarios. It would seem, however, that using both quantitative and qualitative indicators and measures would maximise the benefits of either approach while at the same time minimising their disadvantages.

The next two subsections provide an assessment of Kenyan journals using qualitative and quantitative indicators, based on the data extracted from Ulrich's Directory. The procedure followed in extracting the data from the Directory is explained in Section 9.5.

Indexing or abstracting in mainstream bibliographic and/or citation databases

The inclusion and coverage of journals in bibliographic databases are one of the indicators of the quality of the indexed and abstracted journals. Since the launch of the Science Citation Index in 1964 by Eugene Garfield, the number of citation indexes has increased tremendously. The WoS's indexes, Scopus and Google Scholar are the most popular mainstream citation indexes. Other citation indexes, which are largely associated with specific geographic regions, are Scientific Electronic Library Online (SciELO), the Indian Citation Index, Korea Citation Index, Russian Science Citation Index and Serbian Citation Index. These citation indexes and other bibliographic databases offer journals and journal publishers avenues to disseminate research as well as curate their publications.

Table 9.1, which was generated using the data obtained from Ulrich's Directory (see s. 5), reveals that of the 108 Kenyan journals (presented in Appendix A), only 33 provided information on their abstracting and indexing status in mainstream bibliographic databases. The journals with the highest number of indexing databases were *Journal of Applied Biosciences*, which was indexed in 66 databases, followed by the *African Journal of Food, Agriculture, Nutrition and Development* (62), *Journal of Animal and Plant Sciences* (62), *The East African Medical Journal* (61) and *Tea* (51).

Kenyan journals are indexed mainly in bibliographic databases rather than citation indexes. The bibliographic databases of the Centre for Agriculture and Bioscience International (CABI) are the most commonly used to index Kenyan journals. The Centre is a not-for-profit information organisation focusing on agricultural and environmental issues. The Kenyan journals appeared in a total of 65 CABI databases and abstracting services, with CABI Animal Production Database, CABI Environmental Impact, CABI Potato

TABLE 9.1: Abstracting and indexing of Kenyan journals in mainstream bibliographic databases.

No.	Title	ISSN	No. of databases
1	*Journal of Applied Biosciences*	1997-5902	66
2	*African Journal of Food, Agriculture, Nutrition and Development*	1684-5374	62
3	*Journal of Animal and Plant Sciences*	2071-7024	62
4	*The East African Medical Journal*	0012-835X	61
5	*Tea*	1015-7174	51
6	*Journal of Agriculture, Science and Technology*	1561-7645	48
7	*African Journal of Agricultural and Resource Economics*	1993-3738	48
8	*Pachyderm*	1026-2881	38
9	*Kenya Veterinarian*	0256-5161	28
10	*East and Central African Journal of Pharmaceutical Sciences*	1026-552X	28
11	*Discovery and Innovation*	1015-079X	26
12	*African Journal of Science and Technology*	1607-9949	23
13	*Journal of East African Natural History*	1026-1613	17
14	*AFER*	0250-4650	14
15	*Transafrican Journal of History*	0251-0391	12
16	*Our Planet*	1013-7394	10
17	*Scopus*	0250-4162	9
18	*Africa Journal of Evangelical Theology*	1026-2946	6
19	*KCA Journal of Business Management*	2071-2162	6
20	*Kenya Past and Present*	0257-8301	5
21	*Africa Media Review*	0258-4913	5
22	*African Journal of Health Sciences*	1022-9272	4
23	*Journal of Civil Engineering Research and Practice*	1729-5769	4
24	*Ecoforum*	0250-9989	3
25	*Kenya Nursing Journal*	0301-0333	2
26	*African Journal of Medical Practice*	1023-8190	2
27	*Thought and Practice*	2076-7714	2
28	*The Annals of African Surgery*	2523-0816	2
29	*Wajibu*	1016-9717	1
30	*Hekima Review*	1019-6188	1
31	*International Journal of Tropical Insect Science*	1742-7592	1
32	*World Applied Programming*	2222-2510	1
33	*Journal of Meteorology and Related Sciences*	2412-3781	1

ISSN, International Standard Serial Number; No., number.

Abstracts (Online), CABI Veterinary Science Database and CABI VetMed Resource indexing the largest number of journals (i.e. 11) each. Thirty-one EBSCOHost databases were the second highest ranking among the databases belonging to the same company indexing the journals. ProQuest, too, featured prominently, as its 15 databases were among the popular databases for Kenyan journals. Table 9.2 provides the top 30 databases that indexed and/or abstracted the largest number of Kenyan journals. All of these databases belong to CABI.

An examination of the SJR system, which draws its data for the purposes of ranking journals from the Scopus database, revealed that only eight Kenyan

TABLE 9.2: Most commonly used abstracting and indexing databases for Kenyan journals.

No.	Name of database	No. of journals
1	Animal Production Database	11
2	Environmental Impact	11
3	Potato Abstracts (Online)	11
4	Veterinary Science Database	11
5	VetMed Resource	11
6	Animal Science Database	10
7	Forest Science Database	10
8	Plant Protection Database	10
9	Review of Plant Pathology (Online)	10
10	TropAg & Rural	10
11	Agricultural Economics Database	9
12	Agroforestry Abstracts (Online)	9
13	Botanical Pesticides Abstracts	9
14	Forestry Abstracts (Online)	9
15	Global Health	9
16	Horticultural Science Database	9
17	Nutrition Abstracts and Reviews. Series A: Human and Experimental (Online)	9
18	Nutrition and Food Sciences Database	9
19	Parasitology Database	9
20	Review of Aromatic and Medicinal Plants (Online)	9
21	Rural Development Abstracts (Online)	9
22	Biocontrol News and Information (Online)	8
23	Crop Science Database	8
24	InfoTree	8
25	Maize Abstracts (Online)	8
26	Plant Breeding Abstracts (Online)	8
27	Plant Genetics and Breeding Database	8
28	Postharvest Abstracts	8
29	Review of Medical and Veterinary Entomology (Online)	8
30	Soil Science Database	8

No., number.

journals met the threshold for inclusion among the ranked journals and are therefore indexed in Scopus. The top-ranked Kenyan journal is *Pan African Medical Journal* (*r* = 48; SJR = 0.242), followed by the *African Journal of Food, Agriculture, Nutrition and Development* (*r* = 57; SJR = 0.219); *International Journal of Virology* (*r* = 87; SJR = 0.151); *Scopus* (*r* = 88; SJR = 0.151); *Annals of African Surgery* (*r* = 101; SJR = 0.132); *East African Medical Journal* (*r* = 109; SJR = 0.125) and *African Journal of Agriculture and Resource Economics* (*r* = 135; SJR = none). The highest-ranked African journal in 2018 was the *African Journal of Disability* (*r* = 1; SJR = 1.944), published in South Africa.

Ulrich's Directory indicates that the *Africa Journal of Evangelical Theology*, *Kenya Nursing Journal* and *African Journal of Medical Practice* ceased their indexation in the WoS, and only one journal is still indexed in the WoS citation indexes, namely, *Pachyderm* (ISSN: 1026-2881). It should be noted that journal

selection for inclusion in Clarivate Analytics' WoS citation indexes is a tedious process. The indexing service has, however, come under heavy criticism regarding its bias for English-language- and global North-based journals, to the exclusion of journals published in the East and the global South. In recent times, however, the WoS has endeavoured to expand its scope and included the journals indexed in some citation indexes published in the East and the global South, such as the Chinese Citation Index, the Russian Citation Index and SciELO.

Coverage in online portals

The information provided in Ulrich's Directory regarding online availability of the journals followed a pattern similar to the one discussed earlier concerning the indexing and coverage of journals in abstracting services. We reiterate that although the visibility or presence of journals in online platforms is not necessarily an indicator of the quality of journals, their inclusion or coverage in online portals is an important indicator of the recognition of the journal's standing among similar journals. Moreover, a journal's online presence increases its chances of being used and therefore cited, a factor that enhances its citation impact and subsequent recognition by the mainstream citation indexes. The most popular online portal among the Kenyan journal publishers is African Journals Online. African Journals Online is a non-profit organisation that works to increase global and continental online access, awareness, quality and use of African-published, peer-reviewed research. The portal was established in 1998 and is based in South Africa. Other companies or organisations that have given Kenyan journals online visibility and accessibility include Directory of Open Access Scholarly Resources, which indexes journals such as *Scopus, African Journal of Physical Sciences, International Journal of Social Science Management and Entrepreneurship, International Journal of Current Business and Social Sciences* and *African Research Journal of Education and Social Sciences*. EBSCOHost databases are listed among the online platforms that provide accessibility and visibility to Kenyan journals, although the indexing service is also categorised as a bibliographic database (see section on 'Explaining the narrative'). Kenyan journals generally have limited visibility on online portals.

Predatory publishing and journals

Ethical scholarly practice in research is one of the qualitative considerations when assessing the quality of journals. Of particular interest is predatory scholarly publishing and journals, which have proliferated in recent years. The number of predatory journals stands at about 13 000 (Linacre 2020), having grown from 8000 in 2015 (Shen & Björk 2015), and Linacre (2020) cautions that the growth of predatory publishing shows no signs of slowing down. Whereas there is no universally agreed-upon definition of predatory journals,

Beall (2015), Callaghan and Nicholson (2020) and Linacre (2020) have noted that predatory journals exhibit the following key characteristics:

- Editors do not exist or are deceased.
- The journal's website does not have a clearly stated review policy.
- The journal falsely claims indexing in well-known databases (especially Scopus, DOAJ and Cabell's).
- The website either does not provide a physical address for the publisher or else gives a fake address.
- The publisher or journal's website seems overly focused on the payment of fees.
- Quick publishing timelines are promised (suggestive of no or less rigorous peer review).
- Aggressive marketing through incessant calls for submission of articles (spamming).
- Basic quality weaknesses exemplified by poor editing and proofreading.
- Titles that do not indicate a specialised focus (multidisciplinary and transdisciplinary).
- The editor-in-chief is not a renowned specialist in the area of publication (although this can be faked).

Despite having elicited controversies, Beall's list of potential, possible or probable predatory scholarly open access journals and Cabell's blacklist are the most commonly relied upon sources of information about predatory journals. An examination of Beall's list for Kenyan journals yielded the following entrants: *International Journal of Current Business and Social Sciences* and *Journal of Animal and Plant Sciences*, while the blacklist contains the *International Journal of Vocational and Technical Education and Training* as predatory. There is a need to investigate the validity of the inclusion of the aforementioned journals in the lists.

Finally, we believe that there is a need to formulate a national policy on predatory scholarly publishing. Besides the efforts directed towards establishing and recommending whitelists of journals in several countries, some countries, such as India, have, in addition to whitelists, proposed the publication of a blacklist of journals, to discourage researchers from publishing in questionable journals (Patwardhan 2019). In South Africa, the NRF has published, on its website, a policy brief on predatory journals.

