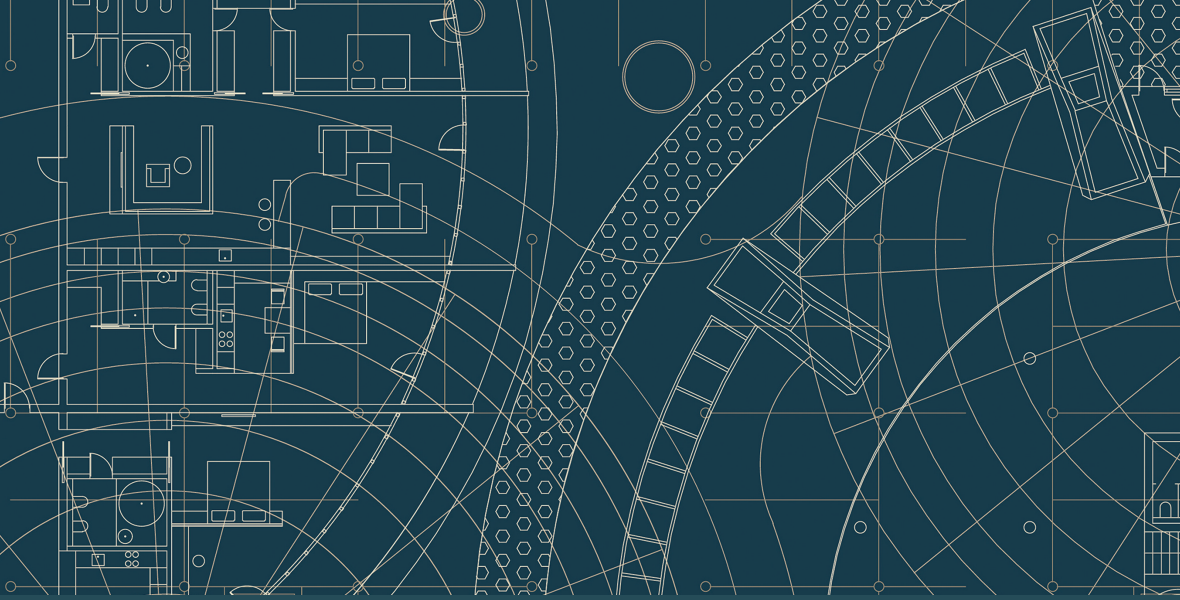

Perspectives on Education in Africa

HIGHER EDUCATION ICT INTEGRATION IN AFRICA

READINESS, IMPLEMENTATION AND TRAJECTORY

Edited by Ke Yu and Reuben Dlamini

Higher Education ICT Integration in Africa

This multidisciplinary edited volume examines higher education's ICT integration in Africa, contributing a new and inclusive angle to better understand how to manage ICT or other technological disruptions in resource-constrained contexts.

Tackling ICT incorporation in HEIs from different levels, chapters document case studies from countries such as Uganda, South Africa, Rwanda, Eswatini, and Zimbabwe to demonstrate the complexity of integration and examine their successes and conditions for success. The cases included in this book examine both change content and process, while some cases also make explicit reference to various technology adoption models. As a whole, the book highlights conceptual and empirical research to inform practices and policy development in Africa, improving multilevel success and change readiness in ICT incorporation in HEIs.

Addressing various gaps in existing literature, this book will be of interest to scholars, researchers, and academics in the fields of higher education, ICT integration, and educational technology more broadly.

Ke Yu is an associate professor at the Department of Education Leadership and Management, Faculty of Education, University of Johannesburg, South Africa.

Reuben Dlamini is an associate professor and head of science and technology at the Wits School of Education, University of the Witwatersrand, South Africa.

Perspectives on Education in Africa

Series Editor - Kerry J Kennedy
Series co-editors - Joseph Divala, Juliet Perumal, Elizabeth Henning, and Linda Gardelle

The African continent is at a crucial moment in its history. Conflicts, political disappointments, developmental difficulties and poverty issues are well disseminated by the international media, but it also has a promising demography and hopeful economic growth. Education is at the heart of the challenges facing the continent, and research into Africa's 21st century potential is of increasing interest to international scholars and policymakers alike.

This series aims to examine institutions regarded as fundamental in helping African countries face major challenges across the Continent. It seeks to offer tools for analysing, understanding and decision-making concerning contemporary issues of education in Africa. Believing that perspectives should not be observed, analysed and strategized from outside, the series draws on local knowledge and experience, promoting interaction between African and non-African scholars in order to explore the implications for the future, and the ways in which education in Africa can be enhanced, influenced and developed.

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Edited by Ke Yu and Reuben Dlamini

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Contents

Contributors

Tendayi Dzinoreva is a doctoral scholar at the Ali Mazrui Center for Higher Education Studies, University of Johannesburg, South Africa.

Neil Davies Evans is a teaching advancements at universities (TAU) fellow, South Africa.

Karen Ferreira-Meyers is an Associate Professor, Coordinator and Senior Lecturer in Linguistics and Modern Languages, Institute of Distance Education, University of Eswatini, Eswatini. She is also a Research Fellow, University of the Free State.

Logan Govender is a senior lecturer in the Ali Mazrui Centre for Higher Education Studies, University of Johannesburg, South Africa.

George Jjagwe is a lecturer in the Department of Agricultural Extension and Community Engagement, and the ODEL Coordinator Faculty of Agriculture and Environmental Sciences, Mountains of the Moon University, Uganda.

Sanele Khakhu is a strategic tutor for development studies and a PhD candidate in industrial sociology, University of Johannesburg, South Africa.

Thomas (Arno) Louw is a senior specialist: e-learning, University of Johannesburg, South Africa.

George Mavunga is a senior lecturer in the Department of Languages, Cultural Studies and Applied Linguistics, University of Johannesburg, South Africa.

Zahraa McDonald is a research associate with SARCHi Teaching and Learning, University of Johannesburg, South Africa.

Thabo Motshweni is a service provider for Class Act Educational Services and a PhD candidate in sociology, University of Johannesburg, South Africa.

Maxwell Vusumuzi Mthembu is a lecturer in the Department of Journalism and Mass Communication at the University of Eswatini, Eswatini.

Lucy Babirye Nanteza is a senior programme coordinator of Open Distance and eLearning (ODEL), Department of Open Distance and Electronic Learning, Mountains of the Moon University, Uganda.

Irénée Ndayambaje is a senior lecturer at the Department of Foundations, Management and Curriculum Studies, School of Education, University of Rwanda, Rwanda.

Nqobile Ndzinisa is a lecturer in the Department of Journalism and Mass Communication, University of Eswatini, Eswatini.

Gciniwe N. Nsibande is the learning and teaching coordinator at the Centre of Excellence in Learning and Teaching (CELT), University of Eswatini, Eswatini.

Innocent Twagilimana is a senior lecturer and dean for the School of Education, University of Rwanda, Rwanda.

Series Editor's Foreword

The African continent is in a crucial moment of its history. If conflicts, political disappointments, developmental difficulties, and poverty issues of Africa are well disseminated by the international media, it should not gloss over the fact that Africa is also a very dynamic continent, with a promising demography and hopeful economic growth.

Education could be viewed as at the heart of the challenges facing Africa. Schools could offer the promise to achieve the goals of the development, both in social aspects as well as economic and political. Since independence in the 1960s, the number of schoolchildren has multiplied by 40 in sub-Saharan Africa. Many states in Africa, from north to south, are faced with the emergency of mass-schooling while many problems remain: shortage of basic facilities, infrastructure, lack of teaching and learning materials, shortage of qualified teachers, distance between home and schools in rural areas, hunger and poor nutrition, difficulties for schooling in areas affected by conflicts, and schooling for girls. Development and improvement in higher education and vocational training is also a key challenge for African countries, many of which are witnessing the massive student mobility (with its crucial problematics of "brain drain" but also "brain gain"). Some countries stress the need to privatise education to try to achieve international targets. Many of them rely on international support to reach their goals. All these challenges, however, should not obscure the dynamism of African students, the growth of the quality of education in some African countries, such as Morocco, and other visible examples across the continent.

In focusing on education, the purpose of the proposed series is to examine an institution that is regarded as fundamental in helping African countries face major challenges across the continent. "*Education is the most powerful weapon which you can use to change the world*" said Nelson Mandela. This series will seek to offer tools for analysing, for understanding, and for decision-making concerning contemporary issues of education in Africa.

A basic assumption of the series is that the perspectives on education in Africa should not be observed, analysed, and strategised from outside Africa. The series will primarily draw on local knowledge and experience within Africa with the potential to decolonise African education and provide insights

by which Indigenous knowledge can be promoted and developed. This does not rule out considering perspectives from outside the continent, especially in the context of globalisation, but these will not dominate. This series, however, will also promote interactions between African and non-African scholars in order to explore the implication for education in Africa. Yet the focus will always be on education in and for African people, the way such education can be enhanced, the factors that influence it, and future directions in which it can develop.

This book is on the integration of technology, a topic of general interest not only in education but almost in every major sphere of human activity. Understanding technology innovation as a major disruption, the book argues for the importance of developing change management strategies to facilitate technology implementation. This can take into account both the needs of users as well as funding constraints so common in many countries. Technologies are important, but so too are contexts. The cases provided here demonstrate just how important these contexts can be.

Kerry J. Kennedy
Series Editor

Introduction

Ke Yu

This introduction introduces what this book is about; but more so, it is also about how and why the book came about. It is the history and origin of the idea behind the book and those who significantly contributed to shaping the book, as well as how the book is expected to contribute to existing literature.

The origin of this book emerged long ago. It was shortly after I had just joined University of Johannesburg (UJ) and met with the late Professor Michael Cross in one of the education faculty's meetings. The year was 2018, and the discourse of 4IR in the country and UJ was picking up. With the lead of then–Vice Chancellor Professor Tshilidzi Malawala, UJ re-oriented itself and spearheaded a vision centred around 4IR. Michael was not completely convinced. He has been watching technology for a while—since when Information and Communication Technology (ICT, commonly denoted as the third Industrial revolution (3IR), the predecessor of 4IR[1]) first emerged in the South African Higher Education (HE) landscape, when Castells' theory of the information society was gaining popularity in South Africa (SA), when the hope for ICT's potential to revolutionise everything, teaching and learning included, was high. The question that kept bothering him was "if ICT is the solution, what is the problem?"

It turned out that years ago, around 2007 to be more precise, along with the previous wave where SA's interest in ICT in HE peaked—a number of related publications came out around that time, see Chapter 4 in this book—he had completed a project with scholars at a Sweden university to compare the ICT development in Higher Education Institutions (HEIs) in the two countries.[2] Years had passed, things had changed, ICT had become more omnipresent, it was time to update this study, and Michael said to me, "I still wonder though", he added, "how my earlier question on what the problem is if ICT is the solution would be answered now". Subsequent discussion led to a decision to re-focus on opportunity, realisation, and the gap in between (a typical normative and reality comparison). We were also ambitious. We wanted to follow both policy and practice, both ICT in HE and HE in ICT, as well as the relationship between ICT and 4IR. Unfortunately, before further details were

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ironed out, COVID-19 hit. The world (HEIs included) came to a stop (for a while, fortunately not for too long), and Michael sadly passed away.

In the re-conceptualisation of the logistics and focus of the book, the decision was made to change from writing every chapter oneself to an edited volume where African scholars were invited to contribute to examining ICT HE incorporation in their countries. Michael has always been a pan-Africanist with a wide range of networks with African scholars; many followed him from University of the Witwatersrand (Wits) to UJ and stayed for their postdoctoral fellowships at UJ. Africa is also an interesting angle as resource-constrain—both in terms of physical and human development—is often said to be the main reason for suboptimal ICT integration in these localities, although ICT is still expected and portrayed as a catalyser (Baliamoune-Lutz, 2003), "the foundation" to a thriving economy and a fundamental contributor to "a transformative socio-economic process" (Avgerou, 2008, p. 135). The reality, however, often remains that large-scale successful ICT adoption in HEIs in Africa, both at the institutional and national levels, is scant.

At this point, Zahraa McDonald's—a postdoc at Michael's centre at the time, also one of the contributors in Chapter 4—input was instrumental. It was during brainstorming with her that we further decided to focus more specifically on examining ICT incorporation through the lens of change readiness in addition to opening up this book for African scholars. Although technically we are no longer in the 3IR, so readiness to change might not exactly fit, change, especially technical change, is not only continuous, but also depends on how readiness is conceived (for more details, see Chapter 2). Change readiness is and should also be used to examine not only things that have not happened yet, but also has great value to examine the implementation process itself. In this sense, ICT is well placed not only in terms of examining how change readiness constantly adapts, but also shed insight on something that has happened—ICT implementation—as well as onto something more on the horizon—4IR. With the accelerated transition towards online learning in HEIs during the COVID-19 pandemic, as well as the forecasted greater disruption of 4IR, examining both readiness and implementation of ICT integration is crucial to draw on lessons learned and plan ahead.

These are the areas and literature gap this book seeks to address: the limited interface between ICT incorporation and change readiness. In addition to this gap, this book also contributes to the gaps in existing literature related to methodology, change readiness in relation to technology adoption models, attention to the developing country context and (higher) education, as well as a shortfall of existing multilevel change readiness models (explained more in detail in Chapter 2). Not only are all case studies in this book located in the developing country context and focus on higher education, something that existing literature (both change readiness and ICT incorporation in HEIs) hasn't sufficiently covered. The case studies reported in this book also address the methodology skewness of quantitative studies in existing change

readiness literature, providing insights from reviews, document analysis, and qualitative studies. The cases included in this book also exhibit better incorporation of both change content and process, while some cases also make explicit reference to other technology adoption models. All these address the various gaps and skewness existing literature exhibits. In addition one of the other specific contributions made in this book is the multilevel change readiness model proposed in Chapter 2, which not only serves as the overarching theoretical framework of the case studies reported in this book, but is also not only more comprehensive in terms of the components it contains (including cognitive and affective dimensions, as well as components such as attitude, receptiveness to change, belief, intention, commitment to change, change capacity, etc.), but also outlines more clearly the different (multi)level the model can apply (compared with existing models). We propose that this multilevel perspective should be adopted as the norm to examine ICT incorporation because ICT adoptions are pursued by multiple stakeholders through multiple platforms where different levels influence each other. This is why success at one level (e.g. individual or project) does not necessarily lead to success at the next level. This understanding does not only echo the warning from the two existing multilevel change readiness models (Rafferty et al., 2013; Vakola, 2013), but also confirms the complexity of the readiness to implementation where readiness is a necessary but insufficient condition to actual change. In other words, in situations where readiness is high, other contextual factors (e.g., opportunities or barriers to enacting readiness) might facilitate or impede actual change behaviours. Typical factors for opportunities or barriers proposed in the model and examined in the case studies include resources, organisational culture, climate, leadership, funding, policy, coordination, etc.

Chapter Organisation

Here below, a brief overview of the chapters is outlined.

Chapter 1 provides an overview of the existing scholarship and literature on ICT incorporation in higher education in Africa. Chapter 2 focuses on change readiness and develops the multilevel change readiness framework that is used as the theoretical framework for the case studies in the forthcoming chapters.

Chapters 3–10 are case studies from five African countries, Uganda, SA, Rwanda, Eswatini, and Zimbabwe, tackling ICT incorporation in HEIs at different levels. Chapters 3 and 4 focus on the interface between national and institutional policies. Chapter 5 is a national examination of Rwanda. Chapter 6 takes on a different angle and looks at data analytics in SA's HEIs. Chapters 7 and 8 are intuitional stories. Chapter 9 examines one particular (teacher preparation) programme, while Chapter 10 zooms in further into one aspect of teaching and learning (assessment) in a French teacher preparation programme. The conclusion chapter summarises the book as a whole.

Taken together, the case studies explore the topic of ICT incorporation in Africa through change readiness and provide insights on conditions necessary for the multilevel success of ICT incorporation in HEIs on the continent. It contributes to the dearth of knowledge on the state of readiness for HEIs in Africa to successfully implement ICT integration for instructional and administrative activities or explanation on why some projects/institutions take off on ICT while others do not. In addition, this book proposes a new and more inclusive change readiness framework and multiple perspectives to better understand how to manage ICT or other technological disruptions in resource-constrained contexts. The cases from different countries demonstrate the innovations in ICT integration and how they lead to new forms of professional practices enabling disruptive innovations. The framework and case studies on readiness also provide some insights into 4IR readiness. From the double perspective of critical eye and practical lessons for higher education administrators, management, and leadership, the contributors' analyses in this book propose intellectual and practical steps towards a more coherent change management mindset that can be used to better understand and manage ICT or other technological disruptions in resource-constrained contexts.

Notes

1 Cooper (2011) claims that the difference between 4IR and 3IR is not qualitative and should not be seen as a separate development.
2 The two countries might appear to be too different as a comparison, but he came up with some fairly convincing rationale for the comparison. Unfortunately, this finding from this project was never published.

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Chapter 1

Digital-Centric Higher Education an African Perspective

Reuben Dlamini, Thomas (Arno) Louw, and Ke Yu

Introduction and Background

The widespread adoption of information and communications technologies (ICTs) in higher education in South Africa suggests that universities are positioning digital tools as a central tenet of teaching and learning. Like any other organisation, higher education institutions (HEIs) needed to "revisit their practices and processes to accommodate environmental dynamic" (Menon et al., 2022, p. 1175). According to Charles M. Vest, President Emeritus at MIT (as cited in Wheeler, 2007), "we are seeing the early emergence of a meta-university—a transcendent, accessible, empowering, dynamic, communally constructed framework of open materials and platforms on which much of higher education worldwide can be constructed or enhanced" (p. 1). However, ICT is central to the transcendent, accessible, empowering, dynamic, and communally constructed framework of the university. Therefore, universities in Africa needed to seize the moment, given that digital technologies have long been celebrated in developed economies as revolutionising and revitalising university teaching and learning (Liu et al., 2020; Shen & Ho, 2020). Moreover, global society has largely accepted the ever-changing technologies that happen alongside the advantages of the "information superhighway".

One such advantage is the immense benefits that ICTs brought when they entered higher education. Yet, at the university level in developing economies, there is "non-existence of a common, unified practice in centres of higher education" or centres of teaching and learning for integrating digital technologies into teaching and learning (Mercader & Gairín, 2020, p. 2). Given that digital technologies are becoming an integral part of HEIs, it is necessary to gain a more realistic understanding based on local and contextual research. Research indicated the pedagogical affordances of digitalisation and IT-enabled business transformations, such as interactivity, integration, ubiquity, collaboration, visualisation, automation, and multimodal representation of content (Coskun, 2015; Daniela et al., 2019; Mhlongo et al., 2023). According to Mhlongo et al. (2023), "the boundaries of learning have been extended beyond the 'brick-and-mortar' through

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technology-supported instructional (TSI) activities" (p. 2). In developed economies, digitisation and digitalisation have become the prerequisite for teaching and learning (Lagstedt et al., 2020; Stefanovic & Klochkova, 2021; Tømte et al., 2019). However, large-scale successful ICT adoption in higher education in Africa, both at institutional and national levels, is scant.

Pandolfini (2016) concurred that institutional development is not always as swift as technological developments, and stakeholders are not always aware of current developments. Yet, students in secondary and tertiary education are mostly aware of technologies, such as smartphones, and their developments among the X, Y, and Z generations (Muhtadi et al., 2021). In developing countries, such as South Africa, the paralysing question of funding often casts a dooming light on implementing ICTs in higher education for sound pedagogy. The incapacitating spark to a fully digitally, blended learning environment comes about when the current socio-economic affordances are taken into consideration. However, achieving the goal of keeping up with current and future trends of ICTs in higher education in South Africa also became the impetus towards excellent developments waiting to be implemented. It is inevitable to avoid the very conscientious technoculture of Africa awaiting new developments, especially those inquisitive minds roaming in HEIs and those in practice already confronted by Fourth Industrial Revolution (4IR) developments.

Currently, there is a dichotomy between what the industry needs and what it is offered in terms of training and development by the higher education sector. The complementary strength between industry and HEIs is becoming more visible and underpins effective cooperation. Therefore, the cooperation of enabling training and development beyond the "brick-and-mortar" classroom is inevitable, and digitalisation is key to fast-tracking such developments. Consequently, digitalising institutions that offer the necessary qualifications have become highly competitive. Institutions that use ICTs and online learning in the form of e-learning trends are more likely to be chosen to obtain "sought after" qualifications with scarce skills. From this stance, one can conclude that e-commerce around higher education caused traditional and online training to become immensely competitive (Penprase, 2018). Although there is an aggressive global trend of higher education as a business industry, the offerings of training courses still show a clear disconnect between technology as ICTs and teaching and learning, and therefore, topics about integrating ICTs into teaching, learning, and assessment are still in the infant stages in Africa. Some institutions are situated in Africa but are often not attended by people living in Africa.

For the vast majority of educational institutions, the line between technology (ICTs) and teaching and learning is not fading fast enough. The integrative nature of ICTs with teaching and learning is well realised, yet not fully implemented nor completely understood in praxis. Mpungose (2020) explained that the digital divide is "a huge factor limiting the feasibility of e-learning in a South African context" (p. 2). Accordingly, Stefanovic and Klochkova (2021) asserted that digitalisation and ICT usage "have changed

all aspects of the educational process, bringing some benefits and bringing some drawbacks" (p. 1). In South Africa, tertiary education is still concentrated on physical access, "notwithstanding the limited resources and enabling infrastructure available to teachers and learners" (Mhlongo et al., 2023, p. 6). Accordingly, plans to incorporate technologies into higher education in South Africa have focused on the policy and operational level and not on the professional development level. However, this chapter detects a progressive increase in infrastructure and digitalisation implementations and less focus on digital literacy development among academic staff (Dlamini & Ndzinisa, 2020; Mdiniso et al., 2022; Sekome & Mokoele, 2022).

Digital literacy refers to the ability to apply various forms of ICT tools "to access, manage, integrate, analyse and synthesise digital information sources" (Kaeophanuek et al., 2018, p. 292) as well as "a set of skills required by 21st Century individuals to use digital tools" (Reddy et al., 2020, p. 66). Lack of digital literacy has widened the digital divide in South Africa and, according to Mdiniso et al. (2022), "the severity and complexity of these differences that have led to digital segregation are beyond comprehension" (p. 212). Unfortunately, new research done in HEIs and the applicable developments are continuously relying on industrial developments. Digital literacy in HEIs is as important as in an industry where companies are maximising the full potential of ICT.

Evidently, computing made businesses all over the world increase productivity with large leaps, and consequently, demands a different set of skills from the workforce in society. Literature from the 1990s revealed ridiculed narratives when stating that personal computers would become a household appliance by the turn of the century. On the contrary, one decade later, e-learning, online courses, working from home, and higher education have already geared up for a silent digital revolution that has happened to a great extent in secondary and tertiary education (Ogulade et al., 2016; Olsen et al., 2017). The business discrepancy influencing the seamless integration of current trends of using ICTs for teaching and learning brought about the tension between brick-and-mortar classrooms and the use of ICTs in existing pedagogies in higher education. Developing countries are often crippled by financial constraints (Maphalala & Adigun, 2021). This brick wall results in education sectors seeing modernisation as idealistic and too aspiring, and, therefore, reverting to long-term goals for higher education and even ignoring integrating ICTs as educational wonders. Yet the motivation to modernise learning endures by bridging the gap between industry skill shortages and ICTs in higher education; this becomes the nexus.

ICT in Higher Education: Competing Arguments

All over the world, higher education is currently adjusting to global socio-economic changes, with ICT playing a central role. There is accelerating expansion in the number of higher education students estimated at 4.3%

average annual growth in tertiary enrolment (Tremblay et al., 2012). This means that traditional institutions will be unable to meet this demand. Historically, "the bubble burst" in 2001, and some renowned universities in the Northern Hemisphere began showing a lot of interest and doubt in using new technologies, especially the internet, to deliver courses and programmes. Zemsky and Massy (2004) gave two reasons for the "boom-bust" in e-learning, especially in the USA. Firstly, e-learning has attracted businesspeople and innovators into an industry that had yet to mature and enabled them to compete and take over. The then-successful ICT market outside the university was a clear signal that tapping this huge market would help commercialise education. Secondly, computer usage in academia had been experimented with for a decade before this, and commercial products had been used in design and to teach students (Zemsky & Massy, 2004). There are four main arguments put forward for why universities currently see ICTs as a great opportunity to enhance their activities: (i) demand for higher education, (ii) competition, (iii) income generation concerns, and (iv) the need for student support determined by the massification of higher education. Despite the affordances of digitalisation to enhance HEIs' instructional and management activities, many institutions are yet to fully adapt to the new normal. Research showed evidence for poor ICT adoption in HEIs in Africa (Mpungose, 2020; Ndzinisa & Dlamini, 2022; Onu et al., 2023). Many HEIs have used digital technologies to enhance teaching and extend learning opportunities so they can better meet the profile of all students in South Africa (Ndzinisa & Dlamini, 2022). In 2020, HEIs proceeded to integrate digital learning platforms; however, they "did not take into consideration the 'messy realities of students' engagements with digital technology'" (Ndzinisa & Dlamini, 2022, p. 2263). This created a dichotomy between the "haves" and "have-nots", "aggravating epistemic injustice and digital inequity" (Ndzinisa & Dlamini, 2022, p. 2263). Odhiambo (2022, p. 1) asserted that the World Economic Forum in 2013 confirmed that "an increase in the digitisation of a country by 10% could lead to a 0.75% increase in GDP per capita". This has been confirmed by a number of studies associated with Singapore and a number of Association of Southeast Asian Nations countries (Appiah-Otoo & Song, 2021; Haldar et al., 2023; Zhong et al., 2023). Under the new normal, digitalisation is non-negotiable and has become a core force in driving sustained access to tertiary education.

The use of ICT in the education arena has resulted in the development of a new phenomenon: the emergence of new concepts with new meanings that serve to enhance teaching and learning. These include concepts such as e-learning, traditional e-learning, collaborative learning, technology-enhanced learning, and mobile learning (M-learning). However, without the consideration of socio-economic challenges besetting students in developing economies contexts, the transition to virtual teaching and online learning excluded already marginalised and impoverished students (Mdiniso et al., 2022; Ndzinisa & Dlamini, 2022; Sekome & Mokoele, 2022). Virtual teaching and

online learning are terms now associated with many universities to link students and educators beyond physical spaces. However, according to Gatautis et al. (2015, p. 465), the "process should not be interpreted as a generic or deterministic process of adaptation that can be replicated across institutional contexts". There are many contextual elements to be considered, such as levels of readiness at the individual, institutional, and policy levels.

Aside from the pedagogical affordances, remote teaching and online learning accentuate the well-known relationship between access and social inequality, which actualises the need to revise brick-and-mortar learning (Goralski & Falk, 2017). The complex interplay between students, technology, education, and change demands institutional systemic change to "restructure and provide innovative educational opportunities, capitalizing on advancements in technology in order to meet the learning needs of all levels of education" (Miller et al., 2020, p. 2). With the complex interplay between students, technology, education, and the ongoing skills necessary for remote teaching and online learning, it is important to explore how digitalisation impacts lecturers' professional practices and students' online learning experiences. Dlamini (2022b) contended that the ubiquity of digital technologies and online platforms to deliver higher education in Africa was bound to exclude students and, therefore, "to achieve convergence with the offline legacy culture of instructional activities, meant that there must be pedagogically and technologically sound methods" (p. 3). This means incremental changes in instructional activities grounded on instructional design principles and models, which outline systematically designing, developing, and delivering learning experiences (Reigeluth & Carr-Chellman, 2009).

The Intersection of Digital Technologies with Teaching and Learning

The inexorable growth of ICT in higher education has produced greater changes in the education space, particularly at the intersection of digital technologies with teaching and learning. As a result, the transition to digitalisation demands appropriate technological knowledge and competencies. Digitalisation has the potential to enable inclusivity and access to tertiary education and overcome challenges such as inequitable access to educational resources (Dlamini, 2022a; Mhlongo & Dlamini, 2022; Omoda-Onyait & Lubega, 2011). Overcoming these challenges has the potential to revolutionise access to and availability of educational resources in multimodal forms using multimedia and interactive tools to support inclusive and transformative education experiences. It is the mandate of universities to transform students' educational practices, regardless of their social realities. Inclusivity encompasses integrated educational "practices that embody multiple student identity group[s]" (Danowitz & Tuitt, 2011, p. 43), and a transformative education experience entails an integrative and holistic understanding and

perspective change of how students view the world (Mezirow, 2003). The shift to digital education and online learning means aligning digital infrastructure and ICT training to the learning goals of HEIs.

The increasing need for HEIs to incorporate innovative methods of teaching and learning made digitalisation unavoidable beyond the COVID-19 pandemic (Ramola, 2021; Toquero, 2020). Accordingly, digitalisation meant that "the set of skills and competences integrating digital literacy is expected to be guaranteed in higher education" (Tejedor et al., 2020, p. 1). In Africa, most HEIs were not prepared to transition to online teaching and learning during the pandemic because the academic staff and students lacked technological knowledge and digital pedagogies (Dlamini & Ndzinisa, 2020). In this study, we took a closer look at the trends of ICT integration in higher education in Africa by exploring scenarios that are emerging with respect to the use of ICT in HEIs. This exploration was guided by the following questions: What are HEIs' strategic responses with respect to the use of ICT in Africa and other parts of the world? What are the implications for technology use in administration, management, and teaching and learning processes? Furthermore, we explored the conditions that influenced the choices of technology adoption and usage.

The mass movement into digitalisation in HEIs has the potential to afford individuals multiple pathways to cognition and professional practices. However, lecturers and students must acquire online-driven competencies to design responsive curricula and gain access to digital tools and pedagogies. e-Readiness and ICT integration must happen in three areas, namely macro (institutional), meso (curriculum), and micro (individual). At the macro level, senior executive teams create ICT direction and policies; at the meso level, different faculties work on specific subject content and sequencing; and at the micro level, the different actors are targeted to ensure the macro and meso levels are achieved. Therefore, HEIs must "scale up the training of the teachers for online learning instruction" (Toquero, 2020, p. 3). In Africa, there have been numerous innovative approaches to digital education and online learning, but little research has been done on these innovations to document best practices and increase evidence-based practices to improve remote teaching and online learning.

Aside from the academic implications of remote teaching and online learning, it is necessary to rethink the curriculum and online-driven competencies for e-readiness and digital teaching. The transition to emergency remote teaching (ERT) means full-scale digital teaching and learning (Hodges et al., 2020). Figure 1.1 illustrates the configuration of ICT implementation in higher education. All three levels play an important role in ICT appropriation in higher education. The concept of ICT integration in higher education is not new; however, the rapid development of digital technologies has revolutionised tertiary education. In higher education, ICT refers to the various digital resources and tools (Wang & Woo, 2007). During the COVID-19 pandemic, it became clear how digital devices and tools can support new

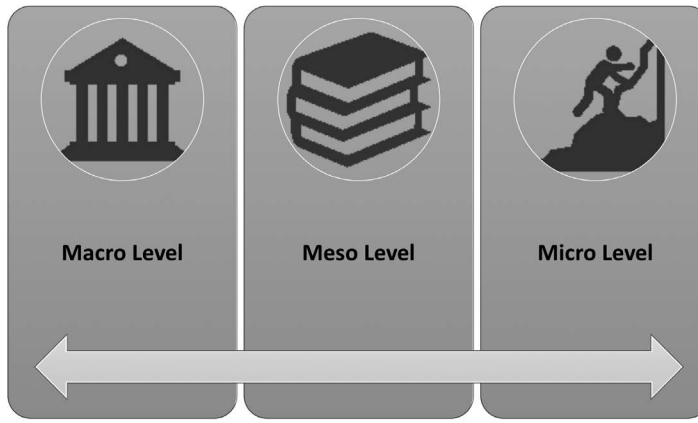

Figure 1.1 ICT integration areas

approaches to university administration, teaching, and learning (Akcil et al., 2021; Hodges et al., 2020; Ndzinisa & Dlamini, 2022; Ozerbas & Erdogan, 2016). However, there are essential elements that make ICT integration in higher education a seamless process that is inclusive and transformative.

According to Wang and Woo (2007, p. 149), a "simple placement of hardware and/or software will not make integration naturally follow". Van Merrienboer et al. (2017, p. 253) asserted that "the quality of education suffers when pedagogies are not aligned with physical learning spaces". Carvalho and Yeoman (2018, p. 1120) established that "innovative learning spaces emerged in response to the influx of educational technologies and new social practices associated with twenty-first-century learning". ERT required new pedagogical designs, access to internet-enabled digital learning platforms, and instructional design principles for online teaching and learning architecture (Dlamini & Ndzinisa, 2020). Therefore, ERT put pressure on academic staff to make the transition as smooth as possible to ensure all students, regardless of their socio-economic status, attained educational excellence (de los Reyes et al., 2022). However, in Africa, there were huge variations because of context and digital inequalities affecting the pedagogical metamorphosis to unlock the potential of digitalisation in higher education. Socio-technological inequalities were made visible, especially when HEIs transitioned to ERT with unstable connectivity and a lack of digital capital resources.

The Convergence of Classroom and Online Education

The proliferation of digital technologies in higher education resulted in the convergence of traditional classroom and online education, one of the greatest trends across the globe (Forbes, 2022; Liasidou, 2022; Ndzinisa & Dlamini, 2022). There is evidence that most students in developing countries

struggled with the transition to online distance learning during the pandemic (Ndibalema, 2022). The COVID-19 pandemic caused a major global disruption that resulted in the exacerbation of inequalities. However, the pandemic permanently changed the provisioning of higher education and enabled creativity and the rethinking of curricula. Through a systematic analysis of the effects of the pandemic, lessons were learned and digital innovation and teaching approaches were accelerated (Draxler-Weber et al., 2022). Unlike in Africa, for pedagogical continuity, European HEIs pursued user-oriented policies to grapple with the new challenges of massification, democratisation, and inclusion (Dell'Omodarme & Cherif, 2022). This was done to create evidence-based policies supporting digital education.

In Africa, the instructive decision-makers' responses came at the cost of accessibility because of "socio-economic challenges, including poor internet connectivity, a core requirement for ERT" (Ndzinisa & Dlamini, 2022, p. 2263). The internet penetration rate in Africa is 43.2%, compared to the world's total penetration rate of 67.9%, and the internet growth between 2000 and 2023 was 13 233%.[1] Against this backdrop, internet connectivity in Africa is affecting economic opportunities and social welfare and, therefore, impacts digital education and online learning. Therefore, most African countries are missing the benefits of the internet and digitalisation improving socio-economic conditions. Consequently, this reinforces the information and knowledge gap between the "haves" and the "have-nots" and increases spatial inequalities. According to Ndzinisa and Dlamini (2022, p. 2263), the "pervasive inequality among students confined in dramatically inferior under-resourced communities was endemic". Spatial inequalities are an endemic feature of Africa that involve economic and social inequalities across geographic distances.

Spatial inequality refers to "inequality in economic and social indicators of wellbeing across geographical units within a country" (Kanbur & Venables, 2005, p. 11). As the internet becomes increasingly central to higher education access, investing in telecommunication infrastructure and digital skills through training and development is important. Figure 1.2 presents the comparative statistics of internet penetration rates in the world. The internet growth of 43% in 2021 indicates hope for digitalisation in Africa. However, this must happen simultaneously with digital training and development opportunities to unlock digital affordances in Africa. Internet access in Africa is significantly low compared to other regions across the globe.

Inequality in human digital capital increases unequal access to the internet (Mathrani et al., 2022; Mhlongo & Dlamini, 2022). In Africa, unequal access to connectivity and the internet constitutes one of the major challenges to bridging the digital divide and the deep spatial inequalities across regions (Mathrani et al., 2022; Ndzinisa & Dlamini, 2022). Hence, large sections of the population of Africa have limited access to basic digital services, and this affects how distributed systems are being used; in this case, digital education

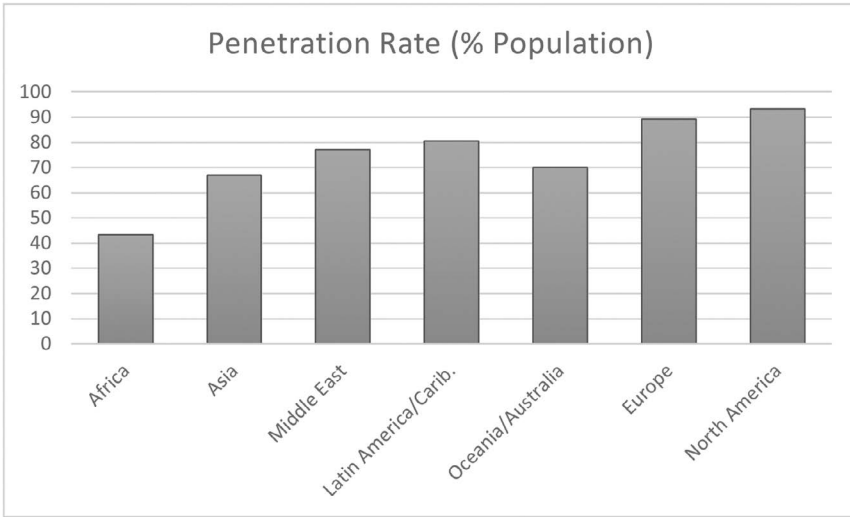

Figure 1.2 Internet penetration rate (https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx)

and online learning. Unequal access to digital capital aggravates digital inequity and, therefore, it is important to align digitalisation with the context. Some HEIs stood out in their ability to digitally innovate, but it was done at the expense of user-oriented approaches. Accordingly, user-centred design creates "highly usable and accessible products through an iterative design process in which users and their needs are involved in each phase of the design process" (Dell'Omodarme & Cherif, 2022, p. 3). It is therefore disheartening to witness Africa, especially HEIs in Africa, skip a systematic approach to digitalisation as a precondition for inclusive growth and sustainable development (van de Heyde & Siebrits, 2019).

There are four categories that represent higher education change, namely institutional, individual, policy, and curriculum. In the literature, there is a lack of systemic change models for the 21st-century university, with the exception of the agreement on digitalisation and various narratives on rethinking teaching and learning models (Atchoarena, 2021; Jõgi et al., 2015; Laurillard, 2002). There is a danger in unplanned systemic change because the motives could displace the public good and humanistic vision of HEIs. Therefore, for any transition to be effective and efficient, there must be a systemic approach with a comprehensive awareness programme on the instructional strategies being adopted by the institution. Jonas-Dwyer and Pospisil (2004, p. 195) agreed that the "technological revolution has been a catalyst for change in universities"; however, "research has shown that introducing new educational technologies alone does not improve teaching and learning outcomes". It is therefore important that any technological revolution

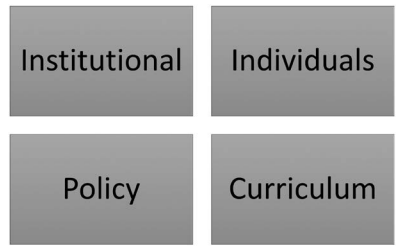

Figure 1.3 Overview and conceptual underpinnings of higher education systemic change

is accompanied by systematic training on digital skills to ensure collective digital intelligence. In the context of development, the acquisition of digital skills is a requirement in many aspects of everyday life, especially in the information society (Mhlongo & Dlamini, 2022a; Tejedor et al., 2020). Hence, HEIs are obligated to close the gap between digitalisation and the demands of the 21st century. Figure 1.3 illustrates the key constructs in the transition to remote teaching and online learning.

The transition to remote teaching and online learning must be sustainable and evidence-based and align digital infrastructure and workforce digital skills. Moving forward, universities must expand their hybrid and remote work policies to align with students' needs and evolving preferences. Figure 1.3 provides evidence that digitalisation must be long term and comprehensive with all the necessary resources and adaptive institutional policies to improve equity in the learning environment. Evidently, most university students in Africa do not have access to a stable internet connection. This is a societal issue that needs government consideration when issuing licences to telecommunication companies so that digital infrastructure expansion is accelerated to facilitate more inclusive digital environments. Digitalisation is the key enabler of economic and education development and, therefore, the issue of unequal diffusion cannot be ignored. According to Mathrani et al. (2022, p. 627), "if societies do not have equitable access to digital tools and resources that can provide them with a stable online presence, digitisation will not be inclusive and not deliver them equal opportunities".

In spite of the substantial changes in higher education administration to teaching and learning strategies with the adoption and appropriation of digital systems and technologies, little effort has been made to develop differentiated digital education resources. Therefore, more research is needed in Africa to provide an understanding of how to use the full potential of digital tools in multimodal education presentations. The trends in the use of digital resources in higher education vary as a result of technological knowledge and competencies that academic staff, students, and professional administrative staff should have. This implies that the analysis of trends of ICT usage in

higher education should be studied to develop the best professional practices to ensure the pedagogical potential of digitalisation to enrich tertiary education (Ricardo-Barreto et al., 2020). Accordingly, institutions of higher education should collaborate with the government and the private sector to provide "technological resources and suitable connectivity necessary for educational innovation" (Ricardo-Barreto et al., 2020, p. 396). This educational innovation will enable students to "build advanced scientific and abstract thinking skills for problem-solving that they can apply in their professional career" (Böhm & Unnold, 2021, p. 177). However, in Africa, "there is something of a paradox in an unprecedented level of interest in the use of ICT for developmental aims" to inform policy (Thompson & Walsham, 2010, p. 112). In our observation, HEIs in Africa lack sufficient geographical contextualisation of digitalisation. Instead, Africa follows a post-hoc analysis with no contextual grounding in empirical evidence beyond Western and Eurocentric cases.

Following Western and Eurocentric discourse on digitalisation in higher education results in "institutionalised underdevelopment and injustice" (Murphy & Carmody, 2015, p. 17), meaning limited attention is paid to ICT implementation in universities in Africa and the main focus is universities in developed countries. According to Odendaal (2016, p. 619), "the development potential ICT is frustrated by the mundane: physical and socio-economic barriers such as lack of training, time scarcity, resource prioritization and poverty, literacy, hardware access and infrastructural limitations". Adhering techno-optimists, universities in Africa are investing in digital systems to avoid missing out on the dominant discourse on the information revolution, hybrid education, and the fact that "new technologies promise possibilities to stimulate economic growth, educational outcomes and democratisation" (Hammett, 2018). As a result, some regions in Africa adopted an instructive approach to the transition to remote multimodal teaching and online learning during the COVID-19 pandemic (Ndzinisa & Dlamini, 2022). This forced transition was aggravated by digital inequities and did not recognise the "socio-economic and socio-cultural contexts in which technology transfer has to be considered" (Servaes, 2012, p. xiii). According to Ndzinisa and Dlamini (2022, p. 2263), the instructive approach "did not take into consideration the messy realities of students' engagements with digital technology". At the same time, government and university authorities in Africa, in an effort to promote ERT as an educational innovation during the pandemic, adopted a techno-orientalist mindset, despite the unresolved problems of digital access and inequalities.

Drawing on in-depth empirical evidence, we analysed the e-readiness of universities in Africa and documented the ICT trends in higher education to explain the greater challenges and trends that universities in Africa face in their transition to e-administration and e-education. The adoption and appropriation of ICT tools are important to achieve social change, but there is overwhelming evidence that the intersection of technology and education

depends on equitable access to digital tools and resources by all actors (Dlamini, 2022b; Dlamini & Rekai, 2022; Mhlongo & Dlamini, 2022). A key concern in Africa is the upscaling of systematic training on digital skills to ensure collective digital intelligence to enrich the social and educational appropriation of digital tools in HEIs. In addition, the diffusion of digital tools and usage in HEIs remains a major challenge due to unreadiness, which includes unreliable electricity, lack of technological pedagogical knowledge, obsolete digital infrastructure, a linear approach to education, and weak ICT policies to incorporate the affordances of technology (Bati & Workneh, 2021). Increasing the use of digital tools across higher education does offer pedagogical benefits, but there is an additional need to upskill academic staff. This must be done at the institutional level with enabling policies and responsive curricula to promote pedagogical change.

In Africa, the huge variations in EdTech interventions can be attributed to the focus mainly being on hardware and software with no sustained support for academic staff to develop their digital skills and confidence. There is an urgent need to review traditional teaching approaches that are not inherently designed with student-centric pedagogies, and the COVID-19 pandemic "escalated the need to offer teachers [educators] various support options for using technology for remote teaching and learning, including digital pedagogical strategies and mental wellness support" (Hennessy et al., 2022, p. 2). From an education perspective, the intersection between academics, technology, and pedagogies is fundamental to the transformative power of ICT to unleash quality remote teaching, online learning, and world-class learning experiences for all students. This intersection has the potential to expand access to education and bridge the gap to inclusive and equitable quality education for all.

The Evolving Scholarship of ICT in Higher Education

Scholarship in the field of ICTs in higher education covers a broad range of expertise. The changing landscape of higher education incorporates hybrid approaches with traditional practices (Dlamini, 2022a; Khoza & Mpungose, 2022; Mpungose, 2020; Ndzinisa & Dlamini, 2022). After the pandemic, a number of challenges have continued to reshape global higher education, and Wheeler (2007) saw a "brewing disaster in balkanized identity management with no way to influence a rational institutional strategy, leading effective ICT for universities" (p. 3). It took the COVID-19 pandemic to realise the needs of the 21st-century university and rethink higher education. This was an opportunity for new inter-institutional collaboration to leverage digital infrastructure, digital education resources, and digital skills across the 26 HEIs in South Africa.

