A POST-COVID-19 PANDEMIC MULTIMEDIA FRAMEWORK FOR TEACHING AND LEARNING IN OPEN DISTANCE ELEARNING IN SOUTH AFRICA

by

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Date of submission: 17 January 2023

DECLARATION

DECLARATION BY STUDENT

I declare that

A post-COVID-19 pandemic multimedia framework for teaching and learning in Open Distance eLearning in South Africa

is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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17 January 2023
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Date

DECLARATION BY SUPERVISOR

I, Prof G van den Berg declare that the thesis has been submitted to originality checking.

_____

Prof G van den Berg

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DECLARATION BY CO-SUPERVISOR

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ABSTRACT

Information Communications Technology (ICT) evolves at an unmatched pace globally, affecting society across all disciplines. Higher Education forms an integral part of the basis and foundation of economic, social, and all-around technological innovation; thus, curriculum integration continually requires adaptation. The University of South Africa (Unisa), as an Open Distance Learning institution in Africa has, in recent years, been offering teaching and learning using a blended learning approach. However, when the Coronavirus (COVID-19) pandemic hit the world, almost every aspect of the University's operations was subjected to a lockdown and its associated regulations. Global change management across disciplines affected not only Unisa but also all other higher education institutions worldwide. Unisa faced challenges such as its outdated legacy ICT infrastructure, a lack of tools-of-the-trade for staff, staff unreadiness, and unpreparedness for remote learning. Data allocation, network connectivity challenges, assessment integrity, and students' geographical areas negatively impacted the academic project.

Within an interpretative paradigm, this qualitative case study aims to develop a post-COVID-19 pandemic multimedia framework for teaching and learning in Open Distance eLearning in South Africa, and a triangulation design was employed. For data collection, the study engaged fifteen participants from three selected support departments (four deans, eight lecturers from four selected colleges, and three support staff participants). The multimedia framework was achieved by analysing data collected through questionnaires, interviews and document analysis. To analyse the data, the study applied a thematic approach where themes emerged from the data collected. Once all the data had been collected, data triangulation was fulfilled through document analysis of Unisa Policies. The study discusses distance education, including an in-depth analysis of the background, history and generations, as this information informs a crucial part of the study and the multimedia framework. Due to the nature of the study, the teaching and learning theories employed are: behaviourism, cognitivism, constructivism and connectivism. The study used the cognitive theory of multimedia learning, which deals with Mayer's multimedia design principles. The study findings identify challenges and require amendments to policies,

the updating of software, the upgrading ICT infrastructure, the upskilling of staff members, a zero-rated website for student ease of access and making the use of WhatsApp messaging both official and legal, as well as data allocation. Based on the findings, the study's multimedia framework proposes using multimedia technologies to advance higher learning, but not without caution regarding confidentiality being applied, along with other principles.

KEY TERMS

Information Communications Technology (ICT), Cognitive Theory of Learning, Cognitive Theory of Multimedia Learning, Distance Education, COVID-19 pandemic, Behaviourism, Cognitivism, Constructivism and Connectivism, Multimedia framework, Open Distance eLearning (ODeL)

ISISHWANKATHELO

UbuChwepheshe boLwazi noNxibelelwano (i*ICT*) buguquka ngesantya esingenakulinganiswa kwihlabathi liphela, buchaphazela uluntu kuzo zonke iinkalo. Imfundo ePhakamileyo iyinxalenye ebalulekileyo yesakhiwo nesiseko sezoqoqosho, ezentlalo, kunye nazo zonke izinto ezintsha zeteknoloji; ngoko ke, ukuhlanganiswa kwekharityhulam ngokuqhubekayo kufuna ukuguqula indlela yokuphila. IYunivesithi yoMzantsi Afrika (i*Unisa*), njengeziko leMfundo yoMgama eVulelekileyo (i*Open Distance Learning)* eAfrika, kwiminyaka yakutshanje, ibonelela ngokufundisa nokufunda kusetyenziswa indlela yokufunda exutyiweyo. Nangona kunjalo, xa ubhubhane wehlabathi intsholongwane ikhorona (i*COVID-19*) wahlasela ihlabathi, phantse zonke iinkalo zokusebenza kweYunivesithi zahlaliswa ngendlu kunye nemimiselo ehambelana noko. Ulawulo lwenguqu yehlabathi kuzo zonke iinkalo aluchaphazelanga i*Unisa* kuphela kodwa nawo onke amanye amaziko ezemfundo ephakamileyo kwihlabathi liphela. I*Unisa* iye yajongana nemingeni efana nezixhobo zayo ze*ICT* ezinembali ephelelwe lixesha, ukungabikho kwezixhobo zokusebenza kwabasebenzi, ukungalungeli kwela xesha kwabasebenzi, kunye nokungalungeli ukufunda kwabafundi besebenzisa ubuchwepheshe emakhaya. Ulwabiwo lwedatha, imingeni yoqhagamshelwano lweintanethi, ukunyaniseka kovavanyo, kunye neendawo zokuhlala zabafundi ziyichaphazele kakubi iprojekthi yezemfundo.

Ngokusebenzisa indlela yokuqonda ulwazi lwenzululwazi kunye nokuyinyani (*interpretative paradigm*), esi sifundo ngomzekelo sophandontyilazwi sijolise ekuphuhliseni isikhokelo sikanxazonke(*multimedia framework*) sasemva kwexesha likabhubhane wehlabathi i*COVID-19* sokufundisa nokufunda kwiMfundo yoMgama eVulelekileyo eMzantsi Afrika, kwaye kusetyenziswe uyilo oluntloboninzi/lweendlela ezininzi (*triangulation design*). Idatha yolu phando iqokelelwe kubathathinxaxheba abalishumi elinesihlanu abavela kumasebe amathathu okuxhasa iyunivesithi akhethiweyo (iinqununu/iintloko zeefakhalthi ezine, abahlohli abasibhozo abavela kwiikholeji ezine ezikhethiweyo, kunye nabathathinxaxheba abathathu abangabasebenzi nabaxhasa ukusebenza kweyunivesithi).

Isikhokelo sikanxazonke sifezekiswe ngokuhlalutya idatha eqokelelwe ngoxwebhu lwemibuzo, udliwanondlebe, kunye nokuhlalutywa kwamaxwebhu. Olu phando

lusebenzise inkqubo yohlalutyontyilazwi lomongo ukuqokelela idatha, apho imixholo ithe yavela khona kwidatha eqokelelweyo. Emva kokuba yonke idatha iqokelelwe, idatha entloboninzi ifezekiswe ngohlalutyo lwamaxwebhu eMigaqonkqubo yaseUnisa. Olu phando luxoxa ngemfundo yomgama, kubandakanywa uhlalutyo olunzulu lwemvelaphi, imbali kunye neezizukulwana, njengoko olu lwazi lwazisa inxalenye ebalulekileyo yolu phando kunye nesikhokelo sikanxazonke. Ngenxa yohlobo lophando, iithiyori zokufundisa nokufunda ezisetyenzisiweyo zezi zilandelayo; indlela yokuziphatha (*behaviourism)*, eyangokwengqiqo (*cognitivism*), eyokudalwa kolwazi nokuqonda ngokwamava okuphila/ezentlalo (*constructivism*) kunye neyokuqonda ukufunda kwixesha lobuchwepheshe/ledijithali (*connectivism*). Uphando lusebenzise ithiyori yengqiqo yokufunda okunxazonke (*cognitive theory of multimedia learning*), ejongene nemigaqo yoyilo olunxazonke lukaMayer(*Mayer's multimedia design principles*). Iziphumo zophando zichonga imingeni kwaye efuna izilungiso kwimigaqonkqubo, ukuhlaziywa kwesixhobo sekhompyutha esingabambekiyo (*software*), ukuphuculwa kwezixhobo ze*ICT*, ukuphuculwa kwezakhono zabasebenzi, iwebhusayithi yamahala yokwenza ufikelelo lwabafundi lubelula kunye nokwenza ukusebenzisa u*Whatsapp* kumiselwe kwaye kubesemthethweni, kunye nolwabiwo lwedatha. Ngokusekelwe kwiziphumo, isikhokelo sikanxazonke(*multimedia framework*) solu phando siphakamisa ukusebenzisa ubuchwepheshe bukanxazonke(*multimedia technologies*) ukuqhubela phambili imfundo ephakamileyo, kodwa oku akunokwenzeka ngaphandle kokulumka malunga nokusetyenziswa kwemfihlo, kunye neminye imigaqo.

AMAGAMA ANGUNDOQO

UbuChwepheshe boLwazi noNxibelelwano (i*ICT*), iThiyori yeNgqiqo yokuFunda, iThiyori yeNgqiqo yokuFunda okuNxazonke(*Multimedia*), imFundo yoMgama, ubhubhane wehlabathi i*COVID-19*, Ithiyori yendlela yokuziphatha (*Behaviourism*), Ithiyori yangokwengqiqo (*Cognitivism*), Ithiyori yokudalwa kolwazi nokuqonda ngokwamava okuphila/ezentlalo

OPSOMMING

Die ongekende tempo waarteen inligtingskommunikasietegnologie (IKT) wêreldwyd verbeter affekteer gemeenskappe in alle dissiplines. Aangesien hoër onderwys die grondslag van ekonomiese, maatskaplike en tegnologiese vooruitgang in die algemeen vorm, moet kurrikulumintegrasie voortdurend aangepas word. Enkele jare reeds volg die Universiteit van Suid-Afrika (Unisa), as 'n Oop Afstandsleerinstelling in Afrika, 'n gemengde benadering tot onderrig en leer. Weens die Coronapandemie (COVID-19) is al die Universiteit se werksaamhede ingeperk. Veranderingsbestuur moes in alle dissiplines nie alleen by Unisa nie, maar by alle tersiêre instellings wêreldwyd toegepas word. Die probleme waarmee Unisa te doen gekry het, was onder meer uitgediende IKT-infrastruktuur, personeel was onvoorbereid en geensins vir afstandsonderrig toegerus nie. Probleme met datatoewysing en netwerkverbindings, twyfel oor die integriteit van assesserings en afgeleë gebiede waar talle studente woon, het die akademiese projek belemmer.

Hierdie kwalitatiewe gevallestudie het gepoog om volgens 'n vertolkende paradigma 'n multimediaraamwerk vir onderrig en leer in Oop Afstand-e-Leer in Suid-Afrika ná afloop van die COVID-19-pandemie te ontwikkel. 'n Triangulasieontwerp is toegepas. Data is ingesamel by 15 deelnemers van drie hulpdepartemente (onder wie vier dekane, agt dosente van vier kolleges, en drie hulppersoneellede). Die multimediaraamwerk is opgestel met behulp van die ontleding van data wat aan die hand van vraelyste en onderhoude sowel as 'n dokumentontleding versamel is. 'n Tematiese benadering is gevolg in die ontleding van data waaruit temas voortgevloei het. Nadat die data ingesamel is, is dit getrianguleer aan die hand van 'n dokumentontleding van Unisa se beleide. Afstandsonderrig is bespreek en die agtergrond, geskiedenis en generasies is deurtastend ontleed aangesien sodanige inligting 'n belangrike aspek van die studie en multimediaraamwerk uitmaak. Vanweë die aard van die studie is behaviourisme, kognitivisme, konstruktuvisme en konnektivisme as onderrig-en-leerteorieë aangewend. Die kognitiewe multimedialeerteorie, wat berus op Mayers se beginsels vir multimediaontwerp, is toegepas. Die bevindings wys op die noodsaak vir beleidwysigings; die bywerking van sagteware; die opgradering van IKT-infrastruktuur; die opleiding van personeel; 'n vrygestelde webwerf sodat studente moeiteloos toegang daartoe kan verkry; die

amptelike verklaring en wettiging van WhatsApp-boodskappe; en datatoewysing. Op grond van die bevindings stel die multimediaraamwerk die aanwending van multimediategnologieë voor om hoër onderwys te bevorder, maar waarsku dat vertroulikheid gewaarborg en ander beginsels nageleef moet word.

SLEUTELBEGRIPPE

Inligtingskommunikasietegnologie (IKT), Kognitiewe Leerteorie, Kognitiewe Multimedialeerteorie, Afstandsonderrig, COVID-190-pandemie, Behaviourisme, Kognitivisme, Konstruktivisme en Konnektivisme, Multimediaraamwerk, Oop Afstand-e-Leer (OAeL)

DEDICATION

To the Lord Almighty, it was your GRACE Lord…Elshadai, Thixo wam, THANK YOU.

This study is a dedication to my parents, Nobesuthu and Ndodiphela Mayekiso. The truest ORIGINS of LOVE. This has always been my mothers' dream. Msuthukazi, this one is for you ntombi, usizale ungenanto, wasithwala, wasikhulisa, wasikhuthaza oku kwesikhukhukazi, uliQhawe lethu Mfenekazi. Ndibulela ngokungazenzisiyo.

My siblings, the deputy parents: Babalo and Zamandulo Mayekiso, ndibamba ngazo zozibini ngothando lwenu olungunaphakade. I know without a shadow of a doubt, you will always have my back. Ndininqwenelela amathamsanqa odwa.

To my nieces and nephews: Gwiba, Sikelelwa, Ndinani, Alwaba, Phumelela and Zimingonaphakade Mayekiso, niziinkwenkwezi, nihambe ngamandla eninawo, ningemi, the sun will rise. Ningoyiki. Yonke iminqweno yenu iyakufezekiswa.

Ndibulela nakumhakhulu wam ongasekhoyo u-Eunice Nothemba Mayekiso: Aah Nongciki ntombentle! Camagu kuMaCwerha, oMaHlahlane oGxarha, oVambane!"