Quantitative indicators and metrics to support the accreditation of journals in Kenya

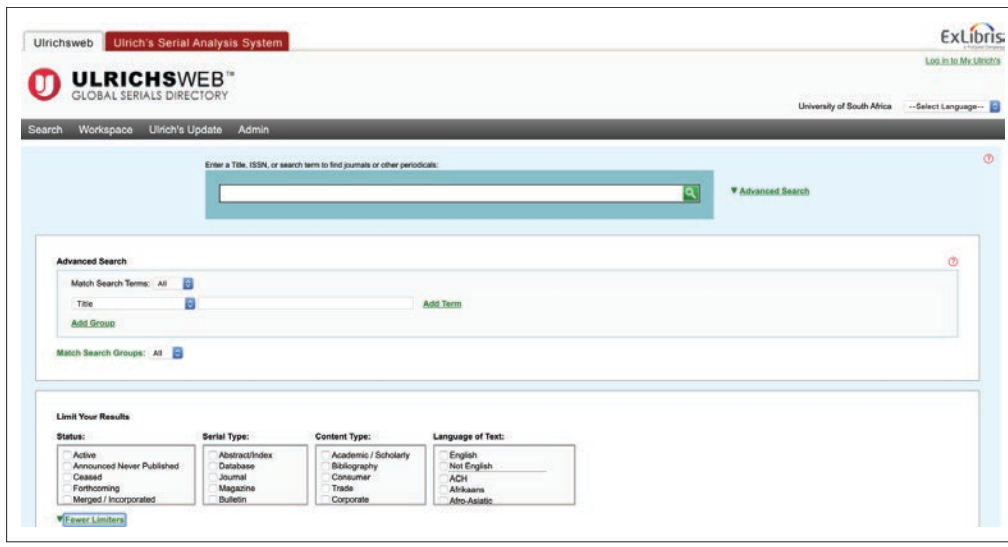
The research underlying this chapter revealed various metrics and indicators which can be applied to support the journal accreditation processes in Kenya.

First, a list of journals published in Kenya was obtained using the Ulrichsweb Global Serials Directory ©2018. The limiters were the *country* of publication of journals (i.e. Kenya) and *peer-reviewed journals*. The downloaded data included: journal name, ISSN, serial type, format of publication, status, subject category, publisher, start year, content type, editorial description, website (where applicable), language of publication, circulation, abstracting and indexing, frequency of publication and key features. The search platform in the Ulrichsweb Global Serials Directory is shown in Figure 9.1.

Once the list of scholarly journals had been obtained from the Directory, a list of journals with ISSNs was isolated to collect citation and publications data from Google Scholar using the Publish or Perish (PoP) program, as shown in Figure 9.2. Google Scholar is considered a good source of citation data (Bar-Ilan 2006; Bar-Ilan, Levene & Lin 2007; Noruzi 2005; Onyancha 2009; Onyancha & Ocholla 2009; Pauly & Stergiou 2005; Yang & Meho 2006).

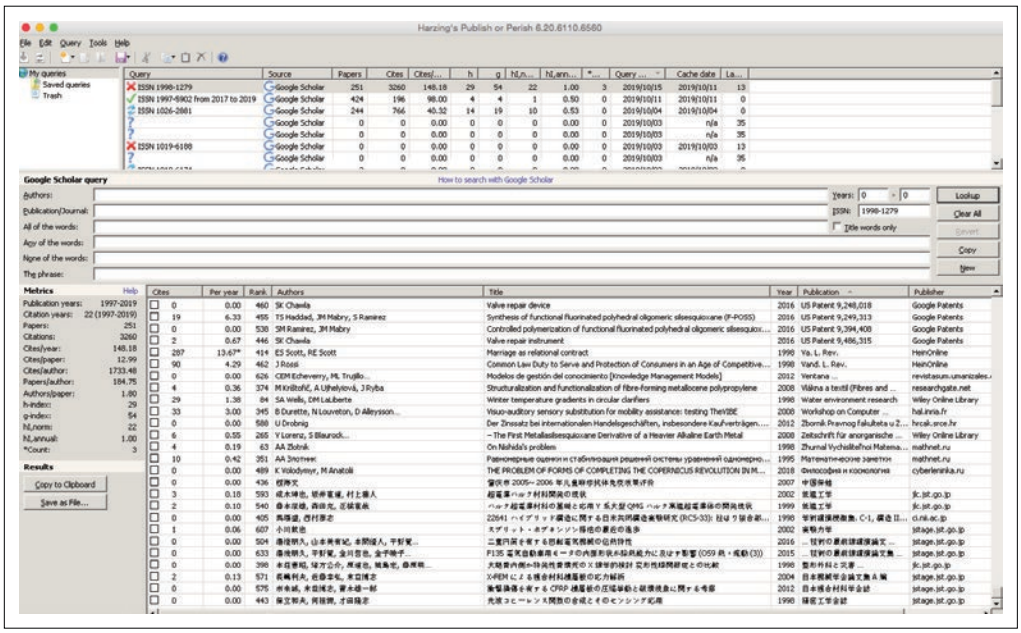
PoP enables one to conduct searches in a variety of ways, including searching for a journal's citation and publications data using its ISSN as a search query. This option was used to obtain relevant data for each of the journals that had an ISSN. A total of 228 journals that had ISSNs were subjected to a search in Google Scholar using this software. The following data, which was deemed relevant for the assessment of the journals to compile this chapter on accrediting journals in Kenya, were extracted:

1. Number of articles.
2. Papers per year.



Source: A screenshot of the Ulrichsweb Global Serials Directory ©2018, taken by Omwoyo B. Onyancha, used with permission from Omwoyo B. Onyancha.

FIGURE 9.1: Ulrich's global directory search desktop.



Source: A screenshot of the Publish or Perish software's search platform, Omwoyo B. Onyancha, published with permission from Omwoyo B. Onyancha.

FIGURE 9.2: Screenshot of the process used to clean data (example of journal ISSN: 1998-1279).

3. Papers per issue.
4. Years of publication.
5. Start and end year of publication.
6. Number of citations.
7. Citations per paper.
8. H-index.
9. G-index.

These quantitative measures are explained further and expressed in Appendices A and B.

Productivity or publication indicators

A journal's consistency and regular publication of its issues and, by extension, its articles are an important factor to consider when assessing its quality. Appendix A consists of productivity indicators for journals published in Kenya, namely number of papers, years covered in Google Scholar, the start and end years of publication, frequency of publication, papers per year and issue. Whereas the number of publications is a measure of the volume of research published in the journals, the years of publication and publications per year (or volume) and per issue are a measure of productivity or publication rate for each journal. The latter indicates the consistency of the journal and the

regularity with which it publishes papers. Journal publishers often spell out, from the outset, the number of issues that the journal will publish as well as the minimum number of papers to be published in each issue or volume. The CUE may prescribe the minimum number of papers that a journal may publish in a volume (per year) or issue for purposes of accreditation. It is not cost-effective, for instance, for a journal that publishes one volume per year to publish only two papers per volume. Furthermore, such a journal will in all probability generate fewer citations than a journal that publishes several volumes in a year. When subjected to a Pearson Correlation run, the data in Appendix B yields high correlation coefficients as follows: (1) papers versus citations ($r = 0.98$, $p < 0.001$), (2) papers versus citations per paper ($r = 0.32$, $p < 0.001$), (3) papers versus h-index ($r = 0.78$, $p < 0.001$), and (4) papers vs. g-index ($r = 0.73$, $p < 0.001$). This brings us to the question of the upper limit. How many volumes should a journal publish? Should there be a limit? This is another area in which the CUE may provide direction through a policy document governing journal accreditation. Recent practice among some journal publishers has been to publish as many papers in a journal as possible so as to maximise profits generated through article processing charges. This practice, if left unchecked, may lead to unethical publishing behaviour, which may result in journals being blacklisted. The frequency of publication of the Kenyan journals ranges from one volume to 12 volumes in a year, as shown in Appendix A. It was also noted that some journals appear irregularly, with no specific information on the frequency of publication on their websites. These journals are marked with an asterisk against their names in Appendix A. In the case of some, the information in the Frequency column was obtained from the Ulrich Periodical Index, but upon checking the journals' websites for confirmation, the frequency of publication was found to be irregular. Irregular publication of the issues of the journal may be attributed to contemporary open access scholarly publishing, which enables publishers to publish papers when these are ready, without waiting for an issue to be complete before publishing. This practice allows the journal to enter circulation and to be accessed without necessarily waiting for all the papers to be ready. There is a risk attached to this, however, as the expected papers may for some reason or another not be ready for publication in the said volume or issue. To prevent this, many journals have adopted the 'online-first-publication' of papers in unspecified issues as they await the publication of the final copies of the issues.

With regard to the most productive journals measured in terms of the number of papers per year, the *East African Medical Journal*, which publishes 12 issues per year, registered, on average, 95.2 papers per year. The journal published a total of 8088 papers between 1935 and 2019, with an average number of papers per issue of 7.9. The *Journal of Applied Biosciences* took second place with 78.5 papers per year and an average of 6.5 papers per issue.

Other journals to have performed relatively well in terms of the number of papers per year, with the corresponding papers per issue, include *International Journal of Business Management and Finance* (77.0; 12.8), *African Journal of Education, Science and Technology* (55.3; 27.7), *African Journal of Food, Agriculture, Nutrition and Development* (53.8; 13.4) and *Journal of Animal and Plant Sciences* (52.6; 4.4). Appendix A further shows that there were 36 journals that published fewer than five papers per year, even though most claimed to publish 12 issues a year, which would translate into fewer than two papers per issue. This pattern requires further investigation, as it is possible that the journal's papers may for some reason not be visible in Google Scholar. For example, it is possible that the journals largely publish their papers in print, or, if the journals are published electronically, that the avenues of distribution of their papers are not discoverable on the Internet.

Of the 108 journals in Appendix A, 30 appeared to have ceased publication, as the last publication date was 2017 or earlier. The *Kenya Nursing Journal*, for instance, last published in 1991, according to the Google Scholar data. The number of journals that yielded no publications between 1991 and 2017 are shown in Figure 9.3. This figure reveals that the number of journals not to have published papers, or with no publications detectable by Google Scholar, since 2017 (two years prior to the data collection for this report) has continued to grow, particularly since 2006. Ulrich's Directory identifies 112 journals as ceased or suspended. However, we noted that a number of these so-called journals lacked ISSNs; ISSNs were detectable for only 39 of the 112.