The biggest shift experienced in higher education is the transition to customised learning and the emergence of new disciplines, ranging from e-learning, e-pedagogies, neuroscience, artificial intelligence, artificial pedagogy, robotics, coding, instructional design, learning experience design, and many more

integrated sciences. There is evidence that these technologies transformed the normative conception of teaching and learning (Dlamini, 2022b; Shen & Ho, 2020) and created new possibilities to improve teaching and enhance learning (Mhlongo et al., 2023). e-Learning is perhaps the most widely used concept from a global perspective. It refers to any form of learning that uses the internet for mediation, interaction, or facilitation. The learning can take place individually (guided or instructed by a computer) or as part of a class. The concept of e-learning is linked to different kinds of educational programmes and uses of technology, from straightforward distance courses and curricula to blended learning activities (Dlamini, 2022b). It is reasonable to say that HEIs would have never innovated from a face-to-face teaching model to remote teaching and online learning if the pandemic had not happened. The above narrative further aligns with Langthaler and Bazafkan's (2020) statement that digitalisation "has been commonly referred to as a major opportunity for economic development and for overcoming societal problems such as poverty, inequality and exclusion" (p. 4). However, the on-the-spot adaptation to virtual engagement provided an opportunity to engage with the discourse on e-learning and distance learning caused by the pandemic.

These original building blocks of ICTs and all education part-disciplines bring educational technologies even closer to understanding learning and open many gateways for teaching as a science. The skills requirement for digitalisation in education, the implementation of digital practices (pedagogies), and the impact on HEIs are important for the evolving scholarship of ICT in higher education (Dlamini, 2022b; Fietz & Lay, 2023; Langthaler, 2021; Uleanya, 2023). In addition, this is the role of ICT to "mak[e] the invisible, visible" while balancing access, cost, and quality (Prinsloo & Uleanya, 2022, p. 489) and to understand the readiness of HEIs to implement digital education and 4IR tools (Awodiji & Katjiteo, 2023; Mhlongo et al., 2023). For example, in initial teacher education, there is a dearth of research about the development of online teaching placement activities and conducting practicals in technical and vocational education streams. These are important practical activities for obtaining teacher and engineering qualifications. However, this "hyper-emphasis on clinical practice—extensive immersion in the field" (Kidd & Murray, 2020, p. 542) approach with the advancement of technology has been widely challenged.

With the dearth of research on the development of online teaching placement activities and practicals, there is a requirement for innovative educational strategies to take the stone-age HEIs' models to the virtual world. However, to ensure comprehensive readiness, governments must engage in public-private partnerships on digital infrastructure development given that "4IR and Sustainable Development Goals (SDGs) are inherently interconnected" (Awodiji & Katjiteo, 2023, p. 194). Companies in various sectors are adopting cutting-edge technologies to enable customer-centric services and, therefore, HEIs must learn some of the digital innovations

happening in the corporate space. Accordingly, digitalisation enables active learning and ubiquitous schooling (Awodiji & Katjiteo, 2023; Mhlongo & Dlamini, 2022). However, the proliferation of these concepts raises important questions that pose new challenges to education practitioners and researchers.

It is important to know, for example, how well they describe new phenomena, how they are interpreted in different contexts, what contexts they originally emerged from, what contexts they are now used in, and how their meaning has shifted over time. It was not our purpose to review these concepts or to address these questions. We concentrated on the readiness, implementation, and trajectory of HEIs' ICT integration in Africa.

Conclusion

The most fundamental change in the approach to education brought about by ICT is the change in emphasis from the teacher and teaching to the learner and learning, and the increasing emphasis on flexible education. This led to the definition of the classroom and the modes of instructional delivery are also changing (Sharma et al., 2017). This was a result of the paradigm shift from teacher-centred to learner-centred approaches "to improve student engagement and learning opportunities" (Alamri et al., 2021, p. 62). The shift from teacher-centred to learner-centred approach challenges the stone-age HEI models relying on the "one-size-fits-all" model and is aligned with what Alamri et al. (2021) terms the "industrial-age model that assumes all learners share similar characteristics without focusing on their individual differences" (p. 62). Carrillo and Assuncao Flores (2022) point out "accessibility, authenticity, collaboration, democratization and personalization as important characteristics of online teaching and learning practices after the pandemic" (p. 3).

HEIs in Africa, similar to their global counterparts, have served triad functions of teaching, research, and community services since their early establishment. Also similar to their global counterparts, they have transitioned from assuming a responsibility of promoting and protecting national culture—University of Culture—to University of Excellence which incorporate the ethos of utilitarianism, new public management, and emphasis on measurable performance (Readings, 1996) that emphasise cost-effectiveness and return of investment. Due to the development agenda and a collective culture that emphasise social contract and responsibility in Africa; however, HEIs in Africa are shouldered with double tasks to propel the knowledge economy and civic education through human capital, employment readiness, contribution to national innovation and competitiveness, and societal relevance. Against this backdrop, ICT's disruptions in African HEIs present disjunctions and disparities but also opportunities for them to fulfil their triad functions and deliver their economic and social contract.

The critics of the convergence of the traditional classroom and online education, also known as the blended learning approach, argue that the approach is old given the availability of 4IR tools and advanced digital technologies (Dlamini, 2022b; Langthaler & Bazafkan, 2020). However, in Africa, there is inadequate multi-level analysis, and this chapter is challenging scholars for a multi-level perspective emanating from Africa. Therefore, there is reasonable scholarship in the general field of ICTs in higher education (Ng'ambi et al., 2018). From this stance, sound research remains current, stimulates new and creative developments, and generally feeds back into teaching practices in higher education. Therefore, the continuous drive is supposedly caused by intentional curiosity from e-learning enthusiasts to bring the adequate integration of ICTs and teaching and learning to fruition throughout Africa. Arguably, it can be preliminarily concluded that there is limited use of ICTs in higher education and that proper use may become a means to service the needs of various industries.

Note

1 https://www.internetworldstats.com/stats.htm

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Chapter 2

Multilevel Change Readiness

Theoretical Exploration of Existing Models and Proposal

Ke Yu

Introduction

Organisational change is always "an integral part of organizational life" (Vakola, 2013, p. 96). However, as the external environment becomes more complex and fast-changing in the contemporary world, the volatility, frequency, and magnitude of change have all increased (Rafferty et al., 2013). The omnipresence of change (Burnes, 2004) further results in increasing pressure for constant adaptation for organisations. As such, change has been identified as one core issue in any organisation's future prospects (Burke et al., 1984).

Organisational change initiatives are often time-consuming, costly, chaotic (Gleick, 1987), and with high failure rates (Kotter, 1996). Estimate varies and the reported range of failure is wide. Porras and Robertson's (1992) review of organisational development literature settles on 62%: 53% of no change and 9% change in opposite indirection rather than intended. In Cândido and Santos's (2015) review, a broader range of 7%–90% is reported. The typical estimate in the field is an agreement that it exceeds 50% (see e.g. Getachew & Zhou, 2018).

In a way, this is not surprising. By nature, "change brings uncertainty … a perceived breach of the psychological contract" (Alolabi et al., 2021), disruption of established order or routine (Amis & Aissaoui, 2013), involving uncomfortable unlearning and relearning (Lewin, 1951). Change initiatives also tend to be dominated by a top-down agenda and "leader-centric perspective" (Amis & Aissaoui, 2013, p. 70, also see Bouckenooghe, 2010). However, understanding these challenges doesn't automatically translate into strategies to mitigate the challenges despite the proliferation of research in organisational changes in different disciplines, including organisational studies (Armenakis et al., 1993; Bouckenooghe & Devos, 2007), implementation science (Kolodny-Goetz et al., 2021), and other fields "including public health, military planning, political science" (Ford & King, 2015, p. 507).

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Change Literature: A Brief Review of the Historical Evolution

One salient observation in terms of the history of organisational change is a shift from *resistance* to *readiness* (Bouckenooghe, 2010; Bouckenooghe & Devos, 2007; Seo et al., 2004; Stevens, 2013). The late 1940s (e.g. Coch & French, 1948) was the time discussions on change resistance emerging; while that towards readiness occurred about a decade later (e.g. Jacobson, 1957). This is not to say that change resistance ceases to attract attention after the rise of interest in readiness; in fact, a "growing number of studies … examine both" (Bouckenooghe, 2010, p. 502). However, aligning with a broader shift towards positive psychology (Seligman & Csikszentmihalyi, 2000), "positive organisation scholarship" (K. S. Cameron et al., 2003) and appreciative inquiry, this shift sees notable increases in attention towards the enabling or facilitating factors for optimal functioning rather than a preoccupation on inhabitance and obstacles alone (Bouckenooghe, 2010; K. Cameron & McNaughtan, 2014; Nord & Jermier, 1994; Oreg, 2006). An accompanying feature of this shift is an implied expectation that change readiness is a "precursor to the behaviors or either resistance to, or support for, a change effort" (Armenakis et al., 1993, p. 681). Therefore, this focus also becomes more proactive instead of reactive (Stevens, 2013).

Kurt Lewin, one of the earliest theorists, has a profound influence on conceptualising the change process. His change model (1947)—consisting of three stages: unfreezing, changing, and refreezing—is used not only to describe system change, but is also seen applicable "as an individual change model" (Wheland-Barry et al., 2003, p. 190). Among more contemporary change theorists, Armenakis et al.'s (1993) conceptualisation is the most widely accepted and influential change readiness model and definition (Bouckenooghe, 2010; Vakola, 2013). Armenakis et al.'s model largely sees change readiness as similar to the unfreezing stage in Lewin but focuses more on attitude with "a strong emphasis on the cognitive component" (Bouckenooghe, 2010, p. 503). The main components of the model include a belief about the necessity/desirability of the change and a belief in the efficacy of the individual and organisation to undertake change. The focus in this model is primarily on the individual level, possibly reflecting an expectation that "individual readiness to change can be a proxy for group or organizational level because individuals are the ones actually implementing the change" (Khedhiri, 2018, p. 179). Possibly due to the influence of Armenakis et al. (1993), Bouckenooghe (2010) observes a skewed bias in empirical change readiness studies that focus on attitude as a variable (68%) and cognitive perspective (55%).

Change Readiness: A Concept Lacks Clarity and Consensus

One challenge that has hindered a faster advancement of the field, many scholars point out, is the complexity and lack of robustness surrounding the definition of change readiness.

First, there are a number of similar terms used, including *change readiness* (Eby et al., 2000; Vardaman et al., 2012), *readiness to change* (Snell, 2001; Walinga, 2008), *organisational change readiness* (Nesterkin, 2013), and *readiness for organisational change* (George & Jones, 2001; Harris & Cole, 2007; Sonenshein, 2010).

Second, despite the wide range of available organisational change management or readiness models (e.g. Armenakis et al., 1993; Holt et al., 2007a; Rafferty et al., 2013; Stevens, 2013), behaviour change models (e.g. Lewin, 1947; Michie et al., 2014), as well as other relevant frameworks on adaptation readiness (e.g. Ford & King, 2015), many scholars express concerns over the confusion and lack of conceptual clarity about what readiness is (Stevens, 2013). For example, is it a unidimensional construct, one concept with multiple dimensions or multiple constructs altogether (Bouckenooghe, 2010; Holt et al., 2007a; Madsen et al., 2005; Stevens, 2013)? There are also debates on whether readiness should be seen as distinct from more general attitudes towards change (Bouckenooghe, 2010). Despite an acknowledgment of the general agreement on the conceptual core based on Armenakis et al. (1993), Bouckenooghe (2010, p. 506) similarly laments that the "conceptual sloppiness … [result in] no real definition or description that allowed us to determine the essence and overlap" of the various proposed understandings of the concept.

Even among those who agree that this concept should be seen as a multifaceted concept, they often can't agree on which aspect(s) the concept includes and should be the main focus in any conceptual or empirical analysis (Fagernæs, 2015; Stevens, 2013). Probably due to the influence of Armenakis et al.'s (1993) seminal work, many scholars have adopted their focus on seeing change readiness as an attitude (Bouckenooghe, 2010; Lines, 2005; Rafferty & Simons, 2006; Rafferty et al., 2013). However, others have also proposed or highlighted the importance of seeing it as a commitment to change (e.g. Herscovitch & Meyer, 2002), openness to change (e.g. Pettigrew et al., 2001), the importance of change efficacy (e.g. Vakola, 2013), or capacity (Oreg, 2003). Some conceptualisation places emphasis on differentiating the cognitive and affective dimensions (Ajzen, 2001; Eagly & Chaiken, 1993; Rafferty et al., 2013) while others highlight the need to add the dimension of intention (Ajzen, 1984; Elizur & Guttman, 1976; George & Jones, 2001; Olson & Zanna, 1993; Piderit, 2000). Similar confusion also applies to the change readiness scales or measurements (Fagernæs, 2015).

> Furthermore, there is the tendency for the proponents of differing conceptual orientations to operate within silos rather than attempt to theoretically or empirically integrate the change readiness literature and assess the extent to which these various constructs are truly distinct from or similar to one another.
>
> (Stevens, 2013, p. 343)

Trying to consolidate these, Weiner et al. (2008) and Hold et al. (2007a) propose that change readiness should instead be seen as multidimensional.

Additional Observations About Change Readiness Literature

Chapter 1 provides a detailed examination and specific exploration of the literature on ICT incorporation. Here, the more detailed observations of various literature gaps in terms of change readiness are outlined.

Methodology Skewness in Change Readiness Literature

Despite an awareness that change readiness can be assessed through different research methodologies, including questionnaires, interviews, and observations (Armenakis et al., 1993), empirical studies on change readiness tend to adopt quantitative methods only, relying on questionnaires and a variance approach, often through a statistical linear model (61%, Bouckenooghe, 2010; Fagernæs, 2015). Many of those studies construct and test change readiness scales or factors that influence readiness (e.g. Gagnon et al., 2014). Such focus, however, limits the fuller reflection of respondents' actual experience as well as opportunities for triangulation (Fagernæs, 2015). The need to incorporate other methodologies, particularly those using qualitative methods, has been highlighted by a number of scholars, including Rafferty et al. (2013), Piderit (2000), Fagernæs (2015), and Szabla (2007).

Another observation here is that often only one dimension (change content or process) is examined (Amis & Aissaoui, 2013), despite the importance of incorporating both (Barnett & Carroll, 1995). Within those examining the process, the tendency is also a separate investigation of variables rather than the holistic process (Gresov et al., 1993). Along a similar vein, both Bouckenooghe (2010) and Stevens (2013) suggest a greater attention to process that "conceives of change as a narrative description of a sequence of events that unfold over time" (p. 509). This is related to another "confusion" in the change readiness definition: some proposed considering readiness as the focus and end product of analysis, while others examine it in relation to implementation (Stevens, 2013). Vakola (2013) briefly touches upon this when she highlights the inadequacy of the tendency that "readiness has [only] been conceived as a pre-change concern … [therefore a] need of maintaining readiness throughout the change process and beyond" (p. 103). Stevens (2013) is more explicit in his proposal towards a process-based view of change readiness.[1]

Change Readiness Models with Regard to Technology Adoption

Adoption of technology essentially entails a change in behaviour. However, cross-reference between the change process or the change readiness literature

and technology adoption literature almost never occurs (e.g. seen from their reference list).[2] This lack of cross-reference between the two strands of literature is one big loss regarding cross-pollination and mutual development of both fields. This applies to all above-mentioned change readiness models and all well-known technology adoption models (many appeared around/since the mid-1990s),[3] including:

- Task-Technology Fit Theory, TTF (Goodhue & Thompson, 1995);
- Technology acceptance model, TAM with its variations (Davis, Venkatesh & colleagues, 1986–2008);
- Theory of diffusion of innovations, DIT, Rogers, 1960 into the 2000s (Rogers et al., 2014), the most famous one appears in 1995;
- Electronic Data Interchange diffusion, EDI (Iacovou et al., 1995).

Instead, the focus of the technology adoption models tends to be more on the technology itself, e.g. highlighting the features technology should have to facilitate adoption (change). Both TTF[4] and TAM[5] are examples of this, with their central point clearly set on technology. These models also often do not reference each other (except EDI citing Rogers).

As technology adoption itself is often not the main objective (goal) of organisations except the tech companies, but only means to assist in achieving organisational goals better (more efficiently or effectively), change initiatives related to technology tend to be less direct, focal, well defined or planned in companies, "follow[ing] a typical programmatic step-by-step sequence" (Bouckenooghe, 2010, p. 507). This, however, presents an opportunity to examine change readiness through complex interactions occurring within organisations simultaneously.

Another potential area of cross-pollination is continuous changes. One key feature of technological adoption is its continuous nature, which is different from other episodic changes (Weick & Quinn, 1999) where Lewin's (1947) unfreeze and re-freeze stages apply. This is also where ongoing, evolving, incremental, and cumulative change can be examined. In fact, this—a need to differentiate change readiness as a (static) state or particular stage (e.g. Prochaska & DiClemente, 1983) or a continuous process—has been one area scholars have highlighted. Blending readiness and implementation can also be userful as readiness and implementation can feed into each other[6] (Rahi et al., 2022) and the same factors that affect readiness also affect implementation (Lewis, 2011; Yilmaz, 2017). So far, however, few studies have specifically examined continuous change, except Bouckenooghe (2010, not focusing on tech adoption, who claims that continuous changes tend to be less invasive, more pull-driven, and therefore often generating greater agency from the change recipients and exhibiting more positive attitudes and less resistance to change. Also see Clegg & Walsh, 2004). More studies are needed to test the broader generalisability of Bouckenooghe's (2010) finding.

Change Readiness in Developing Country Context

Limited literature sets out to examine change readiness in the developing world. Echoing the need for multilevel conceptualisation, Getachew and Zhou (2018) highlight the features of such a context and its implication: resource limitation (e.g. "inadequate infrastructure, government policies and lack of information technology", p. 203), which often results in higher dependence on external stakeholders. This, Getachew and Zhou (2018) claim, could further result in "less concerned about the benefits of change … [as compared to a more] rationalistic, cognitive and deterministic orientation guided by goals of technical efficiency and performance [in the developed countries" (p. 202), but more about institutional legitimacy and status.

Among empirical studies on the topic, a preoccupation with the quantitative method is again observed. For example, AlMalki and Durugbo (2023) apply a Delphi method (71 experts in universities, business, and government involved in the tech sector) to distill institutional change readiness factor (for 4IR) in Bahrain. Regression modelling is particularly popular. For example, Mathur et al. (2023) test a causal relationship model in India using linear regression (factors grouped into individual factors—experience of change*,[7] trust in management, social relationship and commitment towards organisation* and organisation factors—organisational support, leadership participation in decision-making*, and communication system). Pakistan scholars Rahi et al. (2022) position their structure modelling in knowledge management and change readiness, testing the pathway from individual-level constructs such as competence, relatedness, autonomy*, and knowledge management strategies (codification strategy* and personalisation strategy—knowledge sharing, often through socialisation) to change readiness, through the mediator of self-efficacy in a commercial bank setting.

Change Readiness in (Higher) Education

Often "predictors used in the profit business are of little value in academic sector" (Khedhiri, 2018, p. 180). Therefore it is important to explore more specifically how change management and readiness have been explored in (higher) education. Besides differences in terms of being in private or public sector, HEIs are also often more "loosely coupled" (Weick, 1976, p. 1), "where faculty members operate with considerable autonomy and are free from daily monitoring by administrators, individual actors may resist implementation of what they see as merely symbolic policies" (Cox et al., 2017, p. 835). However, change readiness in education features much less research (Spina et al., 2014), despite a related topic—change management in educational reform—is widely studied. This observation is echoed by Haffar et al. (2023) when they claim that "research studies into organizational changes in HEIs are comparatively underdeveloped" (p. 113396).

Table 2.1 TAR

	Technology	*Culture*
Institution Level	**Technological Readiness** • Mature IT systems • Stable IT systems • Compatibility of new and existing IT • Current patterns of IT use • Past experience with IT implementation	**Organisational Readiness** • Clarity of mission • Communication • Decision-making process • Openness to change
Project Level	**Project Readiness** • Administrative and technological resources • Training • Ongoing support • Incentives	**Motivational Readiness** • Need • Vision of benefits • Perception of functioning

Source: Karp and Fletcher (2014, p. 4).

Among limited studies within change readiness in education, Karp and Fletcher's (2014) TAR model is one example. Developed out of desktop research reviewing "nearly 75 journal articles and books from a wide range of subject areas, including organizational behaviour, healthcare, educational technology and engineering … also examined six surveys on organisational readiness for change developed through and validated by empirical research studies" (p. 3), this framework was validated by six colleges that undertook reforms. Despite the similarity between TAR's differentiation of two levels (similar to the group and organisational level pointed out in multilevel analysis models, Table 2.1) and an specific attention on readiness or culture, however, none of the influential change readiness literature is included in its reference list, except that from Bouckenooghe et al. (2008) on change environment scale development.

There are some empirical studies focus on the transition towards online teaching. Lloyd et al. (2012) approach this by examining barriers[8] to online education using questionnaires in one university in the United States. Five factors are identified: interpersonal (e.g. interaction), institutional (e.g. policy, IP, decision-making participation, incentives), available training, technology reliability and support, and cost/benefit (workload, time commitment). A few other studies have also explored change readiness for the sudden (and often forced) change to online teaching during COVID-19. For example, reviewing both technology adoption and change readiness literature, Mehta (2021) applies structural equation modelling to analyse data collected from Indian school teachers amid COVID-19 and the relationship between the two TAM variables (perceived usefulness

and perceived ease of use*) plus autonomy* to change readiness, together with the relationship between change readiness and perceived stress.

Among studies that are situated in the developing country context, Khedhiri (2018) explores four dimensions (transformational leadership style, nature of teamwork, communication channel, and access to information and motivation)—with a focus on the mediator role from transformational leadership[9]—as predictors for change readiness in one public university in Saudi Arabia through logit modelling. Focusing on *affective commitment to change*, Haffar et al. (2023) examine the influence of different kinds of culture (adhocracy**, hierarchy, market and group**) towards *change commitment* through mediators of self-efficacy**, appropriateness, management support, and personal valence**. The data was collected among academic staff in 10 Jordanian HEIs. Novel et al. (2022) test the influence of motivation to change readiness (contributing 20.3%) among students in Indonesia. Also situated in Indonesia, Erlyani et al. (2022) explore the role of communication climate** on change readiness in one university. In Ethiopia, Gebretsadik (2022) examines the relationship between change leadership and constructs such as discrepancy, appropriateness, efficacy*, principal support*, and valence* in five colleges and institutes.

The skewness towards the quantitative application of change readiness is again apparent. Spina et al.'s (2014) study is among the few qualitative explorations on the topic, focusing on a reform in teacher performance evaluation in Illinois. From teachers and administrators, this study explores perceived need and advantages and barriers for such reform at the individual level, highlighting the lack of consensus that the reform is needed at the system level as one major obstacle to change readiness. Using Q methodology, Du et al. (2022) is the only mixed-method study that explores the perception of what is most important for change readiness: it differentiates individual (cognitive and affective), relationship (with peers and students), and environment (leadership, culture, policy, society). The study finds that "change readiness was mainly within their micro-teaching practice environment, with little anticipation of commitment to a wider institutional scale of change … [possibly] constrained institutional conditions and supports" (p. 12079).

The Rise of Multilevel Analysis of Change Readiness: An Historical Overview

As mentioned, a focus on the individual cognition aspect has been the norm in the field (Rafferty et al., 2013), although and there is increasing recognition that readiness and related sensemaking process are both social processes (Amis & Aissaoui, 2013). Scott (2008) confirms the concern that the scholarship of change readiness is almost developed separately or parallel with the

development in institutional theory that focuses primarily on external social structures and pressures at the macro level (e.g. mimetic pressure, normative pressure from norms and standards, coercive pressure from significant partners. Also see Getachew & Zhou, 2018). In fact, for a long time, change readiness tends to be examined either on the individual level (Cunningham, 2006; Judge et al, 1999; Vakola et al, 2003; Wanberg & Banas, 2000) or organisational level (Clegg & Walsh, 2004; Cunningham et al, 2002; Hitt et al, 2007; Weiner, 2009; Van de Ven & Poole, 1995), where these two levels are often not differentiated altogether (Vakola, 2013, 2014). The same applies (Fagernæs, 2015) to the change readiness measurements (e.g. Vakola, 2014, focusing on the individual level only; Weiner et al., 2008, focusing on organisation level only).

In addition, despite abundant literature on group resistance and recognition that group norm has a powerful effect on individuals (Cummings, 2004), collective readiness at the group level is scarce in literature (Menting, 2022; Rafferty et al., 2013): there are "only a few models in the organisation studies and change literature that specifically described the phases of the change process at the group or team level of analysis" (Wheland-Barry et al., 2003, p. 189. Also see Vakola, 2013). In other words, despite the prevalence (employees within departments within organisations; students nested in classes in schools in the district; patients with doctors in hospitals; siblings nested within families), the nested nature (also called cluster membership, Goldstein, 1995) is often not explicitly examined (Bouckenooghe & Devos, 2007).

Scholars recognise that this nesting structure is often one source of analytical complications when (dialectical or iterative) interactions/dependence among the different levels and their dynamics are inadequately considered (Amis & Aissaoui, 2013; Vakola, 2013) or when multiple observations or measurements are sampled from each object at multiple levels, violating the independence assumption needed for statistical analysis (Bauer et al., 2020). When nesting is not explicitly acknowledged or built into analysis, the result might be an overestimation, or worse, false identification of an effect where none actually presents (Bauer et al., 2020). This is particularly problematic in statistical analysis—the method demonstrated above to be most commonly used in empirical change readiness modelling. However, but it is equally tricky in studies using other methodologies where it is assumed that aggregating lower-level observations explains observations at a higher level (Bouckenooghe, 2010; Getachew & Zhou, 2018) or data collected on one level is used to conclude on another.

> While the level of theory and measurement when studying change readiness has overwhelmingly been at the individual level, researchers often use these data to make statements about an organisation's readiness for change.
>
> (Rafferty et al., 2013, p. 112)

The complication from nesting also aligns with the system theory (Von Bertalanffy, 1968, first proposed in the 1940s but gained prominence from this 1968 publication) increasingly accepted in social sciences (Hutchins, 1996; Meadows, 2008; Wheatley, 2006) where the focus is specifically on "interrelationships … [as] a process of discovery and diagnosis and as a sensibility for the subtle interconnectedness that gives living systems their unique character" (Senge, 2006, p. 68).

The inadequate consideration of nesting in change readiness—this word seldomly appears in any change readiness literature (except Stevens, 2013), even among those who explicitly embrace multilevel analyses—is surprising. It is also puzzling because changes are often initiated or pursued by multiple stakeholders (often with competing interests) through multiple platforms in a system where one part influences another. There might be a cross-over effect, but different levels could also easily be out of sync (Caldwell et al., 2004). What is urgent or important at one level might not be agreed upon at another level; the higher-level change process might also not be sensitive to the time required for the lower levels, resulting in a faster (and out-of-sync) pace at different levels. One (individual, team, or organisation) "may spiral between one stage and the next several times and may stay at one stage for a very long time" (Wheland-Barry et al., 2003, p. 190). These might all contribute to observations that success at one level (e.g. individual or project) does not necessarily lead to success in the next level.

Therefore, it is encouraging that the necessity of applying multilevel analysis in change readiness examination is increasingly voiced (e.g. Cappelli & Sherer, 1991; Dansereau et al., 1999; Mowday & Sutton, 1993). This is not to say that a concern and general consensus that change readiness should be seen as a multilevel phenomenon never existed. Armenakis and Bedeian (1999) point to the importance of including *context* (attributes in the environment where change happens, including opportunities or barriers to enacting readiness, including resources, organisational culture, climate, leadership, funding, policy, coordination, etc.) and *process* (change implementation) in addition to *personal attributes* (e.g. personality). A similar notion can also be seen in Judge et al. (1999). Holt et al. (2007b) test these three dimensions with an additional *content* (nature of change[10]). In the broader behaviour change literature, Michie et al. (2014) further propose the importance of considering *opportunities* (at both individual and organisational levels) in addition to individual-level constructs such as *capability* and *motivation*. Overall, however, up to the beginning of the 2010s, research that "assessed these factors simultaneously as they relate to organizational change … [remain] rare" (Bouckenooghe & Devos, 2007, p. 4). The main breakthrough emerged in 2013 with the publication of two seminal works in two separate journals (Rafferty et al., 2013, in *Journal of*

Management; Vakola, 2013, in *Journal of Change Management*[11]), which will be exmamined more in detail below.

Multilevel Analysis of Change Readiness: Revisit and Review

Vakola's (2013) conceptual contribution to the multilevel change readiness literature lies in the specific attention to the three levels highlighted (organisation, group, and individual) with a detailed explanation of what each level entails. She also explicitly highlights readiness "dynamics" (p. 101) through the relationship between the various levels, claiming that ignoring the "dynamics between the various levels of readiness contributes to the development of a partial approach to both theoretical and empirical work" (Vakola, 2013, p. 97). The writing in this article, however, is largely normative.

One focus of Rafferty et al. (2013) is to address two areas (p. 111, 112) claimed to be inadequately addressed in literature: the affective element and multilevel, both of which were reviewed comprehensively in the article.[12] Despite the attention to the affective component, however, one key shortcoming of this work is a remaining simplistic view of attitude where only two possibilities (either positive or negative) are acknowledged. This simple binary view, however, does not align with the findings from various other studies (e.g. Cacioppo et al., 1997; De Liver et al., 2007) that point to the possible existence of an ambivalent attitude (embracing both negative and positive), resulting in conflicting beliefs (for example, within an individual's cognitive aspect of change readiness, or between one's cognitive and affective aspect, sometimes found in different data collection instruments; Fagernæs, 2015).

In addition, despite attention to group level in both articles, no discussion is made on what group actually is referred to and potential complications that might arise from different kinds of group formations. For example, formal and informal groups, or groups that are more hierarchical or more flat (Diefenbach & Sillince, 2011; the two might overlap, but not necessarily) could give rise to different dynamics regarding how information flows and how supportive the group culture might be. There are also functional and divisional groups (Fairfield, 2016) where some (e.g. task teams, existed for a particular purpose) have shorter "shelf lives". Reorganising or restructuring also essentially means disbanding or re-organising groups. Be more specific with what kinds of groups are under investigation would add further nuance to the multilevel conceptualisation. In addition, there are also in-group and out-group dynamics (Castano et al., 2002), which means that a within-group culture might be affected by their identity or contrast to out-group. Inadequate attention to these group structures and dynamics would limit the explanation power of these models.

Multilevel Change Readiness Model for ICT Incorporation in HEIs: A Proposal

This section proposes and explains the proposed multilevel change readiness model for ICT incorporation in HEIs that guides the empirical studies reported in the case studies in the remaider of this book. The aim of proposing this model is to address the shortcomings of existing change readiness models while also bearing in mind the main observations (as well as shortcomings) of existing change readiness literature. This change readiness model is not only more comprehensive in terms of the components it contains, but it also outlines the different (multi) levels more clearly. The following section specifies what this model contains, explains the various components, and further explains critical aspects that should be born in mind when applying the model.

Specify the Levels

As indicated by other scholars advocating multilevel, levels here can refer to individual, group/team, departments, organisations, consortiums (or any kinds of partnerships), industry/sector/field, national, supernational, etc. The current representation in the model shows only two levels: the inner circle represents the individual level; the outer one for the system (team/group/project/institution/nation…). However, this outer level can be operationalised into any of those collective levels depending on the needs and focus of an empirical investigation.

It is also to be noted that certain components exist both at the individual and system level, e.g. *funds* while others exist only at the system level, e.g. *leadership*. For the components that exist at both individual and system levels, their individual and system levels mutually influence each other, e.g. *individual will* influences overall *political will* at the system level and vice versa.

Specify the Components

The components included in this model are informed by the existing literature. The principle to guide which components to include is to be sufficiently comprehensive[13] (e.g. beyond just *cognitive* and *affective*, Rafferty et al., 2013), but also remain simple and concise (e.g. through unifying the components at different levels as much as possible by identifying the components that are applicable for both individual and system levels). In this regard, Michie et al.'s (2014) behaviour change wheel which highlights three aspects: *capability*, *motivation*, and *opportunities* is found to be a good base for constructing this model.

One example of the decision of what to exclude is the distinction between cognitive and affective dimensions. Although the usefulness of this distinction is acknowledged, what can also be observed is that many components entail both cognitive and affective dimensions. For example, although *knowledge* is largely cognitive, it also includes attitude and receptiveness towards *knowledge*, which is affective; similarly, *will* is largely affective, but also includes cognitive/rational consideration. Therefore, the proposed model does not include this, but instead stresses the need to consider both cognitive and affective dimensions in all aspects of the model.

Other notable explanations include:

- There is not necessarily a strict one-on-one relationship between the components and aspects: e.g. *support* (under *capacity*) might well fall under *opportunity*;
- *Capacity* (which can be further differentiated into innovation-specific capacity or general capacity, Kolodny-Goetz et al., 2021) and *motivation* tend to apply more within the level, e.g. individual capacity and motivation; while opportunities tend to indicate those beyond the level. However, this is again not cast in stone;
- The different aspects interact with and mutually influence one another: e.g. *opportunity* influences *motivation* and *capacity*; *motivation* influences seeking out/blocking *opportunity* as well as *capacity*. The same applies to the different components within an aspect: they usually reinforce each other, but they can also inhihit each other; e.g. one might not be *committed* to change, although one is *receptive* and has an overall positive *attitude* towards it;
- Change nature is not denoted separately in the model as the change nature/target this book concerns is ICT adoption. However, change readiness examined in this book can be about change itself, ICT more broadly or specific technology. It can further include the aspects technology adoption models have focused on, e.g. perceived ease of use (found to be significant in Mehta, 2021);
- Group formation is not separately included as a component in the model, but the application of the model is encouraged to consider the different group formations and their potential impact on group dynamics.

Below are further explanations of the components included in the proposed model:

1 *Motivation*[14]: broadly corresponds to *valence* (found to be significant in Gebretsadik, 2022; Haffar et al., 2023).

   - *Attitude*: includes how much one is receptive or open towards change as well as how much one is overall positive/negative towards change.

This can be influenced by previous experience of change (found to be significant in Mathur et al., 2023), autonomy (found to be significant in Rahi et al., 2022 and Mehta, 2021), a sense of control, or general appetite for risk-taking.
- *Will*: this is similar to *intention* to change. It denotes how much one is *willing or wants* to change.;
- *Motivation*: how much one is (intrinsically or extrinsically) motivated to change. This can be impacted by a perceived need for change or benefits of change.
- *Commitment*: how much one is committed to change (due to or despite other elements).

2 *Capacity*: as a whole, this corresponds to change *efficacy* (found to be significant in Gebretsadik, 2022; Haffar et al., 2023).

- *Knowledge*: includes possessed knowledge itself, and also ability and willingness to seek knowledge, ability to judge what is relevant knowledge, etc.
- *Adaptative capacity*: whether one has the skills or capability to adjust/expand its coping range.
- *Support* (only for system level): includes all kinds of support structures, strategies, programmes, training, etc.

3 *Opportunity*: all components here can act as mediators between social structures and pressure (e.g. those identified in institutional theory) and other aspects of the model.

- *Adaptive culture*: culture, climate, and orientation to adapt quickly and effectively to pressures for change, including values, vision, rules, norm and support, etc.
- *Policy and law*: relevant legislative framework, regulatory measures, courses of action, etc.
- *Coordination and communication*: clarity of who is responsible for what; the existence of consensus, (level of) agreement, conflicts, as well as how conflicts are mitigated. This also includes the extent of trust and expectation/understanding regarding level of participation.
- *Leadership*: the existence of the leadership position/role/community/practice for change.
- *Funds*: financial resources, including funding priorities related to change
- *Other resources*: any other resources besides finance, e.g. human capital, resilience.
- *Uncertainty and complexity*: this denotes the level of uncertainty and complexity in the larger environment, which can be caused by a potential or actual change, as well as the existence of a sense of safety.

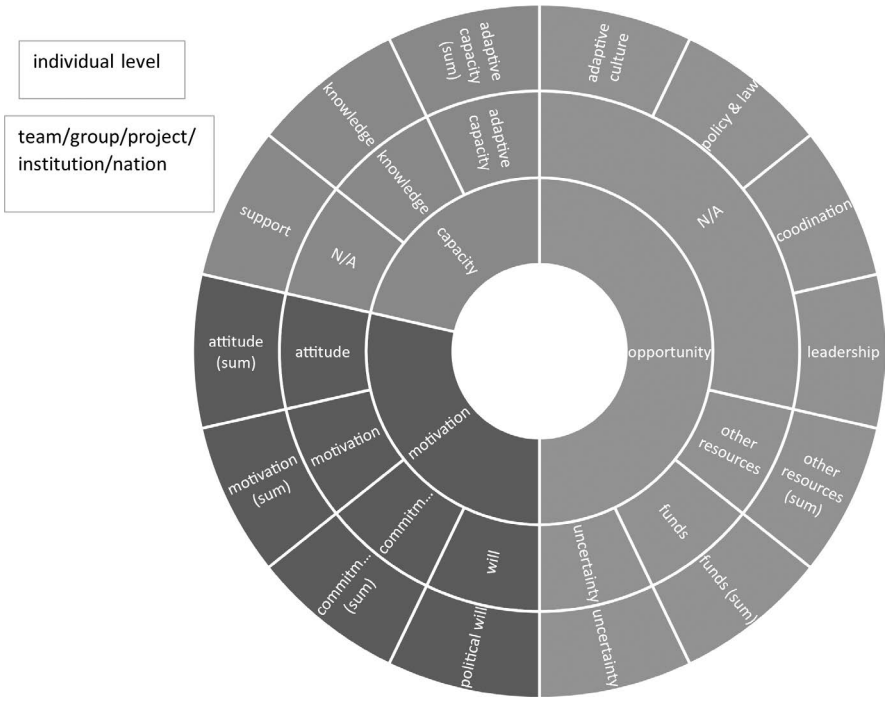

Figure 2.1 Multilevel change readiness model with its components

Conclusion

This chapter reviews the change readiness literature and proposes a multilevel change readiness model that guides the empirical exploration of the case studies in this book. The review pinpoints the seminar scholars and works in the field, as well as the challenges that have hindered faster advancement of the field, including the complexity and lack of robustness surrounding the definition and inadequate attention to the multilevel analysis. Revisiting the two influential works in multilevel change readiness, this review further highlights their shortfalls which are taken into consideration in the proposed multilevel change readiness model. Additional observations of change readiness literature further highlight methodology skewness (favouring quantitative modelling and testing of variables), inadequate cross-pollination with technology adoption literature, and limited exploration in the developing and (higher) education context. Aims to be sufficiently comprehensive and concise, the proposed multilevel change readiness model builds on Michie et al.'s (2014) behaviour change wheel. Further explanation is given for both the aspects and components of each aspect.

Notes

1 Bouckenooghe (2010) adds that empirical examination should go beyond collecting data only from change recipients (applies to 68% of the studies that he has examined) but extend it to change agents (currently 18%), strategists (14%), or simultaneously different groups of stakeholders. As most chapters in this book are literature review or documents analysis, this aspect will unfortunately be less well responded to in this book.
2 For example, the word "perceived" in the two key variables in TAM (*perceived usefulness* and *perceived ease of use*) suggests a focus on individual's perception of technology. Organisational and peer support, both in the design (pre-implementation) phase and postimplementation phase, is highlighted in further explanation of what influences the two variables, signal resemblance to considerations of group and organizational features. The DIT (Roger, 1995) and EDI models (Lacovou et al., 1995) bear even greater similarities with multilevel change readiness in terms of their attention to context and levels. Both point to organisational and external characteristics, with DIT further includes individual as well (only leaders however). DIT also specifically identifies five stages of adoptions (awareness, persuasion, decision, implementation, continuation), whose pre-implementation stages are similar to readiness.
3 There is also the Technology–Organization–Environment Framework, TOE (Tornatzky & Fleischer, 1990). This probably bears greatest similarity in its focus beyond technology itself, but this model was proposed before 1993 when Armenakis et al's (1993) seminal paper came out. Hence, it is not included in the discussion here. It has been widely used (Baker, 2012), but does not seem to have an updated version.
4 TTF originates from organisational contingency theory that emphasises "feature or characteristic of an organization is in accord with the specific circumstances that the organization faces" (Furneaux, 2012, p. 88). The of this model is on the task and technology. No other variables are included.
5 The original TAM model proposed by Fred Davis in 1986 for his doctoral study focuses on two key components of the technology that are seen to influence adoption: *perceived usefulness* and *perceived ease of use*. After a few rounds of modification, Venkatesh & Bala (2008) further expanded on what influenced these two variables.
6 Readiness influences implementation but implementation also influences readiness in the next round.
7 * represents significant predictory effect, with the two individual-level factors possibly mediating the orgnisational-level factors.
8 No direct reference to readiness.
9 The finding doesn't support the critical role transformational leadership plays.
10 Including extent (could be related to the categories such as developmental change, transformational change, evolutional change, and revolutionary change, Porras & Robertson, 1992) and also characteristics such as whether it is episodic or continuous (Weick & Quinn, 1999).
11 In fact, *Journal of Change Management* has a special issue on the topic of change management (2013, volume 13, edition 1).
12 Almost double that for Vakola (2013).
13 Especially at levels above individual, where discussions tend to point out to norms, culture, and leadership, with limited attention to other aspects.
14 Personality indicated in literature is absorbed into this aspect.

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Chapter 3

Absence of a National Policy

ICT Incorporation in Uganda's Higher Education Institutions

George Jjagwe and Lucy Babirye Nanteza

An Overview of Uganda's Higher Education Institutions

Uganda's higher education (HE) system has massively expanded since its liberalization in 1993 (Saphina, 2017) with the introduction of neoliberal policies allowing both the private sector and the state to participate in its offering. This was aimed at providing more opportunities to Ugandans in different geographical locations to access higher education (Bisaso & Achanga, 2023). According to *Uganda's University and Other Tertiary Institutions Act 2001*, the Ministry of Education is the overall coordinator and regulator of Uganda's education. Below the ministry is the National Council for Higher Education (NCHE), a semi-autonomous body mandated to supervise all higher education institutions in Uganda. In the current setting, HE in Uganda includes universities; other degree awarding institutions (ODIs) such as Uganda Management Institute (UMI), which offers degrees up to the doctoral level; and other tertiary institutions (OTIs), such as Makerere Institute of Social Development (MISD), which are limited to only diploma programmes (Bisaso & Achanga, 2023). All these categories of HEIs include both public and private ones (Ministry of Education and Sports, 2019). According to NCHE's State of Higher Education Report for 2020/2021, there were 246 HEs in Uganda (NCHE, 2023). Of these, 9 were public universities,[1] 48 were private universities, 19 were ODIs, and the rest (170) were OTIs. In terms of ownership as per the 2020/2021 NCHE report, the majority (74%) of the HEIs in Uganda were privately owned, leaving only 26% under public ownership. This signifies that most of the HEIs in Uganda are privately owned, operating with the goal of profits.

Uganda is an active member in the international arena and subscribes to protocols from the United Nations (UN), African (AU), and the East African Community (EAC), as well as the international Network of Quality Assurance Agencies in Higher Education (NCHE, 2020/2021-2024/2025 strategic plan, NCHE, 2020). As such, it follows the African Union's ten-year strategic plan (2014), *Science, Technology and Innovation Strategy for Africa* (STISA, 2014–2024), that guides the development of science, technology, and

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innovation on the continent (Daniels, 2017; Iizuka et al., 2015) and stresses the need for ICT infrastructure development such as access to broadband internet, stable electricity, and basic telecommunication services, among others.

ICT Policy Development in Uganda

ICT incorporation in Uganda is a mandate of the Uganda Communication Commission (UCC), National Information Technology Authority Uganda (NITA-U), and Ministry of ICT through regulatory and monitory roles. ICT was liberalized in the country in 1996 after the adoption of the telecommunication policy to increase access to and utilization of ICT services (Ministry of ICT, 2014). The telecommunication policy was enacted in the same year to increase competition and investment in the sector to increase both the quality and availability of telecommunication services. This also led to the privatization of Uganda posts and Telecommunication Corporation. The liberalization led to an increase in the number of telecommunication companies in the country, with over 20 operators currently licensed. The number of telephone subscribers has increased steadily from 49,518 in 1996 (Econ One Research, Inc, 2002) to 33.1 million in 2022, with a mobile phone penetration rate of 60% (UCC, 2022). The cost of telecommunication has reduced significantly (UCC, 2022). Wireless networks have developed, and mobile phones adopted by most Ugandans, although stability and cost remain stumbling blocks for ICT usage in the country (Ariani et al., 2017; Okuda, 2023; Waiswa & Okello-Obura, 2014).

Several other policies have been developed in the ICT domain. The first was the National ICT Policy Framework, launched in 2003 (Ministry of Works, Housing and Communications, 2003), which set out the government's vision for the development of the ICT sector in the country (Ministry of ICT, 2014). This policy framework focused on four key strategies, including infrastructure such as telecommunication networks access to networks; human capacity building of citizens through education and training; applications such as e-government, e-health, and e-education; and regulation focused on creating a favourable regulatory environment for the development of the sector. Among the four, training of human capacity was the key, where collaborative efforts of the industry and the training institutions were recommended (Farrell, 2007). This policy also recognizes the need to embrace lifelong education for all, the goal of lifelong learning (3L), and assigns ICT integration into the education system as the main means to achieve this goal (Farrell, 2007).