To the Magqo Family Lineage: AmaMfene, ooLisa, ooJambase, ooSazanza, siyabulela ngokusithwala. Camagu, makudede ubumnyama kuvele ukuKhanya... Kwabangasekhoyo utatomkhulu uVelile Magqo, uHlathi kwakunye noNosajini Magqo uMaSlango, Ndukuda, Ntamo inemida, Mabelekwa ngetawuli ngenxa yokudabula amabhayi, ndithi Camagu bantu abadala ndiyabulela. Your legacy lives!

To my husband Vuyolwethu and my children, Ubunzulu Imboyothando and Mngcunube Ngcwalisa Bumbantaba Twabu, iintsikelelo zezenu, ningazideli amandla. Ningoyiki, ningamaqhawe, niziinkwenkwezi ezikhanya ebumnyameni. Imingcunube eyokozela amathamsanqa, nakuyiphi na intlango yobomi.

I lastly dedicate the thesis to my children's other grandmother: Nomfundo Iris Euphemia Twabu, Thesis (M.A.) -- University of Stellenbosch, 1998, thank you, love leads the way!

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To my supervisor Professor G Van Den Berg, you have been holding my hand from the master's journey; thank you for your patience, calm, understanding and professionalism.

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For my PhD journey, both my supervisors have carried me through on numerous occasions where I could not see the study through. I appreciate you; your vision remains unmatched. May you continue watering and preserving the hopeless seeds and prune until the student harvest season journey. The remote phone calls and unstable network connections, your resilience and persistence in ensuring we finish strong, thank you.
Enkosi kakhulu.

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To all the study participants from Unisa colleges and support departments, THANK YOU for being available to attend to my request amidst your full schedules. You made it work for this dream of mine. Enkosi (Thank you).

To Unisa for granting me this investment of a lifetime,
THANK YOU.

ABBREVIATIONS

CTL	Cognitive Theory of Learning
CTML	Cognitive Theory of Multimedia Learning
CEMS	College of Economic and Management Sciences
CEDU	College of Education
CHS	College of Human Sciences
CSET	College of Science, Engineering and Technology
COL	Commonwealth of Learning
COVID-19	Coronavirus disease
DHET	Department of Higher Education and Training
DE	Distance Education
ICT	Information and Communications Technology
ICDE	International Council for Open and Distance Education
LMS	Learning Management System
MOOC	Massive Open Online Course
ODL	Open Distance Learning
OERS	Open Educational Resources
RPSC	Research Permission Sub-Committee

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Appendix number	Name of appendix	Attached YES or NO
Appendix A	Interview schedule for support staff member working in ICT	YES
Appendix B	Interview schedule for support staff member working in Multimedia	YES
Appendix C	Interview schedule for support staff member working in Department: Tuition Support & Facilitation of Learning (DTFSL)CPD	YES
Appendix D	Interview schedule for College Dean or Acting Executive Dean staff member working in selected Colleges (COE/CHS/CSET/CEMS)	YES
Appendix E	Questionnaire	YES
Appendix F	Approved ethics clearance access permission	YES
Appendix G	Approved permission to conduct research involving Unisa employees, students and data 2022	YES

CHAPTER 1

ORIENTATION AND BACKGROUND

1.1   INTRODUCTION

The rise of information communication technology (ICT) across the globe is evolving at an unmatched pace and both private and public organisations, particularly the education sector, had to adapt to the digital world. Coronavirus (COVID-19) has urged the move towards utilising and integrating technology and upgrading all the electronic infrastructure to ensure educational advancement. Therefore, multimedia as an integral digital technology part of ICT can be represented using different media formats (Guan, Song & Li, 2018). Multimedia is a combination of more than one type of medium, such as text (alphabetic or numeric), symbols, images, pictures, audio, video, and animations, usually with the aid of technology, to enhance understanding or memorisation (Guan et al., 2018). The use of various multimedia tools in teaching and learning has proven to be genuinely useful in providing unrestricted access to quality education and improving student performance (Abdulrahaman, Faruk, Oloyede, Surajudeen-Bakinde, Olawoyin, Mejab & Azeez, 2020).

It is clear how dynamic and evolving the 21st century is regarding recent technologies, standards, curriculum, student and lecturer requests, and subsequent policies with effective skills that upgrade the approach for lecturers to be professionals who deliver work of high quality that aim to elevate teaching and learning progression (Trust & Pektas, 2018). As a multimedia specialist at an Open Distance electronic Learning (ODeL) Higher Education Institution (HEI), and in my role of assisting academics in implementing and adapting multimedia into teaching and learning, I witnessed how the COVID-19 pandemic drove the adaptation and adoption of multimedia for teaching and learning. Multimedia adaptation in education has effectively advanced the continuation of teaching and learning, which further motivated the choice of this study.

The 2018 Global Competitive Report of the World Economic Forum (WEF) indicated that South Africa's ICT adoption of digital skills is ranked 116th out of 140 countries, which is an alarming state that requires drastic improvement measures (Malan, 2016). The WEF's Global Social Mobility Index of 2020 revealed South Africa's ranking of 77th out of the 82 nations who had been assessed regarding internet access

(WEF, 2020). To improve such rankings, South Africa's shortage of internet connectivity requires attention. To ensure growth, higher education institutions (HEIs) should apply proactive measures by tactically choosing conclusive technologies and preparing and advancing lecturers and students' skills and knowledge. Such measures assist with the assumption of the restructuring role, and the preparation and delivery of quality educational work. Further, the restructuring of various HEIs programmes and various other foreseeable challenges, which the education society will encounter, require urgent prioritization (Yusuf, Walters & Sailin, 2020).

Various methods and mechanisms in education, particularly ODeL, aimed at empowering practitioners and policymakers towards ongoing effective development require implementation (Manamela, 2018; Unesco, 2019). Such mechanisms focused entirely on designing educational programmes combined with compatible technologies to meet lecturers' and students' requests. Through all the various interventions aimed at ODeL innovative efforts, growing creative practitioners and research networks, and refining the necessary digital skills capacity, transformation progress in South Africa remains slow (Nemisa, 2020; Tshabalala, 2020). The COVID-19 pandemic drastically and immensely changed the global ecosystem across the globe (Sharma, Tiwari, Deb and Marty, 2020; World Health Organisation (WHO), 2020).

The COVID-19 pandemic changed the way HEIs globally deliver education, irrespective of the relative merits of distance and traditional education. Globally, all HEIs experienced a shift in the way they teach to effectively adapt to changes in online teaching and learning to improve and maintain lifelong learning (Kandri, 2020). This means that the COVID-19 pandemic experience facilitated the HEIs criteria for managing and transforming teaching (Oranburg, 2020; Kandri, 2020). The COVID-19 pandemic has proven that online teaching and learning is rapidly becoming the acceptable preferred mode of education. Students opted for alternative education models with a negative impact on traditional HEIs' revenues compared to ODeL. During the COVID-19 phase, the HEIs revenue enforced quick adaptation and adoption of online learning (El Said, 2021). COVID-19 has shown how important it is for the Department of Higher Education and Training (DHET) in South Africa, together with HEIs, to accommodate the sudden large-scale online distance teaching activities. There is a necessity for upgrade and improvement to the ICT infrastructure,

bandwidth, data, and ICT tools of trade supply across the educational sector, as well as sufficient governance of such solutions to mitigate possible collapsing ICT infrastructure (Zhang, 2020).

ICT usage in teaching and learning has proven to be an alternative to traditional physical learning due to its attractive benefits and increased demand across the educational sector (Mishra, 2020; Oranburg, 2020). There are plenty of multimedia interactive live video streaming modes of delivery that are purposeful in boosting teaching and learning. Such streaming modes include but are not limited to Microsoft (MS) Teams, Zoom, Facebook and YouTube in which information can be downloaded and stored on learning management systems (LMS) such as Moodle and Sakai (Department of Higher Education and Training, 2021). Additional to the live video streaming modes, there are learning and multimedia video content production software programs such as Adobe Premier Pro, Doodly, Camtasia Studio and Purple Mash that effectively produce useful innovative learning media materials. These video software and content management systems require lecturers to undergo training to be able to utilise the programs and their skills in their teaching (Cullen, 2022). Multimedia interactive educational technologies share an important value, serving as digital up-skilling investments in lecturer training (Lekgothoane & Thaba-Nkadimene, 2019). In addition, in line with the Fourth Industrial Revolution (4IR), innovation, agility, integration, vision, and collaborative works are beneficial to educational course technology integration (Wachira & Keengwe, 2011; Moore & Kearsley, 2012: 91; Tshabalala, 2020).

1.2   BACKGROUND TO THE STUDY

Even though education has been improved by ICT stimuli, the slow growth of ICT infrastructure and capacity, pedagogical approaches and ODeL teaching and learning strategies in South African HEIs still lag behind (Mpungose, 2020). The HEIs that have experimented with various technological inventions have advanced the reshaping of future technologies and looked beyond the traditional educational approach (Yusuf et al., 2020). Multimedia technological inventions play an important role in boosting education through characteristics such as interactivity, delayed or instant dialogue, flexibility, and the integration of various forms of media, which enhance student

learning and increase student motivation (King & South, 2017). Multimedia technologies, such as audio-visual clips, animations, rich graphics, and interactive e-books, allow lecturers and students to annotate, add or change materials, including assessment exercises and feedback (ContactNorth, 2020). As the current pedagogical transformation requires rapid mobilization, multimedia technologies are essential for pedagogical improvement (Rahimi, 2018). Whilst the use of technology has been accelerated by the COVID-19 pandemic, the primary objective in teaching is an integrated quality pedagogy across HEIs to enable efficient teaching and learning (Cobo, Hawkins & Rovner, 2020).

Considering how technology plays a significant role in distance learning, embracing multimedia technologies in teaching and learning may enrich learning for students (Bladergroen, Chigona, Bytheway, Cox, Dumas & Van Zyl, 2012: 23). However, both the pedagogical methods and technological affordance are imperative for a substantiated discourse, otherwise the use of ICT fancy devices and multimedia animations will be the focus but with a lack of cognitive teaching and learning (So, 2010: 256). Even though some advanced countries and HEIs whose ICT infrastructure strategically embraced technology before the advent of the pandemic, the COVID-19 pandemic undoubtedly, accelerated the advanced curriculum re-design and development and phasing out of physical classes, which was a shift from traditional learning to digital learning (Mahaye, 2020). Because of HEIs embarking on online or blended teaching and learning, this study proposes the phasing out of Distance Education's (DE) first-generation correspondence model, as is still practised by some DE institutions (Bozkurt, 2019). Therefore, upskilling and equipping lecturers with recent multimedia technologies, digital literacies, and providing adequate reshaped tools of trade will guarantee sustainability and effectiveness in quality online teaching and learning (Horner, 2020).

Before the COVID-19 pandemic, online education was not strategically embraced by HEIs. However, recent developments have motivated the re-prioritisation and re-consideration of staff re-skilling and student-centredness (Michigan, 2020; Gopal, 2020). The inadequate provision of ICT infrastructure and classroom technologies, especially for the traditional face-to-face HEIs, also required prioritisation (Lekgothoane & Thaba-Nkadimene, 2019; Mishra, 2020). Since the COVID-19

pandemic acceleration, organisations adjusted to distributing work across industries, including the education sector and growth in the various ICT modalities (Kandri, 2020). Schools and HEIs required and relied heavily on online learning, which enforced adequate and effective ICT systems (Torres, 2020). Various multimedia technologies were effectively employed, yielding positive educational benefits (Abdulrahaman et al., 2020). Different ICT-enabling remote-work strategy implementations, such as the onscreen marking software and Virtual Private Network (VPN) connections enhanced effective online teaching and learning quality embedded resources for HEIs (Ivanič & Lea, 2006; Coleman, 2016).

The University of South Africa (Unisa) was one of the HEIs with ODeL expertise that the minister for Higher Education and Training, Dr Blade Nzimande, tasked to share their knowledge and experiences with HEIs that were new in the ODeL field (Makhanya, 2020). Unisa is the largest open distance learning higher institution in Africa and the longest dedicated distance education HEI with global standing. The University enrols nearly one-third of all South African students (Unisa, 2021). ODeL HEIs such as Unisa should be studied and evaluated, as their systems affect lecturers, students, administrators, and policymakers. This type of HEI system further influences significant changes in the conceptualization, funding, design, and delivery of education, which subsequently lead to ease of access and improvement in their teaching and learning quality (Moore & Kearsley, 2012:22).

At the beginning of 2020, during the South African COVID-19 national lockdown, Universities South Africa (USAF), a body made up of all vice-chancellors of South Africa's public universities, brought forward plans to resume studies and incorporate zero rating of online learning educational websites (USAF, 2020). This collaboration was made with various mobile network operators (MNOs) such as MTN, Cell C and Vodacom to provide access to students and reverse billing was applied (Ngqakamba, 2020; Khumalo, 2020). Due to various socio-economic issues of inequality, racial achievement gaps and access to ICT infrastructure and connectivity, various student leaders across the country disputed the commencement of online teaching and learning (Mishra, 2020; Molele, 2020 & Khumalo, 2020). The digital divide and expensive data were cited as challenges. This is due to different socio-economic circumstances and ICT literacy levels among students (Mayer, 2014).

There could be solutions to combat the ICT and education challenges encountered because of the COVID-19 pandemic. Mishra (2020) mentions five (5) key issues in need of attention to build a new world order for education in the post-COVID-19 world. Firstly, Mishra focuses on learning irrespective of modality, secondly, the strengthening of the ICT infrastructure to combat struggles encountered by the education sector. Thirdly, Mishra mentions the focus on learning resource investments rather than building structures to affect the quality of learning materials. Mishra emphasises the development of life-long learning, self-skilling student empowerment for employment, and lastly, collaboration based on transparency (Mishra, 2020).