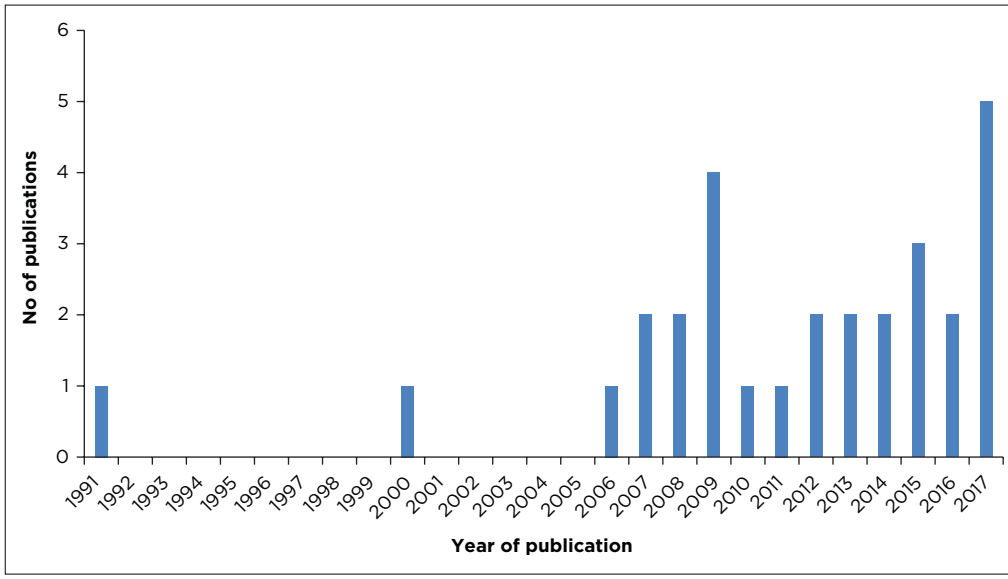


FIGURE 9.3: Number of journals with zero publications per year in Google Scholar.

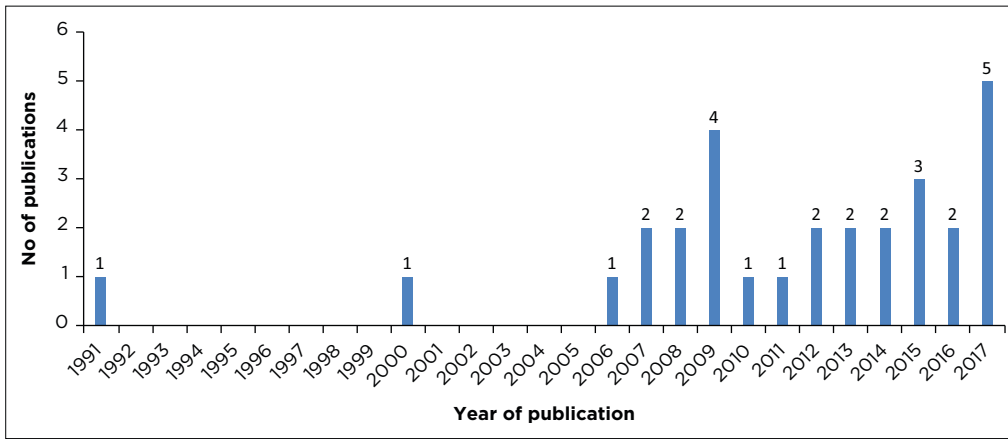


FIGURE 9.4: Number of journals of recent origin in Kenya, from 1991 to 2017.

Ulrich's Directory records the majority of the ceased or suspended journals as belonging to Kenyatta University. The cessation or suspension of publication of journals is a matter of grave concern, and we therefore recommend that the trend should be monitored and investigated to ascertain the underlying reasons for it.

A further notable characteristic of the Kenyan journals listed in Appendix A is the recent emergence of a number of journals in the country's scholarly ecosystem. If the first year of publication, as obtained from the Google Scholar data, reflects the publication by a journal of its first issue, then it is safe to conclude that most journals published in Kenya are of recent origin. Of the 108 journals tabled in Appendix A, 86 were published for the very first time between 2000 and 2019. Of these 86 journals, 66 appeared between 2014 and 2019, with the number per year as follows: 2014 (10), 2015 (3), 2016 (27), 2017 (17), 2018 (8) and 2019 (1). While the recent growth in the number of journals in the country is commendable, as it expands the avenues for research dissemination, the trend underscores the need for quality assurance mechanisms; as the CUE rightly points out, many unscrupulous publishers may taint this otherwise noble industry, particularly against the backdrop of the requirement that Master's and doctoral students in Kenya publish their research findings before they are awarded their degrees.

Citation performance of the journals

Concerning the number of citations, despite their shortcomings, the h-index and g-index are the most commonly used indicators of journal quality. Some of the criticisms that have been levelled against citations and their derivative indicators such as the JIF, h-index, average number of citations per paper or

journal and g-index were discussed in the section titled 'Journal quality indicators and metrics'. This section summarises the performance of Kenyan journals based on their number of citations, citations per paper, h-index and the g-index. Citations are considered valuable in scholarly communication and research, as they 'represent the notions of use, reception, utility, influence, significance, and the somewhat nebulous word "impact"' (Pendlebury 2009). Citations measure different things and therefore play various roles in scholarly communication, science communication and research. For example, they measure the utility of science or research in cases where references are manifestations of scholarly information flows; they reflect intellectual influence; they can be used as a measure of journal quality; citation rates may indicate actual influence and they represent recognition, persuasiveness and awareness (Moed 2005). They are signposts that are left behind after information in a journal has been utilised, hence the argument that a journal that is frequently cited is deemed to be highly used, thus implying its importance or popularity.

In terms of the number of citations, most journals have been cited at least once, with some recording high citation rates. Only 10 journals – accounting for 9.25% of the 108 journals assessed in the chapter – were seen to have received no citations. The low citation rate can be attributed to the fact that most Kenyan journals have been established only recently. It is widely acknowledged that, depending on the research field, citations often take a long time to accumulate. This pattern is visible in Appendix B, which shows that 'older' journals generated more citations than newer journals. For example, the *East African Medical Journal*, whose publications date back to 1935 in Google Scholar, recorded the highest number of citations (71 084), followed by the *International Journal of Tropical Insect Science* (15 784), and the *African Journal of Food, Agriculture, Nutrition* and *Development* (11 950), to name the journals that were cited more than 10 000 times. The Google Scholar data show that the latter two journals were first published in 1980 and 2001, respectively.

The h-index is another 'quality' indicator that can be used to inform decision-making processes relating to the accreditation of journals. The index was originally proposed as an author-level metric to measure authors' research performance by taking into consideration the productivity and citation impact of their publications. It is now applied to other units producing or publishing research, such as journals and institutions. Despite the fact that the index takes both productivity and citation impact into account, it is often considered as a citation metric or indicator. Hirsch (2005:16569), who proposed the h-index, explained it thus: 'A scientist has index h if h of his/her Np papers have at least h citations each, and the other (Np-h) papers have no more than h citations each'.

The index has been widely applied. Its key advantage is that it combines an assessment of quantity (number of papers) and citations. It is therefore preferable to the number of citations only, because it corrects the anomaly associated with authorship or publication of just a small number of papers that are nevertheless highly cited. For example, a journal or an author may publish one article which is highly cited (e.g. 1000 citations), and be considered to perform better than an author or journal that has published 100 papers which have collectively received fewer than 1000 citations, if the number of citations is the measurement indicator. It is for this reason that the h-index is applied in many citation-based assessments.

This chapter considers the h-index in ranking the Kenyan journals shown in Appendix B. The Appendix shows that 19 journals registered an h-index score higher than 11, implying that they had published at least 11 papers that had generated 11 citations each. These journals with the high h-index scores include the *East African Medical Journal* (77), *African Journal of Food, Agriculture, Nutrition and Development* (48), *International Journal of Tropical Insect Science* (48), *Journal for Language, Technology and Entrepreneurship in Africa* (29) and *Journal of Applied Biosciences* (29). With the exception of the *Journal for Language, Technology and Entrepreneurship in Africa*, all the journals topping the list of journals with high citation rates relate to science and technology. This observation is particularly important when considering the h-index and other citation-based metrics or indicators for assessing the performance of journals (and other units of analysis such as authors and institutions), because citation performance differs across disciplines.

Finally, the g-index is proposed as another indicator that can be used to complement qualitative indicators when accrediting journals. The g-index was proposed by Leo Egghe in 2005 to improve the h-index by giving more weight to highly cited articles. The g-index is explained thus (Harzing 2011):

> [*Given a set of articles*] ranked in decreasing order of the number of citations that they received, the g-index is the (unique) largest number such that the top g articles received (together) at least g^2 citations. (p. 13)

This chapter has not considered the g-index as a ranking variable for the journals, as the h-index was deemed to serve the same purpose. In fact, a correlation run based on the two variables produced a coefficient score of $r = 0.97$ at $p < 0.001$, implying very little difference between the h-index and g-index. Nevertheless, there is no harm in considering the g-index in instances where two units post the same h-index, particularly if the purpose of assessing the journals relates to matters such as funding the journals based on their citation performance.

Conclusion

This chapter sought to provide supplementary information that can be considered in journal evaluation and accreditation in Kenya. The review of the published literature and the national frameworks on journal accreditation and evaluation, as well as the analysis of the journals published in Kenya using Ulrich's Periodical Directory, reveal a multiplicity of indicators that can be used to formulate criteria for the accreditation of journals in Kenya. It is evident that different approaches are adopted in different countries. Nevertheless, there are basic requirements that journals must meet in order to be accredited. Increasingly, countries and journal accrediting bodies are using both qualitative and quantitative indicators in the accreditation of journals. As a result, we recommend a multifaceted approach, comprising both qualitative and quantitative indicators, to develop criteria in the form of a scorecard for the accreditation of journals in Kenya. Appendix C (Box 9A-1) provides the information that could be considered in the development of such a scorecard. Section A requires basic information about the journal, while Section B and Section C require qualitative and quantitative information that can assist in the evaluation and accreditation of the journals. It is worth mentioning that the inclusion as well as the scoring of the items outlined in Appendix C will require consensus among stakeholders, because widely accepted criteria (or a widely accepted scorecard) will yield desired outcomes. While Section A and Section B consist of mandatory fields, information in Section C may be used where applicable. As discussed in the section titled 'Background to information access and protection of privacy', some journals have recent histories and therefore have not accumulated citations upon which they can be assessed, hence the proposal that Section C be applied as and when necessary.

Appendix A: Kenyan journals: Publishing trends and productivity

TABLE 9A-1: Publishing trends and productivity in Kenyan journals.