In 2004, assessment for the e-readiness of Uganda was conducted by the United Nations Conference on Trade and Development (UNCTAD). This assessment revealed that Uganda's e-readiness was low in three of the four aspects of Uganda's 2003 policy: ICT infrastructure, human capacity, and e-government. This assessment also made several recommendations for improving Uganda's e-readiness. Besides increasing investment in ICT infrastructure, improving the skills and knowledge of people to use ICT,

and strengthening e-government initiatives, this exercise recommends the promotion of the use of ICT by businesses and encouragement of ICT use by individuals and communities. Subsequently, an ICT working group was formed and further recommended the formation of an ICT ministry to address the challenges of different aspects of ICT scattered in different government ministries, leading to poor coordination and implementation (Ministry of ICT, 2014). As a result, the Ministry of Information and Communication Technology (ICT) was established in 2006 to oversee the implementation of the National ICT Policy Framework (Ministry of ICT, 2014), signalling the government's commitment to ICT development.

To further enforce the development and implementation of policies, the National Information Technology Authority-Uganda (NITA-U) Act was enacted and passed by the parliament of Uganda in 2009 (NITA-U, 2009). This act established the NITA-U as a government statutory agency responsible for coordinating and regulating IT services in Uganda. It also provides technical support and advice for the use of IT in Uganda and promotes the development and use of e-government, e-commerce, and other e-transactions in Uganda. Furthermore, it regulates the procurement of IT hardware and software in the public sector; creates and manages the national databank; sets standards for IT planning, acquisition, implementation, and security; and regulates the electronic signature infrastructure and other related matters as used in electronic transactions in Uganda.

Three acts were enacted in 2011, fortifying ICT regulation. These were the Electronic Signature Act, Electronic Transactions Act, and Computer Misuse Act. The Electronic Signatures Act recognizes the legal validity of electronic signatures and documents, providing a framework for digital certificates and certification authorities. The Electronic Transactions Act promotes electronic transactions by recognizing electronic records, contracts, and signatures as legally valid and enforceable while emphasizing the preservation of integrity and authenticity in digital interactions. The Computer Misuse Act, on the other hand, addresses cybercrime, unauthorized access, data interception, and offensive communication in digital spaces. Collectively, these acts aim to provide legal clarity for using ICTs in Uganda, facilitate electronic commerce, and safeguard cybersecurity. In addition, the National Electronic Government (e-Government) Policy Framework was developed in the same year to ensure online accessibility of all government services and opportunities for community participation in a friendly, transparent, and efficient manner for all sections of society.

In 2014, the National ICT 2003 policy was revised (Ministry of ICT, 2014). This revision further highlighted the role of developing human capacities to use ICTs as one main lag in adopting ICTs (Ministry of ICT, 2014) and where the forthcoming focus for the government would be. This 2014 policy revision requests a review of curricula at all levels of education, aiming to improve ICT investment; improve teacher skills; establish educational resource

sharing; and promote open, distance, and e-learning (ODeL) modes of study (Ministry of ICT, 2014). It also establishes ICT as one of the subsidiary subjects in the Upper Secondary (Advanced Level) curriculum (UCC, 2014b) while a new Lower Secondary Curriculum calls for the integration of ICTs across the entire curriculum, which could develop digital skills for all students (MoES, 2020). Furthermore, to improve the practical skills of students and teachers, between 2008 and 2014 the government, through UCC, has set up and equipped over 1,300 School ICT Labs. In addition, the government set up the Uganda Institute of ICT (UICT) as a Centre of Excellence for ICT Training, Applied Research and Consulting to provide ICT Skills-based and market-driven training and applied research (MoES, 2020). Besides learners and focus on general education, the National ICT policy revision also focuses on the marginalized; women, youth, and people with disabilities, and advocates equal participation and promotion of ICT as an alternative career for this group. Special arrangements for marginalized groups were created, e.g., ICT programmes for women. This revision also emphasized the importance of adopting cost-reducing measures to counter the high cost of equipment, installation, and maintenance. This revision also recognizes the implications and/or risks that may result from failure to mainstream ICT in society and highlights the cross-cutting nature that affects ICT development, e.g. infrastructure development, legal and regulatory framework, as well as the role of other sectors plays including government ministries, Ministry Departments and Agencies (MDAs), and the private sector (Ministry of ICT, 2014).

In 2016, the Ministry of ICT was renamed to the Ministry of ICT and National Guidance (MoICT&NG) and was given an additional mandate to oversee national ICT guidance in Uganda. This includes tasks such as promoting national unity and cohesion and countering harmful propaganda. In the same year, the second national development plan (NDP II, with the theme of "Strengthening Uganda's Competitiveness for Sustainable wealth creation, employment, and inclusive growth") was launched to support Uganda's Vision 2040. NDP II similarly emphasized ICT as a crucial sector in the country and ICT infrastructure and digital skills training as key strategies. To support the objectives of NDPII, the National broadband policy was developed in 2018 (MoICT&NG, 2018), emphasizing the role of broadband internet as a critical enabler. The Third National Development Plan (NDP III) also prioritizes the use of ICT in education (National Planning Authority, 2020).

On October 14, 2022, the Ugandan President signed into law the amended Computer Misuse Act, 2022, recognizing the fast technological advancements since the enactment of the principal act in 2011 and the need to update the regulatory landscape. The amendment broadens one key provision in the principal act regarding the offence of unauthorized access and adds new criminalization of activities such as unauthorized sharing of information about children and abuse of social media. The launching of the national digital transformation Roadmap in 2023 by the Ugandan government signifies

government readiness to support ICT development. This is in addition to efforts like establishing the ICT ministry to guide ICT development and integration earlier in 2006 as well as the recognition of ICT role in the national development plan, including the current Third National Development Plan (NDP III) for the country.

The National ICT Policy in Education and Higher Education Sectors

As mentioned above, ICT skills and human capacity are repeatedly recognized in various national ICT policies as key strategic areas. Not only that, the Ugandan government also specifically recognizes the role of ICT in knowledge dissemination will accelerate social-economic development (Ministry of ICT, 2014). Uganda's Ministry of Education and Sports recognizes the need to adopt global ICT standards in terms of assessment, training, and certification in its draft digital agenda report (MoES, 2020). In this report, the ministry admits that a national ICT in education policy is essential for achieving the country's digital agenda, including SDG4 which aims for an inclusive and equitable quality education (Miao et al., 2022).

In May 2020, the Ministry of Education and Sports constituted a technical committee to spearhead and fast-track the development of the Education Digital Agenda Strategy (EDAS) and ICT in education policy. Aligned with the Second National Development Plan (NDP II), which advocated for human capital development in the sector, and based on other existing strategies and plans developed by other sectors, the EDAS 2021–2025 provides both a Rationale and Action Plan for integrating ICT into teaching, learning, assessment, sports, and administration (Ministry of Education and Sports, 2020). The strategy also aims to establish a framework that harmonizes ICT initiatives for teaching, learning, and management of the education and sports sectors. In 2021, the Ministry of Education and Sports developed the Digital Education Standards and Guidelines (DESG) for the education and sports sector, providing a framework for the effective use of ICTs in education in alignment with the EDAS 2021–2025 (Ministry of Education and Sports, 2021). DESG covers the following areas:

- Management and Governance: The DESG guides the management and governance of ICT in education, including the development of ICT policies and strategies, the allocation of resources, and the monitoring and evaluation of ICT projects. Additionally, it also guides to ensure that the deployment, usage, and services provided by all educational institutions meet the requirements of Education Digital Agenda Strategy (EDAS);
- ICT infrastructure and systems: It guides the development and maintenance of ICT infrastructure and systems, including computer networks, software, and hardware;

- Pedagogy: Provides standards and guidelines on effective e-learning pedagogy and delivery as well as the implementation of blended learning;
- Content development: On five aspects, including approaches of content development, software and tools, process of content development, quality of content development, and finally the contemporary and future approaches;
- Training and professional development: Provides guidance on the professional development of lecturers/teachers/instructors (often the e-learning facilitators and the content developers) in institutions;
- Adoption and diffusion of e-learning: Includes standards and guidelines on strategic planning, operationalization, awareness raising and implementation, monitoring and evaluation, recognition, and awards.

DESG can benefit HEIs by providing a framework for the effective use of ICT, promoting equality and access to the institutions, and promoting research and innovation. However, these standards and guidelines do not provide clarity on the roles and responsibilities of stakeholders in the implementation of ICT in education (Muyinda, 2021). Additionally, they lack a comprehensive plan for monitoring and evaluation (Muyinda, 2021) and hence there are challenges in identifying the progress of ICTs in education and areas of improvement. Furthermore, the standards and guidelines are not clear, but they require adequate funding and resources to be addressed effectively, yet the DESG doesn't indicate the source of the funding.

In the higher education sector, the Uganda National Council for Higher Education (NCHE), a government body mandated to directly supervise HEIs, developed minimum standards for ODeL Programmes in 2019 (NCHE, 2019) in line with the national ICT policy. These minimum standards were designed to guide HEIs in the design, implementation, and delivery of quality ODeL Programmes, highlighting the need for adequate internet bandwidth, well-equipped laboratories, and robust servers. In addition, NCHE highlights ICT in its strategic plan 2020–2025 as one of the themes and reveals plans to support resource mobilization to build human resource capacity (NCHE, 2017). In June 2021, NCHE further developed guidelines for the Adoption of an Emergency ODeL System by the HEIs in the wake of the COVID-19 pandemic. This guideline aims to help HEIs to resume teaching and learning activities remotely during lockdown. The guideline also provides a checklist of requirements for accreditation of ODeL systems as well as requirements for implementation of ODeL.

To this end, drafting of the education sector ICT policy is reported to have started way back in early 2000 (Farrell, 2007), but this is not yet realized (Hosman, 2010). In fact, a study by Mukhula et al. (2021) reveals that even integration in the curriculum, management, and coordination is still low. In the absence of a sector policy, it is also hard for the different regulators to specify the necessary qualifications and training a teacher and/or a facilitator should attain or attend to ensure smooth learning for all categories of learners.

According to Mukhula et al. (2021), policy affects implementation. Davis et al. (2019) note that despite the importance of ICT in service delivery, policy implementation remains a constraint in Uganda's local government. The Ugandan government continues to adopt policies to guide specific government programmes, for instance, the provision of agricultural extension services in the country is guided by the National Agricultural Extension Policy (NAEP) (MAAIF 2016; Mushemeza, 2023). The policy specifies the different roles of the government departments and agencies and the policy strategy stipulates the desired qualifications of the individual actors in agricultural extension services delivery. Hence, the absence of a national sector-specific ICT policy in education (and HEIs) to guide ICT integration also means that HEIs often have to use their strategic plans as the guiding tool for ICT integration and development. This will no doubt affect integration due to a lack of standards and enforcement. Kaliisa and Michelle (2019) emphasize the need for sector-specific policy if the ICT integration in HEIs is to flourish.

ICT Infrastructure Development in Education and Higher Education Institutions

ICT-based education and its effectiveness can only be achieved in the presence of adequate infrastructure (Gupta & Hayath, 2022). However, ICT infrastructure and ICT service provision remain a major stumbling block in the adoption and integration of ICT in the education sector in the sub-Saharan region (Bariu, 2020), Uganda included (Semeon, 2019). Although not unique to HEIs, infrastructure-related challenges manifest for Ugandan HEIs include underdeveloped ICT infrastructure, high internet (bandwidth) costs, and high electricity costs among others (Farrell, 2007). In its 2020/2021 State of Higher Education report, NCHE similarly recognized and echoed the challenges of bandwidth and access to resources. The report specified that the number of computers available for student access (students own + shared) in HEIs in Uganda are only 20,823, which gives a ratio of 12 students per computer (NCHE, 2023).

Reviewing the growth of ICT infrastructure, it is notable that ICT infrastructure in Uganda has bloomed following the liberalization of the telecommunication sector, particularly after the establishment of the Rural Communication Development Fund (RCDF[2]) in 2001, which targeted improving universal access to telecommunications (Farrell, 2007). In partnership with the Ministry of Education and Sports, UCC has implemented the RCDF1 (between 2003 and 2009), RCDF II (between 2010 and 2016), and RCDF III (between 2017 and 2023), focusing on access and usage of communication (UCC, 2024). Critical to note is that the RCDF has been renamed to Uganda Communication for Universal Service and Access Fund (UCUSAF) to improve digital inclusivity in rural and urban Uganda (UCC, 2024). RCDF majorly focused on setting up internet connectivity for the

established laboratories, retooling of ICT teachers, installation of virtual science content, and ICT training for communities (UCC, 2014b). By the end of 2014, 1,027 laboratories had been set up in government secondary schools, 43 in tertiary institutions, 9 in universities, and 7 in health training institutions (UCC, 2014a). Internet connectivity was set up for 816 computer laboratories, 960 teachers had been retooled, virtual science content was installed in 634 laboratories, and 62,000 community members were trained (UCC, 2014a). In 2017, the RCDF policy was revised, coming up with RCDF III 2017/2018-2021-2022, whose focus was broadband rollout. Several developments have taken place including the launch of 22, 3G base stations by the Commission (UCC) in partnership with MTN Uganda in 2019. These marked the start of the much-anticipated network capable of covering the entire country with broadband internet service.

Although NCHE has developed minimum standards and guidelines for ODeL (NCHE, 2020), these guidelines can only adequately inform the adoption, but a national policy is required to guide implementation and operationalize strategies to ensure the establishment of a structure for integration and define the roles of each stakeholder. On the ground, ODeL has been adopted by several universities (albeit at very slow adoption rates) while the majority of the institutions did not meet the requirements of ODeL (NCHE, 2022). According to Bisaso and Achanga (2023), only 47 HEIs equivalent to only 17% applied for and were eventually approved to roll out the ODeL system during the COVID-19 lockdown. NCHE also reported unlimited internet bandwidth and access to e-resources. Some instructors had to resort to using their personal devices and smartphones to access the internet, making teaching expensive for them: one reason that might explain resistance to integrating ICTs into their instructional practices (Nyakito et al., 2021; Ujeyo et al., 2022). This resulted into minimal or intermittent student interactions with facilitators and unequal learning outcomes for students; many graduates don't have the skills to operate highly sophisticated software or equipment (Bwire et al., 2020). This unequal access due to connectivity and gadgets also implies greater reliance on costly expatriates to manage digitized service delivery (Mariyam & Saeed, 2021). Often, service providers/ICT experts are hired from outside Uganda to manage software for HEIs and other government departments.

Human Capacity Development and Information Literacy

New ICT skills and competences need to be frequently retooled (Rana, 2018) as technological advancements are made by the day. In the absence of information literacy and capacity-building initiatives to improve information literacy, ICTs cannot be used effectively to improve educational practices (Li et al., 2019). Despite the existence of policies, programmes and activities aimed at capacity development (MoES 2022), Messina and Tabone (2012)

found very limited knowledge of technology and how to integrate it into pedagogy and context among many academic staff in HEIs. In another study by Bwire et al. (2020), it was emphasized that the major challenge to adoption of online learning was the lack of necessary skills for development of online courses. Ujeyo et al.'s (2022) study of a case study at Busitema University also highlights lack of knowledge and inadequate skills, among the reasons for low levels of ICT adoption by academic staff.

The Ugandan government commits itself to developing and retooling its ICT-talent-building mechanism through the adoption of globally benchmarked training and certification standards (Gillwald et al., 2019). One such initiative is the establishment of the Uganda Institute of Information and Communications Technology (UICT), the only government institution specializing in the training of mid-level technicians. UICT is managed by the UCC, and It offers practical-oriented ICT training at certificate and diploma levels as an alternative to the theoretically grounded degrees offered by universities and other tertiary institutions in this same professional area. The institute provides education and training in all fields related to the communications sector, including telecommunications services, computer engineering, and information technology and business management.

Partnerships

Public-private partnerships (PPPs) are common in ICT for education initiatives (Sarvi et al., n.d.), for leveraging joint resources, respective competences, and strengths in terms of ICT infrastructure and quality educational resources (Semeon, 2019). One most notable PPP in Uganda's higher education is the Research and Education Network for Uganda (RENU, also known as Uganda's National Research and Education Network, NREN), which aims at allowing ICT-enabled collaboration for Uganda's education and research institutions. RENU was founded in 2008 by vice chancellors of Ugandan universities and chief executive officers (CEOs) of some research organizations such as the Infectious Disease Institute, International Institute of Tropical Agriculture, and Mbale Clinical Research Institute among others, with a major focus on allowing for ICT-enabled collaboration for Uganda's education and research institutions (RENU, 2021). It provides high-speed internet network, web hosting, web conferencing, and cloud services among others to its member education or research institutions at lower costs (The Daily Monitor, 2021). RENU has also introduced eduroam, offering secure Wi-Fi that allows connectivity when staff, lecturers, and students move from one institution to another, sometimes even in other public places (RENU, 2021). During the outbreak of COVID-19, RENU extended eduroam in over 300 hotspots (within institutions) in the country, most notably Kampala, Mukono, and Wakiso metropolitan areas. In 2022, Renu Introduced a pocket-sized routing device called Eduroam on the Go, further improving

access by enabling connection to eduroam and the internet anytime, anywhere (Uganda National Council for Science & Technology, 2022). RENU introduced the Shared Bandwidth Capacity (SBC), which enables a number of HEIs to use a range of a specific bandwidth rather than for each subscribing for a dedicated link, enabling smaller institutions a more affordable option for the conventional dedicated links. RENU engineers also provide Direct Engineering Assistance (DEA) to member institutions, e.g. ICT staff at universities to manage and maintain their ICT infrastructure. In addition, RENU with its partners like UBUNTU NET Alliance and INSAP also donates network equipment to selected member institutions as part of the DEA programme (INASP, 2016).

ICT Usage: Institutional Policies and Readiness

The Qingdao Declaration (UNESCO, 2015) emphasized that the application of ICTs in education can be the basis for the achievement of all sustainable development goals (SGDs). The declaration also emphasized access, equity, quality, and learning outcomes as the key pillars of lifelong learning. Greater use of ICTs in education is also associated with benefits including; increased access to education, especially for those from remote areas, improved efficiency of decision-making through timely information (Miao et al., 2022) and fostering the development of 21st century skills (e.g. critical thinking, creativity, emotional intelligence, problem-solving, etc.) (Manyasa, 2021), that are essential to efficiently and effectively access and process vast repositories of information and knowledge. As technology is dynamic and requires individuals to continue adoption and learning, learning agility increasingly becomes crucial. However, all can only be effectively implemented with the presence of well-developed policies and implementation plans (UNESCO, 2011).

From the institution's point of view, universities can integrate ICT use in many aspects, including; teaching and learning, other training, research, outreach, and administration. However, Ujeyo et al. (2022) report limited actual application in all key university functions in Uganda's HEIs: teaching and learning, research, and community engagement. They also report a general tendency of ICT usage in Uganda's HEIs limited to general communication, information sharing (email and memos), and management as well as content creation. Similar to the national focus on ICT infrastructure, the focus of many HEIs in Uganda has been to ensure steady internet availability/access and stability (Omoda-Onyait & Lubega, 2011). This is often accompanied by the provision of basic ICT training: all universities have introductory computer classes (both staff and students). HEIs have also come up with various initiatives to improve their students' ICT competencies, for instance, through didactic innovation, ICT support, or the adoption of blended teaching (Mukhula et al., 2021).

The outbreak of COVID-19 also forced many Uganda universities to continue teaching and learning through Learning Management System (LMS) such as Moodle for both students and staff. LMS such as the Makerere University Electronic Learning (MUELE) System that were not used before the outbreak of COVID-19 are now occasionally used. The National Council for Higher Education is promoting blended learning. However, less focus has been geared towards the quality and format of the content as the emphasis is on technology (Bwire et al., 2020). The inadequacy of teachers to transform their material to suit online delivery modes is still a valid bottleneck. Instructors lacked the necessary skills required to transform their materials to suit online delivery modes (Tweheyo & Mugarura, 2021) and develop effective online courses with well-aligned learning outcomes suitable for different students (Bwire et al., 2020).

At the time of the writing of this chapter, only three universities have ICT policies from online searches. These include Makerere University Kampala (MUK), Mbarara University of Science and Technology (MUST), and University of Kisubi (UniK). Additional queries were put through to two other universities, and the responses received were also negative. MUK is the oldest university in the country, having been established in 1922. Like MUK, MUST is publicly owned and was formed in 1989. The University of Kisubi was established in 2015 and is privately owned. Hence, the following policies for the above-mentioned universities were reviewed:

- Makerere University ICT policy 2016–2020;
- The University of Kisubi (UniK) ICT policy 2020;
- Mbarara University of Science and Technology Information and Communication Technology policy 2019–2024

The following further examines these three policies to assess the readiness of ICT integration in Uganda's HEIs.

Table 3.1 indicates different approaches to ICT integration, likely partially due to the absence of a national sector policy. Although all three policies stress the need to support the targeted users through training for staff and students, the trainings are budgeted for at the department level for MUK, while MUST and UniK are silent about the source of funding for the training. Only UniK emphasized the context for the policy, which was to guide ICT usage to achieve university goals. Another example is that despite the relevance in all spheres/aspects of university management and service delivery (teaching, research, and outreach), however, each university has prioritized specific areas (see the "policy scope" row). For instance, MUK has guidelines under its ICT policy regulations at the different departments and units while for UniK the regulations mainly focus on the use by students and visitors. In MUK, special roles have also been assigned; for instance, the council committee on quality assurance on ICT and gender was charged with

Table 3.1 Existing ICT Policies for Some of the Universities in Uganda

University	*Makerere University (MUK)*	*University of Kisubi (UniK)*	*Mbarara University of Science and Technology (MUST)*
Targeted Users	Staff, Students, and Visitors		
Areas of Application	Teaching and learning Research Administration		Teaching and learning Research Community Outreach Administration
Policy Scope	• ICT Management and Governance • Software Development and Acquisition • ICT Skills Capacity Building and service support • ICT Procurement and Software Licensing and Ownership • Special Needs ICT Usage	• Acceptable Use and User Guidelines • Computer Lab and Equipment • E-Learning • Monitoring and Evaluation	• ICT Management and Governance • Infrastructure Management and Capacity Building • ICT Procurement Disposal • Special Needs ICT use
Sources of Funding	3% of the university total budget is for ICT integration	Not specified	University annual budget
Stakeholders for Implementation	• Directorate of ICT • Council Committee on Quality Assurance • ICT and Gender Department	• ICT Department • Directorate of ICT and Quality Assurance • University Management • Academic Boards of Faculties	• Students, staff, and visitors • MUST computing services • ICT committee • University management • University Council
Monitoring and Evaluation	• Directorate of ICT • Council Committee on Quality Assurance • ICT and Gender	• Directorate of ICT and Quality Assurance • University Management	• Under the leadership of MUST computing services • With the following indicators: computer to student ratio, computer to staff, internet bandwidth, staff and students using internet
Capacity Building	Focus is to support all ICT users through training and other support services	ICT directorate	MUST computing services

advocacy for adoption and utilization as well as effective implementation, which can help the students and other staff to know who to contact when in need of ICT services and the kind of support they can get and is required of them for effective use of ICTs. Another example of the difference is that in MUST, key integration strategies regarding ICT infrastructure development require each unit (faculty) to develop a plan to acquire computer equipment for every financial year. This is not the case with Makerere and UniK. MUK and MUST also outline sources of funding for ICT integration, while this is not mentioned in UniK.

The policies also indicate different levels of comprehensiveness (e.g. seen from all rows of the table, particularly the empty cells, which means no information for that particular aspect): MUK's policy exhausts all necessary policy areas, such as the key partners/departments for implementation, the roles and responsibilities of each partner, the sources of funding, and also recognizes the special groups (women) who are usually marginalized. It defines the procedure for ICT integration to ICT-related activities in learning, teaching, research, and administration. The UniK university policy, on the other hand, focuses primarily on the users only, particularly in terms of guiding the users (employees, students, and visitors) and also the roles of the different partners or units in charge but without sustainability strategy/plan and integration. The main aim is to bar illegal use. The ICT budget also varies with universities; for instance, 3% of the total budget for MUK, while others remain silent about their commitment. Because of the difference in the need, it's also hard to determine whether whatever amount committed to this is sufficient or not, or whether a budget based on the numbers of targeted users, e.g. on total student population, is an effective way to benchmark budgets. The three policies for these universities speak volumes about the role of ICTs in HEIs in Uganda; though many institutions lack specific policies for ICT integration, the global trends in digitizing services including education propel all institutions to embrace ICTs. Though ICT infrastructure development is still a challenge for most universities in terms of equipment, including personal computers for both staff and students, having policies in place is a clear signal for readiness to integrate ICTs. This is because policies guide investment in infrastructure and integration.

Conclusion

Translating policy components into action is the most crucial part of policy formulation (Tezera 2019). This can be achieved by ensuring that both micro- and macro-level actors are working towards achieving the same goals (Siddique 2016). Though the liberation of ICT in Uganda has led to ICT development and use in the country, the absence of a national policy in Uganda, however, remains a stumbling block for monitoring, innovations, and advocacy. Integration in education is still low though Uganda subscribes to a

number of international ICT protocols; more investments are needed in ICT infrastructure. It is important to ensure that teachers and students have access to the minimum basic requirements, such as personal computers, stable internet, and data for proper instruction, learning, and interaction. This requires strategic plans and budgeting for both the government (education ministry and perhaps ICT ministry) and schools, which in turn requires the allocation of resources for ICT activities. In this regards, a national sector policy could serve as a guide to assess the necessary resources needed by universities to meet the minimum standards for ODeL Programmes and streamline access to and utilization of ICT services to all targeted users, especially the students. A specific national ICT in education policy can further be used to optimize the usage of ICTs in the improvement of accessibility to quality education and the development of lifelong learner competencies (Asian Development Bank, 2023).

Notes

1 Makerere University, Mbarara University of Science and Technology, Kyambogo University, Busitema University, Muni University, Gulu University, Kabale University, Lira University, Soroti University (Ministry of Education and Sports, 2019), and the Mountains of the Moon University which joined from 1st July 2022, are the public universities in Uganda at the time of writing this chapter.
2 The project encompasses several key components, including the expansion of digital infrastructure, capacity-building initiatives, support for digital entrepreneurship, the facilitation of cross-border trade, and the harmonization of digital regulations and standards. Interventions address location, physical inability, gender, and cost barriers (Gillwald et al., 2019).

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Chapter 4

Policy Imperatives for ICT in South African Higher Education

Zahraa McDonald, Thabo Motshweni, Sanele Khakhu, and Ke Yu

Introduction

Information and communication technology (ICT) has the potential to transform how people communicate with one another, carry out business operations, and how the government maintains transparency and responsibility towards the public (Clarke, 2020; Shava, 2022). Its impact on education is also increasingly pervasive. Worldwide, many educational and higher education institutions (HEIs) have started to use ICT to improve efficiency and effectiveness in their main functions (Mohammadi, 2015), e.g., by adopting technology-assisted teaching approaches or blended learning models (Hauser et al., 2012). This impact was further accelerated during the global outbreak of COVID-19 when traditional modes of delivering education were significantly disrupted. Although the rate of ICT incorporation continues to occur rapidly in some countries/regions and slowly in others, often impacted by access to relevant resources, including devices (e.g. laptops), electricity and data, this field has gained widespread attention from policymakers and academics over the past two decades.

The education sector (both basic and tertiary institutions) in South Africa (SA) is no exception. When COVID-19 hit and the number of people infected with the virus rose, many HEIs in SA did manage, to various extents, the online teaching transition the Department of Higher Education and Training[1] (DHET) suggested to preserve learning time. The rate, speed, scale, and efficacy all differed, however. Like its counterpart in schooling, many tertiary institutions in South Africa were not prepared for emergency remote teaching and learning (ERT&L). Reflecting at this time, post-COVID-19, we deem it critical and crucial to continuously and further deliberate on how ICTs are (and should be) used to support teaching and learning in relation to access, attitudes, discourses, skills, and structures as well as the availability of infrastructure. In other words, we propose to revisit how we "reset" (Soudien, 2020, p. 7).

The focus of this chapter is on SA's HE ICT policy. To be more specific, we specifically analyse the assumption that policy environments could be (and often are) a catalyst in the readiness to implement ICT development. As mentioned in Chapter 2 of this book, policy is one aspect at both the national

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and institutional level that drives changes (also in turn impacts the individual level), articulating political will and commitment. In other words, the presence (or absence) of policy is often a demonstration of motivation within the readiness model, and hence a harbinger of opportunity (or lost opportunity) for examining change readiness and implementation. With these in mind, this chapter explores the extent to which ICT policies, at national and institutional levels, allowed for the ICT and ERT&L practices to emerge at different institutions in SA. This chapter applies critical analysis and synthesis to relevant literature as well as publicly accessible documents from three institutions that have received limited attention in ICT HE literature in SA so far: University of South Africa (UNISA), Tshwane University of Technology (TUT), and the University of Johannesburg (UJ). The documents were primarily sourced from the institutions' website, with search keywords such as *technology*, *ICT* (with its variation), *4IR* (with its variation), and *policy*. Content analysis in the form of word frequencies (using AtlasTI) was then used to determine the prevalence of key themes in these documents.

The chapter is organized as follows. First, we discuss the higher education landscape in SA, followed by the role of ICT in SA HEIs. This discussion primarily hones in on national policy. The chapter then compares ICT practices implemented in three different institutions during the COVID-19 lockdown. The chapter concludes by providing recommendations to HEIs on balancing the need to maintain their current and future orientation with the requirements of the ICT landscape.

The Overview of the HE Landscape in South Africa: History and Present

Before 1994, education in SA was its "own affair" for the various racial groups, resulting in a fragmented HE system with various institutions designated for specific race groups. Each type of institution of higher learning (universities, technikons, and technical colleges) also had its own qualification structure. During this time, although the apartheid government could not interfere in the universities' affairs (CHE, 2004, p. 23), as universities were founded by an act of Parliament, their functions were prescribed and could be terminated by the government.

The first initiatives for the development of a post-apartheid education system in SA started in the early 1990s when different groups (including NGOs, unions, etc.) raced "for policy position as contending actors … sought to establish symbolic statements of intent for change in higher education" (CHE, 2004, p. 231). From 1994, the "overarching legal and policy canopy" (CHE, 2004, p. 232) and framework for SA's HE transformation were established, leading to the development of "a single, coordinated and differentiated system of higher education encompassing universities, universities of technology [previous technikons], comprehensive institutions, and various kinds of colleges" (CHE, 2004, p. 234)

as well as the establishment of quality assurance (QA) regulatory frameworks (NQF). The overall aim was to redress the inequities, ineffectiveness, and inefficiency of the apartheid system (CHE, 2004, p. 25). The National Commission on Higher Education (NCHE, established in 1994) outlined three more specific goals of the transformation (1996): increased participation, greater responsiveness, and increased cooperation and partnership. Subsequently, the *White Paper on Higher Education* and the *National Plan for Higher Education SA* were published in 1997 and 2001 respectively, further affirming this transformation process. The Council of Higher Education (CHE) was established in 1998, proposing institutional mergers from 36 to 22 institutions.

One key aim of the post-1994 South Africa transformation is to meet the increasing demand for HE access, mostly due to the increased demand and enrolment of black students (Tjønneland, 2017), although while the spaces the HEIs can offer remain constrained (Dyason et al., 2019; Nukunah et al., 2019; Swartz et al., 2019). In later years, additional demands, often in the form of student riots and protests for free university education, also arose due to increasing student debt (Mlambo et al., 2021). In response to this, new universities were established, including the Sol Plaatje University (SPU), the University of Mpumalanga (UMP), and Sefako Makgatho Health Sciences University in 2014. During the State of the Nation address in 2020, President Cyril Ramaphosa further announced plans to establish two more new universities. Different from other African countries, private HEIs exist in SA, but their enrolment is consistently lower than that in the public HEIs (Figure 4.1).

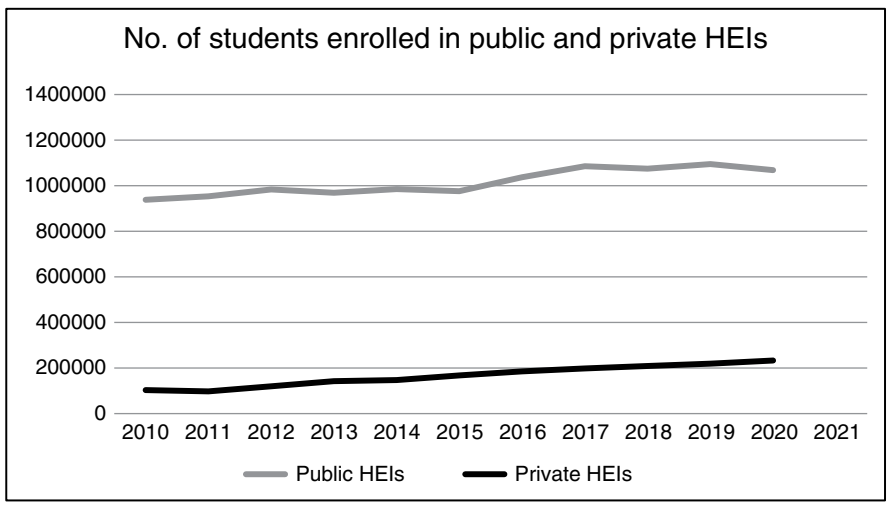

Figure 4.1 Number of students enrolled in public and private HEIs, 2010–2021
Source: DHET (2021).

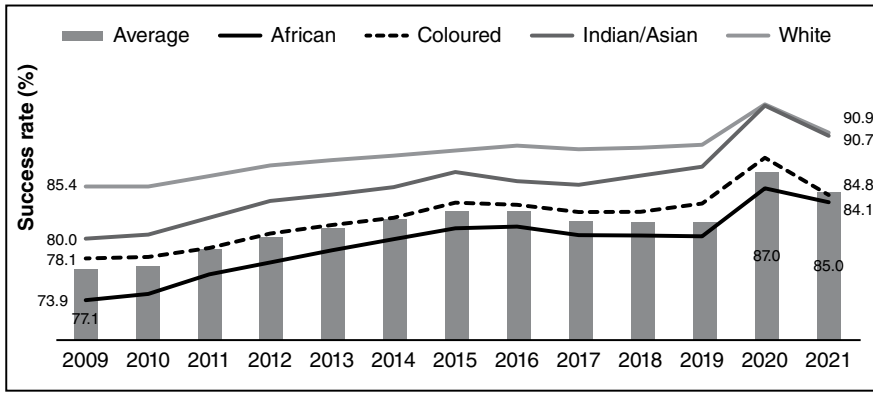

Figure 4.2 Distribution of average undergraduate success rates in public contact HEIs, 2009-2021

Source: DHET (2021).

Another key characteristic of SA's post-apartheid HE transformation landscape is ongoing efforts and challenges regarding more diverse representation in students' success, governance, leadership, and management (Luescher et al., 2022). Despite an overall increase in access, equality remains a goal. Figure 4.2 shows the success rate for students of different race groups over the years.

Summarizing the challenges post-apartheid SA HEIs face, Ng'ambi et al. (2016, p. 3) also point to:

> The soaring cost of education, dwindling government funding, pressures to improve efficiency and throughput and to increase the proportion of students in the HE sector and diverse levels of preparedness of students.

This is the backdrop of ICT development in SA's HEIs. Another backdrop is the common complaint that policy implementation and formulation in the SA are often contested due to the lack of stakeholder involvement in the "architecture of policy-making process" coupled with the absence of a "systemic monitoring and evaluation mechanism" to ensure implementation (Sesemane, 2007, p. 643; Van Greunen et al., 2021, p. 6). In this sense,

> The potential of ICTs is sandwiched between increasing pressure on higher education institutions from government to meet the social transformation and skills needs of South Africa, and the varying student academic preparedness, large class sizes and multilingualism currently experienced in these teaching and learning contexts.
>
> (Jaffer et al., 2007, p. 131)

ICT in South African HE and ICT Literature

There was a flood of examination of ICT incorporation in HE in South Africa around 2006 (e.g., Brown & Czerniewicz, 2007; Czerniewicz & Brown, 2006; Czerniewicz et al., 2008; Hodgkinson-Williams & Mostert, 2006; Soudien et al., 2007), often dominated by case studies without "a coherent theory of online learning" (Czerniewicz et al., 2006, p. 34). Among them, Czerniewicz et al.'s (2006, p. 2007, commissioned by CHE) map the ICT landscape in South African HEIs from 2000 to 2006 is one of the most comprehensive.

Czerniewicz et al. (2007, p. 58) claim that the most commonly used terms related to ICT in education in SA are "e-learning and online learning". While there are disputes about other related terms such as *distance learning*, *blended learning*, *open learning*, *distributed learning*, *multimodal learning* which might also involve ICT, the authors record limited reference to *virtual learning* and *networked learning* in SA compared to locations beyond SA. In this sense, ICT incorporation in SA largely means web-based education.

Through institutional policies and interviews (16 middle-management positions) within various types of universities, Czerniewicz et al. (2006) find evidence of increased interest in technology, seen in for example increased spending on ICT infrastructure, despite "no specific technology policies in higher education explicitly steering practices" (p. 7). They further record primary drivers for this increased interest within institutions in the absence of "the impetus coming from direct external pressures or incentives [refers to national policy. More details in the forthcoming section]" as:

> Three prime movers… individual academic staff (in the form of champions), senior leadership (either informally or formally) and students… numerous examples of ICTs being introduced into higher education by key individuals [from different disciplines]. Sometimes, they are located in pockets of group activity; at other times, they are largely isolated … Sometimes, the drivers are individuals at a senior level who recognize and support activity on the ground … Students are also understood to be the key drivers for and in the future.
>
> (Czerniewicz et al., 2006, pp. 9, 10, 11, original explanation in round brackets)

Cross and Adam (2007) agree with the observation of the importance of ICT champions and strong leadership. Czerniewicz et al. (2007) further record the typical pathway of ICT use from "using technology for administrative support, and then moved onto experimenting with teaching and learning possibilities from there" (p. 55). Often, it was initially ICT-enhanced change to improve existing practices (e.g. making it more efficient), then this evolved to "doing things differently" (e.g. in online communication or collaboration, p. 62), or even transforming institutional setup or pedagogy. Applying a 5-year timeframe,

Ng'ambi et al. (2016, p. 5) outline the SA ICT development (1996–2016) in the following four phases:

- Phase 1 (1996–2000): emergency of computer-assisted instruction, marked by "low ICT infrastructure and institutional control/regulated systems, most of which were home-grown or proprietary systems… [although with] expansion of computers and networks across institutions for use by individual staff" (pp. 6, 12);
- Phase 2 (2001–2005): emergency of email and Internet (also downloading functions for offline reading for students), coupled with a recognition of constraint posted by "access to personal devices… [but with] increasing proliferation of e-learning strategies [beyond administrative purposes]… although in many cases the focus was limited to institutional learning management systems… use was quite narrow and was dominated primarily by instrumental tasks such as finding information and writing assignments" (pp. 6, 7, 23);
- Phase 3 (2006–2010) with "increased interest in designing and evaluating staff development initiatives on the use of ICTs for teaching and learning … questioning perceptions that ICTs were separate from pedagogy and content …. [although] use was limited to supporting traditional practices and only a small number of innovative practices started to mushroom" (pp. 7, 8). Another main feature of this phase is that ICT are "no longer seen as an equalizing force from this period onwards, but awareness was increasing of the complexities of infusing technology into highly diverse and differently positioned institutions of higher learning" (p. 8);
- Phase 4 (2011–2016) with higher "ICT infrastructure and high personal control through cloud-based tools" (p. 12), digital literacies and flexible learning.

Among the studies that seek to explicitly explore the challenges facing further ICT incorporation in SA's HEIs, Sesemane (2007, p. 644) points to institutions'preparedness to deal with "dynamism" of aligning their e-policies with a lack of direct e-education policy at the national level, while Brown et al. (2008) point to infrastructure,[2] perceptions and attitude, as well as enabling environment to stimulate capacity and usage. These challenges often leave many "ICT initiatives have largely remained pilot or small-scale projects, which are not always aligned with the mainstream strategic goals of the institutions" (Cross & Adam, 2007, p. 90). Concurring with this, other scholars (Czerniewicz et al., 2007, p. 68. Also see Brown & Czerniewicz, 2010; Liebenberg et al., 2012; Naidoo & Raju, 2012) have also confirmed that an earlier view seeing ICTs as great equalisers have receded, instead, attention is more placed on the local realities and complexities of implementing ICTs in diverse and divided terrain.

ICT Policy in South Africa's HE Sector

Czerniewicz et al.'s (2006) ICT landscape mapping exercise also examines SA's ICT policies. One key observation Czerniewicz et al. (2006) point to is a difference with many other countries such as England, Australia, and Canada where "interest in technology is related to the national policy framework and impetus provided by funding bodies" (Czerniewicz et al., 2007, p. 54). Instead, SA's ICT HE sector is marked by an absence of a national policy. This is even more striking compared to "an exemplary approach to integration" (Cross & Adam, 2007, p. 74) and prioritization of ICT at the schooling level with its own *e-education White Paper*.

> There is no coherent national policy framework specifically steering ICTs and higher education in South Africa. In fact, there is no specific educational technology policy for higher education, nor is there any monitoring or coordination of relevant related policies. References to educational ICTs in a number of related educational policies do exist in ad hoc, limited and indirect ways … there are numerous national ICT policies, structures and initiatives, which define and steer a national commitment to ICT take up… [e.g.] e-commerce policies, general ICT policies, telecom competition policies, telecom regulatory policies and e-government policies, all of which frame educational possibilities and intersect with higher education. However, a concern has been expressed within the ICT sector itself about the lack of up-to-date policy coordination.
>
> (Czerniewicz et al., 2006, p. 21)

While acknowledging that there might be "policies being made implicitly and in practice… [and] there are arguments both for[3] and against[4] an overarching policy (pp. 29, 30, footnotes added from other parts in the same report)", Czerniewicz et al. (2006) outline potential implication as follows:

> The fragmentation of references to ICTs in higher education across so many pertinent policy documents leads to contradictory decisions being made, as well as unintended consequences occurring. Such a lack of coordination also opens up the possibility of key issues falling through the cracks. The lack of a single critical eye on these issues is a matter to be noted and addressed at a national oversight level.
>
> (p. 23)

This is particularly concerning given the empirical finding from Czerniewicz and Brown's study that in SA, HEIs with more structured and formal e-learning policies (often driven from above) often exhibit higher and more consistent ICT use as well as better support and more available resources

(Czerniewicz & Brown, 2009). Even for the desirable outcome of greater ICT variety and innovation in conditions of having unstructured e-learning policy (loose policy definition) and loose control of implementation, Czerniewicz and Brown (2009) still caution a necessary addition of policies to scale up and spread the benefits of ICT activities and innovations.

> Lack of policy becomes a serious constraint when such activities are to be scaled up or evenly distributed… without policy oversight there is also the danger of the inequalities exemplified in the different parts of the pre-merger institutions remaining in place.
>
> (Czerniewicz & Brown, 2009, p. 129)

Although ICT is seen as hosting "immense opportunities and possibilities" in SA's HE transformation vision (Cross & Adam, 2007, p. 78), ICT is often only mentioned indirectly in national policies, mainly "pair economic change in an information economy with educational change, and relate this to the need for ICT-related graduate competencies" (Czerniewicz et al., 2007). Pointing to SA's HE White Paper 3 (1997) and HE Act (Republic of South Africa, 1997) as an example, Cross and Adam (2007) illustrate:

> While the White Paper emphasizes increased participation in higher education as a major policy goal, no reference is made about the use of ICTs as a possible resource to expand access. The strategies suggested in the White Paper only calls for planned expansion as opposed to massification and does not prioritize the use of ICTs… while the White Paper emphasizes the need for flexible education offerings, it relates flexibility to issues of diversity in offerings, articulation between programmes as well as entry and exit points to create access, it does not refer to flexibility in the modes of delivery provided by ICTs … the White Paper calls for improvement in teaching and learning strategies to improve quality and throughput, but does not assume that ICT should be used for this purpose. The only reference to technology made in the White Paper concerns the concept of resource-based distance learning which should include the use of appropriate technologies[5]… refrains from making assumptions about the relationship between ICT and teaching and learning issues. Briefly, the White Paper on higher education does not provide firm directives on ICT and its relationship to higher education.
>
> (pp. 78, 79)

This can also be seen in the White Paper's 2001 "implementation framework for achieving the White Paper's vision, approaches ICTs with a degree of scepticism and caution, particularly in the context of the strategies aimed at addressing the problems faced by disadvantaged students" (Cross & Adam, 2007,

p. 79). Other indirect references made by other policies, often against the backdrop of new demands and advancement in the 21st century, include:

- In the *Foresight ICT report* (1999), the relationship between ICT and the new economy is made as: "as economics move from the industrial paradigm to the Knowledge paradigm, ICT will have a growing impact on the learning and development of individuals and organizations.… Focus is needed on needs-driven, ICT facilitated, virtual learning" (Cross & Adam, 2007, p. 49). It refers to ICTs both as a content area for broader technology-enhanced learning, as well as ICT-related graduate competencies.
- The *National Plan for Higher Education* (RSA, 2001) similarly places ICT against the broader context of the 21st century's new knowledge economy (invoking Castells, 1996) where ICT is discussed as graduate attributes.
- The *National Research and Development Strategy* (RSA, 2002) claims that "we have to ensure that as many of our people as possible master modern technologies and integrate them in their social activities, including education, delivery of services and economic activity. This relates in particular to communication and information technology" (p. 3). This strategy also refers to universities as key role players in the national system of innovation (NSI).
- South Africa's macro-economic strategy: the *National Development Plan* (NDP) (NPC, 2012). At the time of release, the NDP claimed that South Africa's ICT infrastructure was abysmal (NPC, 2012) but aspires to 2030 where "ICT will underpin the development of a dynamic and connected information society and a vibrant knowledge economy that is more inclusive and prosperous" (NPC, 2012, p. 190).
- The *Higher Education Qualification Sub-framework* (HEQSF, CHE, 2013, currently under review) acknowledges the importance of teaching and learning with technology and further encourages HEIs to integrate technology into the curriculum to enhance students' digital skills. It recognises that technology can support T&L; however, it does not provide specific guidelines about integrating technology. This HEQSF (currently in draft) is expected to provide increased guidance with regard to online learning when it has been finalized (CHE, 2022).
- The *Green Paper* and *White Paper for Post-School Education and Training* (RSA, 2012, 2014) refer to the necessity for using ICTs in post-school education to ensure equitable access. It mentions digital learning and infrastructure, e-learning and open education resources (OER), ICT skills development, ICT-enabled support services, and ICT governance and quality assurance.
- *SA's White Paper on ICT* (RSA, 2016) is an overarching national policy outlining the government's vision and strategic direction for the development and utilization of ICT in the country. This White Paper recognizes the role of ICT for socio-economic development, digital inclusion, and

> effective governance in the country and outlines SA's vision and strategy to harness such potential. In embracing a broad view of ICT (including all forms of technologies for receiving, storing, and processing information, including various forms of communication, such as computing and information technology, internet, broadcasting, audio, and fixed wireless telephony, Shava, 2022), this White Paper outlines aspects including broadband connectivity, ICT infrastructure development, digital inclusion and skills development, e-governance and service delivery, innovation and research, cybersecurity, ICT governance and regulation, as well as international cooperation.