HEIs have been increasingly advocating better collaboration resources and sharing joint solution creations in preparation for possible new norms of curriculum delivery (USAF, 2020). The proposed collaborations should be with organisations such as DHET and mobile network operator (MNO) service providers for data and digital devices. However, for any collaboration to yield positive results, content sharing and collaboration relevance require appropriate governance principles (Michigan, 2020; Gopal, 2020). HEIs must conduct a necessary multimedia technology skills audit of staff and students through surveys and a Personal Development Plan for staff members (Department of Higher Education and Training, 2021).

HEIs should consider employing open government data (OGD) policy for effective service delivery to its providers and beneficiaries (Ubaldi, 2016). Open government data (OGD) is defined as any data or information generated by public bodies at all government levels, and are made available to the public to access, reuse, and redistribute without copyright restrictions (Xiao, Jeng & He 2018:573 in Tang & Jiang, 2021). The above collaborations impact essentials such as policy making for curriculum design, pedagogical changes for online teaching and learning compatibility, data and networks for content delivery and storage for students' accessibility as this applies across various sectors of business and society (Yusuf et al., 2020; Mishra, 2020). As HEIs operate across various disciplines, courses, and assessments, it should be noted that education will not be efficient through a quick-fix, set-up overnight or a band-aid approach to learning. Instead, ODeL requires extensive preparatory planning to be delivered effectively (Mishra, 2020).

1.3   PROBLEM FORMULATION

The outbreak of the COVID-19 pandemic compelled HEIs to adapt to the sudden shift to distance and digital forms of teaching and learning. The COVID-19 pandemic hugely impacted ICT and multimedia integration in teaching and learning due to unreliable ICT infrastructure and HEI unreadiness. This study stems from the higher demand for greater access to quality education, the provision and access to online learning to successfully harness digital transformation into teaching and learning practice (Mishra & Koehler, 2006: 1031; Mishra, 2020). Lecturers should note that aesthetic multimedia integration in a pedagogically sound manner in employed technologies is not always equivalent to teaching with it (Mishra & Koehler, 2006: 1033). Stakeholders such as the heads of colleges, executive management, and all-round structures within HEIs should be aware of how to apply multimedia integration in a pedagogically sound manner such that multimedia delivery matters as much as content delivery (Kilanioti, Fernández-Montes, Fernández-Cerero, Karageorgos, Mettouris, Nejkovic, Albanis, Bashroush & Papadopoulos, 2019).

With the HEIs adapting to various technologies for teaching and learning during and post-COVID-19, which has changed education forever, various forms of multimedia inclusion form part of the enhancing technologies (Lalani & Li, 2020). However, the adaptation of multimedia, such as audio-visuals, has revealed that lecturers sometimes unintentionally disregard pedagogies whilst including multimedia. This is due to their lack of sufficient pedagogical content knowledge and experience necessary for effective online remote classroom teaching (Knoster, 2021; Huber & Helm, 2020). Additionally, lecturers should know which technologies and pedagogical strategies to incorporate into their lessons, as technological competence and pedagogical competence are necessary for the effective integration of ICT into teaching and learning (Mishra and Koehler, 2006; Tiba, 2018). As much as some lecturers indicate that technology could be time-consuming and hinder their progress in completing all the work required in the curriculum, skilled lecturers disregard time as an obstacle stating their enjoyment in using technology for teaching and learning (Johnson, Jacovina, Russell & Soto, 2016). With ODeL, lecturers should understand how the intersection of technology, pedagogy, and content can provide meaningful learning experiences for students (Sailin & Mahmor, 2018). Frameworks of knowledge,

such as the technological pedagogical content of knowledge (TPACK), play a vital role for lecturers (Kurt, 2018). These frameworks help lecturers with connections, blending of technologies, curriculum content, and specific pedagogical approaches to produce effective, discipline-based teaching by means of technology (Harris, Mishra, & Koehler, 2009: 396 & Burns, 2011).

Lecturers may encounter difficulty using software that demands their attention and time seeking impromptu thinking if they have no previous experience. HEIs should therefore offer training to equip the lecturers to deal with such challenges (Lederman, 2020). Even though multimedia technologies may be marketed as teaching and learning tools, some cases reveal that, although engaging and stimulating, some multimedia technological tools offer little or nothing in the way of deep content learning (Darling-Hammond, Flook, Cook-Harvey, Barron & Osher, 2020). Multimedia may be recognised by administrators and policymakers as frivolous or unnecessary flashy animations and not as an excellent teaching and learning enhancer. The idea of frivolous or unnecessary flashy animations might frustrate enthusiastic lecturers and relieve the non-technology-savvy lecturers (De Sousa, Richter & Nel, 2017).

The dramatic consequences of the COVID-19 pandemic led this study to emphasise the importance for a curriculum to include multimedia and to regulate best design practices as well as the cognitive processes to achieve sound pedagogical principles for student experience stimulation (Hodges, Moore, Lockee, Trust & Bond, 2020). COVID-19's dramatic effects revealed the improvisation of lectures through adaptive, innovative technological multimedia technology enhancement of online lessons, which often lacks pedagogical strength (Kumi-Yeboah, Kim, Sallar & Kiramba, 2020). COVID-19 revealed how lecturers timeously face adversities through the inability to reach students due to geographical lack of connectivity and economic circumstances (Di Pietro, Biagi, Costa, Karpiński & Mazza, 2020). Lastly, adversities such as the often-depleted ICT infrastructure, inefficiencies, and expensive data are hindering accessibility for students. Such adversities also form part of the dramatic effects that COVID-19 has had (Bozkurt, Jung, Xiao, Vladimirschi, Schuwer, Egorov, Lambert, Al-Freih, Pete, Olcott Jr & Rodes, 2020).

1.4 RESEARCH QUESTIONS

Based on the research problem, this research study aims to produce a multimedia framework for Online Teaching and Learning at Open Distance HEIs post-COVID-19 in South Africa. For this reason, the research question serves as a guide towards relevant resources, leading and focusing on data collection (Jansen, 2007: 3).

Primary research question

How can a post-COVID-19 pandemic multimedia framework be developed for teaching and learning in Open Distance eLearning in South Africa?

Based on the primary question, the following secondary questions were formulated:

- What are the experiences of lecturers in ODL regarding teaching and learning with multimedia during COVID-19?

- How has multimedia impacted online pedagogy during COVID-19?

- How is multimedia supporting teaching and learning at ODL in South Africa?

- What are the recommendations for the inclusion of multimedia in teaching and learning in ODeL post-COVID-19?

- What are the key elements of a post-COVID-19 pandemic multimedia framework for teaching and learning in ODeL in South Africa?

1.5 AIM OF THE RESEARCH

Based on the main question of this research, the aim was formulated as follows:

To develop a post-COVID-19 pandemic multimedia framework for teaching and learning in Open Distance eLearning in South Africa.

To reach this aim, the following objectives are targeted:

- To determine the multimedia experiences of lecturers in ODL regarding teaching and learning during and post-COVID-19.

- To establish how multimedia has impacted online pedagogy during COVID-19 in ODL post-COVID-19.

- To explore multimedia technologies supporting teaching and learning at ODL in South Africa.

- To establish the recommendations for the inclusion of multimedia in teaching and learning.

- To determine key elements of a post-COVID-19 pandemic multimedia framework for teaching and learning in ODeL in South Africa.

1.6   RESEARCH DESIGN

Research design can be viewed as the research structure, as it is the "glue" that holds all the elements in a research project together. In short, it is a plan for the proposed research work (Akhtar, 2016). According to Selltiz, Jahoda, Deutch and Cook (1965:50), "A research design is the arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy and procedure". Research designs are strategic types of inquiry within a qualitative, quantitative, and mixed methods approach that provides specific direction for procedures in a research study (Denzin & Lincoln, 2011; Creswell & Creswell, 2018:11). Since the research design and methods are chosen by the researcher, it also allows researchers to improve on research methods that are suitable for the subject matter and set their studies up for success (Saeed, 2020). Over the years, technology has advanced how researchers conduct data analysis and analyse complex models and, thus, have established new procedures for conducting social science research (Creswell, 2018:11). This section offers a plan for the research, including the research paradigm, research approach as well as research

type. The research design process in qualitative research begins with philosophical assumptions that the inquirer makes.

1.6.1 Research paradigm

Research paradigms are classified into three main possibilities, namely positivism, interpretivism and critical paradigms (Okesina, 2020). The research paradigm categories represent how differently we see the world. Since scientific knowledge is composed of facts, and reality is regarded as independent of social construction, positivism requires that human beings and scientific knowledge be studied similarly (McMillan & Schumacher, 2010: 5).

A critical paradigm is an alternative paradigm related to society whose purpose is to critique and justify the existing status quo in society and to provide alternative knowledge to produce a better social order (Universitas Gadjah Mada, 2020). A critical research paradigm is a perspective on research that addresses social inequities and power differentials; the methodologies include action research, participatory action research, critical research, and feminist research (Brewer, Torrisi-Steele & Wang, 2015).

The interpretivist paradigm (see Chapter 4, Section 4.3.1) is employed to understand contemporary social reality (Chowdhury, 2014). By examining participants' daily interactions in their natural environments, the interpretative paradigm was found most suitable for this study. Using an interpretivist paradigm, I was able to view participants socially, seeking situational distinctiveness (context) as significant to comprehend and interpret the meanings constructed throughout (Nieuwenhuis, 2007: 59).

1.6.2 Research approach

Research approaches are plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation which may also include philosophical assumptions, strategies and research methods (Creswell & Creswell, 2018:3). There are three research approaches, namely qualitative, quantitative, and mixed methods (Creswell & Creswell, 2018:3). A

qualitative approach was employed in this study to compare different findings in the service of accurately validated conclusions, allowing for deeper reflection and understanding (Pokpas, 2018; Creswell, 2018: 557).

Both interpretive and naturalistic approaches are employed in qualitative research on the subject matter, clarifying what meaning brings to people (Denzin & Lincoln, 2003 in Aspers & Corte, 2019). Quantitative research, however, employs questionnaires, surveys and experiments to gather revised numbers organised in data, which affords the data to be characterised through statistical analysis (Hittleman & Simon, 1997 in Antwi & Kasim, 2015). Maxwell (2005) in Cohen, Manion and Morrison (2018: 304) suggests that, whilst quantitative research is interested in discovering the variance and regularity in the effects of one or more independent variables on an outcome, qualitative research is interested in the causal processes at work in understanding how one or more of the interventions or factors leads to an outcome, the mechanisms of their causal linkages. According to Stake (1995:37), qualitative and quantitative research emphasise three major differences: explanation and understanding as the purpose of the inquiry; the researchers' personal and impersonal role; and knowledge discovered, as well as knowledge constructed.

Since there usually is doubt and uncertainty about the dimensions and characteristics of the problem, qualitative research aims to research and reveal unknown issues about the situation and thus employs soft, easy data to get fruitful rich data (Domegan & Fleming, 2007). I interacted with the participants using data collection methods to immerse myself in fieldwork and understand the participants' experiences of online teaching and learning (Denzin & Lincoln, 2005:3-4; McMillan & Schumacher, 2010:12). Qualitative researchers study things in their natural settings, attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them (Denzin & Lincoln, 2011 in Creswell, 2013: 44). I collected data in an open-ended manner by not adhering rigidly to research tools, but rather allowing participants the liberty and flexibility to express their views on any unplanned topic, and this gave them comfort (Yin, 2011:8).

1.6.3 Research type

There are five research types applicable to qualitative studies, namely narrative research, phenomenology, grounded theory, ethnography, and case studies (Aspers & Corte, 2019). This study employed a case study, which can be described as a study of an occurrence in action (Cohen et al., 2018: 384). Case study research is a qualitative approach in which the investigator explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection (Creswell, 2013: 97). Case studies involve multiple sources of information (such as observations, interviews, audio-visual material, and documents and reports), and reports a case description and case themes (Creswell, 2013: 97). Case studies also investigate clearly defined boundaries between contemporary phenomena within the real-life context (Yin, 2003). The remote online distance learning and multimedia phenomenon at an ODeL HEI during COVID-19 was explored in its daily context by engaging with participants using online learning (Yin, 2011:17).

There are different kinds of case studies, namely exploratory (as a pilot to other studies or research studies), descriptive (providing narrative accounts) and explanatory case studies (testing theories) (Yin, 1984). This study employed an explorative case study to investigate distinct phenomena characterized by a lack of detailed preliminary research (Wiebe, Durepos & Mills, 2009). Case studies seek evidence from various occurrences for triangulating purposes and for "prior development of theoretical propositions to guide data collection and analysis" (Yin, 2002: 13-14). Within the interpretivist paradigm (see Chapter 4, Section 4.3), this case study explored the participants' relationships and interactions using multimedia for online teaching and learning enhancement. Participants shared opinions and online learning experiences of how their work environment fits within a case study design. Participants' responses towards the research questions were informed by their experiences and perceptions of online learning (Hitchcock & Hughes in Cohen, et al., 2018:376).

The qualitative case study was instrumental in this research, as it enabled me as the researchers' approach to collect information (Yin, 2014). As discussed above, the

study employed certain research methods within the research design, which are discussed next and in detail in Chapter 4, Section 4.6.

1.7   RESEARCH METHODS

This research methods section elaborates on data sources and reveals the methods employed for selecting participants. This section further elaborates on the methods used for data collection, how the data was analysed, and the procedures followed during data collection.

1.7.1   Selection of participants

Each research employs specific sampling procedures to select participants (Creswell & Plano Clark, 2011:172). Sampling procedures comprise of the following: the venue or location where research is conducted; participants providing data in the study and how sampling was completed; the required number of participants to assist with research questions as they are involved as part of instruments to collect data and lastly; recruitment procedures for the participants (Creswell & Plano Clark, 2011:172). Since a clear set of inclusion criteria defines the scope of the synthesis, this study's synthesis was through the identification of participants with expertise in and experience of online distance teaching and learning (Cohen et al., 2018 436). In this research study, purposeful sampling was employed, and participants were identified for inclusion through their involvement in online teaching and learning (McMillan & Schumacher, 2010: 327). Chapter 4, Section 4.6.2.2, details in depth the selection of participants.