Journal Name	ISSN	*P*	yrs	yr1	yr2	*F*	p/yr	P/I
The East African Medical Journal	0012-835X	8088	85	1935	2019	12	95.2	7.9
Journal of Applied Biosciences	1997-5902	1569	20	2000	2019	12	78.5	6.5
International Journal of Business Management and Finance	2616-1818	77	1	2018	2019	6	77.0	12.8
African Journal of Food, Agriculture, Nutrition and Development	1684-5374	1022	19	2001	2019	4	53.8	13.4
Journal of Animal and Plant Sciences	2071-7024	579	11	2008	2019	12	52.6	4.4
European Journal of Business and Strategic Management	2518-265X	119	3	2016	2019	12	39.7	3.3
International Journal of Tropical Insect Science	1742-7592	1354	40	1980	2019	4	33.9	8.5
International Academic Journal of Human Resource and Business Administration	2518-2374	162	5	2014	2019	4	32.4	8.1
Journal of Human Resource & Leadership	2616-8421	32	1	2018	2019	12	32.0	2.7
Journal of Entrepreneurship & Project Management	2616-8464	30	1	2018	2019	12	30.0	2.5
Discovery and Innovation	1015-079X	842	29	1990	2010	4	29.0	7.3
International Academic Journal of Information Sciences and Project Management	2519-7711	114	4	2015	2019	4	28.5	7.1
International Journal of Business Management and Processes	2616-3209	57	2	2017	2019	12	28.5	2.4
African Journal of Education, Science and Technology	2309-9240	332	6	2013	2019	2	27.7	27.7
International Journal of Finance	2520-0852	52	2	2017	2019	12	26.0	2.2
Journal of Strategic Management (Nairobi)	2616-8472	26	1	2018	2019	12	26.0	2.2
International Journal of Social Science Management and Entrepreneurship	2411-7323	49	2	2017	2019	12	24.5	2.0
Journal of Health, Medicine and Nursing	2520-4025	49	2	2017	2019	12	24.5	2.0
Journal of International Business, Innovation and Strategic Management	2617-1805	24	1	2018	2019		24.0	
The Annals of African Surgery	2523-0816	278	12	2007	2019	6	23.2	3.9
International Journal of Finance and Accounting	2518-4113	66	3	2016	2019	12	22.0	1.8
Africa Journal of Technical and Vocational Education and Training	2518-2722	62	3	2016	2018	1	20.7	20.7
Mara Research Journal of Humanities & Social Sciences	2519-1489	39	2	2017	2018		19.5	
Journal of Finance and Accounting	2616-4965	37	2	2018	2019	12	18.5	1.5
Journal of Human Resource and Leadership	2519-9099	55	3	2016	2019	12	18.3	1.5
Wajibu	1016-9717	616	34	1985	2009		18.1	
International Journal of Supply Chain and Logistics	2520-3983	36	2	2017	2019	12	18.0	1.5
Our Planet	1013-7394	512	29	1990	2009	4	17.7	4.4
African Development Finance Journal	2522-3186	33	2	2017	2019	4	16.5	4.1
African Multidisciplinary Journal of Research	2518-2986	47	3	2016	2019	0.5	15.7	31.3
Kabarak Journal of Research and Innovation	2305-784X	62	4	2015	2019	1	15.5	15.5
Kenyan Journal of Nursing & Midwifery	2518-8631	46	3	2016	2019	3	15.3	5.1

p, Papers; yrs, Number of years of publication; yr1, First year of publication; yr2, Last year of publication (as at the time of data collection); F, Frequency of publication in a year; p/yr, Average number of papers per year; P/I, Average number of papers per issue.

Table 9A-1 continues on the next page→

TABLE 9A-1 (Continues...): Publishing trends and productivity in Kenyan journals.

Journal Name	ISSN	P	yrs	yr1	yr2	F	p/yr	P/I
World Applied Programming	2222-2510	118	8	2011	2016	12	14.8	1.2
African Journal of Health Sciences	1022-9272	365	25	1994	2019	4	14.6	3.7
Journal of Sustainable Research in Engineering	2409-1243	68	5	2014	2019	4	13.6	3.4
Mara Research Journal of Kiswahili	2520-0577	27	2	2017	2018	6	13.5	2.3
International Journal of Entrepreneurship and Project Management	2518-2838	40	3	2016	2019	12	13.3	1.1
AFER	0250-4650	410	31	1988	2012	4	13.2	3.3
African Journal of Education and Practice	2519-0296	38	3	2016	2019	12	12.7	1.1
The East and Central African Journal of Pharmaceutical Sciences	1026-552X	210	17	2002	2019	4	12.4	3.1
Journal of Education	2616-8383	12	1	2019	2019	12	12.0	1.0
Journal for Language, Technology & Entrepreneurship in Africa	1998-1279	251	22	1997	2019	2	11.4	5.7
Journal of Business and Strategic Management	2520-0402	34	3	2016	2019	12	11.3	0.9
African Journal of Science and Technology	1607-9949	200	18	2001	2013	6	11.1	1.9
International Journal of Supply Chain Management	2518-4709	33	3	2016	2019	12	11.0	0.9
Journal of Public Policy & Governance	2616-8413	11	1	2018	2019	12	11.0	0.9
The Strategic Journal of Business & Change Management	2312-9492	66	6	2014	2019	4	11	2.8
Journal of East African Natural History	1026-1613	272	25	1994	2019	2	10.9	5.4
International Journal of African and Asian Studies	2409-6938	43	4	2015	2018	3	10.8	3.6
Journal of Agriculture, Science and Technology	1561-7645	234	22	1997	2019	6	10.6	1.8
Thought and Practice	2076-7714	102	10	2009	2015	2	10.2	5.1
Pachyderm	1026-2881	191	19	2000	2018	2	10.1	5.0
International Academic Journal of Procurement and Supply Chain Management	2518-2404	30	3	2016	2019	4	10.0	2.5
Mara International Journal of Social Sciences Research Publications	2523-1464	20	2	2017	2018		10.0	
Journal of African Interdisciplinary Studies	2523-6725	10	1	2018	2019	12	10.0	0.8
Scopus	2313-1799	161	18	2001	2019	2	8.9	4.5
International Journal of Social Science and Information Technology	2412-0294	42	5	2014	2018	4	8.4	2.1
Tea	1015-7174	198	24	1995	2017	2	8.3	4.1
Journal of Tourism, Hospitality and Sports	2312-5179	41	5	2014	2018	3	8.2	2.7
Journal of Education and Practice	2520-467X	15	2	2017	2019	12	7.5	0.6
Hekima Review	1019-6188	160	22	1997	2011	2	7.3	3.6
Human Resource and Leadership Journal	2520-4661	21	3	2016	2019	12	7.0	0.6
Journal of Civil Engineering Research and Practice	1729-5769	101	15	2004	2012	2	6.7	3.4
Global Journal of Health Sciences	2519-0210	20	3	2016	2019	12	6.7	0.6
Transafrican Journal of History	0251-0391	303	48	1971	2000	1	6.3	6.3
International Academic Journal of Health, Medicine and Nursing	2523-5508	12	2	2017	2019	4	6.0	1.5
Kenya Past and Present	0257-8301	281	48	1971	2009	2	5.9	2.9
African Journal of Medical Practice	1023-8190	144	25	1994	2006	6	5.8	1.0
International Academic Journal of Law and Society	2519-772X	17	3	2016	2019	4	5.7	1.4
Kenya Veterinarian	0256-5161	217	39	1980	2014	2	5.6	2.8
Africa Media Review	0258-4913	159	31	1988	2013	4	5.1	1.3

p, Papers; yrs, Number of years of publication; yr1, First year of publication; yr2, Last year of publication (as at the time of data collection); F, Frequency of publication in a year; p/yr, Average number of papers per year; P/I, Average number of papers per issue.

Table 9A-1 continues on the next page→

TABLE 9A-1 (Continues...): Publishing trends and productivity in Kenyan journals.

Journal Name	ISSN	P	yrs	yr1	yr2	F	p/yr	P/I
International Journal of Communication and Public Relation	2520-7989	15	3	2016	2018	12	5.0	0.4
International Academic Journal of Social Sciences and Education	2518-2412	24	5	2014	2019	4	4.8	1.2
Mara Research Journal of Information Science and Technology	2518-8844	14	3	2016	2017		4.7	
International Journal of Economics	2518-8437	14	3	2016	2019	12	4.7	0.4
Journal of Public Policy and Administration	2520-5315	14	3	2016	2019	12	4.7	0.4
International Journal of Current Business and Social Sciences	2312-5985	22	5	2014	2014	12	4.4	0.4
Ecoforum	0250-9989	116	27	1992	2007	4	4.3	1.1
Journal of Developing Country Studies	2520-5307	13	3	2016	2019	12	4.3	0.4
International Journal of Environmental Sciences	2519-5549	12	3	2016	2019	12	4.0	0.3
International Journal of Applied Computer Sciences	2522-6258	8	2	2017	2019	12	4.0	0.3
Kenya Nursing Journal	0301-0333	181	47	1972	1991	2	3.9	1.9
Africa Journal of Evangelical Theology	1026-2946	111	29	1990	2007	2	3.8	1.9
International Journal of Management and Leadership Studies	2311-7575	11	3	2016	2016		3.7	
Journal of Gender, Agriculture and Food Security	2413-922X	11	3	2016	2018	2	3.7	1.8
African Journal of Physical Sciences	2313-3317	18	5	2014	2019	4	3.6	0.9
International Journal of Education, Management and Administration	2519-9544	7	2	2017	2019	12	3.5	0.3
International Journal of Agriculture	2520-4629	10	3	2016	2019	12	3.3	0.3
International Journal of Technology and Systems	2518-881X	10	3	2016	2019	12	3.3	0.3
African Journal of Oral Health Sciences	1608-7232	57	19	2000	2008	4	3.0	0.8
KCA Journal of Business Management	2071-2162	48	16	2003	2017	2	3.0	1.5
International Journal of Business and Public Management	2223-6244	23	8	2011	2018	2	2.9	1.4
Journal of Poverty, Investment and Development	2520-4637	8	3	2016	2019	12	2.7	0.2
Scopus	0250-4162	97	39	1980	2008	2	2.5	1.2
Journal of Agricultural Policy	2520-7458	5	2	2017	2018	12	2.5	0.2
Mara Research Journal of Medicine & Health Sciences	2523-5680	5	2	2017	2018	6	2.5	0.4
International Academic Journal of Information Systems and Technology	2518-2390	5	2	2017	2019	4	2.5	0.6
International Academic Journal of Innovation, Leadership and Entrepreneurship	2518-2382	16	7	2012	2019	4	2.3	0.6
International Academic Journal of Arts and Humanities	2520-4688	7	3	2016	2019	4	2.3	0.6
African Research Journal of Education and Social Sciences	2312-0134	10	5	2014	2018	4	2.0	2.5
African Journal of Computing and Information Systems	2519-5875	4	2	2017	2018	12	2.0	0.2
Sci-Afric Journal of Scientific Issues, Research and Essays	2311-6188	17	9	2010	2017	12	1.9	0.2
The African Journal of Technology	1998-9350	9	5	2014	2015	2	1.8	0.9
International Academic Journal of Economics and Finance	2518-2366	75	48	1971	2019	4	1.6	0.4
Journal of Meteorology and Related Sciences	2412-3781	11	8	2011	2017	4	1.4	0.3

p, Papers; yrs, Number of years of publication; yr1, First year of publication; yr2, Last year of publication (as at the time of data collection); F, Frequency of publication in a year; p/yr, Average number of papers per year; P/I, Average number of papers per issue.

Table 9A-1 continues on the next page→

TABLE 9A-1 (Continues...): Publishing trends and productivity in Kenyan journals.

Journal Name	ISSN	P	yrs	yr1	yr2	F	p/yr	P/I
International Journal of Online and Distance Learning	2520-4033	4	3	2016	2017	12	1.3	0.1
African Journal of Agricultural and Resource Economics	1993-3738	11	10	2009	2018	4	1.1	0.3
AICMAR Bulletin	1684-1476	17	18	2001	2009	1	0.9	0.9

p, Papers; yrs, Number of years of publication; yr1, First year of publication; yr2, Last year of publication (as at the time of data collection); F, Frequency of publication in a year; p/yr, Average number of papers per year; P/I, Average number of papers per issue.