In 2017, DHET published a position paper on online programme and course offerings (2017). In this position paper, DHET recognizes online learning as one mode of education and training provision towards open learning. However, the discussion is limited to open learning principles, a categorisation of online offerings (matrix of level of technology use—no digital, digital support, internet supported, internet dependent to fully online, and site of delivery—site based, blended/hybrid, and off-site/remote), legislative environment (referring to White Paper for Post-School Education and training, 2014[6]), an emphasis on regulation (norms and standards), and a recognition that:

> Whilst there is a range of online courses and programmes offered by higher education institutions in South Africa through a combination of all modalities [matrix] … a consolidated and comprehensive database that provides information about these, and that is maintained and updated to record changes in a rapidly evolving environment, is not in place.
>
> (DHET, 2017, p. 13)

Not only does the focus often shift back to open learning (not necessarily online learning), but the vocabulary also tends to be largely normative (e.g. on ICT benefits and value). While recognising a need to align legislation, policies, and funding to support online programmes and courses, the position paper also does not position the department at the centre of this alignment (except the sentence that "The DHET is committed to exploiting the potential of large-scale provision to reduce per-student cost, and to the funding of quality online offerings", p. 19). Instead, it often points to the role played by the South African Qualifications Authority (SAQA) and HEQCs.

ICT Institutional Policy

The lacuna in a national policy framework in SA means that institutional policies are not led by national policy, but instead often "have to rely on a series of incoherent and fragmented statements scattered through several policy documents in higher education to make institutional choices aligned

with national concerns" (Cross & Adam, 2007, p. 74). When responding to global drivers and local contextual complexities, HEIs are often sometimes caught in conflicting values. Cross and Adam (2007) go as far as to claim that "ICTs' are not prioritized per se, *unless* institutional planners and practitioners have conceptualized such programmes and initiatives as falling within or adding value to the national imperatives for institutional repositioning, survival and transformation" (p. 78, emphasis added).

All these have resulted in varying approaches to ICT policy at the institutional level (Czerniewicz et al., 2006), sometimes within isolated pockets of projects (Cross & Adam, 2007). In fact, a wide range of practices is discerned, ranging from having well-defined and explicit formal ICT policies to those with no relevant policies whatsoever. Czerniewicz et al. (2006) categorize them in terms of those with formal policies (even though some only outline key principles and intentions without operational or implementation documents); those working on draft policies or acknowledging the need for them); those integrated into others (usually teaching, learning, and assessment) policies; and those with no evidence for policy framework at all (Czerniewicz et al., 2006); those with structures present (e.g. teaching and learning structures, higher educational development structures, IT structures and faculty departments, etc.) but not substantiated by policy frameworks, sometimes through emerging practice (where decisions and choices on the ground shaping an emerging policy framework, also see Isaacs, 2007). Cross and Adam (2007) categorize them into proactive and reactive policies (the latter dominate, which Cross and Adam [2007] again attribute this to the lack of national sectoral policy). Czerniewicz et al. (2006) further report a lack of standardization in position titles and the location of structures, potentially causing tensions or indicating differing priorities within institutions.

ICT Institutional Policy at Three HEIs

In what follows, an analysis and discussion of three institutions' ICT policy landscape is conducted to understand the extent to which ICT policies, at institutional levels, allowed for the ICT practices that emerged at different institutions. The institutions were selected for their size and proximity to each other, as well as differentiated nature and scope. A brief historical background and context of the institutions are provided as well.

Only publicly available information on ICT policy, what the institutions have developed, and regard as sufficiently final to place in the public domain is drawn on, meaning that policies that are not publicly accessible or did not conform to the search terms used are not included in this analysis. The terms used to search on institutions' websites were "vision", "mission", "ICT", "policy", "information and communication technology", "ICT policy", "digital policy", "digital", "online learning", and "online learning policy". This analysis is limited to what could be located on the institutions' websites

using these search terms and not what they might have provided if a request were made. The analysis for each institution commences with their current vision and mission followed by a summary of the policy documents about three key concepts associated with ICTs: innovation, technology, and digitization. Within the effect of and on institutional support, research and learning are highlighted.

In the policy documents reviewed for all three institutions, none articulate explicitly the focus of ICTs in the national policies discussed above. In other words, none of the policies connect a specific mechanism or process to a national policy as it relates to ICT. At UJ and TUT, the main tool is the learning management system (Blackboard). Blackboard is an online learning management system that provides students and staff with increased accessibility, quick feedback, improved communication, tracking, and skill development (Bradford et al., 2007). The tool is used for a variety of purposes, such as accessing academic modules, communities, and announcements. Learning activities facilitate the structured delivery of learning in a set order, or simultaneously, as deemed appropriate. Each unit is associated with a summative assessment task, as well as a shorter formative quiz. The University of South Africa's (UNISA) learning management system (LMS) was known as Sakai, which gave faculty, staff, and students access to various tools such as communication, assessment, and content delivery (Badaru & Adu, 2022). The essential components of a Sakai LMS site can be conveniently accessed through the utilization of Access keys. These keys facilitate navigation to key elements including content, tools, personal sites, and notes, as highlighted by the University of South Africa (Badaru & Adu, 2022). UNISA transitioned from using Sakai to Moodle. The decision was to facilitate the acquisition of digital skills by students and demonstrate confidence in the use of electronic media after graduation. The use of Moodle LMS allows lecturers to upload course materials for students to access and make downloads at their convenience (Badaru & Adu, 2022). Makhaga's findings corroborate this point of usefulness revealing that lecturers develop learning contents and notes by using PowerPoint slides, and audiovisual presentations and deliver all on the Moodle LMS for students to access and use for learning, assessments, and examinations (Makhaga, 2020).

ICT Policy at the University of South Africa (UNISA)

UNISA is a distance education university headquartered in Pretoria, South Africa. It was founded in 1873 as the University of the Cape of Good Hope and was later renamed the University of South Africa in 1916. UNISA is the oldest university in South Africa and one of the largest universities in the world, with over 300,000 students enrolled from over 130 countries. The university offers a wide range of undergraduate and postgraduate programmes in various fields.

As a distance learning higher education institution, UNISA's vision expresses its commitment to providing high-quality distance education to students across South Africa and beyond (UNISA, 2023). The university's vision is to be an African university in the service of humanity, providing leadership in distance education and promoting social justice and equality (UNISA, 2023). To achieve this vision, UNISA's mission is to provide accessible, affordable, and relevant education that meets the needs of its diverse student population (UNISA, 2023). The university aims to develop graduates who are critical thinkers, problem solvers, and responsible global citizens, with the skills and knowledge necessary to contribute to the development of South Africa and the world (UNISA, 2023).

Moreover, UNISA claims commitment to promoting diversity, inclusivity, and social responsibility, and strives to create a welcoming and supportive environment for all students and staff (UNISA, 2023). The university values integrity, excellence, and innovation, which, it asserts, guides its operations and decision-making, and underpins its commitment to academic and research excellence (UNISA, 2023).

Seven documents were identified on UNISA's website for analysis of the ICT policy (Phakeng, 2015; UNISA 2016, 2017, 2018, 2019, 2020, 2021). The documents' focus is not ICT or ICT policy as such; no such document could be located. However, the documents are focused on communicating the institution's strategy.

Already identifiable in the title of five of the documents representing UNISA is the term *innovation*. The strategy of UNISA is avidly focused on *research and innovation*. One of the mechanisms adding support to the strategy is a Knowledge for Innovation (K4i) research unit that was operating with a budget of R11.6 million between 2019 and 2022 (UNISA, 2019).

> The K4i mandate is to conduct an environmental scan and a baseline study of the level of digital skills in South Africa, looking at the individual, organisational/company and government levels. In addition, the project team must host digital skills events for academics, the government and digital skills practitioners.
>
> (UNISA, 2019, p. 17)

The K4i research unit is, however, not mentioned in the 2020 and 2021 reports.

Technology is a salient feature of the UNISA documents analysed. Technology is, for example, regarded as a mechanism to enhance learning (UNISA, 2017). UNISA also houses a South African Research Chair in (SARCHi) Law, Society, and Technology and an Institute for Science and Technology Education (ISTE) (UNISA, 2019). Mathematics, life sciences, physics, chemistry, and ICT are the five main research focus areas of the ISTE (UNISA, 2019).

UNISA's Open Distance Learning (ODL) policy aims to "position UNISA as a leading provider of higher education opportunities through open distance

learning (ODL) nationally, on the African continent and internationally" (UNISA, 2016, p. 1). The ODL policy has a section dedicated to the appropriate management, administration, and ICT systems (UNISA, 2016). "UNISA will rely on well-defined processes, procedures and robust organisational systems supported by ICT" (UNISA, 2016, p. 8). ICTs are considered to be part of the enabling environment to support ODL (UNISA, 2016).

UNISA's ICT policy outlines the acceptable use of technology on campus (UNISA, 2016). The documents thus emphasize the importance of responsible use of technology resources and digital citizenship on campus. UNISA has an online platform, MyUNISA, which enables online learning (UNISA, 2016). In 2018, UNISA reported that the library had enhanced its ability to provide research support via technology (UNISA, 2018).

Infrastructure is recognized as the basis for enabling the use of technology and innovation (UNISA, 2016). UNISA has thus committed to constantly reviewing and developing governance and management of technological infrastructure (UNISA, 2016).

ICT Policy at the Tshwane University of Technology (TU)

The Tshwane University of Technology (TUT) is a public university of technology located in Pretoria, South Africa. It was established in 2004, when the former Technikon Northern Gauteng, Technikon North-West and Technikon Pretoria merged. The university offers a wide range of undergraduate and postgraduate programmes in various fields.

The vision of the Tshwane University of Technology (TUT) commits the institution to providing high-quality education and research that contributes to the development of South Africa and the African continent (TUT, 2019). The university's vision is to be a leading institution of higher learning that produces graduates who are innovative, socially responsible, and technologically proficient (TUT, 2019).

To achieve this vision, TUT's mission is to provide relevant, cutting-edge education and research that meets the needs of its students and the broader community (TUT, 2019). The university aims to develop graduates who are critical thinkers and problem solvers, with the skills and knowledge necessary to address societal challenges and contribute to economic and social development (TUT, 2019).

Moreover, TUT avers a commitment to promoting diversity, equity, and inclusivity, and strives to create a welcoming and supportive environment for all students and staff (TUT, 2019). The university values excellence, integrity, and accountability, which, it claims guides its decision-making and operations, and underpins its commitment to academic and research excellence (TUT, 2019).

TUT is dedicated to providing a transformative education that prepares students for success and leadership in a rapidly changing world, while also contributing to the growth and development of South Africa and the African continent (TUT, 2019).

Four documents were identified on TUT's website for analysis of the ICT policy (TUT, 2017, 2018, 2019, p. 2020). The documents' focus is not ICT or ICT policy as such; no such document could be located. However, the documents are focused on communicating the institution's strategy.

Already identifiable in the title of two of the four documents analysed is the term *innovation*. The strategy of TUT is avidly focused on *research, innovation, and engagement*. Further explicated, the 2020 Annual report states that the strategic goals include being 'responsive to societal and environmental needs through impactful research, innovation and technology transfer' (TUT, 2020, 52).

Institutional support for research and innovation is activated via dedicated funding as well as a focused directorate (TUT, 2020). TUT (2018) also contends that, as a new-generation university, how research and innovation intersect with teaching and learning should be considered deeply. "The innovation office resides under the leadership of the research Director and is responsible for technology transfer, patents, innovation activities and commercialisation" (TUT, 2018, p. 8). TUT (2019, p. 3) adopted a decolonial position with learning being "a continuum of creation, innovation and technology transfer to serve the aspirations of our communities".

Technology is a defining feature of the TUT documents analysed, not least because "technology" is part of the name of the institution. In particular, TUT (2018, 2019, p. 2020) uses the term "technology transfer", which is expounded as "including development projects and other forms of innovation, commercialization, prototypes, evaluation and other externally commissioned contracts, etc." (TUT, 2018, p. 5). Technology transfer appears to mean that the institution applies its expertise as widely as possible. This interpretation might not exactly be what TUT intends though. In another example, TUT (2019, p. 11) claims that

> Our digital transformation will create strategies to reach a larger and more diverse community of learners, catalyse ground-breaking research capabilities and technology transfer, as well as employ new business models to improve our services.

Digitalization is considered crucial to both technology transfer as well as enhancing experiences of student learning (TUT, 2019).

ICT Policy at the University of Johannesburg (UJ)

The University of Johannesburg (UJ) is a public university located in Johannesburg, South Africa. It was established in 2005, as a result of a merger between Rand Afrikaans University (RAU), Technikon Witwatersrand (TWR), and parts of Vista University. With the merger, UJ became the largest comprehensive university in South Africa, offering a wide range of undergraduate and postgraduate programmes in various fields.

UJ's vision is to be a premier African university, recognized internationally for its quality, relevance, and impact (UJ, 2023). The university aims to provide students with a transformative education that prepares them for leadership and service in diverse and dynamic contexts (UJ, 2023).

The university's mission is to produce graduates who are innovative, creative, and critical thinkers, with the skills and knowledge necessary to contribute to the development of South Africa and the continent (UJ, 2023). The university claims commitment to excellence in research, teaching, and community engagement, and strives to build partnerships and collaborations that address societal challenges and create opportunities for growth and development (UJ, 2023). UJ furthermore avows dedication to providing a world-class education to its students, while also contributing to the social, economic, and cultural development of South Africa and the broader African continent (UJ, 2023).

Seven documents were identified on UJ's website for analysis of the ICT policy (UJ, 2009, 2011, 2016, 2017, 2020, 2021; Sibanda, 2019). The documents at UJ have a more specific focus on ICT and ICT policy. The policy framework regarding ICT at UJ is thus more publicly accessible, suggesting the ICT policy at UJ might be more developed and sophisticated.

While innovation is not absent from UJ's documents, it is not as overtly expressed in the titles of the selected documents. This could be explained by the fact that documents analysed for UNISA and TUT are strategic plans and reports thereof while UJ's documents are focused on ICTs and their application for learning. The documents do point to the ICS (Information Communication Services) partnering with the Research and Innovation Division of the institution (UJ, 2021).

In addition, the more strategic document that was analysed, UJ's (2011) quality improvement plan, makes reference to innovation. According to UJ (2011), the higher education qualification council (HEQC) recommended that UJ develop and implement an innovation strategy to bring it in line with legislative requirements. In addition, the institution envisions undergraduate students who are innovative and "active participants in technology innovation" (UJ, 2011, p. 93).

The ICS report however acknowledges that soaring innovation has to be balanced with operational activities due to constant technological change (Sibanda, 2019). These bring about the presence of specific threats such as cybersecurity, for which UJ has developed a roadmap to improve security in this regard (Sibanda, 2019).

Innovation at UJ is also tied to teaching and learning activities as well as the quality and credibility of academic programmes (UJ, 2017). UJ's online policy has been in place since 2016, linked to its mission to inspire "its community to transform and serve humanity through innovation and the collaborative pursuit of knowledge" (UJ, 2016, p. 5).

UJ's documents are more explicit about how technology and specifically ICTs are developed and implemented in the institution. For example, UJ

reports having an IT Steering Committee that operates strategically to guide and effectively manage ICT within the institution (UJ, 2021). UJ moreover reports developing the skills of those who are to implement ICT systems as well as specific platforms such as Microsoft DevOps (UJ, 2021). By at least 2011, UJ had an ICT task team that was intent on ensuring ICT services were provided across all campuses (UJ, 2011). Technology-driven programmes were also associated with online learning (UJ, 2016).

ICS reports responsibility for ensuring that infrastructure and systems are geared towards digital transformation (Sibanda, 2019; UJ, 2020). Online learning has moreover been supported by the Blackboard learning platform (UJ, 2016).

Based on the review of policy in the public domain at three institutions, there is, amongst institutional policies, will for ICT development and support, like in national and higher education policy demonstrable. In particular, the concept of innovation was present in the strategic objectives or vision of all three institutions. The concept of digital transformation was also a theme for both TUT and UJ. Moreover, the call to avoid perpetuating the digital divide in the NDP is visibly articulated in the visions of all institutions of social justice (UNISA), socially responsible (TUT), and transformative education (UJ).

For TUT and UNISA, the policies identified were mainly at the strategic institutional level. UNISA has a policy specifically focused on open distance learning (ODL) that features ICT and technology. Although the policy has a specific focus, it is a strategic rather than an operational document. UJ also has an online learning policy. Although a policy dedicated to online learning could not be located for TUT, the strategic documents refer to learning and technology as being commensurate. The policies of all institutions have elements of coordination and leadership; be it appropriate management of ICT systems (UNISA), dedicated directorate (TUT), or ICT task team (UJ). Operationally driven policies could only be found at UJ. ICT policies were, however, not explicit about how infrastructure limitations of students beyond campus walls could be addressed. Evidence from the policy documents suggests that all three institutions are motivated to engage in ICTs. In addition, the policies point to institutional commitment to foster and support ICT development, particularly with regard to teaching and learning.

Conclusion and Implications

This chapter considered the extent to which ICT policies, at national and institutional levels, might allow for ICT practices to emerge at different institutions. In other words, what can we infer from policies about the readiness of the HE sector in South Africa to engage in ICT-related practices? The analysis of policy documents and reports illustrates that ICT is engaged within both the national and institutional policy domains. The institutional analysis

suggests that concerning vision and aspiration institutions did not have vastly different articulations to the extent that innovation and technological innovation specifically were promoted and encouraged. The commitment to innovation showcases that political will or will to foster environments that are ICT-friendly and promoting. UJ was, however, the only institution with a sophisticated and detailed suite of policy and reporting documents that could be accessed publicly. It would be interesting to explore if the presence of a detailed operationally orientated policy provides for more fertile grounds for implementation and resourcing for more opportunities.

The need for ICT policy to facilitate and guide how ICTs are expected to impact T&L as digitalization in society has increased and will not likely decrease as technology constantly transforms and innovates. Given the recent emergence of artificial intelligence and machine learning applications generating additional disruptions in how information is being synthesized and increasing how it could impact T&L, specific policies focused on ICT and learning at HEIs are more imperative than ever before. It is thus recommended that HEIs, the CHE, and DHET should proactively review ICT policies as well as resource and pedagogic strategies related to how T&L might be either supported or disrupted and its impact on either promoting or hindering inequalities. In addition, the policy review process should include broad-based (internal and external) stakeholder participation to mitigate against reproducing insular practices.

Notes

1 Who governs SA's HEI sector.
2 Although this is sometimes overestimated "at the expense of dimensions that relate to the development of human resource capacity and to the production, exchange and dissemination of information-content issues, including pedagogical issues" (Cross & Adam, 2007, p. 92).
3 "Provide a clear statement of principles … express values in relation to overall intentions and goals ... ensuring that the required human resource development could take place in a coordinated way and in a manner that is appropriate and responsive to local conditions... play a role in an accreditation system for the emerging career paths of people working in this field" (Czerniewicz et al., 2006, p. 21).
4 "Spawn additional regulations which change-weary academics and managers could be resistant to even if the intentions were sound... problem of resourcing" (Czerniewicz et al., 2006, p. 21). SA's higher education qualification council (HEQC) also promises that HEIs will grant self-evaluation status to institutions that prove that they have efficient quality management systems in place (CHE, 2004, p. 22).
5 Except its sub-section 1.13, where it states a need "to meet the needs of an increasingly technologically-oriented economy".
6 Also, policy for the provision of distance education in South African universities in the context of an integrated post-school system (2014).

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Chapter 5

ICT Readiness, Implementation, and Trajectory in Higher Education in Rwanda

Innocent Twagilimana and Irénée Ndayambaje

Introduction

Higher education is widely regarded as crucial for socio-economic development, political sustainability, and global knowledge societies (Materu, 2007; Wang et al., 2021). Access to higher education is seen as impacting social values and individual quality of life (Florea & Horvat, 2009; Ozturk & Kılıc, 2019). The successful completion of quality higher education is associated with positive returns at individual and societal levels (Glass, 2013; Patrinos & Psacharopoulos, 2020). In the African context, higher education is valued for its role in contributing to the continent's participation in the global knowledge economy (Heleta & Bagus, 2021). Despite improvements in access, barriers such as performance-based filtering and financial constraints persist on the continent. To address these challenges, international organizations advocate for the use of information and communication technology (ICT) to enhance education, emphasizing its potential to increase access, improve quality, and foster innovation and collaboration in educational provision (United Nations, 2005; World Bank, 2003). ICT is recognized as a cognitive tool supporting constructivist teaching and learning (Ertmer & Ottenbreit-Leftwich, 2012).

This chapter is result of a desk review of various sources of information. It aims to examine the level of readiness for change in terms of ICT integration in Rwandan higher education, focusing specifically on the existing opportunities, capabilities, and other factors such as attitudes, motivation, or commitment. Additionally, the chapter assesses the progress made by the country in achieving digital equity in the sector of higher education.

Higher Education Landscape in Rwanda

Rwanda, a landlocked country in East Africa, has made significant progress in rebuilding its higher education sector since the devastating genocide against the Tutsi in 1994. With a commitment to national development and

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socio-economic transformation, the Rwandan government has implemented various reforms in the higher education sector. These reforms are mainly designed to enhance access, quality, and relevance, leveraging information and communication technology (ICT) as a key enabler. This section provides an overview of the higher education landscape in Rwanda, emphasizing the role of ICT in driving changes.

Structure and Types of Institutions

The higher education system in Rwanda comprises universities, polytechnics, and vocational training institutions. The system follows the Bologna process, with undergraduate (bachelor), graduate (master), and doctoral (PhD) levels of education. The Rwandan higher education system is structured and regulated by the Ministry of Education through the Higher Education Council (HEC, 2007). The latter is the main regulatory body responsible for coordinating and overseeing higher education institutions in the country. It regulates the establishment and accreditation of universities and ensures quality standards.

Concerning the types of institutions, Rwanda has a mix of public and private higher education institutions. As reported by the official website of the Rwandan Higher Education Council (January 2024), three public higher learning institutions are currently in place. They are comprised of the University of Rwanda (UR), the Rwanda Polytechnic (RP), and the Institute of Legal Practice and Development (ILPD). The same website reports the existence of 31 private higher learning institutions in the country. They include 19 national private institutions and 12 international institutions. The latter include African Leadership University (ALU), Adventist University of Central Africa (AUCA), Carnegie Mellon University Africa (CMUA), University of Global Health Equity (UGHE), Oklahoma Christian University (OCU), Akilah Institute for Women, etc. Based on the statistics from the Rwandan Ministry of Education (Republic of Rwanda, 2023), 46% of the national higher education student population is enrolled in private institutions, and 55.4% in public institutions.

The University of Rwanda is by far the largest institution in terms of student population. Out of 95,863 students who were enrolled in higher education in Rwanda for the academic year 2021–2022, 31,506 were from the University of Rwanda. This was 32.8% of the total national student population, which was also 73.6% of the public higher education student population.[1] The University of Rwanda was established in 2013 through the merger of several existing public institutions "to create a unified and more efficient higher education system in the country" (University of Rwanda, 2020). The University of Rwanda encompasses a wide range of disciplines and has multiple campuses across the country.

Recent Reform Initiatives Undertaken in Rwandan Higher Education

In recent years, Rwanda has embarked on a series of reform initiatives in its education system. These initiatives were motivated by the intention to develop a skilled workforce based on criteria such as quality, accessibility, and relevance of the national education system (Republic of Rwanda, 2013). In higher education, key reforms include the following:

- *Expansion of Access*: Rwanda has actively worked towards increasing access to higher education, both in terms of enrolment numbers and geographical coverage. Key initiatives under this component have focused on building new institutions (e.g. University of Rwanda, Rwanda Polytechnic), expanding existing ones, and promoting inclusiveness by introducing equality and diversity policy for higher education (Republic of Rwanda, 2007).
- *Curriculum Development and Quality Assurance*: The Rwandan government has implemented curriculum reforms to align higher education programmes with the needs of the job market. Quality assurance mechanisms, including accreditation and continuous evaluation, have been introduced since 1997, with the creation of the national Higher Education Council (HEC), to ensure that institutions maintain high academic standards.
- Research *and Innovation*: To promote research and innovation, Rwanda has invested in research infrastructure including the creation of e-libraries, established research centres like the National Council for Science and Technology (NCST, 2021), and fostered collaboration between academia and industry (Republic of Rwanda, 2021). This approach aims to create a conducive environment for the generation of knowledge and the use of research findings to address real-world challenges.

Another set of Rwanda's HE reform is related to ICT Integration to enhance teaching, learning, and administrative processes. For example, e-learning platforms (e.g. MOODLE, Canvas online learning platform, Google classes) have been promoted to allow institutions to offer a diverse range of courses and reach a broader student base. These platforms facilitate flexible learning schedules and provide opportunities for remote education, making higher education more accessible. Investments in digital libraries and online resources have also augmented the availability of educational materials, facilitating a culture of self-directed learning and research.

Some higher education institutions in Rwanda have embraced smart campus initiatives, incorporating technologies like smart classrooms, interactive whiteboards, and campus-wide Wi-Fi (Republic of Rwanda, 2020). These initiatives enhance the overall learning experience and contribute to the development of digital skills among students. ICT has also been used to

streamline administrative processes, from admissions to grading systems. This not only reduces paperwork but also enhances the efficiency of educational institutions, allowing them to focus more on academic and research endeavours (Byungura, 2019).

Scholarship of Integration of ICTs in Higher Education in Rwanda

A few scholars have examined ICT integration in higher education in Rwanda during specific time phases. For example, Ruhinda (2013) analysed the early stages of ICT integration in Rwandan higher education. Twagilimana and Mannikko-Barbutiu (2017) looked into the status of policy goals and visions, while Uwizeyimana (2019) explored specifically the COVID-19 period. One common theme is a compliment of the government's commitment, particularly through ICT infrastructure. Murenzi (2006), for example, compliments the commitment of the country to provide a conducive environment for ICT-enabled learning through the establishment of the Rwanda Education and Research Network (RERN) and the integration of Wi-Fi connectivity in universities. Karekezi et al. (2023) discuss Rwanda's commitment to integrating ICTs into higher education through its well-defined policy frameworks. Reference is made to the National Information and Communication Infrastructure (NICI) plans, notably NICI-1 (2000–2005) and NICI-2 (2006–2010), which laid the groundwork for ICT development across various sectors in the country. In one of her various contributions to UNESCO publications on ICT in education policies, Isaacs (2011) offers an in-depth examination of Rwanda's ICT in education initiatives, including higher education. Isaacs highlights the government's commitment to leveraging ICTs to bridge educational disparities and enhance the overall quality of higher education. She notes that Rwanda's proactive approach to incorporating ICTs in higher education reflects a concerted effort to address the country's socio-economic challenges through innovative educational practices.

A number of scholars have also explored the challenges faced. Ruhinda's work (2013) on the establishment of ICT infrastructure such as internet connectivity and computer labs also explored initial early efforts and challenges faced by institutions in adopting and effectively utilizing these technologies. Byungura et al. (2016) analysed the challenges encountered in the process of capacitation of higher education faculty members who must be prepared to harness the potential of ICTs to enhance learning. This was in reference to a series of training initiatives undertaken in Rwanda, often in collaboration with international partners, to up-skill educators of all levels regarding the use of ICTs in their day-to-day duties (Republic of Rwanda, 2017). Exploring the status of ICT policy goals and visions in Rwanda, the existing implementation strategies and plans, as well as challenges of ICT adoption in different levels of education in Rwanda,

Twagilimana and Mannikko-Barbutiu (2017) similarly note: "Despite the progress made in integrating ICTs in Rwandan higher education and capacity building, challenges such as inadequate infrastructure, absence of a culture around the use of ICT, limited availability of digital content, and lack of expertise in project coordination persist" (p. 8), hindering the full realization of the intended benefits. A case study by Uwizeyimana (2019) explored the response to COVID-19 by the University of Rwanda. The author analysed the university's news articles and official communications around the COVID-19 lockdown period. The findings revealed that the university was not indeed prepared to continue its teaching and learning activities remotely online, and that the decision to go online was top-down. Furthermore, it pointed out the lack of access to the required infrastructure and tools, the lack of technical support and training, and the digital divide that exists among students, as the major challenges to a successful remote online teaching and learning process.

Strategic Policies and Operational Plans for ICT Integration in Higher Education Institutions in Rwanda

The Rwandan government's role in ICT integration in the higher education sector is fundamental. This section explores the government's policies and plans more in detail. In Rwanda, national ICT efforts are reflected in various strategic policy documents that formulate clear visions and policy goals concerning the use of ICT in different areas of life, including education. These documents include (i) *Rwanda Vision 2020;* (ii) *Policy on Science, Technology and Innovation;* (iii) *Economic Development and Poverty Reduction Strategy* I & II; (iv) *National Strategy for Transformation I;* (v) *ICT in Education Policy*; etc. In the *Rwanda Vision 2020* document, an explicit emphasis vis à vis ICT in education is on "improvement of ICT infrastructure" (Republic of Rwanda, 2012). The *Policy on Science, Technology and Innovation* aims at "promoting publications, studies, investigations and reports in the ICT sector" (Ministry of Science, Technology and Scientific Research, 2006). The *Economic Development and Poverty Reduction Strategy II* points to the necessity of "connecting all schools, availing technical support, training teachers in basic ICT skills, and initiating ICT professional certification courses" (Minecofin, 2013). In the *National Strategy for Transformation (NST1)*, which is more recent, an emphasis is on the commitment of the Rwandan government to "increase the use of ICT in teaching and learning through scaling up SMART classrooms and ICT devices as well as the implementation of the new competence-based curriculum" (Republic of Rwanda, 2017: 31). Concerning the *ICT in Education Policy* document, it reflects a series of aspirations that include development of a relevant ICT professional base; increasing ICT penetration and usage; development of education leadership and teachers' capacity through ICT; and using ICT

to enhance teaching, learning, and research in higher learning institutions (Ministry of Education, 2016).

In parallel with the mentioned strategic policies, a series of programmes, plans, and projects meant to operationalize the existing strategic policies have been developed. They are reflected in documents such as (i) National Information and Communication Infrastructure (NICI) Plans; (ii) SMART Rwanda Master Plans; (iii) The Master Plan for ICT in Education; (iv) University of Rwanda ICT Policy and Master Plan, Phase 1; etc. These operational policy documents comprise plans and programmes for real implementation of what is proposed in the national strategic policies. In general, they provide a framework for the deployment of infrastructure, development of a skilled human resource base (including both the technical staff who handle operations, and the ICT staff responsible for the engineering back-end operations), creating conditions for pedagogical and curricular change, etc.

The above frameworks and mechanisms are part of a process undertaken by Rwanda to create an enabling environment for ICT development. In 1998, the Rwandan ICT for Development policy, commonly known as NICI, was adopted to implement policies and plans that would address Rwanda's developmental challenges in the information and technology age, to accelerate the country's socio-economic development (Republic of Rwanda, 2015). In 2000, the government of Rwanda began implementing the ICT for Development policy, and subsequently developed and implemented NICI I (NICI-2005 Plan), the first of the four/five-year rolling plans. The NICI process, which coincides with the mentioned Vision 2020, began with the first of four/five-year rolling plans, NICI I (NICI-2005 Plan), that focused on establishing the appropriate institutional, legal and regulatory framework, liberalization of the telecoms market, and reduction of entry barriers to the telecom market as well as an effective implementation and coordination mechanism (Republic of Rwanda, 2015).

Regarding higher education in Rwanda, the mentioned national strategic policies are matched by specific operational programmes and plans spelling out the intended processes, projects, resources, etc. For example, the National Information and Communication Infrastructure (NICI) plans comprise projects that tackle issues related to access to ICT infrastructure and equipment, capacity building, technical support, etc. for this level of education in the country. NICI 1 (NICI-2005 Plan) was aimed at creating the necessary conducive environment that would enable the establishment and growth of Rwanda's ICT sector, while NICI II (NICI-2010 Plan) was aimed at providing world-class communications infrastructure as a backbone for current and future communication requirements (Republic of Rwanda, 2015). In both NICI I and NICI II, effective deployment of ICT in Education was one of the key pillars. Thus, the higher education level was concerned though sometimes at a bit broader degree.

However, with NICI III and NICI IV, which were generally aimed at addressing the deficiencies demonstrated in the previous NICI plans, a strong institutional framework was created to support practical implementation to achieve tangible and measurable outcomes (Republic of Rwanda, 2015, p. 68). NICI III, for example, accomplished, among other actions, establishment of basic infrastructure through ICT adoption for educational institutions (Ministry of Youth and ICT, 2016, p. 55). NICI III also set out a skills development plan through six main projects (Mukama, 2014), which ultimately are linked to the mission of higher education. These projects are:

- ICT Professional certification programmes: developing a competent and relevant ICT professional base;
- SchoolNet: increasing the penetration and usage of ICT in 9- and 12-year basic education;
- ICT training for teachers: developing teacher capabilities in and through ICT;
- Rwanda Education and Research Network (RwEdNet): enhancing teaching, learning, and research through ICT in higher education;
- Open, distance and e-learning (ODeL): increasing access to education;
- Digital library: increasing access to scientific publications for educational institutions and the general public.

Overall, the NICI plans' results for higher education mainly include the establishment of a connection between educational institutions of Rwanda and a global research/education network (Ministry of Youth and ICT, 2016). Other expected accomplishments like the promising idea of a digital library, access to digitized information (for students, teachers, and schools), and the creation of ICT professional education and qualification programmes can also be mentioned. Opportunities related to the availability of improved educational content, curriculum, and systems could also be expected.

SMART Rwanda Master Plan is also part of the mentioned operational policy documents. One of this plan's principles is to "[leverage] powerful ICT innovations such as open data, big data analytics, cloud computing, and mobile apps to transform society into a smart society" (Ministry of Youth and ICT, 2016, p. 23). The plan upholds the application and utilization of ICT investment "through higher education and training to develop skills and improve capabilities for innovation and higher productivity" (p. 23). SMART Rwanda Master Plan suggests enhancing connectivity to improve education quality by enabling the delivery of digital content for instruction, irrespective of their location. The authors of the document consider that strong connectivity will also facilitate the relationship between institutions.

The *Master Plan for ICT in Education* (Republic of Rwanda, 2020) is another operational document that tackles the issue of ICT in higher education

in Rwanda. In line with the projects proposed in NICI plans, the Master Plan for ICT in Education suggests that, because the level of enrolment is still very low in higher education in Rwanda, "technology to support Open, Distance and e-learning can play a critical role to train teachers, up-skill existing unqualified teachers and increase access to tertiary education" (p. 10). As suggested by the Master Plan for ICT in Education document, "deep integration of ICT within the higher education and technical & vocational sector" is necessary "to improve access, increase quality and relevance and drive research and innovation" (Republic of Rwanda, 2020, p. 58).

The Master Plan for ICT in Education document deals not only with the issues related to the infrastructure and equipment, but also the curriculum content and professional development of staff. According to the plan, "effective ICT integration at Technical and Vocational Education and Training (TVET) and higher education will require that all students and lecturers (…) be equipped or facilitated to acquire a personal computing device in line with global best practice" (Republic of Rwanda, 2020, p. 60). As put by the plan, the student and lecturer computing devices must, among other functions, help them to create teaching and learning content. The plan specifies that "every student will be required and facilitated to acquire their own computer with a guarantee scheme" while the "lecturers will be provided with the university-owned computers and that the Higher Education Council will deliver a mandatory e-Learning course to all lecturers" (Republic of Rwanda, 2020, p. 1). Referring to the issue of ICT and curriculum content, the Master Plan for ICT in Education document states that "technology in Education enables the development of 21st-century skills critically needed by the graduates which include critical thinking, problem-solving, communication, collaboration, visualisation, etc." (p. 1).

Apart from what is indicated in the above-presented programmes and plans, specific plans for integrating ICT in the process of teaching and learning in higher education in Rwanda can be found in particular institutional plans. This is the case for the University of Rwanda ICT policy and Master Plan, phase 1 or the University of Rwanda Information and Communication Technology (ICT) policy. The *University of Rwanda Master Plan* has been developed to "provide the guiding framework for implementation of ICT services and systems" (University of Rwanda, 2017, p. 1). As is the case for some other documents described above, the University of Rwanda Master Plan has more focus on modalities of deployment of relevant infrastructure and equipment and establishment of technical staff. The issues related to the academic dimension are covered by just one of the plan's objectives on: "Ensuring that all staff and students have the requisite skills for the full exploitation of ICT services and systems as demanded by their functions through continuing training intervention" (University of Rwanda, 2017, p. 3). Concerning the actual field situation and practices, initiatives have been taken as demonstrated in the lines below.

The Implementation of Policy and Plans in Higher Education in Rwanda

To implement the mentioned strategic policies and operational plans in higher education in Rwanda, practice-oriented initiatives have been taken. One of the noticeable steps is the fact that the blended mode combining face-to-face and e-learning has been adopted as the official mode of teaching delivery in higher learning institutions in Rwanda (Republic of Rwanda, 2020). As such, the adopted official mode of delivery in higher education in Rwanda constitutes a positive move for the expected pedagogical and curriculum change if the integration of ICT in the process of teaching and learning at this level of education is to be concretized. For more details on the status of e-learning in higher education in Rwanda, the existing national ODeL policy, strategic plan, and implementation frameworks can be consulted.

The actual implementation of the plans in the Rwandan higher learning institutions has included the availability of computer laboratories that are furnished with desktops, internet connectivity, and software (Mushimiyimana et al., 2022). These laboratories provide academic staff and students with access to teaching and learning resources. At the University of Rwanda, which is the largest public higher learning institution in Rwanda, with six colleges scattered across the country, campus-wide Wi-Fi networks are available. They enable access to education resources using personal devices for both staff and students. The networks contribute to the process of teaching and learning on campuses but also enhance collaboration beyond the campus level (Gahima et al., 2022). Colleges from the University of Rwanda have acquired smart classrooms[2] and multimedia studios that are currently in use in the day-to-day teaching activities in some colleges like the College of Education and the College of Business and Economics.

With regard to the development of digital content and online learning, the above-mentioned Master Plan for ICT in Education notes that "the Ministry of Education will work with universities to deploy a standard identity and access management system" which will "manage users, their authentication, authorisation and privileges across all clouds, on-campus and NREN[3] resources" (Republic of Rwanda, 2020, p. 61). The plan specifies that the envisioned content is to be categorized into three forms with specific strategies for each category: (i) foundational skills content; (ii) supplemental content for self-directed informal learning; and (iii) formal certificate and degree course content.

As indicated in the plan, *foundation skills content* is focused on building basic skills ranging from ICT skills, language skills (English and French), basic mathematics, financing literacy, entrepreneurship, and writing and communications skills among others (Republic of Rwanda, 2020, p. 61). The plan specifies that this content will be developed by local universities and the Workforce Development Authority (WDA) and offered online only. For foundational

skills content, the Master Plan for ICT in Education proposes the exploitation of several online Open Education Resources (OER), such as MIT's Open Course Ware or Khan Academy and Massive Open Online Courses available to anybody. The plan notes that the Ministry of Education will work with the universities to develop repositories for OER content and promote MOOCS for students to access supplementary content for their own self-directed or informal learning. Regarding *formal certificate and degree course content*, the Master Plan for ICT in Education plan reminds that lecturers will be trained to convert their existing formal courses into online and open formats. At least 50% of all the credit courses were set as the target for offering to students in online mode within the time frame of the plan.[4]

Regarding the actual implementation of the Master Plan for ICT in Education in higher learning institutions in Rwanda in terms of the creation of digital content and establishment of online learning, the pace does not seem to be as expected, but opportunities were created especially during COVID-19 pandemic. At the University of Rwanda (UR), for example, it is worth reminding that an official e-learning platform or learning management system, Moodle, was in place even before the COVID-19 pandemic as it was initiated in 2015, thanks to the support of the instructional sub-programme of a bilateral research cooperation between Rwanda and Sweden. As announced on UR's official website by the staff in charge of media and marketing, the platform is currently hosting about "95% of all the university of Rwanda teaching modules with an average of 83k visits per day" (UR official website).

Indeed, the existing e-learning platforms in Rwandan higher learning institutions gave rise to online courses,[5] virtual classrooms, and delivery of educational resources as part of the process to enhance flexibility in learning where students are allowed to engage with their studies from anywhere and anytime, thanks to the exploitation of platforms like SmartClass and Moodle (Phoong et al., 2019). Higher learning institutions in Rwanda also provide students with increased access to digital libraries and online research databases (Korukire et al., 2018).

Challenges in Implementing Policies and Plans

Given what has been discussed in the present chapter, a lot has been done in Rwandan higher learning institutions in line with the national strategic and operational policies. A good effort has been made on infrastructure; a certain level of equipment has been achieved, including the availability of computer laboratories, campus-wide Wi-Fi networks on campuses, the creation of smart classrooms, and multimedia studios in some higher learning institutions; technical support has been prepared in terms of making sure the ICT services and systems in place have competent staff to support and maintain

them. We have also noted the enacted initiatives regarding pedagogical and curriculum change with the adoption of a blended mode as the official mode of teaching and learning delivery. This was coupled with an adoption of a national ODeL policy, currently under review. However, the success of the implementation of the existing policies and plans appears to face hindrances, including those related to what Uwizeyimana (2019) described as the digital divide. Referring to UR students' readiness to effectively participate in remote online learning, Uwizeyimana notes that "the majority of the UR undergraduate students are from poor households in rural areas, with no training and access to the necessary infrastructure for participating in remote online learning, and thus were not able to provide their feedback [on their e-learning platform-based learning during the COVID-19 pandemic]" (p. 102). The author specifies some of the involved hindrances, including lack of access to a computer, availability of remote online teaching and learning software, skills related to remote online course delivery, etc.

The findings by Uwizeyimana corroborate what was observed by UNESCO (quoted by Twagilimana & Mannikko-Barbutiu, 2017) in reference to the challenges faced by the Rwandan education system regarding effective implementation of the existing ICT in education policies and plans. The issues mentioned by UNESCO included the following: limited availability of digital learning material, lack of expertise in project management and poor coordination of existing initiatives, technical support, etc. The problem of insufficient expertise has been emphasized by UNESCO as follows: "Despite remarkable progress that has been made in higher education and capacity-building, evaluations of programmes still emphasize that capacity constraints are one of the most critical obstacles to programme implementation in the country" (p. 9).

Regarding content development, a noticeable step was made when we considered where the Rwandan education system was coming from. The situation experienced during the COVID-19 pandemic served as a spur for the quick adoption of a remote online teaching and learning mode. As indicated by the University of Rwanda in the document entitled *Letter to UR students [on] ongoing arrangements for learning […]* (quoted by Uwizeyimana, 2019), the university was "[…] able to register some successes in terms of virtual teaching in postgraduate fields, [and] some modules have been successfully taught and assessed online and even in viva voce exams […] by videoconference" (p. 102). However, as observed by Uwizeyimana (2019), the university did not publish any information with regard to the achieved learning outcomes in its undergraduate programmes. Uwizeyimana notes that the absence of achievement data for undergraduate programmes was linked to the digital divide, not only a lack of access to technological devices and internet connectivity, but also a lack of enough training and technical support for students and teaching staff.

Besides the issue of digital divide or digital equity, findings from UNESCO (2011) indicate that having just a computer does not necessarily translate into meaningful learning outcomes. So, as stated by Twagilimana and Mannikko-Barbutiu (2017), ensuring "technical support and expertise that focus on changes in classroom practices that go beyond rote learning and foster deep understanding and, ultimately, knowledge creation and 21st-century skills are imperative" requirements if the use of ICT in education is also to enhance learning. Unfortunately, as proved by previous studies (Twagilimana & Mannikko-Barbutiu, 2017; Uwizeyimana, 2019), a great proportion of academic staff in the context of Rwanda's higher education still need to develop the capacity to take advantage of the tools available and the new teaching opportunities offered by ICT.

As suggested in some studies (Ertmer & Ottenbreit-Leftwich, 2012; Jonassen & Reeves, 1996; Moonen, 2008), incorporating technology into different subject areas requires prior adaptation or even change in the pedagogical and didactical approaches of those subject areas. In other words, the potential of ICT as a cognitive tool to enhance learning can only be effective when accompanied by a pedagogical and curricular transformation that ICT will come to support. This scenario appears however contrary to the experience we have of higher education in Rwanda where technology often seems to be given a primary role in the process of transformation of the system. This is probably the reason why, as indicated by the literature, the phase corresponding to the integration of ICT in different subject areas does not seem to play out successfully in Rwandan higher education as is the case in many other contexts (Valcke et al., 2007).