1.7.2   Data collection

Data collection is "a technique employed to obtain empirical research data" (Tashakkori & Teddlie, 2003:298). Data collection techniques include interviews, observations (direct and participant), questionnaires, and relevant documents (Yin, 2014). Thus, data from participants were gathered through open-ended questionnaires and face-to-face as well as MS Teams interviews (both online and physical, depending on COVID-19 restrictions) and document analysis.

Open-ended questionnaires

This study collected data using open-ended questions (Creswell & Creswell, 2018:181). In this study, open-ended questions enabled participants to openly express their views and experiences of multimedia and ICT integration in online learning in DE. Open-ended questions reflect quality appraisals to allow judgement, and those standards are inevitably shaped by the context and purpose of assessment (Creswell & Plano Clark, 2018:185). I employed the research questions as the basis for the broad issues to be covered to contribute towards the list of open-ended questions (Creswell, 2013:163-168). Questionnaires with open-ended questions were coordinated and sent to four selected colleges and three support department participants (see Chapter 4, Section 4.6.1.2).

Semi-structured interviews

Semi-structured interviews followed questionnaires to further explore the phenomenon in providing clarity and greater depth. Due to remote working, the study was flexible enough to allow participants to be interviewed either face-to-face or on online platforms such as MS Teams or by way of emails and telephone calls. All the interviewed participants opted for MS Teams interviews. I was able to establish the biographic details of the lecturer participants who opted for interviews on MS Teams, the same way I could with the lecturer participants who opted to complete questionnaires. The study established whether the selected lecturer participants from the selected HEI had any related qualifications, experience, and skills regarding multimedia applications and how they adapted their expertise to their teaching and learning. This was also meant to establish how participants would mitigate challenges they encountered whilst using the tools to enhance teaching and learning.

Participants were interviewed to establish their experience and skills, their qualifications, their encounters, and how they mitigated challenges when employing ICT and multimedia during the emergency remote COVID-19 phase.

Document analysis

Document analysis is a social research method where written documents, whether personal or non-personal, printed or online/electronic material, are reviewed, evaluated and interpreted by a researcher to produce meaning about an assessment topic (Bowen, 2009 in Triad 3, 2016). Documents enable the researcher to save time and expense of transcribing at a time convenient to the researcher (Creswell & Creswell, 018: 188). The criterion checklist referred to online teaching and learning, ICT and multimedia, and ODeL documents for document analysis. Adding to the document analysis was the analysis of the Unisa institutional policies, as this was the research site used for triangulation purposes. Document analysis was necessary to gain information about Unisa's online teaching and learning and the use of technologies on online platforms (such as MS Teams, LMS, web browsers and various internet-based online platforms). I sought ethical clearance (see Appendix F) as well as permission to access documents and to conduct research involving Unisa employees, students, and data (see Appendix G) from the institution (Creswell & Creswell, 2018: 188). Document analysis was conducted after the interviews and questionnaires to cross-reference where applicable. This study's checklist for data analysis entailed identifying trends, organising codes, and identifying patterns of the data which will all be discussed next, as well as in Chapter 4, Section 4.7

1.7.3 Data analysis

Data analysis in qualitative research encompasses searching and arranging the interview transcripts, identification, inspection, and interpretation of themes coming out from the data (Bogdan & Biklen, 2007 in Creswell & Creswell, 2018: 189-190). The researcher then decides how the themes can help answer the research questions as they accumulate an understanding of the phenomenon (Bogdan & Biklen, 2007 in Creswell & Creswell, 2018: 189-190). Data analysis entails a fluid process highly dependent on the evaluator and the study context (Yin, 1994). Universal rules or guidelines do not guide data analysis; it is likely to change and adapt as the study evolves and the data emerges (Yin, 1994). An inductive approach to data analysis was employed to enable categories and patterns emerging from the data to be imposed on the data in advance (McMillan & Schumacher, 2010: 367). I coded and categorized

the data as part of the data analysis procedure (McMillan & Schumacher, 2010: 368).

This study applied a thematic approach where themes emerged from the data collection categories, enabling data analysis findings to be written in narrative structure formulation (McMillan & Schumacher, 2010: 368). A thematic approach involves a textual and iterative process that involves data transcribing, reading, coding, searching for themes, reviewing themes, defining, and naming themes, and then providing the report (Xu & Zammit, 2020). I followed the most widely accepted framework for conducting thematic analysis consisting of a six-step process that involves familiarising the researcher with the data, generating initial codes, enabling searches for themes, helping to review themes, defining and naming themes, and lastly, producing the report (Kiger & Varpio, 2020). The thematic approach is further discussed in Chapter 4, Section 4.7.1.

1.8 ETHICAL MEASURES

Ethical considerations are essential in the research process because they protect the participants from harmful events and the researcher from plagiarism consequences in the academic world (Welman, Kruger & Mitchell, 2005). Ethical research governs the researcher towards standardised conduct regarding confidentiality towards participants, sponsors, and colleagues (Association of Social Anthropologists (ASA), 2020). Ethical research remains a benefactor for participants over potential unforeseen risks (WHO, 2020 & Resnik, 2020). As such, an ethics committee should review all research involving human beings to ensure that the appropriate ethical standards are being upheld (Resnik, 2020). This study's ethical clearance was obtained (see Appendix F) from the Ethics Committee of the College of Education at Unisa. This study also applied to the institutional level Research Permission Subcommittee (RPSC) ethics permission (see Appendix G), for permission to be granted to conduct the research. This study considered informed consent, confidentiality, anonymity, care and fairness when participating in qualitative research (McMillan & Schumacher, 2010: 339). Every participant in the study signed a consent form and was treated with confidentiality and anonymity. Care and fairness can be accomplished through open discussions and negotiations (McMillan and Schumacher, 2010: 339).

1.9 TRUSTWORTHINESS OF THE STUDY

Lincoln and Guba (in Johnson & Turner, 2003: 300) indicate that trustworthiness pertains to how the investigators convinced and persuaded themselves and the readers that the research findings are worthy of attention. According to Lincoln and Guba (in Billups, 2014: 4), credibility (truth), dependability (consistency), transferability (applicability), and confirmability (neutrality) are the four elements that encompass the original trustworthiness framework. The study documented all research procedures employed to ensure the credibility of the study. Regarding achieving transferability, I corroborated the research findings using multiple data sources. I stated how this study's empirical part was carried out to ensure dependability. Constant checking and re-checking of the data through the member check technique and aligning the data analysis with the study's theoretical boundaries helped achieve conformability (Lincoln & Guba, in De Vos, 2005: 346).

1.10 CLARIFICATION OF CONCEPTS

The key terms employed in this study are described below.

- **COVID-19**

  The global pandemic of coronavirus disease 2019 (COVID-19) was first reported on 31 December 2019 by the World Health Organization country office following a cluster of pneumonia cases in Wuhan City, Hubei Province of China. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been confirmed as the causative virus of COVID-19 (Sharma, et al., 2020; World Health Organisations (WHO), 2020)

- **Distance Education (DE)**

  Distance Education (DE) is defined as institution-based, formal education where the learning group is separated and where interactive telecommunications systems are utilised to connect students' resources and lecturers (Simonson, Schlosser &

Orellana, 2011). DE has evolved; thus, many new terms are used to define activities that are the same as or overlap with distance education. This study employs common terms, including online, e-learning, distance, open, blended, and flexible learning (Hailegebreal, Sedi, Belete, Mengistu, Getachew, Bedada, Molla, Shibiru, & Mengiste, 2022).

- **Open distance learning (ODL)**

There are a variety of definitions of ODL by different organisations that relate to the policies and procedures of organisations or HEIs. Since this study focuses on ODL and ICT as well as on teaching and learning, the ODL definitions fit its purpose. The ICDE (2013) states that "open" shows straightforward entry, with minimal obstructions to SA higher education. Today's distance learning incorporates online, e-learning, flexible, and blended learning (Stauffer, 2020). Data and correspondence innovations ordinarily characterise the latter concept, and where such are not accessible by traditional means (for example, correspondence, radio and television) (Burns, 2011).

- **Online learning**

Online learning refers to network-enabled teaching and learning that enables the student to have expanded communication with content, the lecturer and other students (Commonwealth of Learning, 2015: 3). Online and e-learning are used interchangeably in this study. E-learning is a modern form of DE in which teaching and learning accessibility or any form of training or educational material is delivered electronically by means of the internet or an intranet to remote students independently at "their preferred place and time" (Nazim & Mukherjee, 2016).

- **Information communication technology (ICT)**

The United Nations Educational, Scientific and Cultural Organisation defines ICT as the diverse sets of tools and resources used to communicate, create, disseminate, store and manage information (Unesco, 2008:11). ICT keep evolving

and are continuously improved with additional features as times and technologies evolve, thus enabling the use of novel educational materials and the renewal of learning methods. ICT expands blended learning, enhancing active online and offline student collaboration whilst simultaneously acquiring technological expertise (Olatoye, Nekhwevha & Muchaonyerwa, 2021).

- **Multimedia**

Multimedia is a combination of more than one medium type, such as text (alphabetic or numeric), symbols, images, audio, graphics, and video elements and animations that have been digitally manipulated, usually with the aid of technology to enhance understanding or memorization projecting an aesthetic value and maintaining visual consistency (Guan et al., 2018 in Abdulrahaman et al., 2020; Ivers & Baron, 2010). As the main concept of this study, I explore multimedia as an interdisciplinary application-oriented technology capitalizing on the multi-sensory nature of humans as they can communicate with sight, hearing, touch, smell, and taste (Minoli & Keinath in Sharma, 2013).

Adding to the multi-sensory aspect, multimedia supports verbal instruction using static and dynamic images in the form of visualization technology for better expression and comprehension (Alemdag & Cagiltay, 2018 in Abdulrahaman et al., 2020). The hardware and software used for creating and running multimedia applications are known as multimedia technology (Kapi et al., 2017, in Abdulrahaman et al., 2020). Multimedia can be recorded and played, displayed, interacted with or accessed by multimedia devices which are electronic media strategies used to store, communicate, digitally handle and involve multimedia content (Pavithra, Aathilingam & Prakash, 2018). Multimedia technology has some characteristics like integration, diversity, and interaction that enable people to communicate information or ideas with digital and print elements (Abdulrahaman et al., 2020). Digital multimedia integrates up to six media types in an interactive, colour-computing environment (Fetterman and Gupta in Sharma, 2013). Chapter 2, Section 2.4.2 elaborates further on multimedia technology involvement in DE.

1.11 DIVISION OF CHAPTERS

This section contains a summary of what each chapter entails, serving as an overview of each chapter of this study.

Chapter 1 is an introduction and overview of the entire study. The background of the study, which motivated the research, was introduced together with the problem and how the research questions transpired. The aim of the study was established, and the research design, research paradigm, research approach, and research type were explored. The research methods, including the data sources such as the selection of participants, data collection, and data analysis, were discussed. Additionally, ethical measures, trustworthiness, and clarification of chapters are all dealt with in this chapter.

Chapter 2 covers this study's conceptual framework, discussing the study's chosen Cognitive Theory of Multimedia Learning (CTML) framework. This chapter resumes with the general understanding of DE with its definitions, background, history, and generations, revealing the challenges and weaknesses of DE and remote learning with COVID-19 effects. The chapter continues with the teaching and learning that this study has chosen. The second chapter delves into the study's teaching and learning theories. The Cognitive Load Theory (CLT), to CTML is also related, is also discussed. CTML offers a discussion that serves as a guide for lectures on how to apply multimedia effectively in a DE context. This chapter also focuses on Mayers' principles of multimedia design to offer lecturers appropriate guidance in multimedia design. Finally, multiple multimedia technology interventions are also discussed to provide lecturers with knowledge of multimedia technology capabilities and compatibilities towards delivering the product in an ODeL context.

Chapter 3 discusses the policies and multimedia technologies in South Africa and the advantages and disadvantages of multimedia in education as the main concepts of the study. The chapter also discusses how the educational policies on ICTs globally are employed where various countries are referred to. Therefore, the policy overview resumes by discussing the White Paper for Post-School Education and the Policy for the Provision of Distance Education in South African Universities in the context of an

Integrated Post-School System. Additionally, the following are analysed: the DHET policy framework for ODeL, organisational policies, particularly the tuition policy, National e-Skills Plan of Action ICT policy, which the institutional multimedia technology policies fall under, depending on Unisa's structure. Educational policies on ICTs globally are employed where various countries are referred to. This chapter discusses multimedia in education, including its pedagogical approaches, benefits, and disadvantages. The chapter concludes with a global review of online teaching and learning in a DE context, with HEIs on ODeL globally and continentally.

Chapter 4 comprises the research design and methods, where the rationale for empirical research is discussed. Following that are research paradigm, design, approaches, type, and methods, respectively. The research type, the selection of participants, data collection, semi-structured interviews, piloting, scheduled interviews, and triangulation are discussed in depth. Data analysis, ethics measures, and trustworthiness are also covered. Ethical measures are pivotal for any research as they help the researcher to follow the guidelines of the research committee to mitigate any harm or risks to the participants and the researcher while maintaining confidentiality in the release of findings. Trustworthiness elaborates on credibility, transferability, dependability, and conformability as guides for the research.

Chapter 5 deals with the findings and the discussions of the empirical research. The chapter resumed with the findings, which stemmed from the data collection methods employed in the study as well as revealing how the data collection is organised. Additionally, the biographical information of the participants, an overview of the questionnaire and interviews, as well as the themes that emerged from the interviews and questionnaires, are dealt with. In addition to the data collection is the document analysis of all the policies employed in the study, the findings from the document analysis, and the themes that emanated from such document analysis. The chapter reflects on the collective data collection methods employed in the study.