Appendix B: Citation performance of Kenyan journals

TABLE 9A-2: Citation performance of Kenyan journals.

Journal Name	ISSN	P	C	C/P	HI	GI
The East African Medical Journal	0012-835X	8088	71084	8.79	77	99
African Journal of Food, Agriculture, Nutrition and Development	1684-5374	1022	11950	11.69	48	58
International Journal of Tropical Insect Science	1742-7592	1354	15784	11.66	48	60
Journal for Language, Technology & Entrepreneurship in Africa	1998-1279	251	3260	12.99	29	54
Journal of Applied Biosciences	1997-5902	1569	6734	4.29	29	37
African Journal of Health Sciences	1022-9272	365	2552	6.99	25	36
Journal of East African Natural History	1026-1613	272	2696	9.91	23	38
Journal of Animal and Plant Sciences	2071-7024	579	2753	4.75	22	34
African Journal of Science and Technology	1607-9949	200	1623	8.12	19	35
Discovery and Innovation	1015-079X	842	2067	2.45	19	29
World Applied Programming	2222-2510	118	1187	10.06	17	30
Africa Media Review	0258-4913	159	1207	7.59	16	26
Pachyderm	1026-2881	191	716	3.75	14	19
Transafrican Journal of History	0251-0391	303	1084	3.58	14	21
KCA Journal of Business Management	2071-2162	48	850	17.71	12	28
Thought and Practice	2076-7714	102	484	4.75	12	18
Journal of Agriculture, Science and Technology	1561-7645	234	508	2.17	11	14
Scopus	0250-4162	97	319	3.29	11	13
The East and Central African Journal of Pharmaceutical Sciences	1026-552X	210	495	2.36	11	15
Tea	1015-7174	198	380	1.92	10	12
AFER	0250-4650	410	735	1.79	8	9
Kenya Past and Present	0257-8301	281	393	1.40	8	11
Our Planet	1013-7394	512	515	1.01	8	11
Wajibu	1016-9717	616	352	0.57	8	15
Africa Journal of Evangelical Theology	1026-2946	111	245	2.21	7	9
International Journal of Current Business and Social Sciences	2312-5985	22	103	4.68	7	9
Journal of Civil Engineering Research and Practice	1729-5769	101	232	2.30	7	11
The Annals of African Surgery	2523-0816	278	285	1.03	7	8

p, papers; c, citations; c/p, citations per paper; HI, h-index; GI, g-index.

Table 9A-2 continues on the next page→

TABLE 9A-2 (Continues...): Citation performance of Kenyan journals.

Journal Name	ISSN	P	C	C/P	HI	GI
African Journal of Medical Practice	1023-8190	144	554	3.85	6	23
Egerton Journal	No ISSN	200	135	0.68	6	8
International Academic Journal of Human Resource and Business Administration	2518-2374	162	138	0.85	6	7
International Journal of African and Asian Studies	2409-6938	43	120	2.79	6	7
Kenya Veterinarian	0256-5161	217	226	1.04	6	9
International Journal of Business and Public Management	2223-6244	23	153	6.65	5	12
Journal of Sustainable Research in Engineering	2409-1243	68	72	1.06	5	6
Journal of Tourism, Hospitality and Sports	2312-5187	34	86	2.53	5	7
Journal of Tourism, Hospitality and Sports	2312-5179	41	112	2.73	5	7
AICMAR Bulletin	1684-1476	17	98	5.76	4	9
Ecoforum	0250-9989	116	48	0.41	4	5
International Academic Journal of Procurement and Supply Chain Management	2518-2404	30	32	1.07	4	4
International Journal of Finance and Accounting	2518-4113	66	69	1.05	4	6
International Journal of Supply Chain Management	2518-4709	33	47	1.42	4	4
Journal of Gender, Agriculture and Food Security	2413-922X	11	48	4.36	4	6
Kabarak Journal of Research and Innovation	2305-784X	62	61	0.98	4	6
Scopus	2313-1799	161	109	0.68	4	6
The Strategic Journal of Business & Change Management	2312-9492	66	100	1.52	4	5
African Journal of Education, Science and Technology	2309-9240	332	49	0.15	3	3
African Journal of Physical Sciences	2313-3317	18	38	2.11	3	5
European Journal of Business and Strategic Management	2518-265X	119	35	0.29	3	3
Hekima Review	1019-6188	160	58	0.36	3	6
International Academic Journal of Economics and Finance	2518-2366	75	46	0.61	3	4
International Academic Journal of Information Sciences and Project Management	2519-7711	114	54	0.47	3	3
International Academic Journal of Innovation, Leadership and Entrepreneurship	2518-2382	16	17	1.06	3	3
International Journal of Social Science and Information Technology	2412-0294	42	65	1.55	3	4
Journal of Business and Strategic Management	2520-0402	34	29	0.85	3	4
Journal of Human Resource and Leadership	2519-9099	55	20	0.36	3	3
Journal of Meteorology and Related Sciences	2412-3781	11	28	2.55	3	4
Kenya Nursing Journal	0301-0333	181	67	0.37	3	7
Sci-Afric Journal of Scientific Issues, Research and Essays	2311-6188	17	40	2.35	3	4
Africa Journal of Technical and Vocational Education and Training	2518-2722	62	13	0.21	2	2
African Development Finance Journal	2522-3186	33	18	0.55	2	3
African Journal of Agricultural and Resource Economics	1993-3738	11	27	2.45	2	5
African Journal of Education and Practice	2519-0296	38	10	0.26	2	2
African Journal of Oral Health Sciences	1608-7232	57	38	0.67	2	4
African Multidisciplinary Journal of Research	2518-2986	47	8	0.17	2	2
Human Resource and Leadership Journal	2520-4661	21	11	0.52	2	2
International Academic Journal of Social Sciences and Education	2518-2412	24	5	0.21	2	2
International Journal of Business Management and Finance	2616-1818	77	11	0.14	2	2
International Journal of Finance	2520-0852	52	23	0.44	2	2

p, papers; c, citations; c/p, citations per paper; HI, h-index; GI, g-index.

Table 9A-2 continues on the next page→

TABLE 9A-2 (Continues...): Citation performance of Kenyan journals.

Journal Name	ISSN	P	C	C/P	HI	GI
International Journal of Social Science Management and Entrepreneurship	2411-7323	49	59	1.20	2	7
Journal of Agricultural Policy	2520-7458	5	6	1.20	2	2
Kenyan Journal of Nursing & Midwifery	2518-8631	46	12	0.26	2	2
Mara International Journal of Social Sciences Research Publications	2523-1464	20	21	1.05	2	4
Mara Research Journal of Business & Management	2519-1381	20	21	1.05	2	4
African Research Journal of Education and Social Sciences	2312-0134	10	11	1.10	1	1
Global Journal of Health Sciences	2519-0210	20	6	0.30	1	2
International Academic Journal of Arts and Humanities	2520-4688	7	1	0.14	1	1
International Academic Journal of Health, Medicine and Nursing	2523-5508	12	1	0.08	1	1
International Academic Journal of Information Systems and Technology	2518-2390	5	6	1.20	1	2
International Academic Journal of Law and Society	2519-772X	17	2	0.12	1	1
International Journal of Agriculture	2520-4629	10	2	0.20	1	1
International Journal of Business Management and Processes	2616-3209	57	3	0.05	1	1
International Journal of Communication and Public Relation	2520-7989	15	2	0.13	1	1
International Journal of Economics	2518-8437	14	3	0.21	1	1
International Journal of Education, Management and Administration	2519-9544	7	1	0.14	1	1
International Journal of Entrepreneurship and Project Management	2518-2838	40	9	0.23	1	1
International Journal of Environmental Sciences	2519-5549	12	2	0.17	1	1
International Journal of Management and Leadership Studies	2311-7575	11	3	0.27	1	1
International Journal of Online and Distance Learning	2520-4033	4	1	0.25	1	1
International Journal of Supply Chain and Logistics	2520-3983	36	3	0.08	1	1
Journal of Accounting	2520-7466	3	2	0.67	1	1
Journal of Developing Country Studies	2520-5307	13	1	0.08	1	1
Journal of Education and Practice	2520-467X	15	2	0.13	1	1
Journal of Entrepreneurship & Project Management	2616-8464	30	1	0.03	1	1
Journal of Finance and Accounting	2616-4965	37	5	0.14	1	1
Journal of Health, Medicine and Nursing	2520-4025	49	1	0.02	1	1
Journal of Human Resource & Leadership	2616-8421	32	2	0.06	1	1
Journal of International Business, Innovation and Strategic Management	2617-1805	24	3	0.13	1	1
Journal of Poverty, Investment and Development	2520-4637	8	4	0.50	1	2
Journal of Public Policy and Administration	2520-5315	14	3	0.21	1	1
Journal of Strategic Management (Nairobi)	2616-8472	26	4	0.15	1	1
Mara Research Journal of Humanities & Social Sciences	2519-1489	39	3	0.08	1	1
Mara Research Journal of Information Science and Technology	2518-8844	14	4	0.29	1	2
African Journal of Computing and Information Systems	2519-5875	4	0	0.00	0	0
International Journal of Applied Computer Sciences	2522-6258	8	0	0.00	0	0
International Journal of Technology and Systems	2518-881X	10	0	0.00	0	0
Journal of African Interdisciplinary Studies	2523-6725	10	0	0.00	0	0
Journal of Education	2616-8383	12	0	0.00	0	0
Journal of Public Policy & Governance	2616-8413	11	0	0.00	0	0
Mara Research Journal of Kiswahili	2520-0577	27	0	0.00	0	0
Mara Research Journal of Medicine & Health Sciences	2523-5680	5	0	0.00	0	0
The African Journal of Technology	1998-9350	9	0	0.00	0	0

p, papers; c, citations; c/p, citations per paper; HI, h-index; GI, g-index.