Further, besides the hindrances of limited access to available opportunities, and the mentioned capacity constraints, the use of a top-down approach when it comes to decision-making regarding the use of ICT to enhance learning at the university (Uwizeyimana, 2019) is not likely to foster motivation and commitment on the part of key stakeholders, mainly made of lecturers and students.

Conclusion

As shown throughout the review of different policy statements and strategic plans, the ICT sector in Rwanda has made considerable progress in policy and regulatory transformation by establishing a set of policy objectives and a trajectory leading to them. This process actually involved short- and long-term plans with a series of strategies and programmes designed to help the system move forward. The process also strove to align the established programmes and plans with the national social and economic development goals and built on the country's limited resources to establish a series of rolling ICT Master Plans meant to realize the intended impact of the policy on the beneficiaries.

The implementation plans of the national ICT in Education policy also provide modalities for improving the deployment of hardware in schools, ensuring professional capacities, and realizing relevant institutional changes. In such a perspective, plans for future policies are implicitly laid down with a strong emphasis on the necessity for "leveraging ICT in education".

The major challenge in this context remains to translate the emphasized technological leverage into improved classroom practices. Technical support and expertise that focus on changes in classroom practices that go beyond rote learning and foster deep understanding and, ultimately, knowledge creation and 21st-century skills (UNESCO, 2011) are imperative because, as often indicated by research, having just a computer does not necessarily translate into meaningful learning outcomes. Teachers still need to develop the capacity to take advantage of the tools available and the new teaching opportunities offered by ICT. As suggested in various studies reported by UNESCO (2011), despite significant investments in hardware, software, networking, and all efforts deployed to ensure technical competences, effective utilization of technologies in the classroom also depends on the motivation and active involvement of teachers.

However, despite the existence of strategic policies and related plans, ICT is not integrated as expected. Therefore, if a policy implementation that supports social and economic development is to be realized, there is a need to envisage teacher professional development on ICT based on strong curricular and pedagogical purposes. In other words, a shift in the typical approach to designing the operational policies related to ICT is to be envisaged. This one would help focus technology integration efforts on educational purposes that technology enables and supports, rather than on the technology itself (UNESCO, 2008), as this seems to be suggested in the case of Rwandan operational ICT policies.

Notes

1 This was calculated by the authors based on the statistics presented by the Rwandan Ministry of Education (Republic of Rwanda, 2023).
2 As opposed to traditional schools equipped with dedicated and separate computer laboratories, smart classrooms refer to networked classrooms that contain digital content and are used for every subject. In smart classrooms, "technology is brought inside every day classroom with the teacher using technology to teach every subject rather than students going to a dedicated lab or technology being used on an "ad-hoc" basis" (Ministry of Education, 2020, p. 13).
3 National Education and Research Network.
4 The plan was supposed to be implemented in phases starting in 2015 through 2020 (Ministry of Education, 2020, p. 10).
5 Some examples of online courses at the University of Rwanda (UR) are: (i) e-learning programme offered by the College of Education; (ii) Postgraduate virtual programmes hosted (sometimes punctually) by UR in collaboration with other higher learning institutions from abroad (example of the online programme offered by the

Amity University, India, in collaboration with the former Kigali Institute of Education, now UR-CE); (iii) e-learning programme hosted by the UR/College of Medicine and Health Sciences for nurses aiming at upgrading from associate nurses to registered nurses (Mukama, 2014).

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Chapter 6

Data-Driven Decision-Making through PowerHEDA

The Case for Multilevel Data Architecture in South African Higher Education Institutions

Neil Davies Evans and Ke Yu

Data-Driven/Informed Decision-Making

Data-driven or data-informed decision-making (DDDM or DID[1])—"the practice of basing decision on the analysis of data" (Provost & Fawcett, 2013, p. 53)—is not new. This practice in, for example benchmarking, cost-benefit analysis, time series, or group comparison, has been practiced for a long time (Isaacs, 2003). The renewed interest in DDDM, which peaked in recent decades, however, has made it "the operating concept of the day" (Mandinach et al., 2006, p. 3). In 2018, Intel Corporation's CEO Brian Kzanich called data the "new oil", uniting it with other branches of business intelligence and data science and ushering DDDM into a new era (Mandinach & Schildkamp, 2021). Besides the ever-rising demand and expectation for accountability (Cox et al., 2017) and, the emergency of an evidence-based culture (later evolved into evidence-informed and evidence-aware) that is often linked to performance management culture (Mandinach, 2012; Mandinach & Gummer, 2015; Mandinach & Schildkamp, 2021; Oburn, 2005; Spillane, 2012)—the main driver for its earlier use—the current interest is more of a result of the increasing pace of change and interrelatedness in the contemporary world. In addition, data, both in terms of scale and scope, has become more readily available in recent decades. So are available computer processing power and sophisticated analytic tools (Brynjolfsson & McElheran, 2016; Datnow & Hubbard, 2016; Hora et al., 2017; Liu et al., 2017; Mandinach et al., 2006; Provost & Fawcett, 2013; Webber & Zheng, 2020; Wise, 2018).

Theoretically rooted in organisational management, DDDM's potential benefits are indisputable (Hora et al., 2017; Webber & Zheng, 2020). As Van Schalkwyk et al. (2016) claim,

> governance that is not premised on informed decision-making has the potential to foster weak and fragmented institutions prone to corruption and/or the inappropriate allocation of resources.
>
> (p. 68)

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Who would be against the aim of improving performance, maximising customer value, realising greater competitive advantage, and greater operational efficiency through better prioritisation? Who would argue against rigour and objectivity over using only anecdotal, emotion, or pure intuition in decision-making (Hora et al., 2017)? Or minimising cost for successful adjustment in a dynamically changing landscape?

To assist DDDM, the field of business intelligence (BI) has evolved, particularly since the 1990s (Cardoso & Su, 2022; Mutanga, 2015; Mutanga & Kadyamatimba, 2017). The value of BI, widely recognised in various spheres of the economy (i.e. profit and non-profit), is now also embraced by all stakeholders, including funders (Mandinach & Gummer, 2015; Mandinach et al., 2011), policymakers and officials, and scholars (e.g. seen in dedicated discussions in edited volumes, special issues, edited books, focused books, and research syntheses, Mandinach, 2012; Mandinach & Gummer, 2015).

DDDM is generally used for two kinds of decisions: those related to discovering, identifying, or clarifying, and those related to acting (Marsh et al., 2006; Provost & Fawcett, 2013). In addition to these, DDDM also enables prediction, offering opportunities for proactive decisions instead of reactive ones. In the manufacturing sector in the United States of America (USA), the use of DDDM tripled between 2005 and 2010 (albeit with an uneven adoption, Brynjolfsson & McElheran, 2016).

Challenges of greater DDDM usage are also well documented: lack of common terminology, insufficient acceptance or perceived usefulness, accessibility, timeliness of the data or tools, inadequate capacity, support, culture, or leadership, and occasions of data fatigue (Hamilton et al., 2009; Hora et al., 2017; Ikemoto & Marsh, 2007; Mandinach & Gummer, 2015; Mandinach et al., 2006). In addition, scholars have also cautioned against the danger of "data rich but information poor" (Reinitz, 2015. Also see Teng et al., 2023), which recognises that data are always be translated into meaningful information or knowledge (Hora et al., 2017; Ikemoto & Marsh, 2007; Mandinach, 2012; Marsh et al., 2006; Provost & Fawcett, 2013; Spillane, 2012). Another issue in DDDM is data privacy and security (Gaftandzhieva et al., 2023).

Data-Driven Decision-Making in Education

Many of the observations about DDDM outlined above apply to education too. DDDM is not new to education (Mandinach, 2012; Marsh et al., 2006). Activities such as high-stakes test results used in enrolment or progression decisions, teachers' usage of assessment to determine levels of student learning and adjust teaching, or use of student performance in teacher appraisals and promotions, have existed for centuries. Reviewing history, Marsh et al. (2006) remind us of a surge in using outcome data in

school improvement planning in the 1970s and 1980s, the debates about measurement-driven instruction in the 1980s, as well as the "school system efforts to engage in strategic planning in the 1980s and 1990s" (p. 2). Similar to what happens in the broader sphere, DDDM in education has also witnessed a recent renewal, "modelled on successful practices from industry and manufacturing, which emphasises that organisational improvement is enhanced by responsiveness to various types of data" (Marsh et al., 2006, p. 2. Also see Mandinach et al., 2006). This topic has attracted particular attention in the USA after the passing of the No Child Left Behind Act (NCLB) in 2002 (Mandinach, 2012; Mandinach et al., 2006; Marsh et al., 2006), but this rising popularity isn't limited to the USA. Instead, it can be seen spread across the globe, encompassing most developed and developing countries (Datnow & Hubbard, 2016; Marsh et al., 2006).

Data in education is ample and includes both big and small data sets. It includes "instructional, administrative, financial, personnel, welfare, health, demographic, perceptual, behavioural, process and other kinds of data" (Mandinach, 2012, p. 71). As schools and HEIs often receive state funding related to student enrolment and graduation (Gaftandzhieva et al., 2023), there is usually mandatory data reporting on these aspects.

DDDM in HEIs emerges later and features less discussion than that for K–12 education (Cox et al., 2017; Hora et al., 2017). However, data collected in HE tends to be more comprehensive than those collected in the schooling sector, possibly due to its greater use of data sets from learning management systems (LMSs), which often store data on courses taken, marks obtained, attendance, etc. (Dunn et al., 2013). Besides LMSs, HEIs also often have more electronic systems, including student information systems, human resource systems, and scientific activity reporting systems, often accompanied by intuitive dashboards summarising information in descriptive statistics such as graphical charts and graphs (Gaftandzhieva et al., 2023). However, limited attention has been given to the role that information systems play in these settings (Hora et al., 2017, p. 396). Among colleges in the USA, analysts find only 16% of private universities and 19% of public universities believe that their universities use data effectively to inform their decisions (Jaschik & Lederman, 2019).

DDDM in education exhibits tendencies that align with the various characteristics of the multilevel change readiness this book examines. First, it is multilevel as DDDM is and should be applied at various levels: classroom, university, district, province, nation, and the world. "All of these levels might influence the nature of its process" (Ikemoto & Marsh, 2007, p. 110). It is also relevant to the various stakeholders, including lecturers, heads of departments, deans, administrators, district, provincial and national officials or policymakers, etc. (Marsh et al., 2006), although they might require and use different data sets. For example, for the organisation or system

level (HEIs, education authorities, etc.), the aggregated data on the overall accomplishment of plans, targets, and goals are crucial; but for individuals (lecturers and students), it is often assignments, assessments, classroom interactions, and other study unit outcome data that directly is related to student performance (Mandinach et al., 2006). In practice, early warnings in achieving programme outcomes, forecasting graduation rates within academic programmes, calculating and budgeting for students and faculty numbers or equipment needs, or designing interventions for support have been routinely conducted (Gaftandzhieva et al., 2023; Hora et al., 2017; Liu et al., 2017). However, the primary usage tends to be for financial and academic management (Webber & Zheng, 2020), often related to monitoring and identifying trends such as at-risk programmes and modules, learning content that students struggle with, and dropout and retention rates. Often, DDDM is not paired with individualised and just-in-time data to assist in personalised learning or appropriate support (Wise, 2018).

Data-Driven Decision-Making in SA's HEIs

The education level of the South African population is rising (DHET, 2021): compared to ten years ago, significantly more South African adults have primary and secondary education as their highest level of educational attainment (HLEA). However, only 6% of South African adults had a higher education degree as their HLEA in 2020 (DHET, 2021). Exacerbated by HEI training capacity (DHET, 2021), decades later after South Africa's democratic transition, its post-1994 higher education landscape still exhibits unmet needs and unfulfilled potentials (Badat, 2009; Cross, 2004) in formal access, especially for students from disadvantaged backgrounds (Ntombela, 2022; Wildschut et al., 2020). Some scholars also worry about the quality of education and training (Leibowitz et al., 2015; Luckett, 2010), particularly with the rising enrolment and the resultant higher staff/student ratio (Isabirye & Moloi, 2013). Throughput rate and duration also often remain suboptimal (DHET, 2021), despite the launch of the National Development Plan and other efforts to strengthen the HEI and Technical Vocational Education and Training (TVET) sectors. Responsiveness and potential mismatch between the HEI system and labour market absorption also often remain a concern.

South African higher education is regulated by the provisions of the Higher Education Act of 1997, governed by the Department of Higher Education and Training (DHET). As South African universities are fairly heterogeneous, data collection and analysis, are challenging. In addition,

> Universities are largely autonomous and government steers the system by setting goals at the system and institutional levels, and by monitoring the performance of the system and of individual institutions against

> these goals … [largely through] annual block grants and earmarked funds for designated projects. In order to monitor performance, universities are required to submit data for inclusion in the Higher Education Management Information System (HEMIS), which is managed by DHET. Universities are required to capture and submit HEMIS data on students, on staff and on building space data. HEMIS forms the basis for annual state funding allocations as well as system-level policy/steering decisions.
>
> Van Schalkwyk et al. (2016, p. 72)

Data reported on, includes enrolment headcounts, graduation results (throughput rates). It is then converted to HEMIS credits, providing DHET information to calculate block grants or subsidies, including graduation subsidies (a proxy for student success, is calculated on programmes passing, whether at 50% or a distinction). In addition, HEMIS also collects staff demographics, including qualifications, etc.

The HEMIS database is hosted and managed by DHET and maintained by a private IT company (Praxis). Another private IT company (IDSC) extracts data from HEMIS for easier reporting and analysis via its own higher education data analyser (HEDA) platform and delivers other BI services based on the subscription. Few studies, so far, have explored HEDA usage, both in terms of its current and potential use. This is what this chapter focuses and seeks to contribute.

PowerHEDA and Early Alert Systems

HEDA is a BI tool to organise and structure data so that it can be easily accessed and used to support DDDM, e.g. enrolment monitoring and planning, research management, student retention, tracking or benchmarking historical data, etc. HEDA has existed and been utilised in the sector since the early 2000s.[2] Since 2015, IDSC has also offered strategic consulting[3] for South African HEIs (IDSC, 2023).

PowerHEDA is the next generation of HEDA as an integrated tool to produce easily understood data to improve data management. The product suite is made up of 14 modules within its five layers of functionality for HEIs to purchase. It also has a dashboard that provides a visual display of key performance indicators and metrics on a single interactive screen. In addition to snapshots, PowerHEDA also offers cohort analysis. Currently, seventeen (17) public HEIs in SA (out of 26 public HEIs) subscribe to PowerHEDA.

From Layer 1 (data source) to any further layers (Layer 2 reporting to Layer 5 prediction), the following data processing steps need to take place:

Data Sources

1 HEMIS Data Warehouse
2 ITS Views Data Warehouse
3 PeopleSoft Data Warehouse
4 Peer Data Warehouse
5 Research Data Warehouse

Reporting

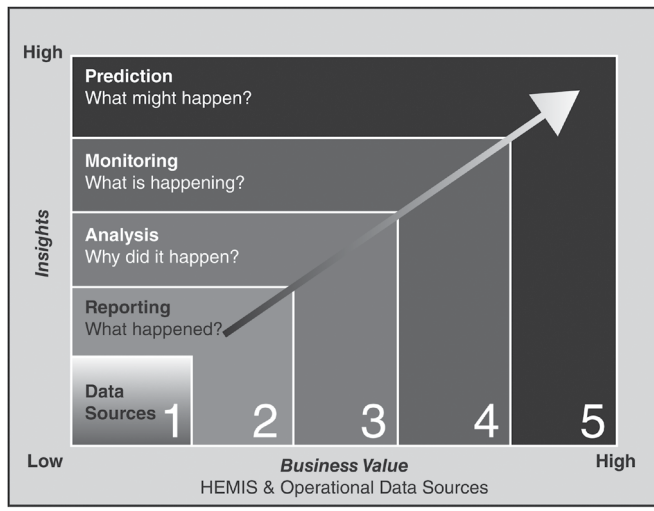
6 PowerHEDA

Higher Education Modules

7 Funding Allocation Model
8 Business Plan Generator
9 Enrolment Planning
10 HEMIS Manager
11 Student Tracking
12 Student Application Ranking System
13 Annual Performance Plan Monitor
14 Viability
15 Workload & Staff Time Sheets
16 Research Information Module

Higher Education Services

17 Learner Analytics & Predictive Modelling
18 Resource Allocation Modelling
19 Space Modelling & Scenario Analyses



The 5 Insight Layers of PowerHEDA BI

1. Data Sources
   - HEMIS Data Warehouse
   - ITS Views Data Warehouse
   - PeopleSoft Data Warehouse
   - Peer Data (HEMIS DHET)
2. Reporting
   - PowerHEDA
3. Analysis
   - Application Requirements System
   - Viability
   - Workload & Staff Time Sheets
4. Monitoring
   - Annual Performance Plan Monitor
   - HEMIS Manager
   - Student Tracking
5. Prediction
   - Funding Allocation Model
   - Learner Analytics Service
   - Business Plan Generator
   - Enrolment Planning
   - Resource Allocation Model

Figure 6.1 Modules and layers of PowerHEDA functionality

Source: http://www.idsc.co.za/forms/home.aspx

To make data more accessible and understandable, it is also often further presented or as visualised through charts, graphs, and dashboards, allowing stakeholders to quickly identify areas of concern or opportunity.

Observations and personal contact with various HEIs in SA show that much current usage of the PowerHEDA lies at either the reporting or analysis layer. Few HEIs go (have purchased) the layers of monitoring or prediction. This sub-optimal usage of the available data is one starting point of the argument made in this chapter.

Another related observation is the sub-optimal availability of PowerHEDA data and usage by potential DDDM users. Similar to reports by Webber and Zheng (2020) and Wise (2018), currently the PowerHEDA data is mainly used only by administrators or institutional researchers, amidst all potential HEI stakeholders including administrators, faculty, staff, students, alumni, and other stakeholders (Figure 6.2), and only for calculating subsidies (both for teaching and learning, and research) or strategic planning Access for academics (faculty) also differs from institution to institution. At some HEIs, this data (PowerHEDA portal) is only available to middle to senior management, e.g. HoD and above, sometimes even HoDs need to

Table 6.1 Data Processing Steps

Data collection: Various sources within the institution are sourced or collected, often in a standardised format (.txt or .csv for example) to ensure consistency. One important data source here is related to students: e.g. enrolment, registration status, disability, NAFS status (financial data), demographic information, level of study, whether first generation, disability, home language, Matric school type, citizenship, residence status, campus, whether scarce skills or not). These data are typically aggregated into reports per faculty/department/module, year, qualification type/code/category, teaching mode (contact, distance and online). Besides student data, PowerHEDA can and often hosts HEI's human resources (staff member) data and research output data.

Data storage: This refers to a data warehouse or a cloud-based storage solution backing up data on proxy servers for mirroring. This is especially crucial in South Africa as the electricity supply is unstable, e.g. during load shedding. Besides standardised formatting, the data is also typically organised or structured in a way that makes it easy to access, filter, query, and use within database management applications.

Data integration: The data from different sources are integrated, involving linking and cross-referencing data within databases to prepare for further analysis. For example, student data can be linked to financial data to identify trends in student debt. Algorithms linked to AI bots can also automatically flag at-risk cases.

Data analysis: Once the data is integrated, it can be analysed to identify patterns and trends. This could include identifying areas of the HEI that need improvement or opportunities for growth. Data analysis can also be used to support decision-making and institutional planning.

Source: Adapted from http://www.idsc.co.za/forms/home.aspx

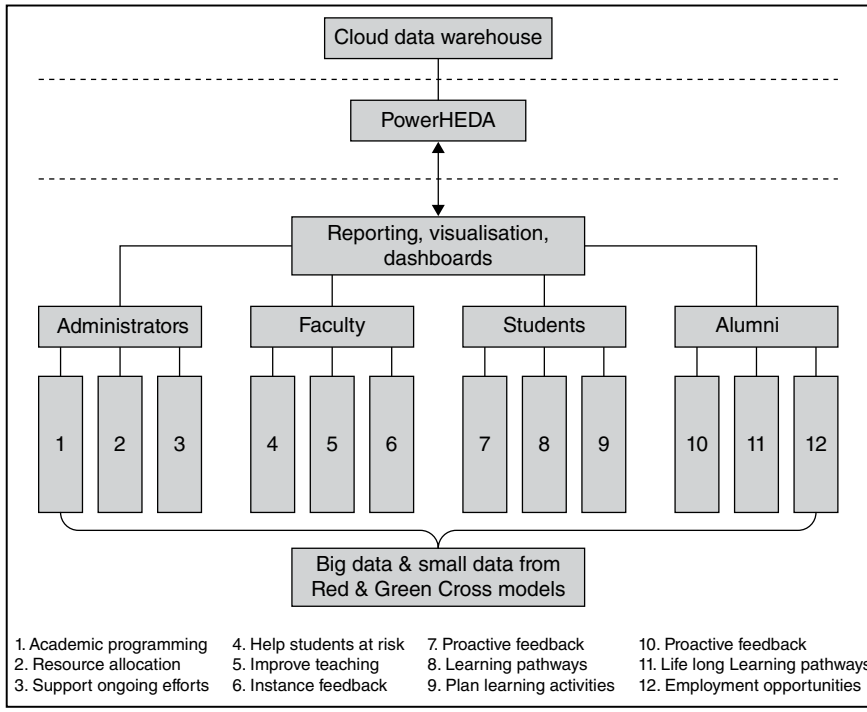


Figure 6.2 Data dissemination and use by four primary stakeholders within HEI

Source: Adapted from Daniel in Evans (2021).

apply for permission to access this data. At others, academics are granted automatic access. Unfortunately, even among the HEIs where PowerHEDA data is made readily available, not only do lecturers seldom engage with it; but many, from our experience, are not aware of its existence.

We suggest that one of the reasons for this sub-optimal use is inadequate data integration. For example, PowerHEDA data, with its inclusion of students' demographic and other background data, would be useful for academics to understand their students and adapt their teaching strategy. For this purpose, however, academics would need learning data (e.g. course performance data from the LMS) linked to each student, or at least to their specific class/module. The current available PowerHEDA data, on the other hand, is only offered at an aggregated level per qualification or department, seldom per module, let alone available per student. Another example is that LMS data, if incorporated within PowerHEDA, could show academics a more holistic picture of a student's learning, for example, which

modules they have taken, which modules they perform well and which ones they struggle with. All this information can be useful in considering teaching strategies. However, again, current LMS data are often only available within one specific module, not able to provide academics with more information on students' overall learning journey. Both these examples would not be useful for subsidy calculation purposes, but they could be useful for students, faculty, and administrators illustrated in Figure 6.2 and provide proactive detection and support for students in need.

In other words, the central argument the chapter advances is that this wealth of data could and should serve much greater DDDM functions within HEIs. In this sense, this chapter serves to outline a vision of the future of DDDM in SA's HEIs.

From Warning to Alerting: Potential PowerHEDA Data Usage

The following section builds further from Evans's (2021) work and proposes how PowerHEDA and other HEI data can be used to alert administrators, academics, and faculty of potential risks and opportunities as well as recommend support to help at-risk students. Drawing from Darries's (2005) presentation at UWC, where he outlines how multiple data sources can be used to create an early warning and alert system, this chapter further pairs data sources with students' life cycles in HEI. This is presented as aspects of the outer cycle in Figures 6.3 and 6.4. The one for undergraduate students (called red cross in Evans's 2001 publication) is depicted in Figure 6.3, while the one for postgraduate students (called green cross in Evans's 2001 publication) is in Figure 6.4. The difference between these two is largely due to the mode of teaching and learning in these two levels as dictated by SA's quality assurance framework (NQF level descriptors of the specific expectation) for its graduates. Undergraduate teaching and learning is normally organised more around teaching and learning and in coursework format, often with large class numbers. At the postgraduate level, coursework modules generally give way to a greater focus on research projects that feature smaller groups or more individualised supervision.

Both figures provide a framework and data sources to track student capability, motivation, risks, and opportunities. The four support pillars—academic, related tutoring support, finance, overall health and wellbeing, applicable for online and campus-based delivery (Darries, 2005)—are what the alerting system can trigger and activate. One main underlying assumption in the conceptualisation of these two alert systems is that the current reactive practice can and should become more proactive, where data (from different data sources) can be aggregated and automatically activate any of the four pillars of support.

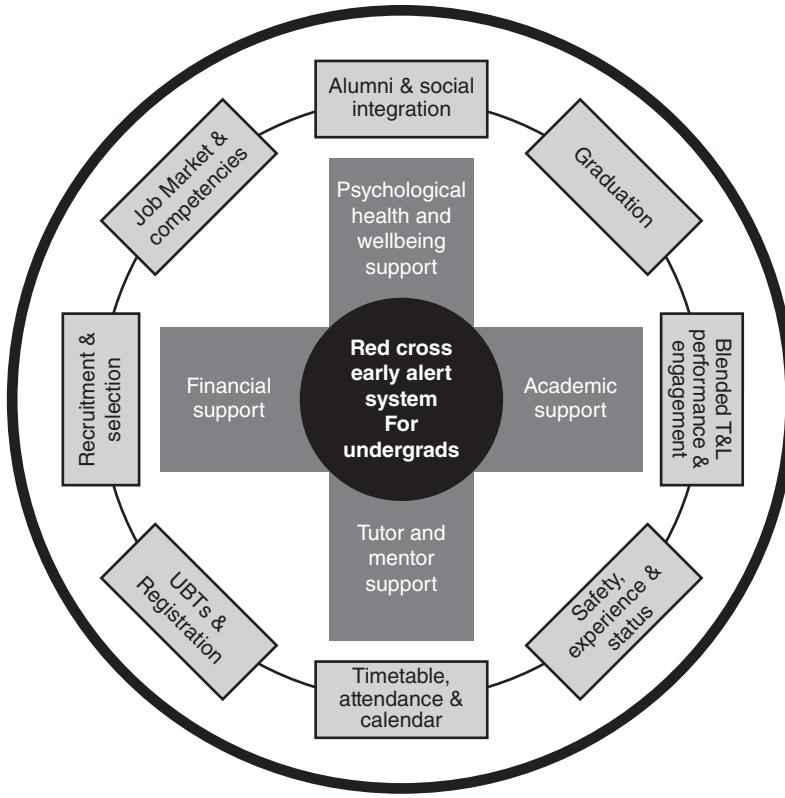


Figure 6.3 Data sources and support pillars in red cross early alert system for undergraduate students (NQF 5-7)

Source: Adapted from Daniel in Evans (2021).

The Undergraduates

Recruitment and Selection

The first aspect of a potential student's engagement with a HEI (and data category) is recruitment and selection. An HEI might market its academic offerings or recruit potential students through reputation, word of mouth, social media, and other digital communication platforms. Besides academic results from Matric and student choices (and sometimes other aptitude tests), some HEIs also consider diversity among their student bodies and target students from certain backgrounds more deliberately. These admissions data can be used to highlight or predict at-risk first-year students and pre-empt their need

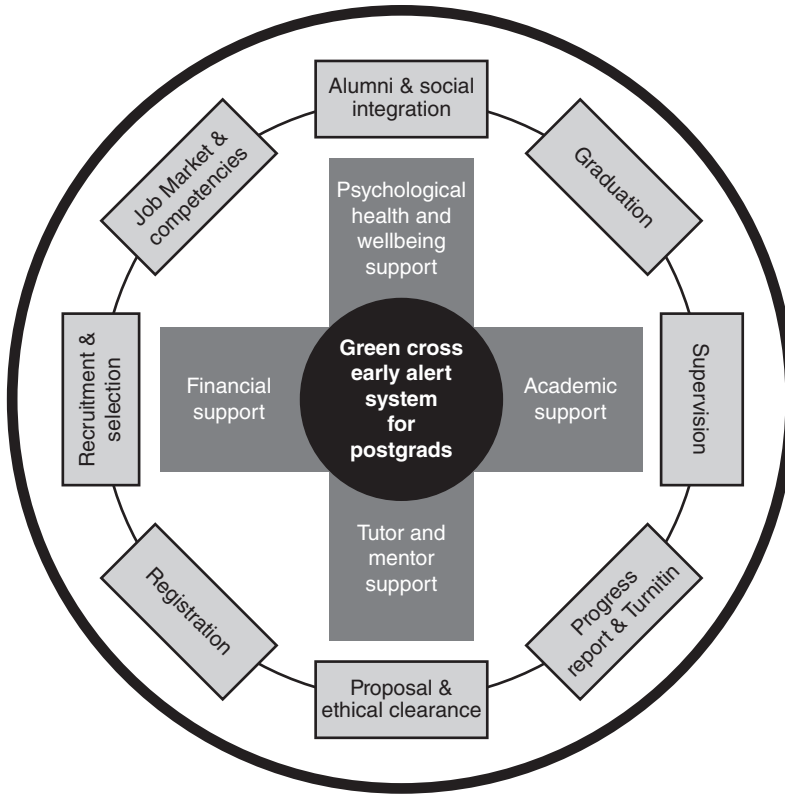


Figure 6.4 Data sources and support pillars in green cross early alert system for postgraduate students (NQF 8–10)

Source: Adapted from Daniel in Evans (2021).

for appropriate support, as well as cases where admission does not match the student's first choice (or interest/intent/motivation).

University Benchmark Tests (UBT) and Registration

For HEIs that administer UBT, this might become another important data source. It may include first-year students' academic literacy, quantitative literacy, and mathematics, etc. All can be used to identify needs and support, including reference to HEI support structures, non-credit-bearing courses, or online courses. Registration also often provides rich biographic information, including the student's background, the secondary school where they complete their matriculation, financial status, parents' and siblings' educational backgrounds, etc.

Timetable, Attendance, and Calendar

Student engagement plays a vital role in predicting student success (Buraimoh et al., 2021). Once the student is registered, timetable, attendance, and calendar events can all be used to verify student attendance and engagement in their courses. Linking attendance with timetable and calendar data can also validate the contact hours (credits) of academic programmes. In addition, attendance data can also be used to triangulate with student success (throughput) data to provide a better understanding of the relationship between engagement and success or to predict students at risk.

Safety, Experience, and Status

The safety data source mainly refers to incident report data (e.g. response times and resolution), which might affect students' overall wellbeing. If a user agrees, this can also be linked to a panic button, ambulance service (which ideally should also include detailed and up-to-date medical records), or protective services that allow security to track potentially at-risk students for their safety.

The experience data can indicate students' satisfaction, whether it is about their studies, learning, living environments or other aspects of their lives. This can also include students' observations and suggestions for improvement.

Blended Teaching and Learning, Performance, and Engagement

This data set can come from a variety of teaching and learning indicators, mostly likely from the HEI's LMS. Linking this with engagement (timetable, attendance, and calendar data) and performance data could provide an overview of students' progression within their modules and qualifications.

Graduation

Graduation data provides the overall statistics on the number of students completing their studies in programmes, the length of study, and other statistics such as the number of distinctions and other merits. Overall satisfaction surveys on their academic journey can also be collected for the HEI to reflect on.

Alumni and Social Integration

Once a student has graduated, he/she becomes an alumnus. With the graduate's permission, this set of data may provide information on employment

and (mis)match between qualifications and employment, as well as alumni integration and achievement in society. This can also be linked with job opportunities, internships, and work-integrated learning experience opportunities that potentially help graduates in seeking, upgrading, or changing employment.

Job Market and Competencies

Related to the previous data set, this data set aggregates to provide an overview of HEI's performance on graduate attributes, competencies, and employability. It can be used to feed back to academic planning and module/qualification delivery.

The Postgraduates

If a postgraduate qualification includes coursework modules, the process and data source would be similar to the red cross system above. When a postgraduate enters his/her dissertation phase, the various aspects outlined in the green cross below then apply. While the four support pillars largely remain the same, some of their lifecycle and data sources might be different from their undergraduate counterparts. For example, their financial risks go from National Student Financial Aid Scheme (NSFAS) to National Research Foundation (NRF); their job market opportunities might also differ greatly from the undergraduates.

Application

The general assumption of postgraduate study is that applicants have achieved the basic disciplinary knowledge and skill attributes to be an independent learner and researcher. Applications and the applicants' records, submitted and verified through the registrar's office, are data sources to base the decision of acceptance or rejection on. This might include grade average from the applicant's previous degree, (the merits of) tentative research topic and/or proposal, writing or research skills, relevant work experience (if applicable), results from other screening procedures (e.g. interviews), and faculty's or department's supervision capacity.

Proposal and Ethics Clearance

After acceptance, supervisors are allocated where students start to work further on their proposals (sometimes including defending their proposals). If the proposal is accepted at a departmental/faculty level, it then proceeds to ethical clearance application and approval, before empirical data collection

can commence. This might be a lengthy and time-consuming process. This process is often not captured on LMS. However, a well-structured document management system for proposal and ethics clearance could flag potential delays and other problems and trigger the appropriate response.

Progress Report and Turnitin

Progress reports (annual or more frequent) can indicate the achievements, milestones, and areas of attention. Timely and proactive records and management of this progress could encourage students to stay on course as well. As chapters of their dissertations are developed and revised, the Turnitin reports could constructively indicate issues with referencing techniques or writing styles. Both could/should be used to flag at-risk students in need of relevant support.

Supervision

Supervision is the central aspect of postgraduate student's academic experience. It is generally a process to coach, mentor, and enculturate a student into knowledge production in their field of discipline. Different supervision styles exist and can be adopted at various stages of the study or depending on the personality of both the supervisor and students. This can range from "pastoral" supervision style (particularly suitable at the beginning of a study when the student needs more guidance) to "laissez-faire" (when and if the student is more independent). Supervision data can include reflection, satisfaction, suggestions, and concerns from both the students and the supervisors.

Job Market

Postgraduates' job prospects are usually better than that of undergraduates, although it may vary from discipline to discipline. HEIs generally collect statistics on job market absorption, employment (mis)match (with academic degree), and sometimes career satisfaction. Such data and analysis can feed back into the review and re-design of the offerings of the academic degrees.

PowerHEDA-Enabled Decision-Making: Other Foreseeable Scenarios

Some of the examples above confirm our call for greater data integration from more data sources. This, however, will require data sharing and collaboration among government, industry/employers, funders, and education and training providers.

For example, the application, selection, and registration process can benefit from integration with student data at the schooling level, as well as student HEI choice data across universities. A student might receive up to four HEI choices, so a single HEI or its department is sometimes never sure if that student, upon receiving an offer, will register or not. This sometimes results in scenarios of registration from walk-ins, especially if the enrolment target is not yet met, from students not even interested in that specific discipline or programme. In this case, a national recruitment and selection process, coordinated through PowerHEDA, capturing potential students' results, backgrounds, interests, and other information, can be used to guide discipline choices and match both in terms of programme and location, which also often remains an important consideration, especially for poorer students coming from disadvantaged background. If one university (or qualification) rejects a student, the university/qualification of the next choice can get a notification immediately. This will facilitate better alignment of students and HEI match and reduce the occurrence of HEIs blindly accepting students without knowing whether the student applies/receives an offer from their more preferred choices or which he/she ultimately registers. It also has the potential to identify and support individual risks early on.

Another potential application is to use PowerHEDA data to support human resources (HR) decisions, e.g. staff-student ratio or workload allocation. Staff recruitment and selection process is lengthy but often inefficient. Vacancies might not be filled in time, creating high-risk modules, or sudden bursts or skewed workload. To this end, PowerHEDA with department statistics such as student headcounts, supervisor-to-student ratios, and undergraduate teaching load could provide richer individual and cohort analyses to assist in work allocation and staff wellbeing.

In addition, the usage of any of the four support pillars can be ploughed back to PowerHEDA as further data sources. This has already happened for financial assistance data, but not for other support. However, access and usage of academic, tutoring support, health, and wellbeing services (e.g. timetable data from CelCAT, wellbeing data from MSecure and Campus Clinic) can be further used as data to give a fuller picture of a student's overall wellbeing and coping level. Students' work-integrated learning, internships, and other vocational social services can also be converted into financial tokens to encourage and reward their community engagement. Further data, such as surveys for the level of satisfaction, various kinds of preferences, and reflections on what works and what does not, can also be collected and incorporated. Such data can be further linked to data on skills shortages with job markets and postgraduate alumni databases for proactive employment placement or subject/career advice for secondary school learners or HEI graduates.

Table 6.2 The Five Areas of Change That PowerHEDA Data Integration May Offer the Three Levels in Higher Education

Change	*Individual Level*	*Organisational Level*	*External Level*
Access	To identify patterns and trends in enrolment and participation, and develop targeted interventions to address the needs of underrepresented groups.	Using PowerHEDA indicators to validate diversity, equity, and social justice within the HEI.	To identify and address the underlying social and economic factors that contribute to inequality and exclusion.
Quality	To identify specific barriers, e.g. academic and soft psychological skills, that prevent individuals from crossing learning and knowledge thresholds.	To monitor and evaluate the effectiveness of existing academic programmes and interventions for sustainable resource allocation.	Further encourage collaboration between education institutions and industry partners. Use alumni data sets to support the development of high-quality and relevant programmes.
Success	To monitor student participation, performance, achievement of outcomes, and realisation of HEMIS credits. To identify support or intervention.	To run competitions or teambuilding exercises to develop a culture of continuous improvement, with a focus on innovation, collaboration, and student-centred learning.	Use benchmarked data to advocate for policies and regulations that promote the collection and use of data in DDDM decision-making.
Efficiency	To monitor enrolment and retention rates for underrepresented groups and skillset deficiencies to develop targeted interventions to support their academic journey.	To make data-driven decisions about resource allocation and programme curriculum review/ revision.	To identify systemic barriers to equity and redress and develop systemic interventions to address these barriers.
Responsiveness	PowerHEDA alumni data combined with stakeholder feedback to identify skills and competencies that are needed in the workforce and develop programmes accordingly.	To develop a culture of DDDM, i.e. data-informed decision-making and provide training and support to stakeholders to build data literacy.	Leverage labour and employment statistics and alumni data to identify emerging trends and changes in the labour market and adjust programmes accordingly.

Discussion and Conclusion

Discussions and examples above show that PowerHEDA data, if incorporated with other data sources, has great potential to assist in ensuring students' success and satisfaction. Data in a well-designed cross-referenced database, including baseline and impact assessments, can also be used to improve understanding students, predict support needs, and ultimately increase the predictive capabilities of the BI for HEIs. A similar system can be developed for academics to predict and support their teaching or research journey, or for senior management and faculty to review, analyse, and track achievement toward HEI's strategic objectives.

To achieve this, PowerHEDA data would first need to be made accessible to all academics and administrators in HEIs. It also requires further integration of other data sources, enabling the calculation of HEMIS credits and workload automatically as well as active monitoring of student applications, participation, and achievement. When applicable, an alert for support and intervention should be triggered automatically. By applying the multilevel consideration of what PowerHEDA framework can offer, we foresee that the data integration facilitating better DDDM for more sustainable change readiness and changes in areas listed in Table 6.2.

Notes

1 DDDM would be used to refer to both hereforth.
2 According to its website, http://www.idsc.co.za/forms/home.aspx, "IDSC Consulting Pty (Ltd) was established in 2012 as part of the group of companies trading as IDSC. Prior to 2012 the business operated in the HE space as Ramsden Trading (trading as IDSC) and began in 2005 with 3 staff and 3 clients".
3 With its data scientists to customise fulfillment for its clients' data needs.

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Chapter 7

Exploring Academic Readiness for ICT Integration Pedagogy at the University of Eswatini

Nqobile Ndzinisa, Maxwell Vusumuzi Mthembu, and Gciniwe N. Nsibande

Introduction

The declaration of the COVID-19 pandemic in March 2020 "has created the largest disruption of education systems in human history, affecting nearly 1.6 billion learners in more than 200 countries" (Pokhrel & Chhetri, 2021, p. 133). To limit the exposure and spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, the virus that causes COVID-19), governments all over the world instituted national lockdowns that resulted in the closure of schools, enforced mask-wearing directives and issued movement restrictions. Like elsewhere (Daries & Valenzuela, 2020; UNESCO, 2023a), the public health response in the Kingdom of Eswatini (formerly Swaziland), a small country located in Southern Africa, has included social distancing and a national lockdown from March 27, 2020, resulting in the closure of businesses, churches, and schools, including higher education institutions (HEIs). As such, learning in Eswatini came to a standstill. Lockdowns were seen as an important response to limit the spread of the virus in terms of public health. However, there was concern that the extensive "school closures would lead not only to loss of learning, but also loss of human capital and diminished economic opportunities in the long run" (Mhlanga & Moloi, 2020, p. 1), especially if schools were closed for too long (Afrobarometer, 2021). To this end, the government of Eswatini ordered the switch from face-to-face learning to remote learning to continue learning (The World Bank, 2020), facilitated by the use of information and communications technology (ICT). However, the abrupt change required schools and universities to promptly adopt online teaching, adapting the technological resources where essential technological capacities for online teaching are often lacking (García-Morales et al., 2021; Ndzinisa & Dlamini, 2022).

This chapter centres around this integration of technology in education and also addresses another notable observation in the African context where the focus was often more on completing classes in primary and secondary schools while institutions of higher education were largely left to chart their own way forward (Ndzinisa & Dlamini, 2022). To be more specific, this

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chapter examines the response to COVID-19 at the University of Eswatini (UNESWA) in terms of ICT readiness through the aspects of digital competencies, connectivity, and related infrastructure. Through unpacking the degree to which academics have implemented institutional ICT policies in integrating ICT in their teaching practices, it analyses the challenges that academics encountered during the COVID-19 lockdown and explores the role of infrastructure and connectivity in the integration of ICT in teaching and learning at this institution.

ICT Integration in Learning: An Overview of the Situation in Africa

ICTs have "slowly become an integral part of the educational ecosystem" (Dlamini, 2022, p. 28). However, the African continent still faces manifold challenges regarding the integration of ICT in teaching and learning. First and foremost, ICTs in teaching and learning need to be done sustainably and cost-effectively (Dlamini, 2018). However, many African countries face socio-economic and technological challenges that have prevented ICTs from permeating in their institutions (Alemu, 2015; Rana & Rana, 2020; Tedla, 2012). Economic factors ranging from the lack of capacity to pay for costly infrastructure to sustaining computer networks introduced through donor funding continue to weigh on already constrained university budgets (Awad & Albaity, 2022). For example, basic infrastructure such as internet access, bandwidth, and hardware and software provision, is inadequate anywhere in Africa (Dlamini, 2018; Kozma & Vota, 2014). Because of this, universities often depend on attaining ICT equipment through donations and direct purchases without central coordination.

Further, the benefits of the integration of ICT in education cannot be fully derived unless a shift from traditional methods of teaching occurs. Despite the affordance of accessing anytime, anywhere online courses (Lubinga et al., 2023), there is a need to explore pedagogical methods of teaching. However, factors such as pedagogical expertise related to technology use, perceptions, and beliefs about ICT and its motivating effects, as well as technological literacy and confidence levels (Bagarukayo & Kalema, 2015; Dlamini & Mbatha, 2018; Dlamini & Ndzinisa, 2020; Ngao et al., 2022; Hennessy et al., 2010) all influence educators' "use, or lack of use, of technology in the classroom" (Hennessy et al., 2010, p. 39). In other words, for effective teaching and learning to occur, remote teaching and learning require not only digital technologies, such as internet connectivity and learning management systems (LMSs), and appropriate gadgets, but also readiness among faculty and students among other things (Mhlanga et al., 2022). This means that the expected benefit from ICT is closely reliant on academics' ability to not only pedagogically integrate ICT in education, but also creatively develop additional teaching materials that may aid students' comprehension

(Núñez-Canal et al., 2022). For purposes of this chapter, we understand integration of technology in education, not simply as the addition of technology to teaching and learning, but as the evolution of novel concepts and transformation in the curriculum to reflect a full incorporation of new technologies (Watson & Tinsley, 2013).

Researchers also argue that the low levels of awareness and commitment of higher education administrators and academics are often another limitation to the integration of ICT into education in Africa (Ndzinisa & Dlamini, 2022). Dlamini and Ndzinisa (2020) acknowledge that while ICT incorporation is inevitable, the transition is often done in less-than-ideal circumstances, which causes tension between technology, context, and pedagogy. During the COVID-19 pandemic, governments and administrators in institutions of higher learning presumed that challenges brought on by the rapid move to ERT would be addressed by simply turning to LMS as well as providing laptops and zero-rated websites for students (Ndzinisa & Dlamini, 2022, p. 2269).

Moreover, many higher education institutions in Africa have neither well-established ICT strategies nor management information systems that provide consistent records on the state of their ICTs (Awad & Albaity, 2022). For this process to be executed efficiently, there must be clear strategies to guide implementation as well as funding support; otherwise, universities might be left to "adopt a piece-meal add-on approach" (Adam, 2003, p. 200).