Chapter 6 concludes with the summary, conclusions, and recommendations that this study proposes as an academic study. The recommendations in Chapter 6 are aimed at HEIs. They offer multimedia, open distance learning, and global teaching and learning. The study's findings elaborate on the "post-COVID-19 pandemic multimedia

framework for teaching and learning in open distance eLearning in South Africa." This study proposes additional research in academia, multimedia, and ICT at large. This chapter's suggestions for further research involve advancing multimedia innovations such as online broadcasting of teaching and learning, skills audit and training of staff, and an overall ICT infrastructure upgrade.

1.12 SUMMARY

This introductory chapter includes the background to the study, which indicates the status of the global educational space. This is further extended to the problem formulation, where an indication of the necessity to resume this study is addressed. Following from that is an extension to the foundation of the research questions, aims, and objectives formulated to assist with the structuring of the study.

The research questions contribute to setting up an essential standard guide towards the aim of the study. The research design reveals which research paradigm, approach, and type this study employed and for what purpose. The research methods revealed the data sources employed, the data collection, as well as the data analysis of the study. The ethical measures and trustworthiness form part of the study to ensure authenticity and ethical results, having gone through the proper approval phases and being employed through the official channels. The clarification of concepts brings clarity towards understanding important terminologies that form part of the study.

The next chapter discusses the chosen conceptual framework underpinning the study, including the background, history, weaknesses and challenges of DE and the chosen learning theories. The learning theories and the CTML framework are dealt with in this chapter.

CHAPTER 2

CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION

A conceptual framework serves as the guiding foundation, providing detailed components or concepts that identify the interrelationships across the project variables to achieve a research project's purpose and mapping out how they come together to draw coherent conclusions (Swaen & George, 2022). As this study is qualitative in nature, the theories employed are meant to be used to clarify concepts, organise ideas, and identify relationships with which to frame this study (The Center for Teaching and Learning, 2022). This section discusses the conceptual framework guiding this study. While the previous chapter introduced the study, this chapter focuses on the various theories and concepts underpinning the study. Various aspects of theories, such as their backgrounds, influences, and theorists who have transcribed to them, are contextually informed and reflected (Higgs, 2013). Since DE is the context of the study this chapter focuses on DE and its history and generations, teaching and learning theories, the CTML, and online remote learning during the COVID-19 pandemic.

This chapter also discusses teaching and learning theories, namely behaviourism, cognitivism, constructivism and connectivism, with George Siemens' connectivism principles. The CTML is the last section discussed in this chapter, including the Cognitive Load Theory and Mayer's twelve Principles of Multimedia. Finally, multimedia technology involvement in DE is discussed to broaden the perspective of how influential and beneficial multimedia innovations are in an ODL teaching and learning set-up. The different aspects that this chapter covers are presented in the figure below.
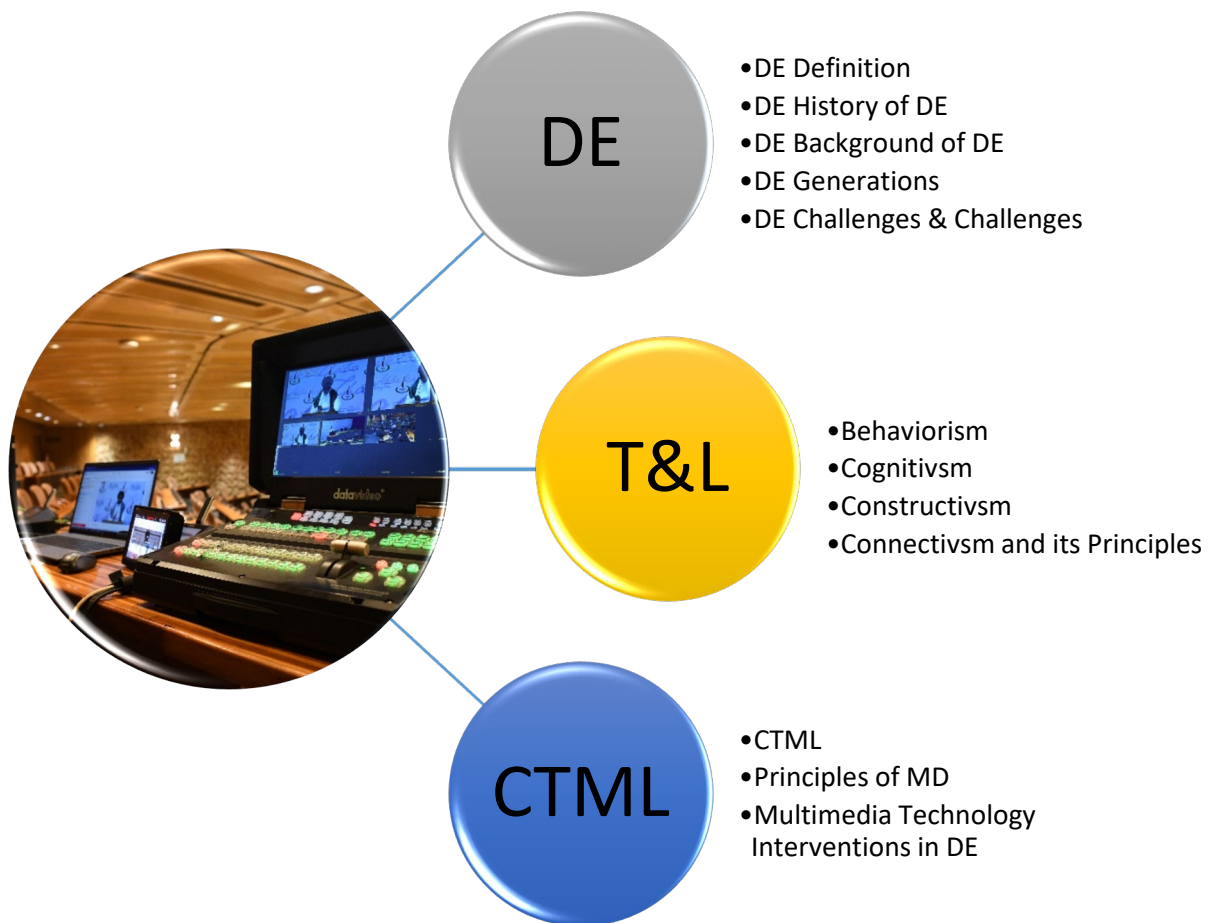
Figure 2. 1 Multimedia learning enhancement

Source: Researcher's own design

2.2 DISTANCE EDUCATION (DE)

The purpose of the discussion is to establish how DE started and who the theorists are that influenced its origin. This section also aims to differentiate between DE and ODeL, as there are a variety of definitions of ODL from different organisations or institutions. Since this study focuses on multimedia and ICT integration through remote online distance teaching and learning during the COVID-19 pandemic, the distinctive role of multimedia within DE HEIs remains significant. The use of multimedia as an enhancement of learning generally is impeccable; thus, with remote learning, how HEIs employ multimedia is vital for students. Therefore, this chapter aims to link DE with technology and multimedia, DE history, and the background, where there are two main fundamental characteristics that DE comprises: physical separation between the student and the lecturer, as well as student-centredness (Varatta, 2017). The following section discusses DE definitions.

2.2.1 Definitions of DE and open distance learning

The term 'Distance Education' (DE) is described as various forms of study at all levels that are not under the continuous, immediate supervision of tutors present with their students in lecture rooms or at the same premises (Holmberg, 1995:9). Holmberg defines DE as the provision of formal education that is delivered through structured teaching and learning by an educational institution using different media to reach students who are not normally required to be physically present at a specified place and time (Holmberg, 1995:9). Adding to the physical absence in the lecture rooms or premises is the benefit of the planning, guidance, and tuition of a tutorial organisation (Holmberg, 1995:9). DE does not imply the physical presence of the lecturer appointed to teach in lecture rooms or in which the lecturer is present only on occasion or for selected tasks (Keegan, 1980). DE serves as a method of imparting knowledge, skills, and attitudes rationalised by the application of division of labour, organisational principles, as well as the extensive use of technical multimedia (Bozkurt, 2019).

DE is also rationalised by reproducing high-quality teaching material, making it possible to instruct great numbers of students at the same time wherever they live. It is an industrialised form of teaching and learning (Peters, 1994:206). Teaching in DE may be defined as the family of instructional methods in which the teaching behaviours are executed apart from the learning behaviours (Moore, 1973:664). Remote online learning during COVID-19 was a forced new DE for some, as all issues of interaction and dialogue were conducted in an online distance learning model (Cleveland-Innes & Garrison, 2012). DE definitions prove the dialogue form of instruction between two parties at the same or different times and/or places and employing multimedia to enhance and produce distributed learning opportunities (Moore, Dickson-Deane and Galyen, 2011). Teaching in DE includes activities that would be performed in the learner's presence in a contiguous situation (Moore, 1973:664). Communication between the lecturer and the student is facilitated by print, electronic, mechanical, or other devices (Moore, 1973:664). DE draws from Desmond Keegan's six key elements (see Chapter 2, Section 2.2.1), where the educational organisation affects the separation of lecturer and student. Media used to link the lecturer and the student remain a beneficial two-way communication exchange for teaching and learning. Students in education are individuals rather than groups in an industrialised form (Keegan, 1980).

Desmond Keegan's six key elements serve as a guide throughout the various sections of this chapter. The separation of lecturers and students by distance has an impact on the delivery of instruction and the influence of HEIs. The evolution of media and technology advances two-way communication. The media adaptations ensure the facilitation of student independence by each HEI in this study. The DE teaching offered across dozens of public and private organisations and learning institutions globally condones the evolution of technologies (Gunawardena & McIsaac, 2013). Such evolution and information delivery systems provide quality access to education (McIsaac & Gunawardena, 1996). Even though DE remains bombarded by technological innovations, the bigger picture requires a look at how to prioritise students in any organisation offering DE, ensuring the tuition is learner centred.

According to Moore and Kearsley (2012: 23), DE does not have a clear-cut definition. Several DE scholars have attempted to offer their own definitions of the term. Various DE theorists such as Michael Moore, Desmond Keegan, Otto Peter, Borje Holmberg and Charles Wedemeyer have inspired and extensively added value in this study. DE is a mode of education in which lecturers and students are separated (Keegan,1993:22–38). The California Distance Learning Project (CDLP) (2011) defines DE as an instructional delivery system that connects students with educational resources, is implemented using available resources, and will evolve to incorporate emerging technologies. Finding out the realities of electronic learning implementation in Distance Learning (DL) in a developing country remains one of the major issues (Letseka, Letseka & Pitsoe, 2018). Many DE theorists have noted that students take on greater responsibility through DE because they have other commitments. They have been self-reliant and disciplined throughout their studies (Roberts, 2019). The importance of the history and the variety of descriptions around DE emphasises that DE did not invent the internet evolution (Moore & Kearsley, 2012: 23).

Open distance learning (ODL) serves as an idealistic concept as it combines the methodology of DE with the concepts of open and flexible learning and is not easy to implement (Belawati & Baggaley, 2010). ODL is a unique form of DE, in which 'openness' presents an ideological position affecting access and availability and increasing assumptions regarding knowledge production and facilitation (Heydenrych & Prinsloo, 2010). Unisa defines ODeL as a multidimensional concept aimed at

bridging time, geographical, economic, social, educational, and communication distances while supporting learning through a wide range of current and emerging digital technologies and resources (Unisa, 2018).

During the COVID-19 period, the ODL learning space embraced remote learning using digital technologies to provide the flexibility required to afford students access to learning (Oke & Fernandes, 2020). COVID-19 has challenged how various DE theorists define DE, such that there remains the need to re-modify the definitions to reveal how data, policy, government, pedagogy, and online education redefine DE accordingly. Whilst the definitions of DE have been elaborated upon, the history, background, generations, and challenges of DE are clarified next.

2.2.2 The History of Distance Education

Online education has been around since the advent of the internet, and before then, people have been using DE to get ahead for several centuries. The history of DE dates back to the 1800s when a Swedish newspaper advertised the opportunity to study "Composition through the medium of the Post" (Simonson, Smaldino, Albright & Zvacek 2009:36). In the early 1890s, educators such as William Rainey Harper were regarded as offering correspondence courses as poor excuses for the real thing (McIsaac & Gunawardena, 1996). The first major correspondence programme in the United States was established in which the lecturer and the student were at different locations (Keegan, 1980). The history of DE and statements by authors such as Burns confirm that DE has been an effective form of instruction despite the normal traditional educational means, which has long been the dominant learning model (Burns, 2011). Even though some regarded DE as inferior, its history has produced massive influences and thus contributed mainly to higher education (Tait, 2018).

2.2.3 Background of Distance Education

DE has become a major topic with its extensions and evolution across educational institutions and various other organisations. DE has two fundamental characteristics, namely physical separation between the student and the lecturer and student-centredness (Mascolo, 2009; Council on Higher Education (CHE), 2014). Student-centred interactive pedagogies are encouraged as students are expected to be

responsible and autonomous whilst building new knowledge through their experiences (Moate & Cox, 2015). DE systems must be designed to produce good-quality standard materials as efficiently as possible, irrespective of the physical location of the student (Anderson, 2008; Anderson & Dron, 2011).

2.2.4 The generations of distance education

Researchers have taken different approaches to the DE phases of development. DE definitions have been adopted depending on the era during which they were developed. Therefore, DE generations are presented with a focus on the factors leading to the formation of new generations (Saykili, 2018). The DE 'generations' metaphor is frequently used to describe the different development phases in DE or paradigm shifts that occurred (Belawati & Baggaley, 2010). DE generations have been discussed, described, and classified into generations according to their dominant pedagogy (Aoki, 2012). Although there are small differences, they broadly agree on the dominant technological forms that define each DE generation (Anderson & Dron, 2011). Over time, none of the DE generations have been eliminated, but the repertoire of options available to DE designers and students has increased (Anderson & Dron, 2011).