Appendix C: Scorecard template for journal accreditation in Kenya

BOX 9A-1: Scorecard template for journal accreditation in Kenya

Section A: Basic Information [Mandatory Fields]	
1	**Name of journal**
2	**ISSN**
	a.→Print copy
	b.→Electronic or online
3	**Publisher**
	a.→Name of published
	b.→Physical address of publisher
	c.→Postal address of publisher (if different from b above)
4	**Editor-in-chief**
	a.→Name of editor
	b.→Highest qualification
	c.→Telephone number
	d.→Physical address
	e.→Field specialisation
5	**Associate editor-in-chief**
	a.→Name of editor
	b.→ Highest qualification
	c.→ Telephone number
	d.→ Physical address
	e.→Field specialisation
6	**Number of editorial board members**
	a.→International
	b.→ Regional (Africa)
	c.→ Local (Kenya)
7	**Publication frequency**
8	**Publication start year**
9	**Broad and focus subject**
10	**Language of publication**
11	**Publication format (print, electronic or online or all)**
Section B: Qualitative Indicators of Journal Quality [Mandatory Fields]	
1	**The journal has a website that provides full postal and email addresses of the editor-in-chief and editors, and at least some of these addresses are verifiable official addresses**
2	**The website provides complete instructions to authors or reviewers**

BOX 9A-1 continues on the next page→

BOX 9A-1 (Continues...): Scorecard template for journal accreditation in Kenya

Section A: Basic Information [Mandatory Fields]	
3	**The journal publishes original research and the content supports highlevel learning, teaching and research in the relevant subject area**
4	**The journal has a well-defined peer review and publication policy**
5	**The journal has a well-defined ethics policy**
6	**The journal has a declared frequency of publication each year**
7	**The journal is published regularly and on time according to its declared frequency**
8	**The journal claims that it is indexed in a given database and this claim is verified**
9	**Journal levies submission or publication charges**
10	**Indexing and abstracting of journal**
11	**The editorial board team members are specialists in the journal's subject focus**
12	**75% of the articles published in any given issue emanate from multiple institutions**
13	**The journal is distributed beyond a single institution (provide circulation statistics where available)**
14	**The journal does not appear on any of the blacklists or lists of predatory journals**
Section B: Qualitative Indicators of Journal Quality [Mandatory Fields]	
1	**Average number of articles published in the journal per issue**
2	**Average number of articles published in the journal per year**
3	**Number of articles in the past 5 years**
4	**Total number of citations since its inception**
5	**Number of citations in the past 5 years in mainstream databases**
6	**Number of citations in Google Scholar**
7	**Impact factor**
8	**Eigenfactor**
9	**H-index**
	a.→Google Scholar
	b.→Web of Science
	c.→Scopus
10	**SJR score**

Chapter 10

Knowledge management publication in two South African journals

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Abstract

The structured literature review was conducted to establish patterns of research publication in KM in South Africa. The study determined the number of publications over a 21-year period. The research design adopted in the studies, theoretical and conceptual frameworks, the unit of analysis, the types of papers published and the main KM research themes were reviewed. Two journals were selected for the review, the *South African Journal of Information Management* (SAJIM) and the *South African Journal of Libraries and Information Science* (SAJLIS). One hundred and twenty-six papers were reviewed. The results reveal that KM publications increased in the mid-2000s, started to decline in 2012, increasing again in 2019. Most research is empirical, with the majority of studies not adopting a theoretical and/or conceptual framework. Literature reviews are popular with researchers and many of the studies focus on general KM issues covering South Africa, Africa and

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the globe. The study concluded that KM research published in two publications fluctuated over the selected period and that there are areas of research that are ignored. Further research is recommended to investigate the causes of the fluctuations and determine the reasons why certain areas of research have been ignored.

Introduction

Knowledge management is a topic of interest in academia and practice (Grant 2015) that has culminated in the rise of a broad spectrum of diverse KM research publications over the years (Ragab & Arisha 2013). South African scholars and practitioners, like their peers across the globe, have been engaged in KM research since its inception. Reviews of KM publications have been conducted by several writers focusing on different periods and areas of interest. The studies have reviewed research themes, theoretical frameworks, research designs, units of analysis, citation analysis and many other relevant issues. Most of these reviews have focused on international trends and patterns in international journals and conference publications. Examples of these are studies by Ribiere and Walter (2013) and Fteimi and Lehner (2016).

In South Africa, a few reviews have been conducted to investigate KM publication patterns and trends, especially in local publications. This study focused on KM research publication patterns in two South African journals. It sought to answer the following question: What are the KM research publication patterns in two South African journals from 1998 to 2019? Specifically, the study answered the following questions: how many articles have been published over the selected period (1998–2019)? What theoretical and conceptual frameworks were adopted over the selected period? What are the units of analysis and geographic coverage of the publications? What are the main areas of KM research (research themes)?

To the researcher's knowledge, no study has reviewed KM research patterns in South Africa in the two selected journals in the period 1998–2019. However, a recent study by Fombad and Onyancha (2017) looked at research publication patterns in KM for development in South Africa from 2002 to 2015. This study is different from Fombad and Onyancha's (2017) study in that the data sources and theoretical frameworks that were adopted are different. The two South African journal publications, *SAJIM* and *SAJLIS*, were selected because they appear in the Scientific Electronic Library Online's (SciELO) list of journals (SciELO, n.d). The researcher is of the view that journals that appear in SciELO are regarded as prestigious by the South African academic and practitioner communities. First published in 1999, *SAJIM* publishes academic and practitioner research. It focuses on several broad fields, including IKM (SAJIM 2019). According to the *SAJLIS* website (SAJLIS, n.d.), *SAJLIS* is the official journal of the LIASA. It was first published as *South African Libraries* in

1933 and later its name was changed to *SAJLIS* (SAJLIS, n.d.). It mainly publishes LIS research, including KM. Journals that publish KM research but do not appear in the SciELO list were not included.

The paper is structured as follows: First to be discussed is the theoretical background, followed by a brief literature review, methodology, findings and discussion; and lastly conclusions and recommendations.

Theoretical background

This section presents the theoretical background of the study. Knowledge management and its different perspectives will be discussed, followed by the chosen framework and its main concepts. First to be discussed is the concept of 'knowledge management'.

Knowledge management

Knowledge management has attracted the interest of academics and practitioners because it is regarded as a vital resource in the knowledge economy (Shongwe 2016). Serenko (2013) outlined four generations of KM. According to his study, the first generation existed prior to the mid-1990s and focused on the role played by technology in KM. It also focused on the creation and storage of explicit knowledge. The second generation lasted from the mid-1990s to the early 2000s. This generation focused on the importance of human factors, tacit-explicit knowledge conversion and the accumulation of knowledge in organisations. The third generation covered the period from the early 2000s to 2013. It focused on the reconciliation of techno-centric and human views on knowledge creation, storage and sharing, and the social aspects of KM. The fourth generation (the current generation) started after 2013: its focus is the knowledge economy and intellectual capital (Serenko 2013:778).

Wang et al. (2018) traced KM initiatives from the 1980s. They stated that KM in the 1980s focused on issues of knowledge acquisition, knowledge engineering, knowledge systems and AI. In the 1990s, it focused on business process re-engineering and total quality management. All these were made possible by IT. Wang et al. (2018) stated that currently KM is driven by big data and the importance of managing knowledge in organisations of all sizes.

There is no universal definition of KM (Handzic 2001; Mäki, Järvenpää & Hämäläinen 2001). Different authors have defined KM differently. Gottschalk (2007) defined KM as organised processes for communicating knowledge to workers so that they can use it after it has been acquired and organised. Dalkir (2011) provided several definitions of KM. These definitions indicate that KM involves the storage, sharing and transfer of knowledge and its application in organisations. Hajric (2018) is of the view that KM involves the initiatives,

strategies, systems and processes that enhance and sustain the creation, storage, sharing, assessment and refinement of knowledge.

Mohajan (2016) is of the view that KM improves the effectiveness and competitiveness of a company by focusing on the strategic processes in an organisation. Girard and Girard (2015) stated that the function of KM is organising and making available important knowledge, wherever and whenever it is needed. Knowledge management aims to make knowledge available to the right processes at the right times in the right presentation for the right cost (Addo & Jennex 2005; Allard 2003). The literature reveals that KM is a series of processes to create, preserve, provide and use knowledge for the benefit of the organisation. These activities are important nowadays because managing knowledge is associated with a competitive advantage.

Knowledge management as a research field and practice has been criticised by several authors. Ferguson (2004) has argued that the literature fails to distinguish between information management and KM. Gorman (2004) is of the view that KM is an oxymoron because knowledge is not manageable. Wilson (2005) called it a fad. However, Grant (2015) has disagreed with those critics and argued that KM has long passed the fad phase. The author agrees with Grant (2015) that KM is not a fad but a multidisciplinary field of study that is relevant in the 21st century and in the Fourth Industrial Revolution (4IR).

Knowledge management perspectives

Several KM theories, models and frameworks have been developed over the years in an ongoing attempt to explain KM processes because of the value knowledge holds in the 21st century. It has improved organisational processes and routines, hence causing the economy to grow (Ramy et al. 2018). Knowledge management pioneers such as Nonaka, Wiig, Senge and many others have laid a strong theoretical foundation for KM, hence the growth of the field and a growth in the number of research publications over the years.

Knowledge management is viewed from three perspectives (Shongwe 2016): the personalisation and codification perspective (Hansen, Nohria & Tierney 1999), schools of thought perspective (Earl 2001) and the life cycle perspective (Alavi & Leidner 2001; Evans & Ali 2013; Shongwe 2016, and many others).

Hansen et al. (1999) are of the view that KM initiatives are concerned with personalisation and codification. Personalisation focuses on managing tacit knowledge that is held by individuals, while codification focuses on converting tacit knowledge to explicit knowledge. In the personalisation process, dialogues between individuals are encouraged to stimulate the KM process. Codification enables the tacit knowledge held by individuals to be converted to explicit knowledge, enabling it to be stored in organisational memory for later use (Hansen et al. 1999).

Earl (2001) views KM from a schools of thought perspective. The schools of thought are economic, behavioural and technocratic. The economic school is concerned with converting organisational knowledge (intellectual capital) to commercial products. The behavioural school focuses on stimulating and orchestrating proactive knowledge creation, sharing and use. The technocratic school focuses on the role played by different technologies in the KM process (Earl 2001).

The lifecycle perspective views KM as several processes that take place in organisations (Shongwe 2016). This study views KM from the life cycle perspective: as a series of processes adopted by organisations in their endeavours to manage knowledge. The processes are knowledge acquisition, creation, sharing, storage, transfer and application (Evans & Ali 2013; Heisig 2009; Shongwe 2016).

A brief review of the lifecycle frameworks

Several KM life cycle frameworks have been created since the adoption of KM as a practice and field of study. A brief review of the latest life cycle frameworks reveals that each framework has different KM processes. For example, Heisig's (2009) framework has six main processes: knowledge sharing, creation, use, storage, identification and acquisition. Dalkir's (2011) framework consists of processes such as knowledge capture and/or creation, sharing and dissemination, and acquisition and application. Evans and Ali's (2013) framework has six processes: identify, organise and store, share, apply, evaluate and learn and create. Evans, Dalkir and Bidian (2015) further developed the framework to comprise seven phases: identify, store, share, use, learn, improve and create knowledge. Shongwe (2016) synthesised existing frameworks and developed a unified framework with five processes: knowledge transfer, storage, acquisition, creation and application (K-TSACA).

The study adopted the K-TSACA framework (Shongwe 2016) as a guide to classify KM studies according to five themes or categories. This framework was adopted because it is new, and it has attempted to combine some processes from previous frameworks to create a unified framework.

Concepts of the K-TSACA framework

A brief discussion of the concepts of the framework is presented in this section. Five concepts are briefly defined and discussed: knowledge transfer, storage, acquisition, creation and application (K-TSACA).

According to Thomas (2019:12), knowledge transfer is a process by which people use a familiar domain (base) to understand a novel domain (target). Zander and Kogut (as cited in Chen & Lovvorn 2011) defined knowledge transfer as the successful movement of knowledge that results in the receiver

implementing new techniques of production. In the K-TSACA framework, knowledge transfer and knowledge sharing are used interchangeably to mean the movement of knowledge from a source to a target. That is the movement of knowledge from an individual, group or organisation to another individual, group or organisation.