The Kingdom of Eswatini's Approach to Integrating ICT in Education

Access to the internet is growing in the Kingdom of Eswatini: out of a population of 1.21 million people, there were over 700,000 internet users at the start of 2023 (Kemp, 2023). The internet penetration rate stood at 58.9 percent of the total population. To put this into perspective, Eswatini's neighbours' internet penetration rates are recorded at 48 percent for Lesotho, 51 percent for Namibia, 74 percent for Botswana, and 82 percent for South Africa (Kemp, 2023). Notably, 106.4 percent of the total population accessed the internet through mobile connections (Kemp, 2023). Still, Eswatini lags behind in the adoption of digital technologies in education. This is evident in the dearth of government funding for ICT solutions and skills shortages. According to the World Bank, the digital infrastructure in Eswatini is poor, mainly due to the lack of competition in the broadband sector (World Bank, 2023). This is concerning considering that broadband access, infrastructure, and connectivity have significant benefits for education. Adequate broadband can enable the use of assistive and adaptive technologies, support the integration of education management information systems, and provide access to quality content for learning (ITU, n.d.). Additionally, digital skills development is seriously inhibited by the limited availability of appropriate educational curricula and quality training, despite the growing demand and importance of digital skills

in Eswatini (World Bank, 2023). While ICT has been identified as a driver for economic growth and sustainable development as per the National Development Plan 2019/2020–2021/2022, gaps have been noted in ensuring a cohesive promotion of the use of ICT to increase efficiencies across education and other sectors of the country (Information and Communication Technology Sector Report, 2022).

In Eswatini, the delivery of education is the responsibility of the Ministry of Education and Training (MoET). The mandate of the MoET is to develop frameworks and policies to guide local implementation of ICTs in schools and HEIs. However, this has not always been the focus. In 1997, the government adopted a national economic strategy called the National Development Strategy–Vision 2022, which championed vocational education until 2010. This means that until 2010, the government's attention on education was more a move away from academic orientation and towards a technical and vocational orientation. Therefore, the move to ICT in education is a fairly recent one in Eswatini.

Numerous studies have extolled the value of ICTs on education in the information age (Das, 2019; Hawkridge, 2022; Shava, 2022). However, there has been a limited systematic approach, in both policy and practice, to include digital technologies into the core of teaching and learning in Eswatini (Mlangeni, 2020). According to Madzima et al. (2016), the prospect of the application of ICT in schools was met with significant enthusiasm in Eswatini. This pre-COVID era saw the implementation of ICT initiatives such as the Republic of China-Taiwan-funded Computer Project in collaboration with the Ministry of Education (MoE) to supply high schools with IT equipment, the African Development Bank (ADB) funded pre-vocational project to equip secondary schools with ICT equipment through the government's Computer Services Department, and the Computer Education Trust (CET), which provided learning resources and ICT equipment to schools (UNESCO, 2023b). These initiatives were largely targeted towards some government-funded primary and secondary schools with tertiary institutions being excluded. However, this enthusiasm does not seem to have translated into a systematic approach to integrating ICT into education in the country. This is evidenced by the scarcity of policies and strategic plans on the pedagogical integration of ICT across all levels of education in Eswatini. This could be a contributing factor to the dearth of literature broadly on the pedagogic integration of ICT in education and in higher education, specifically in the country.

Generally, the focus of the MoET on ICT in education is twofold: ICT as a subject in schools and using ICT as a tool for teaching and learning (Mlangeni, 2020). While there seems to have been limited impact in relation to policy on the pedagogical integration of ICT in Eswatini, shifts needed to occur after government-mandated school closures due to the COVID-19 pandemic. As a result, in August 2020, at the height of the COVID-19 pandemic, the MoET

partnered with telecommunications companies as well as other partners to ensure continuing education during the pandemic. Entities included in such partnerships included the telecommunications regulator in the country, the Eswatini Communications Communication (ESCCOM) whose mandate is to support education through connectivity, through the Universal Access and Service Fund (UASF) (Eswatini Communications Commission, n.d.).

To date, the ESCCOM, through the UASF fund, has procured 945 laptops and 1 trolley for the MoET as well as distributed to a total of 20 schools (Eswatini Communications Commission, n.d.). UNESWA's Institute of Distance Education (IDE), which offers distance education programmes in the humanities, was included in the list of beneficiaries. The telecommunications company, Eswatini MTN, introduced three discounted data bundles for students to use for their studies during the lockdown (MTN Eswatini, 2020). Work-from-home bundles were also introduced to enable non-essential workers to work from home during this time. This was a relevant intervention given that statistics suggest that mobile broadband subscriptions surged by 24.7 percent to 1,379,526 in Eswatini (ESCCOM, 2022). However, such interventions did not address the socio-economic challenges faced by citizens in the country.

In a context where the pandemic caused company closures, increased unemployment, and restricted activity, especially in the informal sector where most of the poor are employed, students and academics without access to electricity, cell phones and other ICT tools may have been excluded from teaching and learning. It is unclear what interventions, if any, were implemented by the second mobile operator, Eswatini Mobile, during this time. Moreover, the expansion of bandwidth to enable efficient online teaching and learning as well as work from home does not seem to have been part of these conversations.

There is a dearth of research into how these investments have contributed to ICT integration in education, particularly in the absence of a cohesive policy framework in Eswatini. Moreover, researchers caution that the provisioning of infrastructure without a change in the fundamental methods of teaching should not be construed as ICT adoption (Dlamini, 2018; Dlamini & Mbatha, 2018; Ngao et al., 2022). This suggests a need to not only focus on the provision of equipment, but also consider educators' and students' digital fluency, and the context in which they work. While it has become normalised to assume that everyone has access to something as ubiquitous as the internet, socio-economic factors among academics still stand at the forefront of strategies that inform the integration of technology into education (Dlamini, 2018). This is imperative given that digital skills are considered to be a prerequisite for the effective use of ICTs in education (Ben Youssef et al., 2022). The digital divide, defined as early as 2004, as the gap between those who have access to ICT and those who do

not (Dutton, 2004), has never been wider than it is today, particularly in countries like Eswatini (Motsa, 2023).

Policy Guidance on ICT Integration in Eswatini

For policy to be funded and implemented in Eswatini, it must be approved at the cabinet level. Since the Ministry of Education was established in the country, it has attempted to develop policies and strategies to harness the role of technology towards building a knowledge-based economy (Madzima et al., 2016). In 2010, the government introduced the Policy for ICT in Education, with the main goal of developing an educational system in which learners leave schools as confident, innovative, and industrious users of new technologies, including ICT, and understand the impact of those technologies on society (Draft Policy for ICT in Education, 2010). However, this has remained in draft form to date (Rugube et al., 2020), implying that the policy framework on ICT integration in teaching and learning in Eswatini is insufficient.

The National Information and Communication Infrastructure (NICI) Policy Implementation Plan 2012–2016 was developed in 2012. It specifically acknowledges that human capital is critical for the development and management of ICTs. To this end, the "curriculum and the development and management of the education system may take into consideration the overall goal of becoming an information society" (NICI Policy Implementation Plan 2012–2016, p. 16). In the absence of an ICT Act in Eswatini, the NICI Policy gives the general policy stance of the government in relation of the role of ICT in the country.

Other legislative frameworks in Eswatini include the 1981 Education Act and 2005 Constitution, but none of these make any reference to the integration of technology in education or distance learning (UNESCO, 2023b). Conversely, 2018/2019–2020/2021 National Education and Training Sector Improvement Programme emphasises the need to improve the quality of education through distance learning, teaching ICT as a subject, and the integration of technology into teaching and learning. Other objectives of this document include strengthening ICT integration in education through the construction of more ICT laboratories, provision of ICT equipment, capacity building for teachers, and implementation of ICT syllabuses for both primary and secondary education levels to build their ICT skills (UNESCO, 2023b). Similarly, the 2020–2026 Education Service Charter includes the application of technologies in education as part of the education system's core value and principle in innovation (UNESCO, 2023b). Noteworthy is that none of these frameworks discuss the expansion of bandwidth to cater to ICT integration into education.

Furthermore, there is a lack of specific policy and statutes for higher education as well as strategic plans in institutions of higher learning (The National

Education and Training Improvement Programme 2018/2019–2020/2021, p. 58). This is problematic because many educational institutions (both schools and public HEIs) rely on the government for direction, financial, and other support. This might result in a situation where educational institutions are left to their own devices to find creative strategies to incorporate ICT or take a reactionary approach that involves waiting on the government for initiative. Clearly, the process of integrating ICT into education requires long-term investment (Gokdas & Torun, 2017). However, the absence of specific policy, statutes for HEIs, and institution-specific strategic plans results in inadequate implementation of national goals thereby failing in the country's quest to become an information society. Because there was no intercession from the Ministry of Information, Communications, and Technology (ICT) regarding an increase of bandwidth for HEIs during the COVID-19 pandemic in Eswatini, any solutions developed by HEIs and faculties (if any) were likely to be implemented in a severely constrained environment. As a result, the feasibility of ICT incorporation was under threat from the start.

The Integration of ICT into Pedagogy at UNESWA

UNESWA is a public university that relies heavily on the government of Eswatini for funding. However, UNESWA is currently in the throes of serious financial difficulties following the global financial meltdown in 2008. Since then, the institution has struggled to secure adequate subvention from the government thus impacting its operations over the years.

UNESWA was established through an Act of Parliament in January 1983. Prior to this, it was part of the University of Botswana, Lesotho, and Swaziland (UBLS), which was founded in 1964. Each of the three southern African countries hosted a campus. The Eswatini campus of UBLS specialised in agriculture, science, social science, and humanities. UNESWA has grown to become the biggest and largest research university in Eswatini (UNESWA, n.d.) with eight faculties and three campuses. Apart from UNESWA, there are three recently established universities in Eswatini. These are the Limkokwing University of Creative Technology (LUCT), the Southern Africa Nazarene University (SANU), and the Swaziland Christian University (SCU). According to the National Education and Training Improvement Programme 2018/2019–2020/2021, UNESWA accounts for about 61 percent of enrolment at the post-secondary level (p. 53). This is a decline from 70 percent in 2012. UNESWA offers various programmes through full-time contact mode and distance learning through the Institute of Distance Education (IDE).

Due to the nature of its distant learning and teaching technique, UNESWA, a dual-mode institution, introduced the blended learning and teaching strategy as early as 2008, which would be piloted by IDE students who largely

studied at a distance by supplementing face-to-face teaching and learning sessions (Chandraiah, 2021). To this end, UNESWA adopted the Moodle Learning Management System (LMS) as its platform of choice. Ten years later, UNESWA's revised Strategic Plan 2018–2022 (UNESWA Strategic Plan, 2018) stressed the necessity of strengthening the implementation of teaching and learning through the Blended Teaching and Learning System in both full-time contact programmes and in distance education. Blended teaching and learning refer to the use of online tools "to communicate, collaborate, and publish, to extend the school day or year and to develop the 21st-century skills students' need" (Pape, 2010, p. 22).

Presently, IDE offers seven degree-level programmes, including a Bachelor of Arts in Humanities, a Bachelor of Commerce, a Bachelor of Education (Adult, Primary, and Secondary), a Bachelor of Science in Computer Science Education, a Bachelor of Law, and another in Information Technology; additionally, it offers three certificates, including Psychosocial Support, French, and Portuguese, as well as a Diploma in Law. The IDE is required to provide distance education programmes along the same regulations as the full-time programmes. However, the multimedia approach and distance study methods are the mode of delivery of the IDE programmes (UNESWA, 2014). It is expected that distance education and full-time students should be equivalent academically, with the only difference being the delivery mechanism because distance education requires that students use technology for learning more frequently than full-time contact students as well as conduct more independent studies (Fowler et al., 2013).

Significantly, IDE relies on UNESWA lecturers who teach full-time contact courses as well as part-time lecturers to teach IDE courses. This reliance on full-time contact academics to teach IDE students may hinder differentiation between full-time and distance education teaching methods, thus necessitating regular training for lecturers to integrate ICT effectively into their lectures (Fowler et al., 2013). IDE employs staff to oversee and coordinate the programmes offered, design and develop instructional materials for distance education, conduct pertinent research, and offer student support. However, following the introduction of Moodle, research into the transition from distance learning to blended learning in the IDE suggested that advanced training and awareness were required due to staff and student preferences for the use of basic Moodle features, which tended to be more like traditional lectures with little genuine interaction as opposed to the expected online learning and teaching environment (Fowler et al., 2013). It is worth noting that before the COVID-19 pandemic, most academics at UNESWA still predominantly used the traditional method in the classroom in terms of pedagogical practices within its blended learning system (Nsibande, 2014).

Similar to universities in countries in the Southern Africa Customs Union (Ndzinisa & Dlamini, 2022), UNESWA accelerated its efforts to strengthen

the online teaching and learning component of the adopted blended learning system when it became evident that the COVID-19 lockdown would not end as quickly as anticipated in Eswatini. Therefore, to save the academic year, management at UNESWA mandated the use of the institution's LMS, Moodle. This meant that every academic at UNESWA had to switch to online teaching, regardless of whether they taught full-time contact courses or were in IDE. Subsequently, the Moodle Handbook (2021a) and the Online Learning and Teaching Guidelines (2021b) were developed to guide the implementation of ICT integration pedagogic practice during lockdown. These efforts were led by the UNESWA Centre of Excellence in Learning and Teaching (CELT), formerly known as the Academic Development Centre (ADC), which is responsible for the professional development and training of all UNESWA academic staff. Additionally, academics were trained on the use of Moodle and the design and delivery of online courses through Moodle and a series of webinars focused on online assessment were organised.

Discussion of Methodological Approach

This chapter reports on the findings from a desktop study on publicly available country-level policies such as the National Development Plan 2019/2020–2021/2022, the National Development Strategy–Vision 2022, the Education Service Charter 2020–2026, the National Information Communication Infrastructure Policy 2012–2016 and the Draft Policy for ICT in Education, 2010 and institutional documents such as the Strategic Plan 2018–2022 (UNESWA Strategic Plan, 2018), Blended Learning policy, the Moodle Handbook (2020), and the Online Learning and Teaching Guidelines (2021) among others. Also discussed in this chapter are findings from interviews conducted with the six individual academic staff members (heads of department in the Faculty of Humanities at UNESWA). The Faculty of Humanities was ideal for the focus of this study because it offered some of its programmes via distance learning through UNESWA's IDE before COVID-19. Departments in the Faculty of Humanities include Academic Communication Skills (ACS), African Languages and Literature (ALL), English Language and Literature (ELL), History (HIS), Journalism and Mass Communication (JMC), and, finally, Theology and Religious Studies (TRS). The participants were 40 years and above in age. They do contact teaching and also lecture IDE courses and have some experience with the integration of ICT into teaching.

The focus of the interviews was not only on the experiences of academics in the pedagogical integration of ICT into teaching at UNESWA, but also on the effect of institutional policies and contextual factors on their ability to integrate ICT in education. Since the pedagogical integration of ICT is

a process, the how, what, and why questions are critical to understanding ICT integration at UNESWA holistically (Altun, Kalaycı & Avci, 2011). The use of document analysis and interviews triangulated the interview data (Denzin, 2012, p. 83).

A Fragmented Policy Environment

This study explores the integration of ICT into education in the Kingdom of Eswatini at individual, institutional, and national levels using UNESWA as a case study. At the macro level, the document analysis suggests that the move towards the integration of ICT is a fairly recent one in Eswatini. A review of the relevant policies further suggests that ICT integration into higher education is fragmented in Eswatini. While the existence of policies that mention the integration of ICT into education in Eswatini is acknowledged, it was noted that this is often in broad terms and largely focused on the provision of technological tools in education to the exclusion of educators' and students' digital fluency (Draft Policy for ICT in Education, 2010). Even though the integration of ICT in education is mentioned in policy documents, this study found that there is an absence of national policies to support the pedagogical integration of ICT into higher education in Eswatini. Additionally, national frameworks seldom give policy direction on the expansion of bandwidth to cater for ICT integration into education. This can be resolved by unequivocally referencing school connectivity in national strategic documents governing broadband deployment strategies can better focus priorities for long-term policy (ITU, 2023).

Resources, Readiness, and Infrastructure for ICT Integration Pedagogic Practice

Additionally, while UNESWA attempted to develop and implement policies to guide ICT integration, particularly during COVID-19, challenges associated with the institutions' inability to fund the transition to emergency remote teaching as well as academics' objections persisted. While the UNESWA Teaching and Learning Handbook, the Moodle Handbook (2020) and the Online Learning and Teaching Guidelines (2021) were developed to guide the implementation of ICT integration pedagogic practice at UNESWA, other factors including the availability of resources and academics' readiness were not considered.

Another challenge, which existed before COVID-19, but was further highlighted during COVID-19, is that of inadequate infrastructure. More specifically, the absence of interventions to increase bandwidth for institutions of higher education had implications for LMS usage, which impact the institutional (meso) and individual (micro) levels of ICT incorporation. A major challenge was that bandwidth at UNESWA was about 60 Mbs per second

during the COVID-19 lockdown. As such, many students could not access the online platform, Moodle, during peak hours. While LMSs are credited with allowing for both synchronous and asynchronous teaching and learning, synchronous teaching and learning were simply not possible at this time.

Besides bandwidth, the lack of internet access and proprietary technologies often act as a barrier to online teaching and learning. IDE has learning centres in the four regions of Eswatini (Fowler et al., 2013) to facilitate teaching and learning for distance education students, these were unreachable during the lockdown. As such, students needed mobile broadband and ICT tools to facilitate their education. Organisations such as the United Nations Development Programme (UNDP) in Eswatini provided data to facilitate online learning for UNESWA students (UNDP, 2020) during the COVID-19 lockdown, however, nothing was forthcoming for academics. While the provision of data for students was necessary given that the cost of data remains prohibitively high in southern Africa, including Eswatini (MISA, 2022), academics were expected to use ICT to teach without any consideration of the costs they were incurring to do so.

All the participants interviewed observed and agreed with this skewed attention against the academics. They proposed that the provision of the requisite tools by the university is essential to ensure that online teaching and learning become a reality. However, the university's financial position made it impossible for students and academics to be provided with ICT tools during the COVID-19 pandemic. As a result, when COVID-19 struck, all departments in the Faculty of Humanities did not have hardware in the form of laptops provided by the institution. Participants stated that without access to laptops and data, they struggled to integrate ICT into their teaching. Since the university was not able to provide ICT tools, participants stated that they often mobilised their own resources to teach online.

> Besides the staff training and manual offered by the university, which were free, UNESWA support to academics was lacking in this area. This was mainly due to the funding constraints faced by the institution, which affected its response to the pandemic in various ways. Thus, there were no ICT tools or data supplied to staff so they had to dig into their own pockets to equip themselves with the necessary basics to teach online.
>
> (Participant 1)

> Major challenges related to access to ICT tools and the expense of data for internet access affected both academics and students. The department and institution did not have a loan or other facility for accessing laptops and no funding for data, which was only provided to students once as part of a partnership agreement with the network provider.
>
> (Participant 3)

Supplementary Factors for Readiness

Socio-economic and technological challenges have prevented ICTs from permeating to a great extent in many institutions of higher learning in Africa (Ochieng et al., 2023). At UNESWA, evidence of this is clear in relation to Moodle. For example, faculty often cited the fact that online teaching was a challenge during the COVID-19 lockdown because, although they were using Moodle to teach, they had difficulty ensuring quality in the work submitted by learners. In some instances, students wrote tests in groups and others were cheating using their notebooks to search for answers. Regarding assignments, it should be noted that the Moodle system used at UNESWA does not have a plug-in for a plagiarism detector. A reason often cited for this is lack of funds.

> The use of Moodle during COVID-19 was fine, but led to various forms of plagiarism which includes group writing of tests and assignments and students failing to submit tests on time because they are reading and writing at the same time.
>
> (Participant 2)

Inevitably, the results of the challenges at macro- and meso-levels manifested at the micro-level. The data reveals several issues that emerged from interviews with members of staff in the Faculty of Humanities. These include training of staff, reliance on the LMS, and other applications for instruction, quality assurance, and lack of hardware.

A major challenge with the introduction of online teaching at UNESWA was that academics were used for face-to-face teaching; hence, the COVID-19-induced transition to online learning caught them off guard. Initially, the assumption from many sectors was that COVID-19 would be eradicated within a short space of time, yet that was not to be. Hence, embracing the LMS, Moodle depended on individual lecturers.

Although the university had already made a pronouncement that lecturers would have to use the online platform for teaching during this period, there were variations in the use of the LMS within departments in the faculty. All the departments, except for JMC, offered similar courses through IDE. As a result, they were already familiar with the affordances of Moodle and its functionality.

> Having participated in earlier trainings on Moodle LMS facilitated by the Institute of Distance Education (IDE), (even before COVID-19), lecturers in the department did not struggle in using the system. They would hold virtual classrooms, design and upload course content on it.
>
> (Participant 4)

> We may not have used it before [for JMC], but staff had to undergo online training on Moodle to learn to design and implement online courses.
>
> (Participant 5)

It is worth noting that, although some departments had embraced blended learning for the courses offered through IDE, others within the faculty had continued to rely on face-to-face sessions with distance learners. This could be attributed to several factors, as noted by participants:

> Due to the pandemic, this experience put us all on a steep learning curve, but we were all eager to learn and be part of the new-normal teaching system. Some of us found it very difficult to learn and understand this technology due to certain factors like age, anxiety, lack of proper training and resources and failure to acclimatize to the sudden shift from the traditional to the modern ways of teaching and learning.
>
> (Participant 3)

These findings are consistent with the literature (Adam, 2003; Aldheleai et al., 2019), which emphasises that ICT integration into education encompasses more than just training, but must consider other factors to ensure readiness. This is supported by findings in this study that suggest that training did not translate into the usage of the LMS, despite UNESWA's offering of training sessions to lecturers who had not previously adopted blended learning prior to COVID-19.

> Even after Moodle training for lecturers, some colleagues were still struggling to perform some tasks on Moodle. For instance, instead of marking students' assignments on Moodle, the colleagues would print out the assignments and mark them manually. Since the students were at home, it is not clear how they received their feedback except to view the general comments and marks awarded for their work as posted on Moodle.
>
> (Participant 6)

> The skills ability of staff was also not up to par, resulting in uploading of notes and non-interactive material on Moodle, which did not enhance teaching and learning. Students also lacked the skills to engage in discussion forums, uploading assignments on Moodle, etc.
>
> (Participant 4)

This suggests that, while some academics were putting the LMS to use, this did not translate to a pedagogic integration of ICT in education.

As noted below, further challenges arose with practical courses in journalism and mass communication.

> Our programme includes a practical component that requires students to be physically present to use equipment. We had a hard time implementing online learning for those kinds of courses. There was also no guidance from the university on how to proceed so we emphasised on the theoretical aspect.
>
> (Participant 2)

This observation brings a different dimension. Universities have to seriously ponder the online space because it is unlikely that some courses will fully migrate online, in particular courses with a practical component. There is a likelihood that some higher education courses will always remain face-to-face, such as laboratory work, experiential learning, and simply because of student learning preference (Blankenberger & Williams, 2020, p. 411).

Despite the challenges noted, however, some evidence of upskilling and ICT integration into education was witnessed at UNESWA during this period. For example, some faculty members used Meta's WhatsApp for transmitting notes or audio files to students, as well as Zoom, Google Meet, and Google Classroom, among others.

> The use of the Moodle system challenged staff members' ICT skills and some adapted quickly while others required time to teach themselves about the new teaching method and practice using it.
>
> (Participant 5)

> We used emails, WhatsApp, Zoom and others. The choice depended on what an individual lecturer knew about various apps. It was not to support Moodle in the beginning, that is, before the Management pronounced Moodle as the main platform. These other platforms were used at the discretion of individual lecturers. There was no definite structure that was followed to control how it should be used.
>
> (Participant 2)

One of the most lauded benefits of ICT integration in education is ICT's capacity to encourage ubiquitous learning (Sarker et al., 2019). However, in cases where faculty wanted to implement synchronous learning at UNESWA, academics often found that students were not eager to participate. Although the literature suggests that students face similar constraints as academics, additional research to ascertain the reasons for this is necessary in UNESWA's context (Gumede & Badriparsad, 2022). Additionally, whereas lecturers had received training on Moodle, full-time students were not familiar with the LMS. This could be one of the factors that impacted the use of Moodle. If lecturers who had received guidance on the use of

Moodle were struggling to maximise the potential of the LMS, students were bound to face challenges.

Concluding Remarks

The COVID-19 pandemic triggered an urgency for many educators to integrate digital information and communication technologies in their educational praxis (St-Onge et al., 2022), where technology was centred as a solution to save the academic year (Aruleba et al., 2022; Mueller & Oguro, 2022). ICTs hold great promise for the future. However, the opportunity to pedagogically integrate ICTs into education presents a profound basis to make education more accessible and equitable than it has ever been before. Further, the pedagogical integration of ICT in education brings us to the cusp of revolutionising teaching and learning. In this sense, the potential benefits of the pedagogical integration of ICT in higher education may remain unrealised if the implementation is uncoordinated and unfunded. In a resource-constrained context like the Kingdom of Eswatini, a precise policy direction must be charted at the national level. Literature suggests that a lack of specific policy and strategic plans on the pedagogical integration of ICT in institutions of higher learning can be problematic because it results in inadequate implementation of national goals (The National Education and Training Improvement Programme 2018/2019–2020/2021, p. 58). This suggests that there is a need for institution policy and strategic plans to be aligned with national policy and legislative frameworks. The existence of policies such as the Blended Learning Policy, the Moodle Handbook (2020), and the Online Learning and Teaching Guidelines (2021) at UNESWA provide a tenuous link to the fragmented national frameworks. Therefore, there is a need for the government to chart a clear policy direction on the pedagogic integration of ICT in education for the entire education sector in Eswatini.

This research further suggests that unplanned systemic change in the integration of ICT in higher education should be avoided because it can exacerbate inequalities to the detriment of indigent students. Therefore, for any transition to be effective and efficient, there must be a systemic approach with a comprehensive awareness programme on the instructional strategies being adopted by the institution.

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Chapter 8

The Evolution of ICTs' Incorporation at the University of Johannesburg

Thomas (Arno) Louw and Ke Yu

Introduction

Tracking the progress made regarding developing Information Communication Technologies (ICTs) is often tricky because ICT is a general platform that involves multiple stakeholders and impacts all aspects of an organisation, manifesting in physical, structural layout, perceptual, visible, and less tangible changes. While there is increasing evidence and literature on adopting digital systems and organisational reform (Dunleavy et al., 2006; Hanelt et al., 2021; Hinings et al., 2018), there still needs to be more understanding of ongoing innovations' scaleup, particularly from qualitative in-depth exploration in developing country context (see Chapter 2). The aspects depicted in the change readiness (Chapter 2) provide a useful framework for examining the changing process of ICT adoption. Towards this aim, this chapter provides an overview and analysis of the organic evolutionary development of ICTs in the case of the University of Johannesburg (UJ) over the past three decades to distil lessons and other learning points.

UJ is among the youngest universities in South Africa. It emerged as a unified entity in 2005, a result of the merger of three distinctively different predecessors[1]:

- Rand Afrikaans University, "a high output, research-focused university" started as early as 1966;
- The Technikon Witwatersrand, established in 1903 as "a township-based university providing mostly undergraduate opportunities for disadvantaged youth"; and
- The Soweto and East Rand campuses of Vista University, "a vocationally focused institution providing technological training" established in 1981 (Barnard & Van der Merwe, 2016, p. 214).

The early years were full of tensions: many were sceptical about the merger. By 2010, however, "the merger was hailed as one of the real success stories

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of the transformation of higher education in South Africa" (Barnard & Van der Merwe, 2016, p. 209), where UJ uses the merger to reinvent itself, distinguishing itself as a new, adaptable, and progressive institution. By the end of 2013, UJ had achieved many of its strategic objectives set in 2011–2020 and therefore adopted a new set of strategic objectives (2011–2025).

As per PowerHEDA data,[2] UJ's annual student enrolment (both undergraduate and postgraduate) is around 50,000, recently increased towards 53,500 in 2023. UJ has eight faculties spread over four campuses. Its undergraduate headcount to permanent staff ratio is about 38:1, higher than other universities (Dhunpath & Subbaye, 2018). The proportion of historically disadvantaged students at UJ is high: NSFAS students (who receive government funding for tertiary education is between 44% and 51% (2019–2023, peaked during 2020 and 2021). Many come from the rural areas. More than half the students are the first persons in the family to attend university. From 2023, UJ launched the Missing Middle fund to assist students whose families neither fall within the income threshold that qualifies for government funding nor can they afford to pay tuition fees (UJ, 2022).

Regarding ICT,

> By the beginning of 2014, it had established wireless connectivity in all of the lecture venues on all campuses; in all on-campus student residences on all campuses; in all libraries on all campuses; in all student centres; in nine so-called "hot-spot" areas situated on all four campuses.… All first-year students are, from 2014, expected to be in possession of a tablet or notebook as an essential learning device. For students who are unable to afford a tablet or notebook, identified through the mechanism of a means test, the university has provided a tablet for free. In all, 2,000 such tablets were distributed to students at the beginning of 2014.
>
> (Barnard & Van der Merwe, 2016, pp. 223, 224)

Access to laptops or the internet at UJ has consistently improved from just above 60% in 2016 to 85% in 2019. In 2017, while blended modules were already in full swing in all faculties, fully online degree courses in various faculties also started. UJ is also at the forefront of South Africa's Fourth Industrial Revolution (4IR) initiatives (Menon & Motala, 2021). In 2020, Artificial intelligence courses were introduced at UJ, which undergraduate students are required to take. During COVID-19, UJ moved quickly: it is among the first three universities (together with UCT and Wits) that started online/remote teaching in 2020 April[3] (Menon & Motala, 2021).

This case study has one overall quest: how UJ—an ICT champion in South Africa's HEIs—arrived at where it is in terms of its ICT ambition and incorporation. Exploring the ICT evolution over three decades (including pre-merger time), the chapter provides a detailed account of what happened

through the six phases we identify in relation to its enabling factors in terms of both stakeholders and structures within the university. The main research questions unpacked in this chapter include:

- What was the main feature of ICTs in UJ at each phase?
- What were the enablers for the change of each phase?

To this end, policies (UJ's policies on teaching and learning; plagiarism polices, assessment policies, some reviewed and revised annually, some every 5 years), reports (annual teaching and learning reports, annual Information Communication Systems [ICS] reports, learning guides for various departments, annual yearbooks for various faculties/modules, personal observations, discussions and reflections, and numerous informal conversations and discussions with staff (often during staff trainings) were sourced. Where applicable, these data sources were used to triangulate. Because of the vast scope of information available, summative tables outlining key features, influencers, and development milestones are given to provide easier reading and comprehension.

The chapter starts with an explanation of why teaching and learning is the core role of a HEI and therefore the focus of this chapter. This is followed by a detailed description of the ICT development in six phases, distinguished along the evolution of the learning management system (LMS). Summative tables are given as matrices about transformational constituents that influenced the organic UJ's ICT evolution of ICTs at UJ. Discussion on enablers, and broader influence context for ICT incorporation at UJ, as well as further examination of resistance and responses follow. The chapter concludes with the overall lesson learnt.

Core HEI Functions and Core Areas of ICT Incorporation

Core functions of UJ (or any HEIs for that matter) are 1) teaching and learning (generally also seen as knowledge dissimilation or transmission); 2) research (knowledge production); 3) service and community engagement (Boyer, 1990). To successfully realise these functions, all HEI's core stakeholders (students, academics, administration, and management)—need to be involved and work together. This makes communication one key cross-cutting component in any successful realisation of HEI's mission and vision. Increasingly, realisation of HEI functions requires the adoption of ICT where the universities need to continually invest in appropriate equipment, provides and updates infrastructure in terms of hardware (devices, internet, workspace, printers), software (e.g. LMS) or other AI tools, and Wi-Fi/data, and provides both reactive and proactive support (e.g. through training, Topp et al., 2006).

Teaching and learning are often at the centre (Newman, 1852) of HEI's *raison d'etre* in Africa (Derrida, 2004). Nyamapfene and Ndofirepi (2017, p. 85) observe "that the teaching pillar takes on a considerable stature" (also see Fongwa & Wangenge-Ouma, 2015; Thomson et al., 2011), a result probably due to "this function's longest history (compared to the other functions) and a greater need and demand for skills and trained professionals in the continent" (Yu, 2023, p. 18). This function also often requires the most planning, resources, and coordination amongst HEI's various entities. For this reason, the description and analysis of the UJ ICT journey grounds itself upon the main development related to teaching and learning.

ICT Incorporation and Evolution at UJ

In general, UJ's ICT adoption and expansion are marked by experiments, learning, testing and benchmarking before a more formal institutional roll-out process. This is realised through ongoing upgrades and training for changes in available technology (particularly the use of LMS activities and resources), the science of teaching and learning through different learning theories (e.g. constructivism, connectivism, etc.), educational taxonomies (e.g. Bloom's taxonomy, SOLO Taxonomy, Marzano and Kendall's taxonomy, Taxonomy of Significant Learning, Webb's Depth of Knowledge Framework and universal design for learning, etc.) and dvelopment in research around other relevant domains, including neuroscience, cybernetics, etc. Table 8.1 illustrates six eras in UJ's experience, co-evolved with the available LMS platforms.

Pre-2000

The period prior to 2000 was characterised by cautious experimentation with ICTs. This era saw UJ (then RAU) making initial forays into digital infrastructure with limited computer laboratories and computers, with basic software applications (MS office suit) and internet access (largely for World Wide Web searches and emails). There was only a few department, for example, the geography department that used computers more intensively.[4]

During this time, some faculties and departments also experimented with digital-enabled education through the initial LMS WebCT. As there was no additional space to host content on the LMS at the time, UJ the university also used learning content management systems (LCMSs) to manage and deliver (access, edit, upload, etc.) content to students (later replaced with OneDrive). Overall implementation of the LMS before the next period, however, remained was limited and fragmented. Some lecturers began to integrate personal computers (PCs) and telephones in their to enhance communication, although assessment largely remained paper-based. Surveys and user reports were collected and analysed, albeit again largely through physical printouts

Table 8.1 Overview of Teaching and Learning: Main Features

 Year ⇨  Visible Changes ⇩	*1994–2000*	*2001–2005*	*2006–2012*	*2013–2017*	*2018–2023*	*2024+*
 LMS	WebCT (Experimental and Pilot)	WebCT (Campus Edition, institution customised, local server)	Blackboard (similar to WebCT with a different look and feel, primary for presentation or assessment)	Blackboard Learn, Campus Edition (Cloud based)	Blackboard Learn 9.1/Ultra (with SafeAssign)	Moodle-based Local: Digikamva
Teaching Methods	Classroom/Lab	Classroom/Lab	Multimodal (either face to face or online)	Integrative (tech and traditional education integrated, as separate entities), emergence of e-learning/automated learning	Blended/Hybrid (learning experience more blended of various teaching methods)	Innovative (greater student-driven in using tech for teaching/ learning)
Hybrid Approach	⃠	⃠	⃠		☑	Cross collaboration/ curricula teaching
Theoretical Approach	Behavioural (traditional, instruction based)	Behavioural	Behavioural	Constructivist (collaborative learning, more focus on knowledge construction); learning to be	Exploratory (students/ lecturer explore interface between LMS, websites, apps, etc.)	Self-regulated

(*Continued*)

Table 8.1 (Continued)

Year ⇨ / Visible Changes ⇩	*1994–2000*	*2001–2005*	*2006–2012*	*2013–2017*	*2018–2023*	*2024+*
Communication	• Paper letters • Telephone • Faxes • Verbal announcement • Face-to-face discussion • Forums • Newsletters • Circulars • Notice boards • Gatherings • Meetings • Limited e-mail (for admin mainly)	+ • Limited e-mail (for teaching and learning) • SMS	+ • E-mail • Internal message (announcement/ messages on LMS platform)	+ LMS messages linked to emails	+ • WhatsApp • LMS App (on phone) • MS Teams, Zoom, Skype, and other • Video calls • Access LMS through own email/ cloud services (in addition to UJ email)	Fully integrated online, mobile, and visual communication
Assessment	Paper-based and practical	+ Online quizzes	+ Diverse assessment strategy (more variety of assessment, e.g. practical or essay)	+ Assessment mainly online, except practical	+ • More "take-home" /open-book examinations • Online invigilation	+ • More personalised assessment • Remote invigilation
Artificial Intelligence used in T&L	⃠	⃠	Turnitin and Respondus	+	+ • GPT/OpenAI Turnitin for AI-generated material	Open AI detection capabilities

(*Continued*)

Table 8.1 (Continued)

Year ⇨ / Visible Changes ⇩	*1994–2000*	*2001–2005*	*2006–2012*	*2013–2017*	*2018–2023*	*2024+*
Data Analytics	• Surveys and usage reports • Computer and physical questionnaire • Centralised statistical analysis	+ • More learning analytics from LMS	+ • LMS generating teaching and learning reports (not individual lecturer, but admin/ senior management) • LMS data informing progressive decisions (with course evaluation)	+ • LMS generating teaching and learning reports (individual lecturer) • Collaborative moderation and just-in-time decisions • Students profiling started	+ • Piloted (and discontinued) analytics projects (BB predict) • System isolated analytics • LMS analytics • Dashboard building (LMS and ITS)	+ • IoT analytics • Customised dashboards • Big data (for larger scale comparison and benchmarking) • AI-driven analytics
E-book availability on LMS	Certain books/e-document at library, not on LMS	Certain books/ e-document at internet, not on LMS	+	Certain books/e-document on LMS (through hyperlink)	Books/documents plug-ins on LMS	• Self-constructed • Voice-interactive
Staff coding	⊘	⊘	⊘	⊘	☑ ⬚	⬓
Student coding	⊘	⊘	⊘	⊘	☑	☑
Chatbot support	⊘	⊘	⊘	⊘	• UJ Chatbot • Ulink Chatbot • ICS Chatbot • Library Chatbot	☑
Robotics (T&L)	⊘	⊘	⊘	⊘	• Peppa • Simulated counselling	⬓

Note: Key Symbols
⊘: Non-existent at the time (Commercial)
☑: Available
⬚: Implemented
⬓: Modular/Adaptable for further development

only. To manage and monitor various devices, an audio-visual unit (AVU) was established at UJ, tasked to set up overhead projectors, sound systems, cameras, document viewers, etc.

In the late 1990s, some departments also started experimenting with computer-based training (CBT) software to deliver interactive multimedia content on computers. For example, the education faculty (still combined with the Faculty of Nursing at the time) started a CBT Education project in 1996 under the leadership of professors Duan van der Westhuizen and Erna Fourie. Later, this project produced a new BEd Honours course (as one of the 14 specialisation courses) entitled *computer-based education*, later evolved into *teaching computer literacy* and *ICT in education*. A dedicated computer lab was established for this module.

2001–2005

UJ entered into a crossroads in the early years of the new millennium. From 2001 to 2005 (the year UJ's merger was finalised), email and internet usage became more prevalent, expanded from mainly for administrative to also include teaching and learning purposes (e.g. access to certain learning materials on the web). Data projectors (with PowerPoint slides) replaced overhead projectors (with transparencies slides).

The LMS WebCT (Campus Edition) was rolled out to other faculties since 2002. Among the acaemics, more lecturers started to explore the realms of digital administration and content delivery, allowing the consolidation of online course content, assessment, and communication with students into one single platform. The use of computer-based assessment (e.g. online quizzes) emerged; so was learning analytics data that could be generated directly from the LMS, replacing the previous manual collection and analysis of user reports.

2006–2012

The transition to Blackboard (from three different versions hosted by Eiffel Corporation of WebCT in 2005), with its plagiarism detection tools such as Turnitin and Respondus from 2006 further ushered in an era of more modern flexible and interactive learning, course management (e.g. Mahara for ePortfolio, adaptive content release and Kaltura for media hosting and streaming), assessment, as well as concerns and resolution for academic integrity. Although ICT function for administration was apparent since the pre-2000, integration with LMS (also with HR, IT, library system, etc.) only started during this period. Usage of data-informed decisions as well as data analytics also emerged, although again mainly for administrative and senior management.

Blackboard greatly reshaped how course content and assessment were delivered and managed during this period. Announcements and messages could now be sent on the LMS platform directly. Assessment methods became more diverse and formative in nature. Before, the LMS could only grade multiple-choice questions (MCQs) and short answers; now, automated grading tools such as GradeScope could grade a wider range of answers (and also generate user stats reports). Online assessment quizzes through question pools or banks (of which the LMS randomly selects so that students would each receive different questions and open-book examinations with comprehensive rubrics also became possible.

This was also a time of transition from experimental technology to a more consolidated approach. Greater interest in technology from the last period resulted in more demand to learn about the technologies and technology-assisted learning in this period. However, it often took the form of adding technology to teaching and learning, not necessarily yet about incorporating technology into teaching and learning.

2013–2017

From 2013, further unfolding of ICT incorporation at UJ was characterised by the maturation and holistic integration of ICT into teaching and learning. E-learning, blended learning, and complete online programmes were increasingly experimented with. Innovative e-pedagogy was no longer separated from teaching and learning, but consciously incorporated into teaching and learning. This was also the time when UJ started exploring adaptive learning technologies (linked to evaluation tools/course dashboard in Blackboard), using data analytics more intenstively (to analyse student performance data to identify areas where students are struggling, provide targeted feedback and support), and personalising learning and assessment for individual students and tailor-make feedback and support to meet students' needs. Translating into assessment practices, more continuous and formative assessments were implemented, based on the scaffolding assumption that the students build knowledge best by doing small review tasks and specific practices. This was also the period when UJ transitioned from a primarily relying on a traditional behavioural-based instruction to a teaching philosophy of "learning to be" that, makinges co-constructing knowledge and tracking how learning takes place at the fore of the teaching strategies.

Both students and lecturers started to rely more heavily on the LMS: online assessment became common practice; learning analytics generated from LMS for individual lecturers was also increasingly used to assist decision making. So was incorporation of internet and web sources in teaching and learning, including cloud services, YouTube, Viva, OneDrive, and Google Drive. Some lecturers also started to use the recording studios established in the previous phase to pre-record lectures. These were then streamed through

streaming services, e-posters, voiced-over slides, discussions, and presentations, so that students could access them anytime. From 2015, blended teaching increasingly shifted towards online content and engagement, from 60/40 to about 50/50.

In 2016, due to student unrest, Blackboard moved its support centre and servers hosted in SA to Amsterdam for consideration for data safety, security, and continuity. Although access wasn't impacted due to cloud storage, the cost of using Blackboard escalated.

2018–2023

From 2018 to 2023, UJ embarked on further technological integration with social media, apps, other online communication tools and devices, greater use of cloud services, and open-source material. AI capabilities within the LMS Blackboard Learn expanded, evolving into a comprehensive virtual learning environment (VLE), integrating open access and videoconferencing tools such as Microsoft Teams, Zoom, Google Drive, and OneDrive with whiteboards and smartboards (in dedicated venues) for synchronous and asynchronous automated and self-paced learning and collaboration. Technology and the support for remote learning, including various chatbots, robots, and learning analytic tools, became infused as an indispensable part of UJ's DNA: intrinsic to the teaching and learning processes. Paperless actions increasingly became the norm. One prime exampmle of this is E-registers (for class attendance), developed by Centre for Academic Technologies (CAT) with ICS (separate from LMS, as a plug-in for the intranet portal) in 2017.

UJ's quick response to COVID-19 and its ability to continue education during disruption is one testament to its digital readiness.

2024+

After reviewing of mobility, cost efficacy and affordances of Blackboard, the decision was made at UJ to transit to a local LMS (Moodle) from 2024. Moodle is an open-source platform with greater flexibility and customisation options than Blackboard, and has greater capability of gamification, analytics, and better integration with other systems, such as the student information system and library services as well as responsiveness towards mobile devices. Further infrastructure advancements are expected to enable even more innovative teaching and learning methods, including profile development builders, holograms, and intelligent campuses, showcasing a seamless blend of technology and education, and reflecting a vision for an inclusive, adaptive, and future-oriented learning environment. This is expected to become more comprehensive to an evenaid more personalised and immersive education, potentially becomingas the new standard.