The table below summarises the generations, authors, and their basic principles or characteristics. This brief table serves to guide the discussion that follows.

The generations	Authors	Basic principles/Characteristics
1st Correspondence	Bates (2005), Peters (1994), as well as Taylor (2001)	**1st** Correspondence – single medium (print) – mass production of technology
2nd Radio and television broadcasting (Mass media)	Bates (2005), Peters (1994), as well as Taylor (2011)	**2nd** Radio and television broadcasting
3rd Combined approach	Taylor (2001), Anderson and Dron, 2011	**3rd** Combined approach – correspondence assisted by broadcasting (open universities)

4th Telelearning	Taylor (2001)	**4th** Telelearning – interactive audio/video conferencing	
5th Online delivery	Taylor (2001)	**5th** Online delivery – multimedia interactive telecommunication media	

Table 2. 1 Generations of DE.

Source: own design from the work of Moore and Kearsley, 2005.

The next section discusses the various DE generations and contributing DE scholars using different lenses. To visit the DE generations, Aoki (2012) employed an organisational lens on the three generations of DE, whilst Bates (2005), Peters (1994), and Taylor (2001) revealed their broad and extensive views of the DE generations employing the technological lens. Anderson and Dron (2011) employed a pedagogical DE perspective, whilst Heydenrich and Prinsloo (2010) revisited the different DE generations. DE has been impacted by open and distance learning developers' practices, philosophies, and cultures (Saykili, 2018).

a) The different generations of DE from and organisational perspective

With the history of DE dating back to the 1800s, DEs' historical evolution through the adaptive use of the organisational perspective motivated various scholars to extensively distinguish between the DE generations and stages. The history of DE is embedded in more extensive, fluid discourses on the role of higher education (Heydenrych & Prinsloo, 2010). From an organisational perspective, Aoki (2012) classifies DE into three organisational models, namely the correspondence model (first generation), the multimedia model (second generation) and the telelearning model (third generation) (Aoki, 2012). The evolution of DE has been classified into generations according to its dominant technology and its dominant pedagogy perspectives. Thus, Aoki (2012) further suggests an additional lens, which is an organisational model. The organisational model has classified DE models into three generations, namely the supplementary, the industrial and the ad hoc model (Aoki, 2012).

Evans (2008) in Aoki (2012) refer to the **supplementary model** as the first organisational model where DE complements traditional education by targeting the students excluded from traditional education for various reasons and requiring access and equity in their lives. It remains a noticeable circumstance that there is a minimal institutional investment in offering DE programmes in HEIs globally, which are usually managed by a special office called "extension programmes," "external study," or "independent study" (Aoki, 2012). Saba (2011) in Aoki (2012) refers to the supplementary model as "independent study," "self-directed learning," "non-traditional and "open education" (Aoki, 2012). In the supplementary model, there will be a further discussion on the correspondence model. After the introduction of the internet in distance education, many existing educational institutions have taken this supplementary model as its core and started to offer dual-mode (online and offline) teaching and learning (Taylor, 2001). A division has been established to assist schools and departments offering DE classes and courses. Schools and departments have expanded their student base beyond on-campus students (Aoki, 2012).

The **industrial model** is the second organisational model of DE and has been associated with mass education, where students learn in the same programme using the same content and method (Aoki, 2012). Employing an industrial organisational model requires the institution to employ a division of labour to produce and deliver courses successfully. The institutions that utilise educational broadcasting such as radio, television, telecommunications satellites, and cable television, should organize themselves around this model, as it is labour intensive to produce such educational broadcasting programs and requires different skill sets and expertise to do so (Aoki, 2012). Most universities employ stakeholders such as audio-visual production houses or multimedia centres, when expert labour is required to produce and render the necessary services for the institution. The drawbacks of this organisational model are the difficulty of responding to the changing needs of students, the inflexibility of adopting new methods and content, and the large organisational overhead (Aoki, 2012). The COVID-19 pandemic has revealed the drawbacks of the organisational model as there have been ICT infrastructural legacy incapability and multimedia equipment compatibilities. From a South African context, it doesn't help that there is also load shedding, which thus requires additional back-up power supply innovations to upkeep the academic project and the economy at large. However, these

occurrences have brought forward endless possibilities for upgrading to advanced technologies.

The third and emerging organisational model of DE is the **ad hoc model**, in which institutions may play a role in the overall process of students learning in various ways of DE by utilizing ICT to provide interaction in addition to content delivery (Aoki, 2012). Institutions that use technology help to improve effective learning by providing flexibility. Technology also provides the customisation of learning through individualized learning programmes structured to be responsive to individual students' needs instead of a one-size-fits-all system (Shemshack & Spector, 2020). Such programmes can be accessed at the student's convenience, as they would have been pre-planned or pre-recorded in the case of multimedia recordings. Higher learning institutions provide a variety of programmes, such as executive business programmes, which are costly for students and institutions because these diverse programmes are dependent on the students' diverse needs (Tremblay, Lalancette, & Roseveare, 2012). An institution may provide services that cover some or all of a student's learning process.

b) The different generations of DE from a technological perspective

DE has evolved through several historical generations (Peters, 1988), with the fifth generation based on the further exploitation of new technologies (Taylor, 2001). The **first generation,** which Taylor (2001), Bates (2005) and Peters (1994) refer to as a correspondence model based on print technology, is about communication correspondence studies (Moore & Kearsley, 2012: 23). The **correspondence model** focuses on print media and mass production of content, which at present is challenged as the demand for print and mass media has declined (Moore & Kearsley, 2012: 23). The correspondence model utilises written and printed texts and postal services for delivering such texts in the forms of books, newspapers, and manuals. Currently, the historical development of printing and correspondence is replaced by modern technologies, such as multimedia deliverables (videos, text, and audio through various mediums), with emergent visual provisions added to the advancement of correspondence teaching and learning support (Lee & Han, 2021).

The **second generation,** which Aoki (2012) names a **multimedia model** based on print, audio and video technologies, is a one-way broadcasting communication model involving synchronous teleconferencing, e-mail communication, learning management systems, and mobile devices as distance-bridging mechanisms (Moore & Kearsley, 2012: 23). Even though there were no major changes in curriculum development, content ownership, or pedagogies in the second generation, there was an introduction of several new mass media technologies that enabled content to be delivered to students anywhere, while requiring minimal equipment (Heydenrych & Prinsloo, 2010). The multimedia platforms also permit students to exercise and develop autonomy by making presentations and acting as resources for their peers and lecturers, thus yielding towards knowledge sharing (Moore, 1993). Since its arrival, teleconferencing has significantly modified figures that were presented in the original theory of transactional distance (Keegan, 1993: 34). Teleconferencing is a telephone conference calling method that connects multiple audio calls at the same time, whether on analogue or computerized systems (Smith, 2020). Video Conferencing and teleconferencing are two models of virtual meetings which allow people to communicate and work with each other without being present in the same room (Cameron, 2018).

The **third generation**, which is the tele-learning model, is based on applications of telecommunication technologies to provide opportunities for synchronous communication (Du Plessis, 2017). Additionally, the third generation is more about open universities with interactive ICT technologies to provide educational content (Taylor, 2001 & Aoki, 2012). Early forms of instruction on computers took the form of computer-assisted instruction (CAI) or computer-based instruction (CBI) (Cotton, 1991).

The **fourth generation,** the flexible learning model, is based on online delivery through the internet (Taylor, 2001 & Aoki, 2012). This model is based on two-way communication achieved through videoconferencing, synchronous and asynchronous computer-mediated communication, and Web 2.0. Social networks, combinations of different systems, and the use of the internet bring about increased opportunities for interaction between the institution and its students (Taylor, 2001 & Aoki, 2012). With DE, both the lecturer and the student play essential roles and content gets transferred

remotely, creating a two-way communication dialogue, conversation and the development of a pedagogy that allows the course content for students' self-independence (Anderson, 2011). Even though dialogue can be positive or negative, its initial purpose is to improve student comprehension and any other relationships for that matter (Ferri, Grifoni, & Guzzo, 2020). These two-way driven dialogues effectively activate teacher-student interaction among the students themselves (Rapanta, Botturi, Goodyear, Guàrdia & Koole, 2020).

Since Moore's' theory of Transactional Distance was written, the most important evolution in DE has been the development of highly interactive telecommunication media (Huang, Chandra, DePaolo & Simmons, 2016). Technological mediation in education requires transactional distance towards relying on technologically mediated communication or interaction, as well as on fourth-generation DE (Weidlich & Bastiaens, 2018). Although Moore's theory provides a useful conceptual lens through which to analyse online learning practices, its tenets may need revisiting to reflect the move towards using synchronous communication tools in online distance learning (Falloon, 2011). Moore believed that synchronous communication channels, such as live media conferencing, allow for more intensive, more dynamic dialogue and are more effective at facilitating transactional distance than asynchronous communication, such as recorded media (Duc, 2012). The delivery of online lessons serves as a general premise for online teaching and learning interactions, particularly to facilitate student enquiries (König, Jäger-Biela & Glutsch, 2020). The delivery of online lessons further permits students' assignments among a few interactions—specifically during COVID-19, when all instruction was remote and online (König, Jäger-Biela & Glutsch, 2020).

Finally, the **fifth generation** is about computer and internet-based virtual classes (Moore & Kearsley, 2012: 23). The fifth generation also provides economies of scale through the "industrialization" of education, leading to digitisation, live streaming, Open Educational Resources (OERs), Massive Online Open Courses (MOOCS), artificial intelligence (AI) which is being redefined, familiarized and adapted to education and curriculum (Graesser, Hu, & Ritter, in Walcutt & Schatz, 2019: 38). The fifth generation essentially aims to capitalize on the features of the internet and the Web (Taylor, 2001). Depending on how the lecturers advance the quality and packaging of their

teaching to the students, the fifth-generation DE can be affordable (Taylor, 2001). The affordability of the fifth-generation DE can provide quality tuition and more effective pedagogical and administrative support services, which are also irresistible to students (Taylor, 2001).

As it stands, DE generations have commonly built on each other's predecessor foundations rather than replacing the earlier prototype (Ireland, 2007 & Anderson, 2011). The commonalities shared among all the generations include features such as pedagogy, curriculum, interaction, medium, production, and storage and delivery, which all contribute to the design of principles (Anderson & Dron, 2011). Therefore, the following is a discussion of the pedagogies of the different generations of DE (Anderson & Dron, 2011).

c) A pedagogical perspective on the different generations of DE

This section is subdivided into two categories. The first discussion is on DE Pedagogies, whilst the second is on the DE Generations.

i.   DE Pedagogies

Anderson and Dron (2011) introduced DE pedagogies that are mapped into three distinct generations (Anderson & Dron, 2011), namely the cognitive-behaviourist pedagogy of DE, social-constructivist pedagogy of DE (which is discussed further in Chapter 2, Section 2.3.3b) as well as the connectivist pedagogy of DE. The lecturer, student, and content are the well-known prime actors in all three generations. For DE to achieve high-quality education, DE employs all three generations to determine learning content, context, and expectations (Anderson & Dron, 2011).

According to Anderson and Dron (2011), cognitive and behaviourist (CB) pedagogies form the focus on how learning was predominantly defined, practiced, and researched in the latter half of the 20th century. Therefore, even within the 21st century, all three current and future generations of DE pedagogy play an essential role in a well-rounded educational experience (Anderson & Dron, 2011). Learning effectiveness is greatly enhanced by applying, at a detailed level, an understanding of how people effectively

learn even when at the centre of a learning community (Anderson and Dron, 2011). Behaviourist notions have been especially attractive for use in training (as opposed to educational) programmes as the learning outcomes associated with training are usually clearly measured and demonstrated behaviourally (Anderson & Dron, 2011 in Moore & Diehl, 2019). From the behaviourist tradition emerged the cognitive revolution, beginning in the late 1950s (Miller, 2003).

Although learning was still seen as an individual process, its study expanded from an exclusive focus on behaviour to changes in knowledge or capacity that are stored and recalled in individual memory (Schunk, 2012:23). Cognitive pedagogy arose partially in response to a growing need to account for motivation, attitudes, and mental barriers that may only be partially associated with or demonstrated through observable behaviours (Anderson & Dron, 2012). Social-constructivist pedagogies in a COVID-19 remote ODeL setup are more appropriate as their deployment is in conjunction with the development of two-way communication technologies (see Chapter 2, Section 2.3.3b). Notably, the advanced availability of various technologies enabled the social-constructivist models to gain a foothold in DE (Anderson & Dron, 2012). Social constructivism was first experimented with by email and bulletin boards and later through the World Wide Web and mobile technologies, which all require connections for communications to take effect (Anderson & Dron, 2012). Like the five generations of DE (see Chapter 2, Section 2.2.4), the evolving ways of social-constructivist models cannot be ignored. Lastly, connectivist pedagogy stresses the development and nurturing of networks as a major component of learning (Wang, Chen & Anderson, 2014). Connectivist pedagogy is based on creating and sustaining networks linking humans to other humans and non-human resources because knowledge resides in networks of humans and non-human appliances (Siemens, 2005; Bell, 2011 in Wang, Chen & Anderson, 2014).

ii. DE Generations of DE Pedagogies

The first generation of DE pedagogy gave rise to the instructional designer profession due to its function of designing learning activities for students at any time, with or without the instructional designer (Anderson & Dron, 2011). The second generation followed the first generation of distance education, defined through mass media, including television, radio, and film (Anderson & Dron, 2011; Garrison, 1985). The third generation of DE pedagogy, which introduced interactive technologies such as first audio, then text, video, the web, and, most recently, immersive conferencing, has emerged recently and is known as connectivism (Anderson & Dron, 2011; Garrison, 1985). Therefore, this motivated further analysis of Garrison and Andersons' three generations of DE Pedagogies. According to Taylor (2001), there is less clarity on what defines the fourth and even fifth generations of DE (Taylor, 2001). With the above discussions on DE Generations and lenses, below is a discussion of the **three different lenses** used to explain DE generations, with an adapted table:

Distance Education Lenses	Distance Education Generations and Authors
The different generations of Distance Education through an organisational lens	• The Correspondence model (**first generation)**, • Multimedia model (**second generation**) • The Telelearning Model (**third generation**) (Aoki, 2012)
The different generations of Distance Education: through a technological lens	• The **first generation** referred to by Taylor (2001), Bates (2005) and Peters (1994) as a **Correspondence Model.** • The **second generation,** which Aoki (2012) names a **Multimedia Model** based on print. • The **third generation** is the **Telelearning Model**. • The **fourth generation,** the **Flexible Learning Model,** is based on online delivery through the internet (Taylor, 2001 & Aoki, 2012). • The **fifth generation** is about computer and internet-based virtual classes (Moore & Kearsley, 2012: 23).