Samoilenko and Nahar (2013) defined knowledge storage as the process of collecting knowledge that is needed, storing it in organisational databases and using it to achieve organisational goals. The K-TSACA framework views knowledge storage as knowledge stored in organisational memory and in individual's minds. Knowledge acquisition means obtaining knowledge and experience from different sources to incorporate them into organisational procedures (Zheng 2012).

Mitchell and Boyle (2010) defined knowledge creation as several processes or activities that add value to a service or output. It is the creation and development of new ideas that add value or enrichment to existing knowing. Knowledge is created through a social collaborative process and individuals' cognitive processes (Gottschalk 2007).

Knowledge is applied when an individual or unit's experiences influence the change in behaviour of another individual or unit (Nesheim, Olsen & Tobiassen 2011). Knowledge gained over time is used in organisational routines and processes. Holsapple and Joshi (2002:57) stated that 'using knowledge is the activity of applying available knowledge to create new knowledge and produce an externalisation of knowledge'. These concepts are used in this context to classify KM research into themes or categories.

Knowledge management research: A brief literature review

Several studies have been conducted globally to analyse KM research. This trend started in the early 2000s when KM was starting to gain popularity. Gu (2004) conducted a bibliometric analysis of KM research and found that KM had not yet developed its own body of literature. The findings of Gu's study are not surprising, because in the early 2000s KM was just starting to attract the interest of academics and practitioners. Other studies analysed several issues including theoretical frameworks, research methods adopted, the units of analysis, the KM areas of research and publication patterns and trends, to name but a few focus areas. Ragab and Arisha's (2013) study concluded that KM research falls into five categories: ontology of knowledge and KM, KM systems, the role of IT, managerial and social issues and knowledge measurement. Through content analysis, Ribiere and Walter (2013) analysed KM themes over a 10-year period and found that knowledge sharing is the key concept most mentioned in the *Journal of Knowledge Management Research*

and Practice. Fteimi and Lehner (2016) analysed the European Conference on Knowledge Management (ECKM) publications to determine the main areas of KM research. They found that research focused on knowledge processes, innovation, learning and technology. Akhavan et al. (2016) conducted a bibliometric analysis of KM research over a 24-year period to analyse the number of authors, keywords, references, and pages of publications. Alajmi and Alhaji (2018) conducted a bibliometric and content analysis of publications from 2002 to 2016 and found that KM publications were increasing during the selected study period. Ramy et al. (2018) conducted a scientometric analysis investigating productivity, research themes and methods and citation analysis issues in KM research.

In South Africa, Fombad and Onyancha (2017) investigated the research patterns and trends in KM for development. They found that there was increasing research on KM in South Africa, but little focus on KM for development.

The brief literature review indicates that different types of studies on the patterns and trends in KM publication have been conducted around the globe. It also indicates a dearth of similar studies in South Africa. This study aimed to address that gap.

Methodology

A brief review of the literature indicates that similar studies conducted in the past have adopted either bibliometrics or structured literature reviews. A structured literature review was conducted for the current study. One hundred and twenty-six articles were reviewed over a 21-year period (1998–2019). The articles were retrieved from the archives of *SAJIM* and *SAJLIS*. *SAJIM* had 100 articles and *SAJLIS* 26, totalling 126 articles. Table 10.1 shows the number of articles retrieved and reviewed. The researcher selected only KM papers. The search criteria are explained further.

According to Massaro, Dumay and Garlatti (2015), the advantage of a structured literature review is its empirical grounding. It avoids the criticism that seminal articles might miss and eliminate researcher bias. A structured literature review is conducted in several steps, as stated by Massaro et al. (2015). The steps include research problem formulation, review protocol development and validation, literature searching, screening for inclusion, quality assessment, data extractions, developing a coding framework, coding, literature analysis and synthesis and reporting findings (Massaro et al. 2015; Xiao & Watson 2019). In this review, six steps were adopted: research problem formulation, review protocol development and validation, literature search and screening for inclusion, developing a coding framework and coding, literature analysis and synthesis and reporting.

TABLE 10.1: Number of articles retrieved for analysis.

Year	SAJLIS	SAJIM
1998	2	0
1999	0	3
2000	0	1
2001	0	2
2002	2	1
2003	0	4
2004	1	6
2005	1	8
2006	1	9
2007	2	8
2008	1	4
2009	2	6
2010	2	3
2011	3	5
2012	1	9
2013	1	4
2014	1	2
2015	2	5
2016	1	2
2017	0	6
2018	2	5
2019	1	7
Total	**26**	**100**

SAJIM, South African Journal of Information Management; SAJLIS, South African Journal of Libraries and Information Science.

A background review was conducted to identify the research problem. A literature review did not find any study conducted in South Africa analysing KM research patterns through a structured review. After the problem identification stage was completed, a research protocol was developed. The latter identified major elements of the review. It determined the procedures to be followed in the review. Steps suggested by Massaro et al. (2015) and Xiao and Watson (2019) were considered in the protocol.

The following keywords were used to search and select articles for inclusion in the study: 'Knowledge', 'knowledge management', 'intellectual capital', 'knowledge work', 'communities of practice', 'learning organisations' and 'organisational learning'. Titles that did not include these words were excluded. This includes information management titles. After this process was completed, a coding framework was developed which captured the following information: publication patterns, type of publication, the research designs used to conduct the studies, the unit of analysis, the theoretical and conceptual framework adopted and the research themes (as informed by the framework adopted). The last step was to report the findings and draw conclusions. That is done in the following sections. It is worth noting that there was no online publication for the years 1999–2001 in *SAJLIS* because

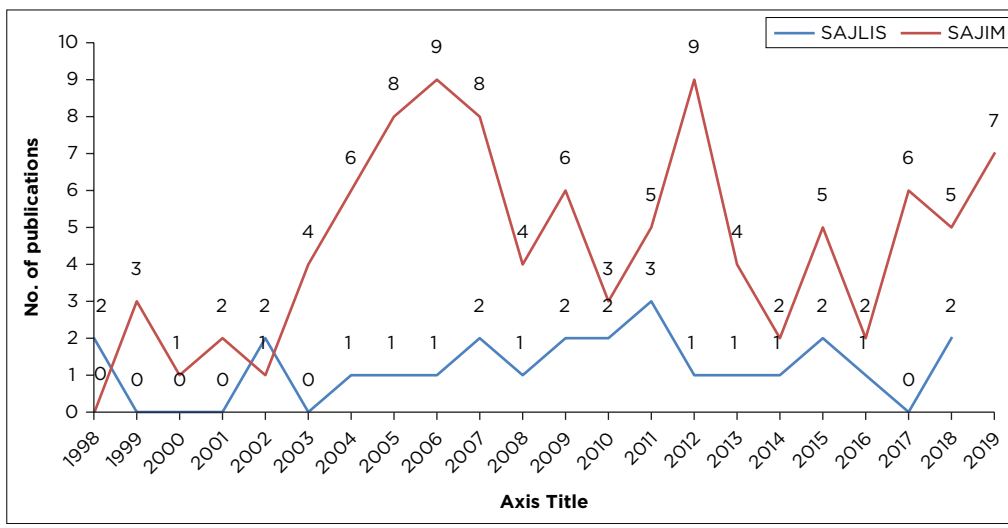
it started publishing under a new body, the South African Library and Information Trust which led to publications being interrupted between 1998 and 2001 (Walker 2014).

Findings

This section presents the findings of the study. Publication patterns, research designs and theoretical frameworks adopted, units of analysis and areas of KM research are presented. Of these, the first to be presented is the publication pattern.

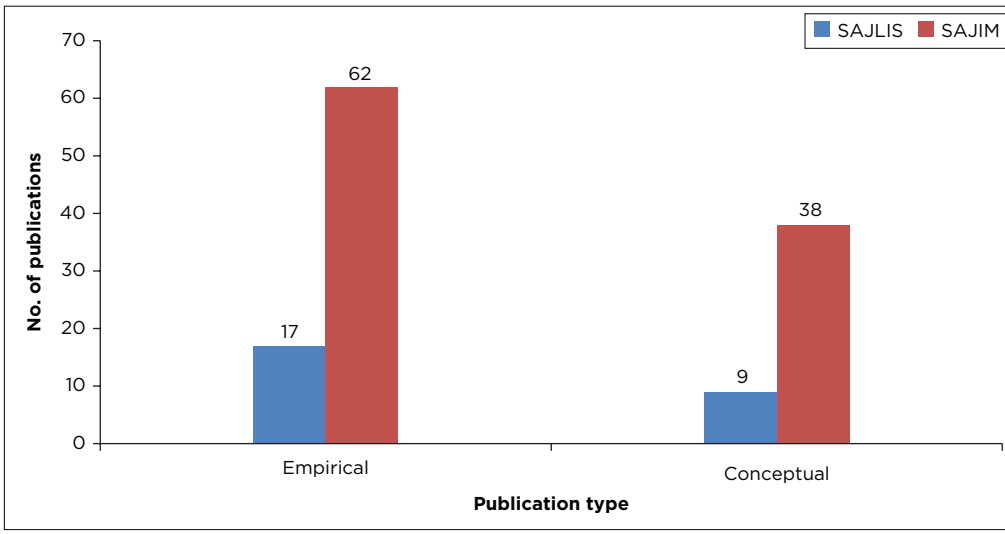
Publication pattern

The publication pattern of KM research over the 21-year period was reviewed to determine KM research output in the two journals over the selected period. The findings show that KM articles started appearing slowly, with only two articles in 1998, picking up a little in 1999 to three articles, before dropping in 2000, 2001 and 2002. This pattern was noticed in both journals. A significant increase in publications is seen only in *SAJIM* from 2003 to 2012. This is not a steady increase; the numbers fluctuate each year. A noticeable decline is seen from 2013 to 2018, but an increase appears again in 2019. It is not clear what causes these fluctuations. We would have expected that by that time (2019), KM research publications in the two journals would have reached maturity; that is, the number of publications should be increasing steadily. Figure 10.1 shows the results.



SAJIM, South African Journal of Information Management; SAJLIS, South African Journal of Libraries and Information Science.

FIGURE 10.1: Knowledge management publication 1998–2019.



SAJIM, South African Journal of Information Management; SAJLIS, South African Journal of Libraries and Information Science.
FIGURE 10.2: Publication by type.

Publication by type

Publications were differentiated by type between empirical and theoretical or conceptual papers. Empirical papers are papers that collected empirical data, while theoretical or conceptual papers are papers that did not use empirical data but were produced by a theoretical synthesis. Theoretical or conceptual papers include literature reviews and theoretical and/or conceptual framework development. The results indicate that empirical papers dominate the publications in the two journals. Over the selected period, there were 79 empirical papers, compared to 47 theoretical or conceptual papers. Figure 10.2 shows the results.

Research design adopted in knowledge management research

The review also sought to investigate the research designs adopted in KM in the two publications. This was to determine which research designs are popular among KM researchers. Eight research designs were found to have been adopted by researchers over the 21-year period. They are surveys, bibliometrics, case studies, content analysis, literature reviews, ethnography, grounded theory and narrative analysis. Table 10.2 shows the results.