Table 8.2 ICT Evolution Enablers at UJ

	1994–2000	*2001–2005*	*2006–2012*	*2013–2017*	*2018–2023*	*2024+*
Supporting structure  Student Walk-in & Telephonic Support	• Central administration and faculty administration offices • Centre for Distance Learning (CD) • Audio-Visual Unit	+ • IT Offices • CenTAL (for T&L support, partly from previous CD) • Assessment division; PADS; Academic Division for Higher Development; Division for Psychological support (other CD)	+ • ICS (renamed IT offices): student and lecturer walk-ins; installation of more network points; also with computer laboratory support	+ • ICS (+ maintenance of network system, including printers) • MAMS (supported by assessment division) • Call Centre • ADS (former PADS, Psycad—former psychological support, CAT—renamed CenTAL, focus on e-learning, LMS support) • Some systems integration	+ • ICS (+ software licencing, system authentication) • More systems integration • Chatbots (library, ICS tech support, ADS)	+ Fully integrated system(s)
 Devices	• Bonded file and CD (for printed paper-based material) • CD-ROM • PCs • VGA monitors • Telephones • Dot matrix printers • Typewriter • Photocopy machines • Sound enhancement (e.g. amplifier) • Lapel microphones • White pull-down screens • Overhead projectors	+ • CD reader/writer • DVD writer • USB drives • VGA monitors • VGA dual monitors • Cell phones (MMS/SMS) • Inkjet (full colour) and laser printers • Scanners • Data projectors • Document viewers • TV monitors, broadcasting to different parts in large lecturing halls • Sound system	+ • Electronic catalogue (for library searches) • Square LCD screens • Smartphones • Laptops (mainly for staff) • Docking stations (for charging) • Laser printers (full colour) • Photocopy printers (full colour)	+ • Tablets (staff and students) • Laptops (staff and students) • Touch screens • Smart devices (speaker, scanner, etc. connected to phone/computer) • AV devices (e.g. video cameras) • Landscape LED screens	+ • Wi-Fi, Bluetooth, and cloud-enabled devices • Full accessibility (disability students) • Network printing • 3D printers • Specialised PCs • Scan-copy-print machines • Integrated microphones • Web cameras • PC tablets • Smartwatches • Interactive whiteboards	• Compact future devices (size reduction) • Devices as default stationery

(*Continued*)

Table 8.2 (Continued)

	1994–2000	*2001–2005*	*2006–2012*	*2013–2017*	*2018–2023*	*2024+*
 Workspaces	• Lecture halls • Smaller classrooms • Laboratories	+ • Computer labs	+ • More computer laboratories for ±3000 PCs	+ • Computer laboratories throughout departments • Printing stations at computer labs	+ • Classrooms with Wi-Fi access • Smart workspaces (with screen, HDMI cable, etc.) • Communal workspaces (open spaces) • Remote spaces • Live maker space	• Smart campuses • Onsite and remote spaces • Smart classroom • Maker spaces for teaching and applications • Interactive virtual reality spaces • Holographic conduct
Operating System	• Central admin servers network • Novell • Windows 3.1 (with MS Office) • Windows 95 (network capabilities implemented)	• Central admin servers expanded network • Novell Groupwise • Windows 2000 (MS Office 2000)	+ • MS Exchange (replacing server network) • Windows 2007 (MS Office 2000, with network capabilities implemented)	• MS Exchange and hybrid integration • Windows 2016 (MS Office 365, OneDrive, etc.)	• MS Server 2016 (network operating system) • Linux virtual servers (partially used) • MS Exchange advance	Fully cloud-based
Internet University Backbone Structure	☑			Cable and Wi-Fi	Cable, Wi-Fi and remote	Flexible for further development

(*Continued*)

Table 8.2 (Continued)

	1994–2000	*2001–2005*	*2006–2012*	*2013–2017*	*2018–2023*	*2024+*
Internet access		☑	☑	☑	☑	Multiversity
Data Storage	• Floppy disks • Tape Hard drive	+ • CD Shared folders	+ • USB 1 memory CD/DVD writers	+ • USB 1 and 2 memory • Shared network folders Private cloud	+ • USB 2 and 3 memory Private and hybrid cloud	Cloud-based RAID cloud storage
WiFi hotspots	⊘	⊘	⊘			☑
Online Streaming	⊘	⊘	⊘		☑	☑

Enablers and Broader Context for ICT Incorporation and Evolution at UJ

This section reviews the broader context, and enables both within and beyond UJ, that have facilated the ICT evolution at UJ. The initial development of the internet worldwide was the ARPANET (Advanced Research Project Agency Network) in the 1950s and 1960s, linking military projects via a network backbone today known as the internet. ARPANET also linked military research to U.S. universities to facilitate information exchange. Over the next two decades, the network developed and expanded to households and school communities. In South Africa, the internet for commercial use arrived in 1995–1996. This pre-2000 era was also marked by the start of SA's broader HE transformative process (although largely about policy formulation). During this time, although computer-based education was already in full swing worldwide,[5] it was not yet well developed in South Africa. Instead, the main alternative to the traditional residential contact instruction at HEIs was distance education where study material (e.g. study guide, study material, assignment, etc.) was printed on paper and posted through postal services. The earliest ICT incorporation during this period took place where CD replaced printed study material. In residentail universities that retained traditional contact teaching and learning mode, lecture halls, labs, and classrooms, sometimes equipped with projectors, microphones, and white screens, remained the main instructional space and devices. Outside classrooms, communication largely occured through notice boards (for staff photos and contact details), letters, telephones, and faxes. E-kiosks were among the earliest technoligical devices installed at UJ during this time. They were touch-screen information stations were set up all over campus for students to access individual information (log-in needed): e.g. to check timetable, LMS, financial statement, etc. The main driver for the start of interest and experimentation in this phase was optimism and growing acknowledgement – from across the world, South Africa to UJ – about ICT's potential to open new avenues for information access, resource sharing, and more efficient communication.

In the early years of the new millennium, revolutionary curricula (e.g. Outcome-based education, OBE) were introduced in SA's schooling sector. In the HEI space, 2001–2005 was the period that merger was implemented. Within ICT, emails and the internet both expanded, so were the availability and usage of CDs (reader and writer) and USB drive–compatible equipment. UJ's infrastructure mirrored this expansion, for example more computers, photocopyers and computer labs were installed. In the classrooms, data projectors with sound systems, as well as TV monitors (set up at different places for large lecture halls so students could see the lecturer and the projection of what was on the screen) also became the new common features. For security

and access control, smart cards (e.g. for the library) evolved from them having to be scanned to tapped.

The expansion and reconfiguration of the ICT supporting structure was instrumental during this phase. The Centre for Distance Learning (CD) evolved into the Centre for Technology Assisted Learning (CenTal) to provide more dedicated support for ICT in teaching and learning. Other parts from the original Centre for Distance Learning division evolved into the assessment division (responsible for administering assessments, checking the exam and readiness of question papers, and archiving question papers); Academic Division for Higher Development; and Division for Psychological support. Throughout UJ, the collective realisation of the potential of ICTs in reshaping education was explicitly aknowledged and incorporated.

During the period of 2006–2012, social networks and mobile technologies, including smartphones and tablet computers swept the world (Ng'ambi et al., 2016). In SA and at UJ, mobile device ownership (both simpler version and smartphones, together with auxiliary devices such as docking stations) amongst students increased. Social media (Facebook, Twitter, etc.) and instant messaging (e.g. WhatsApp) quickly caught up. Laptops became essential devices for staff's work. Full-colour laser printers and photocopiers replaced the inkjet and black-and-white only version. UJ's library moved electronic, e.g. for e-books, e-journals, and online databases, making online searching and learning resources possible. Driven by a realisation of the importance of flexible and accessible educational resources, additional support was also established, including large computer laboratories (for 3000+ PCs), the establishment of ICS (for lab and technical support, including walk-in support centres for hands-on assistance for students and staff), and recording studio. Many of these were built on relevant equipment and conference call centre (facilitated a hybrid form of conferences) established in the last phase (initially on two campuses, with training organised by CAT). UJ also established a call centre e.g. for IT, maintenance, or HR support for staff in 2006 and expanded in 2010 for students. This was initially available only through internal telephone and later expanded to multiple access points, e.g. through LMS, email, toll-free phone (0800) number, and computerised voice-over internet protocol (IP) telephone system's switchboard calls to the university's local network (intranet). In 2012, UJ's online portal (through the internet, used to be primarily for staff members mostly, but also contained timetable information for students) also started to operate as the intranet gateway for UJ staff members, the students, and other stakeholders for a wide range of information and data storage and access point.

Between 2013 and 2017, the widespread availability of cable and Wi-Fi across UJ campuses ensured that internet access was no longer a luxury but a readily available necessity. ICS took on the additional role of maintaining the network system. To cater to the greater demand and need for ICT use in the

wake of the proliferation of devices (e.g. tablets and laptops for both lecturers and students, as well as smart devices that can be connected to computers or phones), various departments established their own computer labs with printing stations. As mobile technologies were increasingly used inside the class, cell phone usage rules were relaxed to enable students using cell phones to record class, or engage LMS during class on their phone. This, changed the meaning of embedded learning.

On the e-pedagogy side, the CAT (Centre for Academic Technologies, staffed with instructional designers and learning experience designers) that focused on academic technology and e-learning, was established in 2015, replacing CenTal. Together with psychological support (Psycad), CAT formed part of ADS that led a university-wide project to re-train staff and students on LMS and implementation of pedagogies for online learning and blended learning. This was dubbed the Pre-evolution. Increasingly, ADS assumed a central role in coordinating academic support where it also mainstreamed the scholarship of Teaching and Learning (SoTL) throughout UJ. Since 2017, the ADS's work has also become more systematic and institutionalised through its Institutional Student Success Initiative (ISSI). A data analysis unit was established within the ADS to provide data support and the centre is moving towards data-informed work.

While cable and Wi-Fi connectivity remained the backbone of intranet and internet access at UJ from 2018 to 2023, system integration increased, linking physical and virtual devices, platforms, and spaces (e.g. smart workspaces and live maker spaces, particularly in the library). In addition to the simulation rooms established for the faculty of health science in 2012 for emergency medical care, virtual reality spaces were also established, initially in the faculties of arts and engineering in 2019. In 2021 and 2022, two additional VR labs were established in another two faculties: education and business respectively. Podcasting facilities were also set up, offering service to both academics and academic support. When electricity supply in SA experienced challenges, Wi-Fi repeaters and backup generators were set up to ensure network and LMS access during load shedding and power outages from remote locations. Chatbots also emerged both as support and teaching tools.

Responses and Resistance

Studies on scalability suggest that true embedment of ICTs into a university's core business comprises four dimensions: critical mass in terms of adoption, integration into organisational values, legitimisation, and sustainability (Rossiter & Crock, 2006). Successful integration also requires a sense of ownership and legitimatisation to include formal policies and resource allocations. As Roger's (1995) Diffusion of Innovation Theory (DIT) predicts, for any innovations, there are the innovators, early adopters, early majority, late majority, and laggards where few people are innovators or experimenters by nature. Instead,

resistance to change is the norm (Ford et al., 2008), because changes require one to venture into unknown and unfamiliarity. As in other fields, literature on changes related to technology has also recorded numerous examples of resistance to change (Ford & Ford, 2009; Watson, 1971). Recorded hindrances to the effective use of technologies for teaching and learning include:

> lack of adequate training of HE practitioners in the appropriate use of technology to improve learning outcomes; institutional barriers limiting broader uptake of such technologies; an increasing need for more effective practices to support personalised learning; the need for a "culture shift" among academics to accept challenges to traditional approaches to teaching and learning and scholarly publication, as they move towards a more open and participatory approach to teaching, learning and research… [as well as] how to balance between learners' connected and unconnected lives. (Ng'ambi et al., 2016, p. 4)

Even with continuous training, retraining and re-skilling to help users keep abreast of the new requirements, can readily result in change fatigue (Orlando, 2014). This indicates the increasing importance of motivation. The following section applies Roger's (1995) DIT model to examine the reactions of individuals within UJ to the changes. It is noteworthy that as technology and people's reaction towards it changes over time, the predicted five stages of technology adoption to the typology of people (including typical reactions to the changes) alo changes, and not remain static.

Stage 1: Awareness

This largely applies to the pioneering faculty members who began experimenting with emerging technologies as early as in the pre-2000 period. Recognising ICT's potential to revolutionise education, excitment of technological advancements were often whispered and echoed in the faculty lounges and lecture halls among these innovators and early adopters. However, the typical reaction from the majority of others around this time, until the merger (2005), were that of scepticism. A typical response was "I'm not sure about this whole 'technology in the classroom' thing. Traditional teaching methods have served us well for centuries. Why fix what isn't broken?"

Stage 2: Interests

Despite initial scepticism, interests, propelled by curiosity, blossomed among a broader segment of faculty members (early majority) into the next phase around 2010. "Perhaps there's something to this after all. I attended a workshop on virtual reality in education, and I must admit, I'm intrigued. Imagine the possibilities!" Workshops and seminars on digital learning tools also

attracted more academics from the early majority who explored innovative teaching methodologies or adapt to the changing educational landscape.

Stage 3: Experimentation and Evaluation

Interests and curiosity spread. Other lecturers and admin (late majority) also started to embarke on experimentation from the beginning of the next phase (around 2013). These late majority carefully weighed the benefits against potential challenges, seeking evidence of positive impact before fully embracing technological integration. Experimentation allowed them to assess the effectiveness of these tools in enhancing student engagement and learning outcomes. A typical response at this stage was "I incorporated online discussion forums into my course, and the results have been fascinating. Students who were once reticent in the classroom now eagerly participate in online discussions, sharing their insights and perspectives".

Stage 4 and 5: Trials and Adoption for Laggards

The laggards primarily include the slow adopters and those with techno phobia who hesitate to try or brace technological change. For a while (around 2008–2012), there was also confusion among staff members to distinguish the IT division from the department of information technology, computer science, and informatics (computer science department). While targeted support and encouragement from UJ as a whole or respective faculty, departments didn't yield positive results, it was eventually the students who pushed these laggards over. Because students are exposed to different lecturers (among whom less resistant, have gone through their initial hesitations, or have started experimenting), they bring these experiences and expectations to the laggards. In other words, the push from the students, including loss of prestige and dimmed respect, increasingly made the resistance more costly and the change inevitable. Although not deliberately planned or pursued, this serves as the last straw or practical incentive to push the laggards. The eruption of COVID-19 also made this process inescapable, albeit no less painful. Slowly, the laggards started to take baby steps in joining the experimentations.

Conclusion

ICT has made significant leaps over the past three decades in South Africa, including at UJ. Looking back, the progress of ICTs' incorporation at UJ can only be described as immense, although it takes time to recognise it because one is immersed in it. Like elsewhere, ICT has been disruptive to the existing teaching and learning practice; but on the other hand, an undercurrent of continuity, in the sense of current evolvement always builds on what has happened during the previous waves (even when it is about resistance), can also be

easily detected in the UJ story. The various LMSs used at UJ distinguished the different timelines and phases presented in this chapter; they also provided the infrastructure to integrate the various digital tools for teaching and learning.

In this chapter, UJ is used as a case study to provide an overview and analysis of the organic evolutionary development of ICTs over time. This chapter contextualises this story by discussing the amalgamation and conglomeration of visible, perceptual, and structural changes, in terms of the infrastructure (both hardware and software), people involved, their interaction, and resulting practice on teaching, learning, and assessment. It is a story of pioneers, early followers, those who only adapted later, and those who finally accepted the inevitability of the changes. One key lesson from this case is the importance of deliberate change management and nudge, coupled with allowrance for organic evolution (e.g. that for the laggards).

In some sense, the UJ story is also a story of modular design by integrating smaller, independent components to achieve specific functionality. These then evolve into an integral part of the process later towards a greater and complete product. In software engineering, modular design often works through a modular programming technique that divides the overall functionality of software products into independent, interchangeable modules that can function and be programmed separately. Although these smaller components and experiments seem to be independent, they are also part of the network that interacts with each other with increasing interdependence. This means that equipment and new positions in IT maintenance are added or adapted for the next era, where's new features and upgrades are often not completely reinvented but reconfigured. This can be seen in smaller changes, such as more plugs for charging, changes in venues, desktop PCs to laptops and tablets, transparencies to PowerPoint, overhead projectors to data projectors, to larger ones including the change from cell phones to smartphones, cell towers to Wi-Fi repeaters, cable to wireless networks, USB charging points, etc. Lecturers and students also had to go through numerous rounds of re-skilling. Many of these changes were small when they happened, but when they aggregate, the overall change is a notable and transformative. We propose that this modular aspect be seen as an integral aspect of the scaling up ICT incorporation where experiments and small wins expand (or travel by word of mouth) into further experiments and uptake, which inevitably drives change at a larger scale.

Notes

1 In this chapter, UJ does not refer to only the merged entity but also its predecessors as the operation of merged universities directly builds on where the predecessors have left off.
2 South Africa's higher education data analyser (HEDA) platform for SA's HE management information system data. For more details, please see the chapter in this book on PowerHEDA.

3 UP and UFS started in May, while others started later (Menon & Motala, 2021).
4 The geography department then used a massive computer and a considerable number of terminals in those earlier days, connected to Meteosat (satellite) to predict weather patterns: the computer needed to upload and boot by using 24 8-inch (±20,5 cm) floppy disks, each containing 80 kilobytes of data. This massive computer was booted on a Monday and dubbed by the students under the name *Bliksem* (Dutch word for *lightning*).
5 New Media Consortium (NMC) was established in the United States in the early 1990s, and recognises and supports innovative uses of new media technologies (mainly text, illustrations, photographs, sound, voice, animations, and video) to enhance learning and teaching in HE. Its direct reference to effective computer-based learning tools is, however, only seen from 2004 onwards (Ng'ambi et al., 2016).

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Chapter 9

Rethinking ICT Integration in Teacher Education Curricula at Diploma Level in Zimbabwe

Tendayi Dzinoreva, Logan Govender, and George Mavunga

Introduction

Expansions in technology have, at a global scale, impacted processes and procedures in all sectors of life, ranging from health, banking, communication, and manufacturing among other sectors. The use of information communication technologies (ICTs) has also been encouraged in teaching and learning. In Zimbabwe, the National ICT policy (2015) statement 11.1 specifically stresses the government's aim to a) facilitate the deployment and exploitation of ICTs in the educational system from primary school upwards; b) work with the relevant ministries to include ICT training and education in schools, colleges, and universities; and c) promote e-learning and use of e-learning materials throughout Zimbabwe (National ICT Policy, 2015, p. 28). In the main, the policy seeks to ensure that the country's ICT trajectory is aligned with global best practices for purposes of universal coverage. This, it is envisaged, will be a game changer for the country's macro-economic landscape with trickle-down benefits to the socio-economic realities of the citizens. The country's focus in terms of ICTs is on developing human capital in terms of technology skills and collaborations with other ministries to ensure equality and equity in the access and utilisation of ICTs in education from primary education to higher education (National ICT Policy, 2015). However, the uptake of technology in teaching remains limited. Research carried out by Musarurwa (2011) and Gomba (2016) in Zimbabwean secondary schools shows that teachers are using technology, albeit with inadequate skills and a lack of resources at the centre of poor implementation of what is supposed to be a technology-driven education. Also linked to this is a technological divide in Zimbabwe relating to access, usage, skills, and affordability (Gomba, 2016; Musarurwa, 2011). One main feature of the technology landscape in Zimbabwe is the differences in its populations' access to technology: those in rural areas have limited to no access to connectivity as a result of poor technology infrastructure. This is attributable to the wide gap between the rich and poor in the country, which, generally, manifests itself in the urban-rural socio-economic binary. This became apparent at the onset of the COVID-19 pandemic when the public

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education sector was caught ill-prepared to deal with the demands for remote learning, leading to the closure of institutions of learning (Dzinoreva & Machingura, 2021).

In the context described above, teacher education institutions are exhorted to develop both digital literacy skills and digital pedagogy skills in pre-service teachers as per the Department of Teacher Education policy. The chapter explores the readiness of Zimbabwean pre-service training institutions to take up these ICT-related challenges, specifically in terms of its relevance for ICT integration skills development. The change readiness framework developed in Chapter 2 is employed to problematise this e-readiness and implementation of ICT integration at individual, institutional, and national levels. Critical theory is also drawn to focus on the power dynamics and inequalities that manifest at different levels in the organisational/institutional change process. The notion of culture, specifically micro-cultures, resource distribution, appropriate skills, and curriculum issues emerge as critical areas of concern, with dynamics at one level of operation impacting other levels. Motivation, commitment, and capability at various levels: institutional, policymaking, and classroom emerge as further challenges. The chapter recommends more focused teacher educator, and pre-service teachers' ICT integration training and development; cultivation of a culture of multilevel readiness for continuous change inherent in the use of ICT in education, targeted training of curriculum advisors, technical and support staff, as well as enhancement of policy knowledge and literacy of policymakers and implementers to ultimately benefit the teacher workforce in Zimbabwe. Overall, the chapter reflects on the importance of readiness for ICT integration into the preservice teachers' curricula and post-service implementation, taking account of the key national, African and global contexts, as well as the political dynamics that characterise change processes, for a reimagined and sustainable 21st-century education system. It begins with providing details on the context of Zimbabwe, in terms of ICT development, ICT in education and HEIs, as well as its usage in teacher education.

ICT Development in Zimbabwe

One of the main objectives of the revised National ICT Policy of 2016 was to improve and increase access to and use of ICTs in all spheres of life. This objective cannot be achieved in the face of poor and limited infrastructure and other ICT-enabling affordances such as electricity. However, there are serious digital disparities affecting Zimbabwe at skills, knowledge, geographical, and socio-economic levels. Coverage is concentrated in affluent urban areas while broadband coverage in rural and remote areas remains limited (Nhendere, 2020). There are also rural areas, such as Binga, without any ICT connectivity or electricity to enable the access to, and use of, ICTs (Nhendere, 2020).

In cases where the infrastructure is available, there is limited knowledge and skills on how to use ICTs as the country suffers from the effects of brain drain.

This adds to the challenges affecting ICT adoption and use in Zimbabwe with the lack of innovation in the ICT field. Brain drain has affected the ICT sector due to the mass exodus of experts to other countries that offer both favourable salaries and working conditions. IT experts leave the country soon after graduation, leading to reduced personnel for training and development (Nhendere, 2020). In addition to the challenges of skills, Zimbabwe is faced with challenges of access and use as a result of very high internet and data costs.

Policy and political decisions have also had huge effects on the growth of ICT in Zimbabwe. Although Zimbabwe has made efforts to introduce technology in health, banking, education, and various other sectors, its economic and political problems have thwarted its vision to expand and modernise existing infrastructure (Zimbabwe Infrastructure Report, 2019). One example of this is artificial intelligence, which has emerged as a major driver of educational transformation; however, Zimbabwe's access ad adoption of applications such as Chat GPT was very slow with speculations that it is because of the sanctions imposed against it by the U.S. government and European Union.

Therefore, ICT developments in Zimbabwe are progressing at a very slow pace with very low levels of adoption and access across the country. Education was not spared from the ubiquitous nature of technology or the broad impact of ICT adoption challenges. What affects mainstream Zimbabwe spills into education, including higher education and teacher education. The major barriers to integration of technology in teaching and learning in education include lack of ICT infrastructure, limited skills among educators and learners, as well as high internet ad data costs for setup, ICT tools, and usage. The COVID-19 pandemic was also a key driver of increased technology use in education. For Zimbabwe, the change was shocking, fast, and rampant, leading to the closure of schools and higher education institutions (HEIs), owing to high levels of unpreparedness for online learning (Dzinoreva & Machingura, 2021).

ICT in HEIs and Teacher Education in Zimbabwe

Chipfunde et al. (2023) state that HEIs should "upgrade their ICT infrastructure and resources in order to maintain the success in computing skills level of staff and students in teaching and learning. They should also promote organisational learning" (p. 6). HEIs in Zimbabwe have adopted the integration of technology for administrative, assessment ad teaching, and learning despite the range of challenges facing ICT adoption in education (Chipfunde et al., 2023). The University of Zimbabwe, Harare Institute of Technology University, Bindura University of Science and Technology, and Midlands State University, among other universities in Zimbabwe (Maphosa, 2020; Mawere et al., 2022; Tsikira & Moyo, 2022), have fully embraced ICT in teaching and learning by ensuring that students have access to the internet

through the provision of computer labs and e-learning resources. Kujeke et al. (2014) state that ICT integration in HEIs is at varying levels, with differences in ICT infrastructure and competencies of both students and learners. Overall, there is a need for improved infrastructure, delivery processes, and harmonised ICT policies in higher education to ensure overall utilisation and associated benefits derived from technology (Kujeke et al., 2014; Pondiwa et al., 2022). Universities such as The University of Zimbabwe, Harare Institute of Technology University, Bindura University of Science and Technology, Midlands State University, and Lupane State University, just to name a few, have also introduced the "Bring Your Own Device" programme to promote access and usage of ICTs for students (Maphosa, 2020; Tsikira & Moyo, 2022). Submission of assignments for most universities in Zimbabwe is through online portals; thus, encouraging and promoting ICT adoption in teaching and learning (Sibanda & Muyambo, 2020).

For teacher education in Zimbabwe, the government supported the integration of technology into teacher education by providing funding, computer hardware, and related tools (Musarurwa, 2011). The Department of Teacher Education (DTE), which runs a Scheme of Association for teacher education colleges, has an ICT policy that makes it mandatory for all pre-service teachers to undergo and pass the compulsory ICT course before they are certified as qualified teachers (Musarurwa, 2011). Despite the existence of the DTE ICT policy, teacher education colleges do not, themselves, have distinct institutional ICT policies to support the DTE policy initiative.

ICT integration in teacher education curriculum was promoted through the College Information Enhancement Programme (CITEP), which provided training for educators in Teacher Education Colleges and Polytechnics (Pondiwa et al., 2022). However, some institutions have, amid limited resources, poor ICT infrastructure, and lack of skills among teacher educators, attempted to promote the integration of technology into teacher education curriculum with much difficulty (Dzinoreva et al., 2023). Thus, ICT integration in teacher education curricula has been taking off at a slow rate due to various challenges.

Conceptual Framework: Expanding on Multilevel Change Readiness

Besides the multilevel change readiness model discussed in Chapter 2, this study also draws on an exploration of critical theory to deepen our reflections on power dynamics at various levels for the study. The multilevel change readiness model offers opportunities to reveal insights around programme and policy implementation; problems and obstacles in the change process, such as organisational coordination at multiple levels and operational efficiency; and how such obstacles can be unlocked for effective implementation.

As a key phenomenon whose implementation or lack of it has far-reaching implications, the integration of ICT into higher education also cannot be done at only one level, that is, the college, department, individual lecturer, or individual student. Rather, it needs to be done at each of these levels to attain a holistic understanding of how what happens at one of the levels is a function of what happens at the other levels. This approach is necessitated by the hierarchical or nested structure of the data that make up the phenomena and how the manifestation of such data at one level is mediated by the nature, form, and behaviour of the data that constitute the phenomena that make up the other levels that are part of the broad issue under study. In the context of this chapter, for example, this implies that in looking at challenges and possibilities associated with ICT integration in individual programmes at a pre-service teacher's college, we need to understand what is happening at the college itself, the national level, and, to an extent, globally. This is exemplified by how the ICTs available for use in programmes at a pre-service teacher's college are a direct function of the individual teacher educators, college, and national contextual realities. This would include the availability of ICT infrastructure and services at the college, the level of the lecturers' pedagogic agency to effect ICT integration, as well as the national economic context that is a predictor of ICT resources and services at the colleges, since these institutions are government-owned and run.

Understanding technology integration readiness in teacher education institutions, from a multilevel analysis perspective, should begin at the individual readiness level. In the context of ICT integration in teacher education institutions in Zimbabwe, readiness can be viewed from the individual teacher educator's confidence in their own technology skills and their ability to integrate technology during pre-service teacher education development. An organisation's readiness for technology adoption is highly dependent on its individual members' beliefs and commitment to the proposed change. Thus, individual readiness to change is a key success factor because "organizations only change and act through their members and even the most collective activities that take place in organizations are the result of some amalgamation of the activities of individual organizational members" (George & Jones, 2001, p. 420). If both teacher educators and pre-service teacher educators' mindsets are not ready for change, integrating technology within teaching and learning will not be effected. For technology integration to be effectively adopted, teacher educators have to possess positive characteristics, such as openness to change, self-esteem, self-efficacy, locus of control, and positive affectivity (Oreg et al., 2011); otherwise, they will resist the change. Additionally, at the individual level, there must be a belief that support will be provided to facilitate the intended change. Thus, if teacher educators and pre-service teachers do not feel supported in the process of technology integration for teaching and

learning, they may not recognise shortcomings and skills gaps, and subsequently, the need for change.

The second level in the analysis of technology readiness would be the group level, which encompasses the teacher educators and pre-service teachers. How these groups perceive and respond to the technology integration change from traditional methods of teaching and learning becomes a key factor in the matrix of organisational change readiness. Rafferty et al. (2013) refer to group readiness as collective readiness that arises from shared individual cognitions and affects through social interaction. Both group and organisational readiness are strongly influenced by "(1) shared cognitive beliefs among work group or organizational members (a) that change is needed, (b) that the work group or organization has the capability to successfully undertake change, (c) that change will have positive outcomes for the work group or organization and by (2) the occurrence of the current and future-oriented positive group or organizational emotional responses to an organizational change" (Rafferty et al., 2013, p. 116). Therefore, to analyse the readiness of teacher education institutions to integrate technology in the development of secondary school pre-service teachers, all aspects of individual and group readiness must be interrogated, as these have a direct effect on institutional readiness for technology integration. For instance, the group's overall sense-making about the institution's commitment to supporting teacher educators with the necessary technology tools and skills capacity building can have an impact on how teacher educators respond to the policy that makes it mandatory to teach with technology. Groups also experience emotional contagion, which has an effect on group readiness for change. Some teacher educators may influence others "through the conscious or unconscious induction of emotional states" (Barsade, 2002). This can be done in the form of "behavioural mimicry and synchrony" (Saavedra & Kwun, 2000), where individuals act towards certain things in the way of the group. This implies that in teacher education institutions, educators may either use or not use technology for teaching and learning in direct mimicry of others.

Thirdly, the teacher education institutions themselves, within the mandate of the National ICT policy framework, are expected to be in a position to implement the desired change, that of integrating technology to develop pre-service teacher educators. The readiness of teacher education institutions in Zimbabwe also has to be analysed from this angle of individual readiness as it is affected by other factors, such as individual teacher educator beliefs, attitudes, skills, and technology resource availability. For effective technology integration for the development of secondary school pre-service teachers in Zimbabwe, institutions must understand that there is a layered and multiple reality to technology integration spanning from the micro to the meso and the macro levels. Figure 9.1 represents our conceptualisation of the different layers, wherein events and interactions occur that have a bearing on the integration of ICT into the pre-service teachers' curricula.

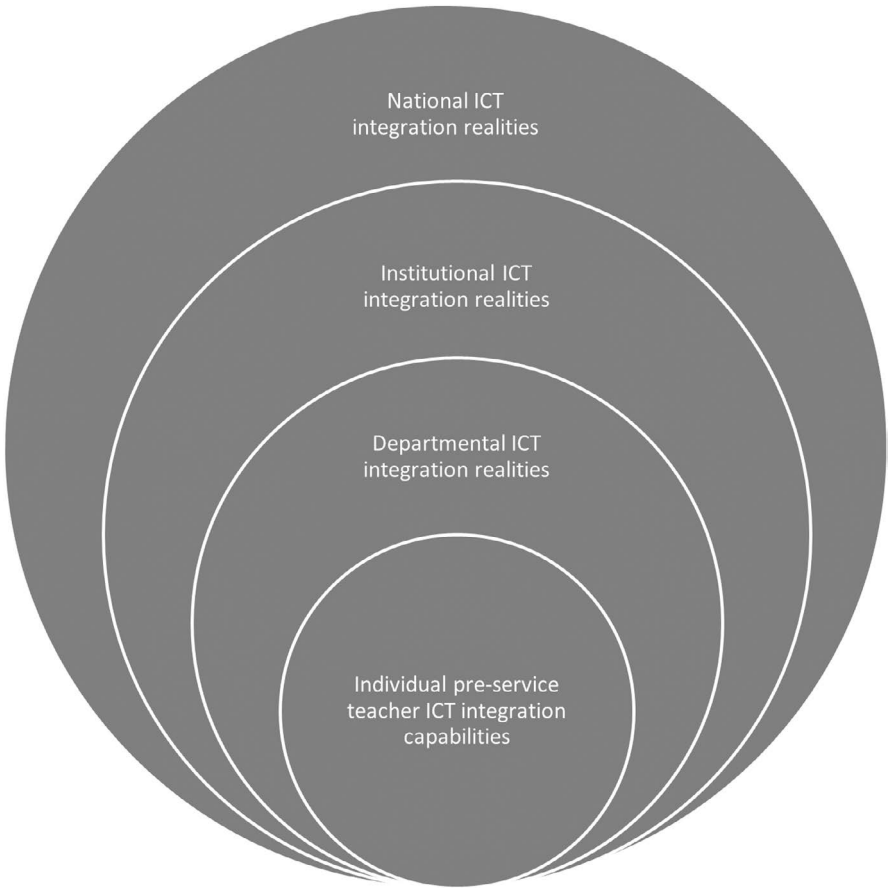

Figure 9.1 A change-oriented conceptual framework for the integration of ICT into pre-service teachers' curricula

The outer layer represents the national ICT integration landscape. At this level, we analyse the national ICT policy and strategies to check the extent to which they facilitate change in the way in which ICT is integrated into the pre-service teachers' curricula. In the context of this chapter, this means that changes at the national level can bring about changes in the ICT integration policies and strategies at the institutional level. This, in turn, has a bearing on what happens at the departmental level and, ultimately, it also manifests itself in the way in which the individual pre-service teachers can integrate ICT into their curricula of specialisation. This raises the crucial question of whether the existence of policies in themselves is a sufficient condition for meaningful change.

Finally, change readiness is also viewed from the practical reality of the ability of an organisation to implement the change. In this case, the questions that arise have to do with the infrastructural capacity of the education institutions to implement technology (availability of technology tools, both hardware and software) and the capacity of its teacher educators as well as the levels of technology knowledge and skills of its pre-service teachers.

In addition to the multilevel readiness change framework, critical theory is also useful in highlighting the issues of power dynamics, inequalities, and social justice, which has relevance for higher education integration in the context of Africa. Examining and critiquing society and culture from the lens of power, inequality, and oppression is key to critical theory. The main argument of critical theory is that social challenges are a result of the unequal distribution of power and resources in society and are perpetuated through the use of power by dominant groups (Canella et al., 2015). Scherer (2009) views critical theory as a school of academic thought that challenges traditionally dominant ways of exploring and explaining organisational phenomena. Thus, in attempting to understand issues of ICT integration in teacher education in Zimbabwe, it is important that we analyse it from a critical perspective.

Given the different social dimensions in the contexts in which integration is supposed to be actioned, critical questions of power and resource distribution are key in fully conceptualising this phenomenon. Is there equal and equitable distribution of ICTs in teacher training institutions in Zimbabwe to enable effective integration? Is access to key enablers of integration, such as electric power and connectivity, readily available? Who has access to technology? Who decides on the distribution of technology within these institutions, and how does distribution occur? Are pre-service teachers positioned in such a way that they can demand the integration of ICTs or do teacher educators use their classroom autonomy to decide on what, how, and when to integrate technology? These questions interrogate the power dynamics and social structures that influence the way ICT integration is understood and implemented. By focusing on social structures and systems through which the integration of technology in teacher education is perceived, understanding the challenges and opportunities emerging from this phenomenon becomes clearer. There is, therefore, a need to use critical theory to understand the "politics of technology" (Feenberg, 2017; Wynne, 2011), which largely influence technology integration at various social and economic levels. In this paper, we explore the various influences that possibly hamper and derail ICT integration, linked to issues of power, equity, structures, and systems within teacher education institutions in Zimbabwe; and how these power dynamics shape readiness for change at different levels. To understand the concrete reality of ICT integration in teacher education, it is important to explore the power dynamics that exist in the process of ICT integration as well as the structural and

systemic issues of resource equality and equity. As Reitz (2018) states, there is no external reality completely independent from the human mind and human interest. The point is to know more about this reality to address issues of inequality. Understanding the contextual realities existing within the four secondary teacher education institutions in Zimbabwe in terms of how ICTs are being integrated into the curriculum provides clarity on factors that may be hampering it. Mere articulation of the challenges facing ICT integration without looking into issues of power, structures, systems, and inequality poses serious problems of attributing problems where they are not intricately tied. Critical theory assists in getting to the root of the ICT integration challenges as well as the change readiness of players involved in the process.

Discussion of Methodological Approach

The chapter draws on a study across four secondary school teacher education colleges in Zimbabwe, which provide the foundation for teacher education for secondary school pre-service teachers. The teacher education colleges are located in four provinces in Zimbabwe and provide teacher education training in various subjects aligned with the secondary school curriculum. Each of the colleges has a specific focus in terms of the secondary education subject portfolio. Within the college curriculum are subjects ranging from STEM, arts, and vocational subjects. One of the colleges covers all areas within the curriculum of STEM, arts, commercials, and technical vocational subjects. Acceptance into these colleges is based on the foundational qualifications of the applicants. Those who possess five Ordinary Level passes are enrolled in the colleges on a three-year programme, while those who possess Advanced Level passes are enrolled in a two-year programme. For the three-year programme, teacher education colleges use a 3-3-3 model, where the pre-service teachers are in college for formalised theory lessons for three terms, followed by three terms of teaching practice in a school of their choice, the pre-service teachers then close off their studies with three terms in college where they are assessed for graduation. The two- year programme follows a 2-2-2 model, where pre-service teachers spend two terms in college, two terms for teaching practice, and two terms for assessment.

The study was a qualitative multi-site case study, employing lecture observations, focus group discussions, document analysis, and interviews for data collection. Lecture observations were carried out over one week in each of the institutions. Lectures were being observed for the integration of ICT in teaching and learning as well as pre-service teachers' engagement with ICTs during the lectures. The SAMR and TPACK frameworks were used to benchmark both strategies used and levels of ICT integration. During the focus group discussions, pre-service teachers were engaged to ascertain their experience with ICTs during teaching and learning and their perceived

readiness to utilise technology given the education received over the course. The lecturers were interviewed to gather data on their ICT skills proficiency, preferred methods of ICT integration, policy and institutional support, as well as challenges and opportunities they face in the process of integrating ICTs for teacher education within the curriculum. In addition, an extensive literature review, including change readiness, multi-level analysis, and critical theory, helps to highlight the practical, operational, and political dimensions of ICT integration in the Zimbabwean context.

The Contextual Realities

ICT Integration in the Zimbabwean Teacher Education Context

Some of the key findings of the study are discussed next, taking account of the contextual realities and pre-service teachers' experiences with ICT integration in Zimbabwe. Following the discussion of the key findings, the main challenges that arise at the implementation and adoption levels are discussed. Data collected focused on determining the realities existing within the delivery of the pre-service teacher education curriculum. Based on lesson observations, the integration of ICTs was found to be minimalistic. Teacher educators are not prioritising the integration of ICTs and in cases where there is integration, it is only being effected at the substitution level through the use of PowerPoint presentation. Table 9.1 shows the forms of integration and the number of times integration was used at the various institutions.

Technology and Resources

One indication of minimalism in ICT integration in the pre-service teacher education curriculum of the colleges is related to technology. Teacher educators (TEs) did not have the requisite technology tools to enable full integration. This is supported by interview data, where TEs pointed out their interest in using technology but failed to do so due to a lack of resources. TE A from Institution A stressed that the reason they could not use technology

Table 9.1 ICT Integration Frequency in Teaching and Learning per Week (Observation Data)

Institution	*Integration per Week*	*Type of Integration*	*Pre-service Teacher Involvement*
A	0	None	None
B	1	Modification	Partial
C	3	Substitution	None
		Augmentation	Full
D	1	Substitution	None

in teaching and learning stems from a lack of resources. Institutional support, where technology is concerned, is not equitable. The TE stressed that

> In this institution, if you are a mere lecturer then you have no access to technology tools. I will tell you, those with positions have more than one gadget. The Lecturers in Charge have been provided with a desktop, a departmental laptop, (which we can't access because the LIC refuses with it, they are afraid we will destroy it) and they also have data which they receive. Sadly, I cannot afford a laptop myself, so I will teach the traditional way.
>
> (Teacher Educator A)

The TE's argument was supported by students during the focus group discussion. One participant was very direct about why there is no integration because, according to the student, "even if he wanted to teach us, where are the resources? Look at this classroom, there is no projector at all. So it is really not his fault. This college has no resources" (Student participant).

The responses provided by some teacher educators confirm Holt et al.'s (2007) definition of change readiness, which states that it is "the extent to which an individual or individuals are cognitively and emotionally inclined to accept, embrace, and adopt a particular plan to purposefully alter the status quo" (p. 235). The Zimbabwean economic conditions have seen teacher educator salaries dwindling and this has created demotivation, leading to a lack of commitment to any suggested change.

The sentiments across the four institutions are almost similar as the state of ICTs in these institutions is not conducive to ICT integration. Institution B has a similar case as that of institution A. There is neither equal distribution of technology tools nor access to connectivity. Data is only provided for lecturers who have positions of authority. Thus, the organisational hierarchical structure with its inherent power dynamics within institutions contributes to the lack of integration in teaching and learning. Those with power prioritise their own access to ICT tools, which in turn negatively affects the TEs who are in the lecture room and are expected to be empowering pre-service teachers with skills and knowledge on how to integrate technology for efficient teaching and learning post-service. Thus, there is evidence of unequal distribution of power and resources in the teacher training institutions, which, as posited by Canella et al. (2015), is perpetuated through the use of power by dominant groups. Consequently, this unequal access and distribution of resources could potentially be one of the main challenges in ICT integration into the pre-service teacher education curriculum, as is discussed later.

Continuous Professional Development

An important finding in this study is the dearth of continuous professional development opportunities for both TEs and pre-service teachers, despite

the availability and access to technology. For example, Institution C is equipped with projectors in all their lecture rooms and TEs use these largely for PowerPoint presentations. The same case was reiterated in institution D. TEs are being merely trained on the use of learning management systems, particularly Moodle and Google Classrooms, which they are unable to use due to various challenges, such as access to internet connectivity and the inability by pre-service teachers to optimise the navigation of these platforms due to lack of advanced training opportunities. TEs from the four teacher education institutions were asked if they received any professional development on ICT use and integration, and their responses showed that they had only been trained on basic LMS literacy to help them access the platforms. Moreover, TEs had not received any further training. Thus, TEs are unable to develop their ICT integration skills at the individual level, as they do not get any continuous professional development in the area of ICT integration. Out of the eight teacher educators interviewed across the four teacher education institutions, two indicated that they were privately seeking out training on how to integrate technology in teaching and learning. Self-motivation is what was driving them to learn beyond what the institution could provide in terms of skills development. One TE interviewed from institution D pointed out that she was realising that the world was going technological in terms of education, and she was personally pushing herself not to be left behind. She stated:

> We are in a world now where technology is what is driving all sectors, education included. See what happened during Covid? Umm that was a big lesson for me. So I am trying to improve myself constantly and continuously so that do not lag behind. I have tried to ask the leaders that be here to assist in this area of technology skills development for lecturers but no one listens. (TE G)

Thus motivational readiness at the micro-individual level (Vakola, 2013), specifically the vision of benefits (Karp & Fletcher, 2014) emerges as an important factor. While individual readiness (prompted by self-motivation) is evident in some teacher educators, their institutional leadership does not complement the efforts they make as resources and support are often lacking. This indicates a prevalence of different cultural attributes among different groups, with some teacher trainees eager to embrace technology, whereas a majority of teacher educators display apathy and lack commitment, thus highlighting the differences in meso-group readiness, an important insight for appreciating macro-organisational readiness (following, Vakola, 2013). As Karp and Fletcher (2014, p. 12) suggest, "gauging an organization's readiness for technology adoption requires understanding the multiplicity of attitudes and norms that make up the college's overall culture", and we would stress, at all levels: individual, group, and organisational. The prioritisation

Table 9.2 Forms of ICT Integration Skills Training for TEs across Teacher Education Institutions

Teacher Educator Codes	*Institutional Continuous Professional Development ICT Courses*	*Nature of Training*
A	Google Classroom	Platform Literacy
B	Google Classroom	Platform Literacy
C	Moodle & Google Classroom	Platform Literacy
D	Moodle & Google Classroom	Platform Literacy
E	Moodle	Platform Literacy
F	Moodle	Platform Literacy
G	Moodle & Google Classroom	Platform Literacy
H	Moodle & Google Classroom	Platform Literacy

of ICT integration skills for TEs across the four secondary school teacher training colleges in Zimbabwe is thus lacking.

Lecture observations, in the main, exposed the lack of preparedness of TEs, and gaps in content knowledge and pedagogical skills. Table 9.2 summarises the type of training TEs have received across the institutions, and highlights the rudimentary nature of the training, which is largely at the technology literacy level.

Findings from the interviews conducted with TEs at the four institutions show that, at the institutional level, TEs are not receiving continuous professional development in ICT integration. The implication for this lack of skills development is that pre-service teacher education is lacking in ICT integration skills development because of the individual, departmental, institutional, and national lack of prioritisation of teacher educator capacity building. Thus, the challenges that teachers meet, post-training, are a result of the lack of multilevel interconnectedness of decisions made around ICT provision and skills development, elaborated on later in the discussion of key challenges.

Curriculum and ICT Integration

Data collected from focus group discussions with pre-service teachers indicated that there is minimal or no capacity building in ICT integration within the pre-service teacher education curriculum. All pre-service teachers are mandated by the UZ's DTE to undertake an ICT course to prepare them for teaching and learning with technologies post-training. The assumption is that teacher education institutions will equip pre-service teachers with practical skills on how to integrate technology into teaching and learning. Practical lessons for pre-service teachers then have to be conducted to ensure that they are knowledgeable and can manage technology in the classroom as well as integrate it while imparting knowledge. Responses from pre-service teachers in three of the four institutions indicated that there is no practical capacity

building as lessons for ICT use and integration are shared as theoretical notes without the actual practice. In one of the focus group discussions, a student from institution D lamented the kind of assessments they were receiving in the ICT course component. He said, "How can you be examined on how to use certain applications by being asked to explain theoretically in an exam? This is really a joke as some of us here have no idea of how to use, most of the packages that are in the course outline. All of us here can type, because we are expected to submit our work as typed documents but am sure those who can go beyond that are able to do it from other sources not from the training we have here". From institutions A and B, the sentiments were similar with pre-service teachers trying to remember when they last had access to the computer or received ICT lessons. They indicated that only those who were majoring in computer sciences were allowed to have 100% access to the computer labs. In institution A, internet access was limited to staff and students from the computer sciences department. Those who had access and did not belong to these two groups had gained passwords from friends or from TEs with whom they were on friendly terms. Access to technology tools is only for a select few. Thus, not all groups and departments benefit and are equipped for readiness to change. The scenario described by pre-service teachers further reflects the notion that critical theory focuses on, that of looking into the social structures and systems that result in the conditions and situations students find themselves in (Feenberg, 2017). The "politics of technology" in this case is a result of differentiated access to technology, which subsequently results in differentiated use of technology, no doubt fuelled by inadequate financial resources. This combination of the political and economic factors produces a system that does not allow all pre-service student teachers to gain access to internet connectivity or for lectures to gain full access to technology, which impacts the readiness at micro-individual, meso-group, and macro-organisational levels.