A pedagogical view of the different generations of Distance Education	DE pedagogies are mapped into three distinct generations, namely:
	• The cognitive-behaviourist pedagogy of DE
	• Social-constructivist pedagogy of DE (discussed further in 2.3.3b)
	• The connectivist pedagogy of DE (Anderson & Dron, 2011).
	Garrison and Andersons' three generations of DE Pedagogies.
	• The *first generation* of distance education gave rise to the instructional designer profession.
	• *The second generation* is characterised by using mass media, including television, radio and film.
	• The *third generation* of DE pedagogy introduced interactive technologies.

Table 2. 2 DE Lenses with DE Generations and Authors.

Source: Own design based on the work of Taylor (2001); Aoki, (2012); Moore & Kearsley (2012: 23) and Anderson & Dron (2011).

Various DE experts have attempted to make the DE model better and have, for various reasons, encountered challenges and weaknesses, which are discussed next.

2.2.5 Distance education: challenges and weaknesses

Despite the noticeable benefits of ODL in teaching and learning, the ICT infrastructure and the curriculum implementation continually encounter various challenges (Coman, Țîru, Meseșan-Schmitz, Stanciu & Bularca, 2020). Teaching has long been identified as a complicated matter, and numerous studies have investigated the characteristics of good teaching (Doyle, 1986). History reveals that during the late 1980s, people started realising that lecturers needed both pedagogical knowledge and subject matter (content) knowledge for good teaching and student understanding to take place (Doyle, 1986; Guerriero, 2013). Additionally, pedagogies, technologies, and social and geographical impact, which impact students' pass rates, employment, and economic status, require prioritization (Siakas, Rahanu, Georgiadou & Paltalidis, 2019). COVID-19 has revealed the capabilities and inefficiency of the current ICT Infrastructure and

its unreadiness to handle the Fourth Industrial Revolution (4IR) regardless of whether the schooling system is traditional or offers ODeL (Katz, 2020).

Each DE generation posed a challenge, as each phase encountered upgrades and changes that impacted not only education but also other industries. Currently, with COVID-19, ODL is no exception, as the unreadiness of embracing technology continually results in further challenges. Such ODL challenges stemmed from neglected tools of the trade, obsolete legacy infrastructure, inadequacies, and a lack of adapting to change (Ferri, Grifoni & Guzzo, 2020). ICT connectivity, multimedia applications, and tools to broadcast and facilitate remotely have also become challenges (Chan, Bista & Allen, 2021). The platforms whose direct purpose is to reach all enrolled students have additionally become challenges for ODeL implementation (Grajek & Educause, 2020). The COVID-19 lockdown has globally impacted the supply chain and the re-production of tools of the trade, such as laptops, as the demand is higher than the supply.

The advanced technologies for effective communication, content, and facilitation of the previously occurred challenges entirely form a list of challenges that need to be addressed (Aceto, Persico & Pescapé, 2018). The mass production of text and the mail system recently emerged solutions-based ICTs for mediation and facilitation also need to be addressed (Aceto, Persico & Pescapé, 2018). Whilst there is a vast richness of the evolution and growth within DE, the emphasis cannot only be on technological development but should also be on communications, student support, and the curriculum as they further advance the context and the basis of DE (Heydenrych & Prinsloo, 2010). Acknowledging the weaknesses and challenges of ODL in teaching and learning is necessary as it will cultivate best practices for HEI ODL. Lecturers need to connect to all different kinds of students, creating teaching that focuses directly on student needs (Western Governor's Education, 2022). The main educational learning theories that this study employed due to their alignment with the study are discussed in detail below.

2.3 TEACHING AND LEARNING THEORIES

Learning theories and their related pedagogical approaches do the following: they design, develop and deliver effective teaching and learning experiences that assist in determining effective technologies (Thomas, 2020). Due to how every learning theory has its concepts and views on learning, there is a need to discuss learning theories and their relation to technologies, particularly multimedia (Ramlatchan, 2019).

Learning theories describe how information is absorbed, processed, and retained during learning (Chaudhary, 2013). Vaill (1996:42) emphasizes that "learning must be a way of being an ongoing set of attitudes and actions by individuals and groups that they employ to keep abreast of the surprising, novel, messy, obtrusive, recurring event" (Vaill,1996:42). The COVID-19 pandemic through its robust aggression, has compelled HEIs to facilitate remote learning and to keep abreast of it, by investing in how DE shares a traditional pedagogical background to advance adult teaching and learning (Blaschke, 2012). Therefore, this study dwells on behaviourism, cognitivism, constructivism and connectivism, respectively, due to their nature of enhancing the effective use of multimedia conceptualisation depending on the lecturer's pedagogy, the subject matter, educational goals, and the students' potential (Siemens, 2005).

2.3.1 Behavioursim

Behavioural learning theory focuses on the individual and the necessity for measuring actual behaviours and not on attitudes or capacities (Anderson & Dron, 2011). Behaviourist theory is attractive for use in training education, thus its learning outcomes are measured and demonstrated behaviourally (Anderson & Dron, 2011). Behaviourism was founded by Watson and Skinner, who suggested that learning change in behaviour is shaped by the environment, the closeness of the occurrence of events, and the reinforcement irrespective of whether positive or negative (McHaney, 2012:164-165). Adult educators often use learning outcomes, competency-based curricula, instructional design, and some programme-planning models that are behaviourist in nature (Merriam & Bierema, 2013:27). Behaviourist learning theory is not only important in achieving the desired behaviour in mainstream education but also useful in ODL teaching and learning, which can be rewarding for

HEI, lecturers and their students (Zhoe & Brown, 2015). Behaviourism, often referred to as literature on learning with its significant influence on higher education, assesses the behavioural change acquired from an individual's response to stimuli (McHaney, 2012:164-165).

a) Behaviourism and its founders

Although Skinner is most associated with the behaviourist theory, Edward Thorndike and John Watson were also crucial in its development. They influenced Skinner (Pound, 2011:93), who believed that human behaviour is predictable, just like a chemical reaction (Zhoe & Brown, 2015). Behaviourist theory does not explain abnormal behaviour in terms of the brain or its inner workings. Rather, it posits that all behaviour is learned habits and attempts to account for how such habits are formed (Zhoe & Brown, 2015:10). Pavlov experimentally demonstrated how stimuli could be conditioned to elicit responses by being paired with other stimuli (Rehman, Mahabadi, Sanvictores & Rehman, 2021). Another individual who advanced a behavioural perspective on learning was Edwin R. Guthrie (1886–1959), who postulated learning principles based on associations and hypothesized that a contiguous relation between stimulus and response established their pairing (Schunk, 2012:114). This section focuses on psychology more than teaching and learning, and the next focuses on education and multimedia technology.

b) Relationship with multimedia technology

Tech-savvy millennials will be provided with initial nodes in their learning networks to give them a foundation for fully understanding concepts to avoid novices being unable to grasp new knowledge. Common pedagogies for this approach include lectures, online course presentations, pop quizzes, video presentations, and several other techniques (McHaney, 2012). Effectively employing the strategies for formative assessment, such as online quizzes, live discussions, asynchronous questioning using messaging platforms, and student submissions of photographs or portfolios, is essential (Müller & Goldenberg, 2021). Instructivism advocates moving knowledge

from teacher to students, as well as a variety of modern technologies suited to support learning (McHaney, 2012:173).

c) Limitations

Behaviourism states that learning is largely unknowable and oversimplifies the complexity of human behaviour (Siemens, 2005). Behaviourism can be critiqued as an overly deterministic view of human behaviour by ignoring the internal psychological and mental processes. That is, we cannot possibly understand what happens inside a person (Siemens, 2005). Engagement would not be present if educators were reduced to facilitators, which is the role of the tutor that has been widely accepted in e-learning (Freire & Macedo, 1999: 48). Behaviourism is where knowledge exists outside the learner and is taught to the student by a teacher (McHaney, 2012:164–165). This study will transition to cognitivism, which is considered a reaction to behaviourism.

2.3.2 Cognitivism

Cognitivism has been considered a reaction to behaviourists' "rigid" emphasis on predictive stimulus and response (Harasim, 2012:58). Cognitivists opposed behaviourists because they felt that behaviourists ignored the role of thinking in learning (Anastasie & Cyprien, 2021). Cognitivism is the theory of learning where students develop knowledge by receiving, storing, and retrieving information from the mind (Malik, 2021). Cognitivism brings more meaning only when concepts that already exist in a person's cognitive structure are relatable (Malik, 2021).

a) Cognitivist theory and its founders

History indicates that the Cognitive theory was advanced by the Swiss psychologist Jean Piaget (1896-1980) and focuses on exploring the relationship between the stages of cognitive development and language skills. Piaget became interested in psychology and began his studies on developing children's' cognitive, intellectual abilities and increasingly complex understanding of the world (Zhoe & Brown, 2015).

Piaget essentially identified four major stages of cognitive abilities: sensorimotor, preoperational, concrete operational and formal operational (Zhoe & Brown, 2015).

Unlike Piaget's notion that children's development must necessarily precede their learning, Vygotsky (1978) strongly believes in a community that plays a fundamental role in creating meanings (Vygotsky, 1978:90). Vygotsky argued that "learning tends to precede development and is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function" (Vygotsky, 1978:90). Since behaviourism and cognitivism have significant implications for viewing learning and education, they are often mistaken for each other due to the very thin borderline that distinguishes one from the other (Siemens, 2004). Cognitive science does not escape all of behaviourism's criticism, such that behavioural learning theory only focuses on external observable behaviour while cognitive learning theory focuses on internal mental processes. This remains the main difference (Atkisson, 2010 & Hasa, 2020).

b) *Relationship with multimedia technology*

Cognitivism often follows a computer information processing model where learning is viewed as a process of inputs managed in short-term memory and coded for long-term recall (Siemens, 2004). In cognitive theories, knowledge is viewed as symbolic mental constructs in the learner's mind, and the learning process is how the symbolic representations are committed (Siemens, 2004, Kop & Hill, 2008)**.** From the teaching point of view, lecturers share and interact with peers to improve their knowledge of the subjects they lecture on and get ideas on how to improve their lecturing techniques (Mukhari, 2016). By participating in online learning communities, lecturers can be empowered with the information and knowledge they require to succeed in their careers (Mukhari, 2016). Students are assigned to engage in self-regulated learning and are required to adjust their learning actions to achieve set goals (Mukhari, 2016). Innovative newer technologies enable remote educational programming deliverance through a synchronous or asynchronous mode of learning between lecturers and students (Sharples, 2005). Technology and pedagogy have influenced each other, thus making ICT at the heart of distance and online learning (Saykili, 2018). Access to

Learner Management Systems (LMS), Open Educational Resources (OERs), and online streaming platforms all require good planning and assigning of activities to the students to enable learner engagement in discovery learning and collaboration (Coman, et al, 2020). The teaching and learning theories, pedagogies, and the correct use of multimedia technology amount to a successful DE pedagogy (Santos & Castro, 2021).

c) *Limitations*

Cognitivism has been criticised for considering the essence of human action to reside in its alleged source in mental processes at the expense of the social surroundings of the action (Arponen, 2013). Due to its inherent limitations, some researchers claim that computation can never achieve the complexity and possibilities of human mental functions and, therefore, cannot be successfully used to describe them (Denton, 2014. Descombes (2010*)* disagreed with the idea that intelligence is a fixed trait and regarded cognitive development as a process that occurs due to biological maturation and interaction with the environment (Alahmad, 2020).

Researchers have cited problems with Piaget's research methods, developmental variations, and how his theory underestimated children's abilities (Cherry, 2019; Alahmad, 2020). Piaget's research methods were questionable as his selection of participants had a limited variety of participants to provide a reliable result, as he mostly had only examined his children (Lilienfeld, Lynn, Namy & Woolf, 2011 in Alahmad, 2020). Modern psychologists have been frustrated by Piaget's reports of his experiment of using clinical methods to collect data arguing how Piaget did not explain the social economic background of the children, the number of participants, the participants' race or ethnicity (Miller, 2011 in Alahmad, 2020). Additionally, it was argued that Piaget did not provide ample detail about his testing measures (Miller, 2011 in Alahmad, 2020). Researchers in the 1960s and 1970s argued that Piaget may have underestimated children's abilities by using confusing terms and particularly difficult tasks in his observations. They made out that children are more adaptable and competent than Piaget's stages give them credit for (Alahmad, 2020). With the criticism regarding cognitivism, the next sub-section will discuss constructivism. The first two theories (behaviourism and cognitivism) were teacher-centred and based on

individual learning. The following two theories are more learner-centred and focus on social learning.