The findings show that literature reviews predominate in the KM publications (48 articles). These are mainly traditional literature reviews with one systematic literature review in both publications. The one systematic review is grouped under empirical research. Surveys are the second most popular methods, with a total of 33 articles. They are followed by case studies (30 articles). Of the

TABLE 10.2: Research designs adopted by knowledge management researchers.

Research design	SAJLIS	SAJIM	Total	Total (%)
Bibliometrics	2	2	**4**	**3**
Case studies	6	24	**30**	**24**
Content analysis	0	2	**2**	**2**
Literature reviews	10	38	**48**	**38**
Ethnography	0	1	**1**	**1**
Grounded theory	0	4	**4**	**3**
Narrative	1	0	**1**	**1**
Survey	7	29	**33**	**26**
Total	**26**	**100**	**126**	**100**

SAJIM, South African Journal of Information Management; SAJLIS, South African Journal of Libraries and Information Science.

30, eight were multiple case studies and 22 were single case studies. Bibliometrics and grounded theory were adopted in four studies each; content analysis in two studies; ethnography and narrative analysis were adopted in only one study each. The results indicate that literature reviews are preferred by KM researchers who published their findings in the two journals.

Unit of analysis

The unit of analysis researchers focus on was also analysed. According to Berg (as cited in Grunbaum 2007:84), the unit of analysis is the focus of the case study (i.e., what the case is). It could be individuals, groups, organisations and cities. In this study, the unit of analysis refers to the organisations, groups and the scope the study focused on. The findings show that most of the publications (49 articles) did not have specific units of analysis. These were mainly conceptual papers or empirical papers that had identified no clear unit of analysis. Forty-one papers focused on a broad local context (a broad African and South African context, not any single organisation). Twenty-one focused on one or more named public organisations in South Africa, Africa in general and globally. In the context of the study, public institutions are government departments (National, provincial or state and local), education institutions and government-controlled institutions. Eleven were business or private institutions either in South Africa, Africa or globally. Four papers had a global scope without indicating whether it was a private organisation or non-government organisation (NGO). The findings are shown in Table 10.3.

Theoretical frameworks adopted by knowledge management researchers

The findings indicate that research adopted either theoretical or conceptual frameworks, but that some did not adopt either. Different scholars differentiate between theoretical and conceptual frameworks. Adom, Joe and Hussein (2018) stated that a theoretical framework is a blueprint that a researcher

TABLE 10.3: Unit of analysis and scope.

Coverage	SAJLIS	SAJIM	Total
NGOs	0	0	**0**
Business or private	0	11	**11**
Public	9	12	**21**
Global	1	3	**4**
Local	11	30	**41**
Not applicable	5	44	**49**
Total	**26**	**100**	**126**

NGO, non-government organisation; SAJIM, South African Journal of Information Management; SAJLIS, South African Journal of Libraries and Information Science.

TABLE 10.4: Number of articles that adopted frameworks.

Type of framework	SAJLIS	SAJIM	Total	Total (%)
No framework	12	50	**62**	**49.2**
Conceptual	11	42	**53**	**42**
Theoretical	3	8	**11**	**9**
Total	**26**	**100**	**126**	**100**

SAJIM, South African Journal of Information Management; SAJLIS, South African Journal of Libraries and Information Science.

adopts to underpin a study. They defined a conceptual framework as a structure explaining the concepts and theories that the researcher uses to explain how the research problem will be explored. In the context of this study, a theoretical framework would be an existing theory or model that has been adopted in the particular study. Conceptual frameworks are detailed explanations of the key concepts and/or theories that inform a study.

The results show that most KM studies did not adopt either a theoretical or a conceptual framework (62 articles). It is possible that these studies did adopt theoretical or conceptual frameworks, but they were not mentioned. Fifty-three adopted conceptual frameworks while 11 adopted theoretical frameworks. Among the 11 theories and models adopted, the SECI model and the diffusion of innovations theory were adopted three times each. The CoP theory was adopted in two studies, and the organisational capacity theory, theory of reasoned action and retention model were adopted in one study each. Table 10.4 shows the results.

Areas of knowledge management study

The areas of study or themes were also investigated. These were informed by the K-TSACA framework. The results indicate that most of the publications involve general KM issues (82 articles). They do not fall in any of the framework's categories. For example, articles about KM systems, KM and corporate culture, KM in organisations and municipalities and others do not fall within any of the framework's categories. Of the 82 articles, four were on intellectual capital, and one each focused on absorptive capacity, while one was on knowledge auditing. Knowledge sharing or transfer is the second most studied area, with

TABLE 10.5: Areas of knowledge management study.

Themes	SAJLIS	SAJIM	Total	Total (%)
General or broader issues	17	65	**82**	**65**
Transfer or sharing	3	26	**29**	**23**
Indigenous knowledge	6	5	**11**	**9**
Storage	0	2	**2**	**2**
Creation	0	2	**2**	**2**
Application	0	0	**0**	**0**
Acquisition	0	0	**0**	**0**
Total	**26**	**100**	**126**	**100**

SAJIM, South African Journal of Information Management; SAJLIS, South African Journal of Libraries and Information Science.

29 articles. These findings support the K-TSACA model which assumes that KM research focuses mainly on knowledge sharing and transfer (Shongwe 2016). Articles on indigenous knowledge are the third most frequent, with 11 articles, followed by studies on knowledge storage and creation, with two articles each. The results indicate that articles published in the two journals focus mainly on general KM issues. Table 10.5 shows the results.

Discussions

The findings show an increase in KM publications in the mid-2000s, but publications started to decline in 2012. Wang et al. (2018) found similar results when they analysed global KM publication trends. Their study found a decline in publications after 2013. The reasons for the decline in both studies are unknown. A steady increase in research publications was anticipated throughout the years because Grant (2015) believed that globally, the KM field had reached maturity. Fteimi and Lehner (2016) shared the same sentiments. They are of the view that KM research is growing exponentially. Alajmi and Alhaji (2018) agreed. Their recent study found a steady growth in the number of KM studies published between 2002 and 2016. Possible reasons for the decline in the two South African publications could be that the journal is shifting focus or that South African researchers are shifting their focus to other fields of study. In 2019, publication started increasing again. It is not clear what caused this pattern. It is an issue that needs further investigation. Knowledge management researchers need to continue their work to contribute to the field's maturity so that it becomes a recognised discipline. Wang et al. (2018:2) believed that KM plays a vital role in promoting sustainable development in organisations and society at large, hence the importance of investing in its research.

The results have also indicated that most research conducted is empirical. According to the PennState University Libraries (2020), empirical research is based on observation and measurement of phenomena and derives knowledge from experience instead of theory or belief. These are studies that use empirical

data to arrive at conclusions. Ramy et al. (2018) found similar findings in their scientometric study of a top KM journal. The same results were found by prior studies by Guo and Sheffield (2008) and Dwivedi et al. (2011). The results of this review confirm global patterns and trends.

As much as empirical research dominates the publications, literature reviews were found to be the dominant single research design used. They were followed by case studies and surveys. These results confirm Serenko's (2013) findings that literature reviews are the most commonly adopted research designs in KM research. Ramy et al. (2018) found similar findings, but Guo and Sheffield (2008) found different results: they found that surveys were the dominant research designs. Gou and Sheffield's results are not entirely in contradiction of this review's and other studies' findings, because surveys were also found to have been adopted several times by KM researchers in other studies in the literature. The unit of analysis is not stated in most studies, but those that did indicate it show that local organisations are the most thoroughly researched. Dwivedi et al. (2011) found that local SMEs were the focus of many researchers' studies.

Surprisingly, many studies did not adopt either a theoretical or conceptual framework. This is surprising, because it is a norm in research to adopt a theoretical or conceptual framework to inform research. A theoretical framework is the foundation for a study. It is based on existing theories. It is the guide to building and supporting a study and provides the structure to define how the researcher will philosophically, epistemologically, methodologically, and analytically approach the study (Grant & Osanloo 2014). It is a set of ideas (concepts) that are interconnected and explain how a phenomenon functions or how its parts are related. It influences how researchers interpret events (Svinicki 2010). Theoretical and conceptual frameworks form the foundation on which the study is based. They act as a scaffold for a research project. Researchers are encouraged to make use of these frameworks to advance theory in the KM field.

It was important for the study to investigate KM research themes, because themes identify the main areas of KM research. Themes can also identify the least researched areas. The main research themes are KM in general, knowledge sharing and transfer and knowledge storage. These results are consistent with Fteimi and Lehner's (2016) findings that general KM issues dominate publications, followed by knowledge sharing and knowledge transfer. Similar results were found by Ribiere and Walter (2013). They ranked knowledge sharing and KM first and second respectively as the main keywords or concepts studied in KM research. Ramy et al. (2018) found knowledge sharing to be the top research topic in KM. The findings of this review confirm findings from these other studies. The study also identified less researched areas, such as knowledge acquisition and application. Future studies must be conducted to investigate why these areas are not studied.

Conclusion

The study concludes that most studies published in the two publications had collected empirical data. It also concludes that general KM issues are most frequently studied, but there are other areas of KM research that are under-researched. The publication count fluctuates, and the cause of this fluctuation is not known. Theoretical and conceptual frameworks are rarely adopted.

The study recommends research that focuses on the ignored areas and the causes of the publication fluctuations.

The study investigated publication patterns in two South African journals. This study has shed light on several issues as indicated in the results. This study will inform the academic and practitioner communities about the status of KM publications in the two local journals, as this has wide implications for KM research in South Africa. Most important, researchers and practitioners will identify the main research areas and those that are overlooked and make decisions concerning future research.

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Chapter 1

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Information, knowledge, and technology occupy significant space in the information and knowledge society and ongoing debates on development such as sustainable development goals (SDGs) agenda 2030 and the fourth industrial revolution (4IR). Disruptive technologies and cyber-physical systems, obscuring the lines between the physical, digital and biological, escalated by the COVID-19 pandemic, present a 'new normal' that profoundly affects the nature and magnitude of responses required to sustain and benefit from the new developments. Africa, known for late adoption of new technologies and innovations, is leapfrogging development stages in several enviable ways. This book, written by eminent African scholars, comprises chapters that satisfactorily address information access, artificial intelligence, information ethics, e-learning, library and information science education (LISE) in the 4IR, data literacy and e-scholarship, and knowledge management, which are increasingly essential for information access, services, and LISE in Africa. We expect the book to support research, teaching and learning in African higher education and worldwide for comparative scholarship.

The common perception is that the African continent is digitally 'behind' the rest of the world. Although in some instances it is true because of a number of challenges experienced by African states, some progress has also been made in recognising and developing the skills necessary in operating in the 4IR. This book is dedicated to understanding some of the challenges associated with automating government and business processes, the extent to which data privacy is tackled, ethical use of data in emergency situations, how data, information and knowledge should and can be used in higher education institutions to foster skills needed for 4IR, and the state of education and research that responds to 4IR. Consequently, this book would be of interest to those scholars and researchers who are interested in understanding the state of digital readiness of the African continent to respond to the 4IR in an ethical way.

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