Teacher Educators' Abilities Questioned

The focus group discussions revealed that in teacher education institutions, technology is being viewed as self-sufficient. However, a major problem relates to the capacity of educators themselves. One student opined that teacher educators "leave us to our own devices. They are using discovery method (self-directed learning). They give us the course outline and tell us to go and find out for ourselves how these work". Another student chimed in and questioned the ability of teacher educators in this area. She said, "Do they know how to use technology themselves? Hahaha, these lecturers are hiding behind self-discovery. I do not trust them. There are students here who are more skilled than them, why not give them part-time jobs to teach the others". Even though in one of the institutions, there was an attempt to integrate technology at the subject level, pre-service teachers in the focus group discussions

raised concerns about the capacity and expertise of TEs in this area. In three of the institutions, pre-service teachers pointed out that generally, there is a lack of interest as a result of a lack of resources as well as TE attitudes with regards to ICTs. They pointed out that in both the mandatory course and in their subject areas, there is no real commitment to ICT integration, and this has affected their confidence in using technology themselves once they graduate. This is reminiscent of what Karp and Fletcher (2014, p. 12) suggest, namely, that "small micro-cultures can exert a large influence over whether a technology is adopted…[which] can create a significant challenge to institution-wide adoption". Thus, although institutional leaders and policymakers and national and provincial levels may have a clear vision of the benefits of technology change, the vision needs to filter down to the organisation's multiple micro cultures (Karp and Fletcher, 2014, p. 12). For such filtration to take place, adequate capacity at different levels is required. The above data suggests that the capacity of teacher educators and students (micro-individual level) about teacher training and development is critical. However, if there is limited readiness or resistance at the meso-group level, especially among teacher educators as a group, the ability of the organisation (macro-level) is compromised (Vakola, 2013).

One student from institution D pointed out that she could not do her teaching practice (internship) in one particular private school as it was well-resourced with technology and most of the teaching and learning at the school was technology-based. The end result was that she left and went to another school that had no technology demands because she was afraid of "the embarrassment that came with a teacher's inability to use technology. I just couldn't". When pre-service teachers are not adequately trained and skilled in technology-based education, they become less confident and choose safer options that allow them to be in full control during teaching and learning, and where they have agency. Critical theory aims to interrogate the reality existing in people's lives to understand the challenges they face and to correct them (Bobka & Braunstein, 2018). The reality of pre-service teacher education is that there is no proper guidance and practice in ICT integration in the TEIs and this is the reason there is limited to no integration post-training. What this suggests is that lack of capacity and skills at the micro-individual level among teacher educators has a trickle-down effect at the micro-individual level among students, and in their teaching practices and with consequences for the organisation. It is this anomaly that requires correction if ICT integration is to be effectively implemented in teaching and learning pre- and post-training and in terms of education quality.

Another key finding from the focus group discussions was that TEs use allocated times for the development of ICT skills in teaching and learning to cover other aspects of the general syllabus without any integration of technology practice. The lecture method remains the most widely used method across the institutions. This further raised questions on whether TEs have a

clear conceptualisation of what ICT integration entails and how pre-service teachers should be guided in the process of how to integrate technology. There appears to be a gap in knowledge and skills. Responses in the interviews with TEs to the question, "What forms of technology integration do you incorporate in everyday teaching and learning?" showed that TEs do not have a full conceptualisation of what ICT integration is as most indicated PowerPoint, WhatsApp, and Google search. One TE stated that she was trying to educate herself in this area and was now knowledgeable about the various functions within the different learning platforms. When TEs and pre-service teachers are ready for change, they are self-motivated to improve their knowledge and skills to overcome systemic weaknesses in the overall ICT integration component of the institution. This is compounded by the lack of accountability at national, institutional, and, in some cases, individual levels. As Vakola (2013, p. 3) contends, "[i]n the context of organizational change, dispositional characteristics, such as openness to change, self-esteem, self-efficacy, locus of control and positive affectivity, were found to act as antecedents of positive attitudes to change" and that these "characteristics are subsequently shaped by situational characteristics, such as high or low trust, high or low organizational commitment, opportunities to participate in the change planning and implementation and the perceived impact of change". Ultimately, an individual's readiness to change implies a proactive and positive attitude that can translate into a willingness to support and confidence to succeed in such an initiative (Vakola, 2013).

The Exception

Institution C is, however, attempting at micro-individual levels, to ensure that its pre-service teachers have adequate knowledge of how to integrate technology in the most basic of ways. Pre-service teachers are encouraged to make use of technology tools in their presentations. In the lessons observed in this institution, they use a variety of methods that integrate technology, such as the flipped classroom method where a video is shared before the lesson for analysis and discussion. Pre-service teachers then presented PowerPoint slides with their analysis. The teacher educator was a facilitator with pre-service teachers leading the setup, control, and presentation of the lesson. There was also evidence of compact discs that had been created by students for projects within the English subject area. This showed practical and hands-on capacity building of pre-service teachers. TEs (the meso-group level) in this institution are also sensitive to the availability and access of technology tools. In one lesson observed, the teacher educator surveyed what technology tools and technology platforms students have access to prepare for upcoming lessons. In institution B, the teacher educator used a drone in one of their lessons, but no pre-service teachers were operating the drone. The TE was in full control of all processes in the lesson, meaning that pre-service teachers

were being viewed as mere recipients of information and could not be trusted with the drone. As Vakola (2013) argues, it is important to create readiness at multiple levels, teacher educators as a group and students as individuals for change to permeate the teacher training organisation. It is, therefore, not surprising, post-training to find teachers who teach in this way. Thus, teaching methods during pre-service training can potentially be copied, thus perpetuating the long-standing belief in "I teach the way I was taught". TEs are not being supported at national and institutional levels, so they collectively react by teaching the way they were taught, without technology, which in effect, translates into resistance to change.

Distilling the Challenges of ICT Integration

In reflecting on the above findings, it is apparent that there are challenges both at the implementation and adoption levels of ICT integration at the four teacher education institutions in Zimbabwe. As highlighted above, the unequal access and distribution of resources could potentially be one of the main challenges in ICT integration into the pre-service teacher education curriculum. The lack of resources, especially at the level of students, constitutes a major barrier that impedes the change behaviours needed for technological readiness in the teacher training institutions in Zimbabwe (consistent with Karp & Fletcher's [2014] RTA framework).

Another barrier to the institutions' change readiness relates to administrative and technical resources, especially training, ongoing support, and incentives (Karp & Fletcher, 2014), central to building capacity at the micro-individual, meso-group, and macro-organisational levels (Vakola, 2013). For example, the biggest challenge for TEs in some of the institutions relates to the development of ICT integration skills, at the individual level, due to a lack of continuous professional development in the area of ICT integration. Lecture observations, in the main, exposed the lack of preparedness of TEs, and gaps in content knowledge and pedagogical skills. Thus, the prioritisation of ICT integration skills for TEs in teacher education institutions is lacking across the four institutions in Zimbabwe.

Significantly, it was found that the challenges encountered by teachers post-training are a result of the lack of multilevel interconnectedness of decisions made around ICT provision and skills development. If at the national level there is no prioritisation of capacity building and clarity of what ICT integration actually entails, then institutions, departments, and individuals within those institutions will invariably lack the pedagogic agency to integrate technology. Pedagogic agency can only be achieved if it is supported at all levels, and when there is readiness to change at all levels (following Vakola, 2013). Another barrier identified in our study is in the implementation of the teacher education curriculum, specifically the gap between theory and practice, and capacity challenges at various levels.

Additionally, the study revealed weak integration in subjects such as English, geography, and sciences on the part of teacher educators (both at micro-individual and meso-group levels) at different colleges, due to lack of resources and advanced technology skills. The results of the study also showed inadequate change readiness at different levels, such as college (macro-organisational level) and the lecturer and student (micro-individual levels), that is needed for effective integration of ICT into the pre-service teachers' curricula. On the one hand, there is resistance to change (more predominant), and on the other hand, there is agency and initiative (less predominant) about change readiness. Consequently, pre-service teachers' capacity for knowledge transfer (the change needed) post-training was negatively affected. Accounting for this situation is a lack of prioritisation of ICTs as critical resources; inadequate institutional support at the various levels; and a lack of continued in-service training provision at individual, institutional, and national levels. Overall, these challenges, it is argued, impact readiness for implementation of ICT integration in pre-service teacher education curricula, with implications for the learning effectiveness of students and efficacy of service delivery on the part of educators, policymakers, and technical support staff. This suggests that ICT change readiness has relevance beyond the teacher education training colleges to include policymakers' knowledge of implementation challenges, as well as teachers' recognition of the pedagogical and knowledge dimensions impacting effective ICT delivery in the classroom of secondary school learners. As Vakola (2013, p. 11) reminds us: "Diagnosing, assessing and creating individual readiness for change should be viewed as an integral part of planning, implementing and evaluating organizational change. Moreover, creating a multilevel readiness may be the answer to some important phenomena such as resistance to change. Models and theories of change at a higher level must be informed by an understanding and analysis of change at macro, meso and micro-levels".

Conclusion

This chapter has highlighted the importance of change readiness for ICT integration in pre-service teacher education programmes in Zimbabwe, especially at the meso-group level (teacher educators) and the micro-individual levels. Interviews with teacher educators provided insights on technology integration dynamics at the institutional, group, and individual levels, whereas focus group discussions with pre-service teachers highlighted student experiences in the teacher training context, including policy resistance, lack of opportunities for technology practice, learning, and the "politics of technology", all of which impact readiness for change at especially the micro-individual and meso-group levels.

Drawing from the change readiness models, we have argued that readiness for technology adoption at each level is a vital element for ICT integration into the Zimbabwean pre-service teachers' curricula. In this regard, it is important to note that examining the readiness of pre-service teacher education

institutions through multi-level lenses is important "for understanding the interrelationships and readiness dynamics" therein (Vakola, 2013, p. 3).

Our study has also found that micro-cultures play an important role in ICT integration at the institutional level and beyond. This can be in terms of how the integration is carried out, for example, in terms of pedagogic practices and the discourses and values associated with it at different levels, such as the national, teachers' college, and individual departments. It is from characterising this culture that, in light of national, institutional, and departmental realities, the necessary changes can be suggested and effected at different levels.

Moreover, at the national level (policymakers), there needs to be a greater appreciation of operational and implementation challenges, specifically resistance to change, the importance of mindset and attitudinal change, and the need for continuous support and training. As such, the emergence of micro-cultures that may be resistant to change or simply not be motivated sufficiently constitutes key barriers. A fundamental challenge remains at the level of infrastructure provision, specifically laptops and data access, which highlights the digital divide conundrum associated with technology integration in the education sector. Thus, power dynamics at different levels can also impact change readiness, notably at the institutional levels characterised by hierarchical structures. The chapter recommends that attention needs to be given to resource distribution, ongoing professional development, and the implications of technology integration for curriculum revision and practice. It is further recommended that more focussed teacher educator and pre-service teachers' ICT integration training and development, targeted training of curriculum advisors, technical and support staff, as well as enhancement of ICT policy knowledge and literacy of policymakers and implementers are needed to benefit the teacher workforce in Zimbabwe, and the ultimate beneficiaries of teacher education programmes, the learners at schools.

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Chapter 10

Transforming Assessment in Teacher Education Programmes

From Static, Conventional Assessment to Flexible e-Assessment

Karen Ferreira-Meyers

Focusing on Teacher Education: Linking Student-Teachers' Experiences, Teaching Practice, and Assessment

Research has recorded a strong link between how student-teachers are assessed and how they then teach and assess once they are employed as teachers (Amua-Sekyi, 2016; Brown et al.; 2020; Schneider & Bodensohn, 2017). As the assessment of these student-teachers typically focuses on how their teaching practices develop, and one's assessment implementation is influenced by one's beliefs, attitudes, knowledge, and skills (Heitink et al., 2016; Karaman & Sahin, 2017), how they are assessed influences one's conceptions about teaching and learning (Yan, 2018) and the kind of teaching practices they adopt (Hill & Eyers, 2016). In addition to assessment literacy and pedagogical concepts, the assessment one experiences during training also influences the extent or focus on certain skills and competencies (Coombe et al., 2020; Giraldo, 2021). For instance, if assessment practices focus primarily on knowledge acquisition and recall, student-teachers may prioritize these skills in their own teaching, rather than emphasizing the development of higher-order thinking skills. Or if a reflective practice or student-centred assessments are modelled during teacher education, reflection and various kinds of formative assessment might also be prioritized or become a habit in teachers' professional careers (Delanoy & Walz, 2022; Muganga & Ssenkusu, 2019). In addition, assessment practices experienced by student teachers during teacher education potentially expose them to diverse contexts and populations, which can influence their understanding of the importance of considering context in assessment, particularly important in multilingual contexts: the norm in many African countries. As such, it is important for teacher education programmes to carefully consider their assessment practices and criteria, and ensure that they align with the kind of teaching practices they want to promote.

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Focusing on Assessment

Assessment is a crucial step in the education cycle, providing valuable insights into the outcomes of learning. It plays a significant role in informing instruction, evaluating learning outcomes, and guiding educational decision-making. Formative assessment and feedback, in particular, further help learners reflect and become more aware of their strengths and learning needs, strengths and interests, so that they can take greater responsibility for their own educational development (Konopasek et al., 2016: Irons & Elkington, 2021). The role of assessment in teaching is recognized in the Swaziland National Curriculum Framework for General Education (2018), which elaborates in detail the assessment policy rationale, policy goal, and policy objectives, including assessment approaches for primary and secondary education that are contained in the said policy. This policy seeks to "develop a national assessment framework to improve quality, equity, relevance, accessibility and effectiveness of education and training", by attaining the following policy objectives, namely to design and administer an assessment system that addresses the needs of the education and training system; design an assessment system that can address market needs and to ensure international acceptance; develop assessment methods and instruments in the areas where they are not available; review assessment methods and instruments and align them with new innovations; develop, provide, and administer guidelines for appropriate standardized assessments for formative and summative assessments; award grades and qualifications; ensure a greater balance between formative and summative procedures; enhance the learning programme through regular national reviews; enhance assessment for learning (formative) as an ongoing form of assessment that provides feedback to both the learner and teacher; and promote the adherence of assessment of learning (summative) weightings stipulated in the national curriculum framework.

With the increasing use of technology in education (Hawkridge, 2022; Olimov & Mamurova, 2022), Africa included (Evans & Mendez Acosta, 2021), online open-source and artificial intelligence tools are gaining prominence in assessment practices. These have, of course, important pedagogical implications (González-Calatayud et al., 2021).

In this chapter, I delve into this realm of assessment, focusing on national and institutional assessment policy and guidelines as well as the new development of e-assessment, and how they impact teacher education programmes for French teachers in the Institute of Distance Education (IDE) in Eswatini. I explore the readiness of these student-teachers and teachers to adopt new assessment methods, and the potential challenges and barriers they may face. I also explore strategies to support teachers, student-teachers included, in getting ready for new assessment methods. The key questions this chapter seeks to answer are: Do future FFL (French as a Foreign Language) teachers have the capacity to teach a competency-based curriculum and assess learners

accordingly? Are universities and higher teacher training institutions capable of training teachers to implement a competency-based curriculum and assess learners in both a face-to-face setting and online? Although the focus of this chapter is on French teachers' training, the conclusions and recommendations might also be applicable to teacher training in other languages or other subjects, as well as online assessment more broadly. Furthermore, I also investigate the link between student-teachers' experiences during their studies, including content, delivery, and assessment, and how these experiences shape their own teaching and assessment practices in (virtual) classrooms once they are employed as teachers themselves.

From Static, Conventional Assessment and Dynamic, Flexible e-Assessment

Assessments can be conducted in traditional paper-based formats, where learners physically write or produce their responses on paper, or in digital formats, where learners input their responses using digital or electronic devices (equipment such as computers, laptops, tablets, or other electronic devices; and online platforms or learning management systems [LMS]). E-assessment can take forms such as online quizzes, tests, simulations, interactive assessments, sometimes even automated scored (Al-Hattami, 2022; Ghouali et al., 2020; Mimirinis, 2019). Related to implementation and logistics, traditional assessment relies on physical printing, distribution, collection of assessment materials, and manual grading and record-keeping, whereas e-assessment involves setting up online assessments, managing access and permissions, ensuring technical compatibility and reliability, and handling electronic submission and grading. Although they differ in terms of their delivery format, use of technology, characteristics, security, implementation, and logistics (Kiryakova, 2021; Sanchez-Cabrero et al., 2021), both traditional and e-assessment, can evaluate the knowledge, skills, abilities, and attitudes of learners.

E-assessment offers additional features and capabilities that are not available in traditional assessments; for example, incorporating multimedia elements, such as videos, images, or interactive simulations, to enhance the authenticity and relevance of assessment content as well as the assessment experience (Sangle et al., 2020). Features such as text-to-speech, screen readers, or alternative input methods can accommodate different learning preferences or accessibility for learners with disabilities (Bagunaid et al., 2022; Rossade et al., 2022). E-assessment may also offer flexibility in terms of time and location, allowing learners to complete assessments remotely or at their own pace.

It can also provide immediate feedback and automated scoring to support timely information on one's performance and integration of continuous feedback into learning processes to support learning, motivation, and other decision-making (Hooda et al., 2022; Zhai et al., 2021). Data collected from e-assessments can also be analysed to identify patterns, trends, and gaps in

learners' performance, which can help in identifying patterns and trends in assessment data (Cope et al., 2021; Zawacki-Richter et al., 2019). This can provide insights into the effectiveness of assessments, identify areas for improvement, support evidence-based assessment practices, guide instructional interventions and curriculum development, and more streamlined decision-making process (Butler-Henderson & Crawford, 2020). They are less prone to human bias and errors, therefore have the potential to minimize subjective grading discrepancies, provide objective standardized scoring help and improve the quality of assessments (Eke, 2023). Therefore, they are often more cost-effective, efficient and more scalable, than the traditional assessment methods (Adenuga et al., 2019). This increased efficiency is often one of the main forces for adopting e-assessment (Bennett et al., 2017).

One key feature, often a key concern, about e-assessment, however, is about security and assessment integrity (Kiennert et al., 2017). Classrooms or exam halls, with additional measures to prevent cheating or unauthorized access, typical in traditional assessments, are much better-controlled environments (Sotiriadou et al., 2020). In contrast, e-assessment presents greater security challenges and potential risks of cheating or plagiarism facilitated by technology; therefore, often requires additional security considerations, such as secure online platforms, anti-plagiarism tools, or remote proctoring technologies (Natumanya et al., 2021; Shalatska et al., 2020). Authentication is also often cited as a possible bone of contention (Okada et al., 2019).

Qotb (2019) highlights the possibility of integrating various methodologies and resources, and practising several activities while making assessment and self-assessment easier. Ndayimirje and Bigawa (2019) demonstrated the possibility with WhatsApp to address certain linguistic and cultural concepts in a more authentic way than the textbook or the teacher, such as "pronunciation, intonation, body language, emotions, humour, posture as well as and strategies for negotiating meaning". As a user-friendly tool, WhatsApp allows informal and interactive communication, as well as peer-to-peer learning. The possibility to hold group discussions and to connect with a wider audience than just the teacher makes sharing diverse perspectives and cultural viewpoints easy. Multimedia can be incorporated to provide real-time context and local content and, by integrating language translation tools, multilingual communication becomes more accessible.

Generative AI-powered assessment systems are the newest addition to the e-assessment portfolio, raising concerns about how these AI tools could be used safely and constructively to improve education and support students' learning and assessment (Baidoo-Anu & Owusu Ansah, 2023). In addition to the typical e-assessment advantages outlined above, AI-powered assessment also has the potential to provide personalized, adaptive, and interactive assessment experiences assessments, allowing for a more targeted evaluation as well as a more accurate assessment of one's knowledge and skills (Alam, 2022; Taylor et al., 2021), or to serve as virtual tutors that can answer students'

questions or provide explanations in formative assessments. However, the impact of generative AI-powered tools such as ChatGPT would be wider and deeper (Arakawa & Yakura, 2023; Caspari-Sadeghi, 2022). Although it is impossible to predict how the education sector will be transformed through these AI technologies, the following showcases some possible scenarios regarding the future of assessment.

Scenario 1: Immersive Virtual Reality Prospective: Immersive VR simulations of classroom environments using headsets and haptic gloves are used. AI can analyse instructors' verbal instructions, writing on virtual boards, gestures, classroom management for clarity, conciseness, organization, vocabulary level, and alignment with learning objectives. Feedback sensors track where teachers spend their time and attention. VR recordings are assessed by reviewers.

Scenario 2: AI-Proctored Teaching Exam Teaching: Candidates plan and deliver a lesson to an AI teaching assistant able to understand verbal instructions, respond to questions, and manipulate objects. In this case, those sitting for a teaching examination (or even a teaching practice session) would practise their lesson delivery skills, while an AI teaching assistant would give them feedback. Sensors track lesson pacing, transitions, clarity of explanations, and questioning techniques. Video is reviewed by human examiners who combine this with the AI's automated scoring for the final assessment.

Scenario 3: Remote Multiplayer Teaching: In online multiplayer simulations, the teacher instructs groups of remotely located real students. Students give feedback on clarity, engagement, and quality of explanations. In this case, the students do the work, not the AI tools. Their feedback is then combined with data from remote sensors tracking the teaching candidate and his or her student's reactions. The teacher also writes a reflective evaluation.

Readiness for New Assessment Methods

It is generally acknowledged that not enough has been done to prepare teachers (pre-service and in-service) for new e-assessment methods (Govender, 2018). Mutiso and Odhiambo's (2022) study of Kenyan teachers observed that most teachers continue to choose more conventional written tests over alternate methods of evaluation. They acknowledged the merit of alternative evaluation, but have not fully embraced it partly due to their lack of the knowledge and ability to conduct alternative assessment. Other scholars caution about the need for appropriate tools to assess teachers' readiness to adopt new assessment practices (Vy et al., 2022).

Readiness for e-assessment can be influenced by several factors, including student-teachers' own experience during their studies, technological knowledge and competence, pedagogical knowledge (pedagogical principles and practices), attitudes and beliefs towards e-assessment, infrastructure and resources

(such as internet connectivity, appropriate hardware and software, technical support, etc.), and other contextual factors of the educational environment (such as the school or institution's policies and guidelines). One key strategy to ensure that prospective and in-service teachers arrive at integrating the above scenario into their daily professional lives is through professional development and training programmes that focus on building teachers' knowledge and skills in e-assessment (Mutiso & Odhiambo, 2022). These programmes can include workshops, seminars, and courses that provide teachers with hands-on experience and training on various online assessment tools, techniques, and best practices. This can help teachers develop confidence in using technology for assessment purposes and improve their ability to design, administer, and evaluate online assessments effectively.

Another important intervention is providing access to relevant resources and materials that can support teachers in implementing e-assessment in their classrooms (Mutiso & Odhiambo, 2022). This can include access to online assessment platforms, digital assessment resources, sample assessment items, and guidelines for creating valid and reliable online assessments. Having access to such resources can help teachers familiarize themselves with the latest assessment technologies and best practices, and incorporate them into their teaching practices.

Additionally, ongoing support and mentoring can be valuable in assisting teachers in getting ready for new assessment methods. This can involve assigning experienced mentors or peers to provide guidance, feedback, and support to teachers as they implement e-assessments in their classrooms. Regular opportunities for reflection, feedback, and collaboration can help teachers improve their assessment practices and build their capacity to effectively use online assessment tools.

It is also essential to consider the context-specific needs of teachers when designing interventions and support for e-assessment readiness. This can include considering factors such as teachers' prior experiences with technology, their access to technology and internet infrastructure, and their cultural and linguistic contexts. Customized approaches that take into account these factors can be more effective in supporting teachers in getting ready for new assessment methods.

The Case Study

Setting the Scene: French and ICT in Eswatini

The history of French language teaching in the Kingdom of Eswatini (formerly known as the Kingdom of Swaziland) is relatively long, as French has been taught since the early 1980s at various levels and in various institutions (universities, primary and secondary schools, public and private, Alliance française and private schools). According to its 2005 constitution and as noted in the

country's education sector policy (The Swaziland Education Sector Policy, 2011), Eswatini has two official languages, English and siSwati, and one national language, siSwati, which has also been known as the ethnic language of the country. English is the main official language, with SiSwati considered an official language, but in practice, its official status remains questionable. SiSwati is accepted as the mother tongue of the citizens, the main language of communication, the language of the home, the everyday language system. Stokes (2009) reported that 95 percent of all inhabitants of the country speak siSwati. Pupils in Eswatini can learn French from the third grade in primary school, but only in selected schools (depending on the expression of the need for French, by either the school, the parents, or the Ministry of Education and Training).

For the level of ICT in the country, Kemp's Digital Report Eswatini 2023[1] reports 710.3 thousand internet users in Eswatini and 335.9 thousand social media users (in a population of around 1,21 million people) in January 2023. This means internet penetration stood at 58.9 percent and social media usage at 27.9 percent, or 41.1 percent of Eswatini's population remained offline at the beginning of 2023. No specific figures can be found on how many of Eswatini's higher education students have internet access or are comfortable with ICTs and AI technologies.

Teacher Education Programmes for French Teachers in Eswatini and ICT Expectations for Teachers

French teachers generally are expected to demonstrate a high level of proficiency in French, including proficiency exams or assessments, such as the widely recognized language proficiency tests, including the Common European Framework of Reference for Languages (CEFR) or the Test de Connaissance du Français (TCF) (Isbell & Kremmel, 2020). Teacher education programmes for French teachers typically start from requirements for certain prior qualifications, e.g. holding a bachelor's degree or higher in French or a related field such as education, linguistics, or French language and literature (Chokah, 2013), and then undergoing formal teacher education programmes to further develop their pedagogical skills and knowledge in French language instruction. Offered at universities, colleges, or specialized teacher training institutions, teacher education programmes may vary in length and content, but typically include coursework on pedagogy, curriculum development, assessment, classroom management, and language teaching methodologies specific to French language instruction. They often typically include a practicum or teaching practice component where prospective teachers gain hands-on experience by observing and/or teaching French lessons in real classroom settings for them to apply the knowledge and skills they have learned (often under the supervision and guidance of experienced teachers). In addition to initial teacher education programmes, in-service teachers may also engage in ongoing professional development opportunities or activities, including

workshops, seminars, conferences, and online courses (Elsheikh & Effiong, 2018) to further enhance their knowledge and skills.

Teacher training in Eswatini prior to 1987 tended to focus on primary school teachers (Primary Teachers Certificate, PTC, offered upon graduation). This certificate was replaced in 1989 by a diploma, the Primary Teachers Diploma (PTD), which prospective teachers obtain after three years of study at a higher education institution. At this time, there was no training programme for teaching French and few students were learning French; in fact, it was only until 1990 that a French studies programme (which was not specifically aimed at the teaching profession as an outcome of university studies but offered a general curriculum) was offered (at the University of Swaziland, became the University of Eswatini in 2018). After obtaining a bachelor's in humanities (majoring in French), most then did a post-graduate certificate in education before going into teaching French at either the primary or secondary school level. Between 2000 and 2010, the number of schools offering French as a subject increased; so was the need to train more Swazi teachers of French. Since 2009, such training started to be offered by TTCs (Teacher Training Colleges, e.g. Ngwane Teacher Training College and William Pitcher College) as well as other universities (e.g. Southern Africa Nazarene University, SANU) also started to offer this from the 2009/2010 academic year. In 2020/2021, the University of Eswatini started offering a bachelor in education (language arts) with a specialization in French. The main objective of French teacher training, whether at the teacher training colleges or the universities, is to accustom pre-service teachers to the teaching environments. However, "despite having obtained a formal qualification, novice student-teachers do not seem to have the knowledge and skill level required, and [during their training] they show extreme dependence on the teacher/instructor/professor" (Dlamini-Zwane, 2018 p. 20). This often applies to French teacher training as well: given the inherently theoretical nature of teacher training, French teachers similarly often find themselves in an acute paradox between what teachers know in theory and their performance in practice. This is further linked to motivation (Botha & Rens, 2018).

One aspect of the broader environment that teachers need to be prepared for (as their teaching directly impacts how learners cope with and thrive in the broader environment), is the strong presence of ICT in daily lives. To this end, the Ministry of Education introduced competency-based education in 2014 for the primary level onwards.[2] This policy directive shifts from the previous more teacher-centred approach to the learner-centred one and a focus on lifelong learning, critical thinking skills, and ICT integration across various subjects. Demonstrations, simulations, greater usage of presentation and discussion, collaborative learning through group tasks, problem-solving, projects, role-playing, and drama (Leblanc, 2002), as well as interviews of native speakers, participation in cultural activities, in a hybrid or blended learning environment, are not only the examples of the shift towards a more learner-centred approach,

as it makes learning more engaging, they also incorporate the 21st-century skills better. This can be included in pre- and/or in-service teacher training (Collin & Karsenti, 2011; Ferreira-Meyers et al., 2022b).

Assessment Policies, Guidelines, and Practice in Eswatini

The need for revision of assessment throughout the education system in Eswatini is noted. It would be useful to review assessment practice in the teaching and learning of French at all levels. In particular, the Eswatini National Education and Training Sector Policy 2018 aimed to encourage teacher training institutions, among other education providers in the country, to include 21st-century competencies in their training plans and programmes.

For French teacher training programmes, assessment may take various forms depending on the specific programme or institution. As a compulsory first-year module, all student-teachers take a computer foundation course, which includes the use of computers, software applications, online platforms, and other digital tools. Student-teachers are often assessed on their ability to plan and implement effective French language lessons, including developing appropriate learning objectives, selecting appropriate instructional materials, and designing engaging and interactive activities for French language learners. In addition, they are sometimes also assessed through observations of their teaching in real classroom settings, where their ability to effectively manage and engage students, implement instructional strategies, and assess student learning is evaluated. Common written assessments in many teacher training programmes include quizzes, essays, lesson plans, and, more recently, (e)portfolios (Piccardo et al., 2019) and reflective journals (Krapivnyk et al., 2021; Seifert & Feliks, 2019; Wicaksono et al., 2020). These are also useful to assess the candidates' knowledge of French language skills, grammar, vocabulary, culture, and pedagogical concepts related to French language instruction (Alavi et al., 2022). Oral assessments may include oral exams, role-plays and presentations, or teaching demonstrations (microteaching), or more formal teaching practice (with classroom observation) where candidates are assessed on their ability to speak and communicate effectively in French, as well as their ability to demonstrate appropriate teaching strategies and techniques. ICT can be incorporated into some of these assessments. For example, digital polling and interactive quiz tools (Chan & Lo, 2022), including Mentimeter Live, Pigeonhole Live, Kahoot, Padlet, and Polleverywhere.

University of Eswatini's French Teaching Programme

The University of Eswatini started placing great importance on authentic evaluation since 2018, which brought about some policies that require lecturers to implement diverse assessment methods as an essential part of the teaching and learning process (e.g. see the Blended Learning Policy, 2019,

and the Policy on Programme Design and Review, draft, May 2021a). The May 2020 draft Assessment and Feedback Policy (an essential part of the overall University's Teaching, Learning Quality Assurance Policy, 2019, p. 4) endorses a comprehensive view of assessment, which refers to all forms of assessed activity, including coursework assignment, presentation, quizzes, portfolios, and written examinations. It sets the policy intention as that "by 2024, all teaching staff will adopt appropriate summative and formative assessment methods, and employ appropriate tools and procedures for providing timely feedback to students on their learning" (p. 5).[3] Regarding ICT, while UNESWA sees it as crucial to integrate assessment strategies that enable students to participate in assessing their own progress, such as self-evaluation, peer evaluation, and co-evaluation techniques (Ferreira-Meyers & Arfa-Kaboodvand, 2022a), the link with doing this online or through other ICT-integrated formats is not explicitly made, except UNESWA's April 2021b Teaching, Learning and Assessment Quality Assurance Policy Framework, which makes a provision for "Innovation and Integration of ICT in Teaching and Learning Committee [which] shall advise on technology enabled learning" (p. 12). No policy document or framework for the use of AI tools has been adopted at UNESWA. No research has been published on the usage of AI tools within UNESWA either. There is no specific section in any of UNESWA's policy documents on assessment that refers to ICT integration in assessment. However, at the end of 2023, a COL-sponsored workshop (9–10 November 2023) organized by UNESWA saw the drafting of an Authentic Assessment Framework. This framework has not yet been adopted by the UNESWA Senate though, so officially it is not yet in existence.

As for the French teaching programme at UNESWA, all modules in the bachelor's degree in primary education (French) include self-reflection activities and most assessment tasks have at least one question on the student-teachers' opinion of a particular aspect of their learning. Below, I note some of the teaching and learning, as well as assessment activities we undertake with our French student-teachers during their four-year bachelor in education (major in French) studies.

This degree in UNESWA requires students to take 10 hours of face-to-face (F2F) classes per module per semester and almost double the time in online interactions (18 hours, primarily through videoconferencing tools like Zoom, BigBlueButton, or Teams). These online interactions are designed using a flipped classroom approach (Han, 2022),[4] while the F2F time is mainly used for tutoring purposes to respond to questions relating to the content. The videoconferencing sessions are used to share knowledge and information, and allow students to speak French when they present their research on specific aspects of French and Francophone language, culture, and literature. These videoconferencing tools also connect Eswatini French learners with native speakers in France for practice sessions or interviews to demonstrate verbal skills in an authentic, real-world scenario. Through an

informal arrangement with a French university (Besançon), whereby their student-teachers interact with ours. The Besançon students teach a class on a particular subject and our student-teachers act as students, IDE students an opportunity to see how teaching is done in another setting and, at the same time, they get additional opportunities to practise their French speaking and listening skills. The Besançon student-teachers also provide them with formative written assessments our IDE students then submit after the Zoom classes. In other words, the online presentations and ensuing discussions between students and the lecturer form an integral part of formative assessment. Other authentic tasks include the use of smartphones to record videos of themselves giving directions, ordering food, or making purchases in French. Working in pairs is done regularly, mostly for learning purposes, but also for formative assessment. In addition, Moodle allows us, the lecturers, to set customized French reading or vocabulary quizzes for each student based on ability level (Ferreira-Meyers & Dlamini-Zwane, 2021). For at least four years, the IDE lecturers have also used WhatsApp to complement teaching and learning beyond mere communication but extended to functions such as recording to send voice messages and videos, as well as integrating resources from other social networks. While not part of "official" course material, the students are also encouraged to use AI-enabled apps like Duolingo (free use) or Babbel (paid use), which automatically tracks their progress and weak spots, creating personalized assessments and activities.

So far, these courses have not yet experimented with AI chatbots like Anthropic's Claude, which could have conversations with students in French, assessing their speaking proficiency through voice recognition or NLP in a simulated real-world interaction. However, this has been in the plan. There are also plans for the future to use Wikimedia or other Wiki sites to empower groups to co-create French course materials, reports, or stories online, exercising autonomy as well the use of virtual reality (VR) or augmented reality (AR) to organize field trips to Francophone countries to digitally immerse students in the culture and language of these regions. When enrolled students increase, autonomous virtual group work on projects via social networking platforms like Padlet will also become possible. Such immersive VR experiences (via simulations or virtual environments), together with tailor-made built-on automated feedback, possibly with the addition of tapping into sensory data analytics, could become the norm in the future. Such practice could be used both in teaching French teachers and by the French teachers when they are teaching themselves. As big data processing and machine learning algorithms adapt to each individual's behaviour, assessing their strengths and weaknesses, it can produce personalized study materials and simultaneous or subsequent assessment activities for each session. This can facilitate progress at one's own pace, motivated by receiving instant feedback and tailored focus on topics and activities taking into consideration one's learning preferences and strategies and weak points.

Recommendations and Conclusion

To equip graduates from higher educational institutions with skills essential for professional practice, such as critical thinking and lifelong learning abilities, there is a need to re-evaluate current assessment practices and fight assessment illiteracy. A few scholars have explored student-teacher preparedness for teaching and e-assessment practice (Nxumalo-Dlamini et al., 2021, for competency-based education; Tsikati & Nsingwane, 2019, for agriculture), but few studies have explicitly ascertained the preparedness of French teachers' readiness for e-assessment in Eswatini. Similarly, lecturers' own assessment knowledge, skills and practice, and preparedness and readiness to embrace e-assessment also need to be examined, potentially also including comparison with usage and efficacy of standardized assessment instruments. The UNESWA French case shows that the lecturers are already experimenting with new assessment tools, but further in-service training and refresher courses, especially those prepared by evaluation experts in humanities, education, and social sciences could be of further help.

In conclusion, supporting teachers to be ready for new assessment methods requires a multifaceted approach that includes professional development, access to relevant resources, ongoing support and mentoring, and consideration of context-specific needs. The use of artificial intelligence tools will become part of the shift from static, traditional, conventional face-to-face assessment to flexible hybrid/blended and e-assessment at the level of personalization of digital language learning for language teachers and language learners.

Notes

1 https://datareportal.com/reports/digital-2023-eswatini
2 The major reforms introduced in Ministry of Education (2014), Swaziland Curriculum Framework, Mbabane, Swaziland, were later reiterated in Ministry of Education (2018), Eswatini National Curriculum Framework For General Education, Mbabane, Eswatini.
3 However, the remainder of the policy remains wide and vague, which will benefit from developing accompanying guidelines to translate policy ideals into practical reality (Fischer & Montaño, 2019).
4 In a 2022 study, Han looked at some advantages and disadvantages of flipped classroom pedagogy for foreign language teaching and learning. According to these study findings and those of Vitta and Al-Hoorie (2020), the flipped classroom strategy improves learning by lowering cognitive load, involvement, accuracy, motivation, attitude, satisfaction with the course, and self-efficacy in higher education.

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Conclusion

Higher Education ICT Integration in Africa

Reuben Dlamini

This conclusion presents some closing thoughts on the discourse discussed in the various chapters of this book and highlights the state of higher education ICT integration in several countries in Africa. In 2020, the COVID-19 pandemic brought heightened awareness of the need for HEIs to rethink their teaching and adopt digitalisation strategies that extend beyond traditional face-to-face classrooms. The focus on this locality arose from an observation that suboptimal ICT integration in these resource-restrained settings is often attributed to inadequate resources, both in terms of physical and human development, yet research on this area in the African context is fragmented. While ICT is recognised as a catalyst for change globally, in Africa, large-scale successful ICT adoption in higher education is scant. This underlines the necessity of a book of this nature to explore the contextual factors at play. Botha (2016) remarked that "inasmuch as we acknowledge the value of digital access and technology adoption as a stimulus and driver of social justice, the majority of those who stand to benefit the most from their affordances are not yet connected" (p. 76). This can be attributed to infrastructure, internet access, and digital skills; hence, the difficulties in turning ICT affordances into opportunities and means to transform tertiary education, especially in relation to improving access, teaching, and learning.

According to Graham et al. (2023), digital transformation in higher education institutions has been both "positive and cautionary" (p. 1). The 2020 pandemic coincided with an increase in the number of students and budget cuts globally. While progress has been made in the adoption and integration of ICTs in Africa, the transition has remained uneven due to systemic inequalities (Dlamini & Ndzinisa, 2020; Mdiniso et al., 2022; Mhlongo & Dlamini, 2022). Given the African context, it became important to study various cases to understand how these countries dealt with complex inequalities and digital inequities. Any one-size-fits-all transition would have meant neglecting the diversity of the students and the context of the different communities they come from. Ndzinisa and Dlamini (2022) examined the tensions and contradictions in the Southern African Customs Union (SACU) region and argued

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that "responsiveness should not come at the cost of accessibility as this will have a negative impact on remote teaching and online learning, and further entrench the vicious cycle of epistemic injustice and inequity" (p. 2262). Mhlongo and Dlamini (2022) argued for a systematic approach to digitalisation, otherwise any siloed transition would place ICT "at crossroads with broader social and contextual issues" (p. 1). Africa at large is confronted with an unprecedented phenomenon of unequal access to tertiary education; therefore, pursuing research in different parts of Africa provides insight into a multilevel analysis that can inform the discourse on ICT readiness, implementation, and trajectory in Africa.

Thus, this book presents a multilevel perspective from different countries to understand the change readiness and implementation of ICT integration, specifically in higher education. Currently, the research base in Africa on ICT readiness and implementation in higher education is fragmented; hence, the cases in this book provide insights into conditions necessary for multilevel success or change readiness for ICT incorporation in HEIs in Africa. Across the chapters, higher education inequalities, digital inequalities, lack of reliable internet, lack of digital skills, and consistent electricity supply were the common limitations to digital education solutions and optimal ICT implementation. At the same time, Graham et al. (2023) confirmed that "the widespread expansion of ICT use during the COVID-19 pandemic uncovered significant issues related to equity and quality" (p. 1). This narrative delves into several cases in Africa as they succinctly capture the experiences of academics on the complexities of digital transformation and the deep underlying structural inequalities in Africa.

In Chapter 1, Dlamini, Louw, and Yu explore the scholarship of ICT in Africa and explain the widespread adoption of ICT in higher education in Africa. They argue that universities in Africa must seize the moment, given that digital technologies have long been celebrated in developed economies as revolutionising and revitalising university teaching and learning (Liu et al., 2020). They conclude that there is limited use of ICTs in higher education in Africa and that proper use may become a means to service the needs of the diverse student population. In Chapter 2, Yu explores the multilevel nature of change readiness by examining existing change readiness literature, models as well as analysing their usefulness and shortfalls. Thereafter, the author proposes and explains a multilevel change readiness model to address the shortfalls of the existing multilevel change readiness models.

Jjagwe and Nanteza, in Chapter 3, describe the Uganda case against the backdrop of an absence of a national policy that governs and guides HEI ICT. They observe that the absence of a national policy on ICT incorporation in HEIs has propelled universities to develop and adopt their policies while others operate in a vacuum, for both public and private HEIs in Uganda. Meanwhile, in Chapter 4, McDonald et al. offer a critical analysis of higher education ICT policy in South Africa and ICT policies in three South African HEIs. Their analysis considers the extent to which policies, at national and institutional

levels, could allow for ICT practices at different institutions. In Chapter 5, Twagilimana and Ndayambaje examine the level of readiness for change in terms of ICT integration in the Rwandan higher education sector, focusing specifically on the existing opportunities, capabilities, and other factors such as attitudes, motivation, or commitment. Thereafter, the authors assess the progress made by the country in achieving digital equity in higher education.

Digital equity is premised on access as a prerequisite for social justice (Botha, 2016; Ndzinisa & Dlamini, 2022). The discourse on higher education ICT integration is critical for the successful implementation of curriculum renewal. Botha (2016) observes that "the most remarkable aspect of the digital revolution is the perceived value of digital access and ICTs as a means of achieving social justice and human flourishing" (p. 76). Hence, it is important to ensure that students, academic staff, and professional administrative support staff are not left behind in the digital revolution regardless of their socio-economic status. Evans and Yu, in Chapter 6, explore the current data-driven decision-making landscape in South Africa, its (suboptimal) usage in education, and argue that although early warnings for various purposes exist, there are missed opportunities that this multilevel data architecture can achieve for better monitoring, evaluation, and learning as well as provision of just-in-time support. In their argument, Evans and Yu establish that there are missed opportunities in the usage of data. Moreover, Evans and Yu concluded that a multilevel data architecture can achieve better monitoring, evaluation, and learning as well as informing just-in-time support.

Despite the promise of technology to break the barrier to tertiary education access, Ndzinisa, Mthembu, and Nsibande in Chapter 7 concluded that unplanned systemic change in the integration of ICT in higher education in Eswatini should be avoided because it can exacerbate inequalities to the detriment of indigent students. Importantly, Chapter 7 applies a multilevel analysis approach to explore the integration of ICT into education in the Kingdom of Eswatini at individual, institutional and national levels using the University of Eswatini as a case study. In Chapter 8, Louw and Yu reflected on the evolution of information and communication technologies at the University of Johannesburg (UJ). They distill the broad lessons and features for ICT incorporation in HEIs through document analysis, personal observations, discussions, reflections, and informal conversations as data for the project. This chapter contextualises the UJ story by discussing the amalgamation and conglomeration of visible, perceptual, and structural changes, both in terms of the infrastructure (both hardware and software), people involved; their interaction; and resultant practice on teaching, learning, and assessment. As can be seen from the discussion, one key lesson from the UJ case is the importance of deliberate change management and nudging, coupled with organic evolution that could give the change a further and firmer push.

In Chapter 9, Dzinoreva, Govender, and Mavunga use the change readiness model, multilevel analysis, and critical theory to problematise the implementation of ICT integration in pre-service teacher education diploma programmes

at four Zimbabwean secondary school teachers' colleges. The findings indicate a weak integration of ICT in subjects such as English, geography, and sciences on the part of teacher educators and there is a lack of prioritisation of ICTs as a critical resource. Consequently, this negatively affected pre-service teachers' digital knowledge development and capacity to pedagogically integrate ICT into their professional practices post-training. In Chapter 10, Ferreira-Meyers focuses on teacher training for French teachers in Eswatini. Ferreira-Meyers explores the benefits and challenges of online open-source and artificial intelligence tools and further analyses how teacher education programmes prepare students and in-service teachers to become online facilitators and assessors.

In conclusion, this book provides its readers with a profound understanding of the state of ICT integration in higher education from the practitioners' point of view. It allows the higher education sector professionals and practitioners to gain a critical understanding of digitalisation and related pedagogies for preparing students for changes brought on by the integration of technology in the classroom. This book further informs policy in developing economies. Although each chapter provides insights into different aspects, the main focus of the book is the state of ICT in higher education in Africa, as seen globally as a catalyst for social and economic transformation. To that end, this book can be regarded as a valuable source, especially for higher education practitioners and policy-makers.

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