2.3.3 Constructivism

Constructivism is defined as a major theory of learning and general educational philosophy, encompassing several different learning theories associating the acquisition of knowledge with a process of building/constructing (Mattar, 2010). Constructivism is the process where the construction of knowledge is not passively received but actively constructed by the subject, based on the individual's subjective interpretation of their active experience (Brau, 2020 & Muller, Buchheister, Boutte, 2017). Constructivism is divided into three broad categories, namely cognitive constructivism, social constructivism, and radical constructivism, which are discussed below:

Cognitive constructivism represents one end, or extreme, of the constructivist continuum and is typically associated with information processing and its reliance on the component processes of cognition (Doolittle & Camp, 1999). Cognitive Constructivism aims to assist students in integrating new information into existing knowledge and derive knowledge in response to constructive interactions with environmental stimuli (Piaget, 1968). Cognitive constructivism only emphasizes knowledge acquisition as an adaptive process that results from the individual learner's active cognising (Doolittle & Camp, 1999). **Social constructivism** affirms that human development is socially situated and that knowledge is constructed through interaction with others, on knowledge deriving from social interactions and communication (Brau, 2020 & Mohammed & Kinyo, 2020). Social constructivism was developed by Lev Vygotsky (1978: 57), who suggested that every function in the child's cultural development appears twice: first, on the social level and, later, on the individual level, between people and then inside the child Vygotsky (1978: 57). Social constructivists emphasize the construction of an agreed-upon, socially constructed reality (Gupta: 2013). **Radical constructivism** represents the opposite end of the constructivist continuum from cognitive constructivism and was developed by Ernst von Glasersfeld (1974). Whilst fully embracing that knowledge acquisition is an adaptive process that results from active cognizing by the individual learner, radical constructivism renders

an experientially based mind, not a mind that reflects some external reality (Doolittle & Camp, 1999). Radical constructivists state that all knowledge is constructed rather than perceived through the senses, thus emphasising the construction of a coherent experiential reality (Gupta, 2013; Von Glasersfeld (1974).

a) Constructivism and its founders

Constructivism was developed as a psychological learning theory in the 1930s. It is a tradition of cognitive constructivist thinking that hinges on the view that knowledge is something that the students 'construct' for themselves (Piaget, 1970). The roots of the constructivist model most commonly applied today spring from the work of Vygotsky and Dewey, generally lumped together in the broad category of social constructivism (Anderson & Dron, 2012). According to Constructivism, knowledge is acquired through a process of active building (Fox, 2001).

b) Relationship with multimedia technology

Social-constructivist pedagogies are appropriate as their deployment is in conjunction with developing two-way communication (see Chapter 2, Section 2.2.4 i) technologies. Multimedia technology interventions (see Chapter 2, Section 2.2.4 b) in synchronous and asynchronous lecture/student interactions help strengthen trust and independence goals in DE (Anderson & Dron, 2011). Multimedia technology interventions in DE lead towards applying openness and flexible learning, which stimulates distance learning (Anderson & Dron, 2011). Various technologies enabled the social-constructivist models to be applied to DE, email and bulletin boards, and, later, through the World Wide Web and mobile technologies. these all require communications connections to take effect (Anderson & Dron, 2012).

Effective two-way communication may be used for teaching and learning within a constructivist context, LMS discussion forums, webinars, MS Teams, Zoom, and various other platforms. Collaborative platforms, such as MS Teams and Zoom, give options (depending on the intention of the lecturers) on who can speak, such that the lecturer is able to mute students, and only they (the lecturers) can comment. In other words, live or recorded/synchronous or asynchronous technologies can be used based on the intention of the lecturer (see Chapter 2, Section 2.4.4). Multimedia

choices can be adapted to serve different purposes because different media can be used to assist students in different ways and achieve different outcomes, thus also individualising learning (Bates, 2015).

c) Limitations

Limitations are inevitable, and thus there should always be solutions-based thinking to assist the request. Although constructivism has supporters and opponents, critics express the need to further arrange the effectiveness of constructivist teaching methodologies to ensure which approach is most effective for educational learning environments. The constructivist approach is further criticised for its rejection of the evaluation of students, leaving them unaccountable for students' progress.   Literature reveals the inconsistencies in interpretations of constructivism in stating the elitist privilege aspect, which mainly benefits a working infrastructure education system (Educational Broadcasting Corporation, 2004). The constructivist group thinking approach is also criticised because of its nature of creating conforming students that have been liberated. Constructivism acknowledges that real-life learning is messy and complex, and constructivist classrooms (whether physical or online) teach big concepts using much student activity, social interaction, and authentic assessments (Schunk, 2012:275).

Critics argue that the constructivist perspective is vague and indistinguishable from discovery learning. It is essentially attempting to make something out of triviality with little or nothing to say about the nature of effective pedagogy (Osborne, 2014). Constructivists claim that, with constructivism, instead of being based on contrasting philosophical ideas, constructivism is similarly grounded on the dualist separatism of the human mind and the external world (Liu & Matthews, 2005). Constructivists practised minimally guided approaches with unguided instructions, are not effectively valuable for learning environments. Critics warn of the importance of exposing learners to tangible objects to ensure knowledge acquisition. Constructivist critics argue that common curricula are ineffective and inefficient for learners and that constructivist approaches focus mainly on cognitive factors, ignoring other contributing environmental and technological factors (Alanazi, 2016). Constructivism focuses on learning experiences for students, making sense of their experience-learning, serving

as a journey rather than an outcome (Merriam & Bierema, 2013:36; McHaney, 2012:164-166). Thus, the study deals with the discussion of Connectivism next.

2.3.4 Connectivism

Connectivism integrates principles explored by chaos, network, complexity and self-organisation theories to help equip students to navigate technology and its networks to their learning benefits (Siemens, 2004; Greenwood, 2020). Connectivism as a theory suggests students should combine thoughts, theories, and general information in a useful manner, accepting technology as a major part of the learning process, ensuring constant connectedness opportunities for student choice of learning (Underwood, 2016). Connectivism is important for this study as it refers to learning with multimedia connections between humans and non-humans, promoting learning that happens outside of an individual, such as through social media, online networks, blogs, or information databases (Hendricks, 2019). Group collaborations and discussions, allowing for different viewpoints and perspectives regarding decision making, problem solving and making sense of information, are encouraged and promote connectivism (Western Government University, 2021 & Greenwood, 2020). At the forefront of connectivism is collaboration, student, and teacher empowerment, and embracing diversity, which remains vital (Western Government University, 2021 & Greenwood, 2020).

Connectivism is proposed as a theory more adequate to the digital age, when action is needed without personal learning, using information outside of our primary knowledge as learning and knowledge are said to "rest in diversity of opinions" (Siemens, 2008 8; Kop & Hill, 2008). Connectivism is driven by the understanding that decisions are based on rapidly altering foundations and continually acquiring new information (Siemens, 2004). Connectivism plays an important role in developing and emerging new pedagogies, where control is shifting from the tutor to an increasingly autonomous learner (Kop & Hill, 2008). Connectivism embraces a learning community where students learn through clustering of similar areas of interest, allowing interaction, sharing, dialoguing and thinking together and extending their networks to additional reliable resources (Kop & Hill, 2008; Bell, 2009 & Transue, 2013).

a) Connectivism and its founders

Connectivism is a third-generation theory that recently emerged and is a relatively new learning theory that was proposed by George Siemens and Stephen Downes (Anderson & Dron, 2012). According to connectivism, learning is building networks of information, contacts, and resources that are applied to real problems (Siemens, 2005 & Downes, 2017). Connectivism assumes that much mental processing and problem solving can and should be off-loaded to machines, leading to Siemens' contentious claim that learning may reside in a non-human appliance (Anderson & Dron, 2012). Connectivism places itself within the context of the actor-network theory by identifying the indiscriminate and overlapping boundaries between physical objects, social conventions, and hybrid instantiations of both, as defined by their initial and evolved application in real life (Latour, 1993). Connectivism reveals the limitations of behaviourism, cognitivism, and constructivism as learning theories, because they do not address learning that occurs outside of people and within organisations. This is opposed to integrated multimedia learning approaches, as technology stores and manipulates it (Siemens, 2008).

Remotely accessible multimedia and non-media information for students, such as OERs, social media, streaming and podcasts, proves critical to support Connectivist learning, irrespective of geographical boundaries and time zones (Garcia, Brown & Elbeltagi, 2013:253). If the silos of traditional knowledge classification schemes are more fluid, perhaps the individual elements of different theories can be adopted, as required, to solve more nuances of learning problems (Rahmatirad, 2020; Kop & Hill, 2008). With the COVID-19 pandemic impacting higher education, learning is collectively mediated through technology. Existing theories satisfactorily address the needs of learning in today's technologically connected age (Kop & Hill, 2008). For connectivism to be a learning theory, the theory's limitations and the full range of contexts in which learning can take place must be accounted for (Siemens, 2005).

Connectivist models explicitly rely on the networked connections between people, digital artefacts, and multimedia offerings and content that previously would have been inconceivable as forms of distance learning (Anderson & Dron, 2011). Technology has played a major role in determining the potential pedagogies that may have been

employed over time (Anderson & Dron, 2011). The pedagogical approaches of lecturers are underpinned by their beliefs about knowledge and their application of learning theory. Therefore, perspectives of knowledge and learning theory will continue to influence teaching and learning in the digital age (Starkey, 2012:28).

b) Limitations

As a fundamental criticism of connectivism, some argue that it is a pedagogical view, not a learning theory (Davis, Edmunds & Kelly-Bateman, 2008). To be relevant at the theoretical level, connectivism should explore the processes of how people learn and the skills they should develop (Verhagen, 2006 in Garcia, et al., 2013). Lecturers and students should establish networks and nodes for knowledge acquisition and sharing in real-time to empower them and their peers (Mukhari, 2016). Kerr (2006) shares a few critique points on connectivism below:

- Connectivism uses language and slogans that are sometimes correct but are too generalized to guide new practice at the level of how learning happens, which does not contribute to a theory or learning reform (Kerr, 2006).

- Connectivism contributes to a general world outlook but misrepresents the current state of established alternative learning theories such as constructivism, behaviourism and cognitivism, thus the basis for a new theory is also dubious (Kerr, 2006).

ŞAHİN and Safieh (2012) add to what Kerr (2006) critiques with the following:

- With the evolution of virtual technologies, connectivism leads to technology's addictive nature, which compromises health and leads to social life isolation, as evidently proven during COVID-19 enforcement, with remote learning that appeared to be the only viable option.
- Although younger generations are more advanced and informed of recent useful technologies, there remains a gap in ICT expert advice, governance policies and infrastructure due to a lack of governmental commitment to encourage society, organisations as well as the HEIS at large.

- The lack of appropriate training, limited access to sufficient resources and time for further advancement and implementation remain a huge restraint (ŞAHİN & Safieh, 2012).

Adding to the above mentioned, connectivism requires the critical ability to draw distinctions between important and unimportant information (Siemens, 2004; Kop & Hill, 2008). Connectivism argues that tremendous changes are happening in the learning processes (AlDahdouh, Osorio & Caires, 2015).

c) Relationship with multimedia technology

Connectivism recognizes that more information exists than one person can access and digest. Therefore, many technologies related to implementing this learning theory involve managing interactions with the internet (McHaney, 2012:194-197). With connectivism, lecturers can upload relevant information on social media tools such as Facebook, blogs, and YouTube. Once information is uploaded for use on social media pages, college lecturers mostly upload the links for their college pages to draw the students' attention back to the formal LMS or a college portal. Social media connectivism coordinates the information sharing of all guidelines, set of resources, procedures and deadlines for students (in various forms such as pdf, videos, text, animations, audio sound etc) which would have been uploaded (Devi, Gouthami & Lakshmi, 2019).

A social media information-sharing approach ensures interactivity through questions and feedback as well as acting on assignments attended by the student (Ansari & Khan, 2020). If a need arises for a lecturer to upload videos and other supported file formats, they have space to do so. Mostly, the multimedia tools may be embedded into the LMS. Even though at times, social media is regarded as an informal learning approach, it is vital as it reaches a substantial number of students (Bates, 2015). Connectivism acts as a theory with the relevant base for higher education's approach to teaching the millennials (McHaney, 2012:164-165). From the above four differentiated and discussed theories is the summary of each as a form of concluding the teaching and learning theories.

Siemens' (2005) principles of connectivism

It is pivotal that lecturers adapt the Siemens (2005) principles of connectivism for multimedia technologies in ODL to enhance teaching and learning. Such principles include the understanding that learning and knowledge rely on a diversity of means such as networks, social media, and LMS as the lecturer and student get various sources to draw, store and share their multimedia technologies. Learning is a process of connecting specialised multimedia and other forms of knowledge information (Siemens, 2005 in West, 2018). Since there are daily upgrades and updates of information, the capacity to know more is more critical than what is currently known in sources, therefore it is critical to verify the information. As learning in ODL is remote and online, it is pivotal that the lecturer understands that multimedia storage and accessibility may reside in non-human appliances such as digital technological devices, cloud storage, laptops, and hard drives (Siemens, 2005 in West, 2018). The network connections, such as data and ICT Infrastructure, practical tools of the trade require facilitation and constant maintenance for continued learning accessibility. Lecturers should be able to see connections between fields, ideas, and concepts as a core skill. Lecturers must strive for accurate, up-to-date knowledge of multimedia learning activities; they must also be able to be decisive, as decision-making is essential for learning. Lecturers must understand that the gradual ever-changing incoming information and constant alterations in the information climate and technological upgrades affect their decisions (Siemens, 2005).

Summary of learning theories

With the above explanations of the section on teaching and learning theories, the table below depicts an overview of the theories of teaching and learning. Although these theories might have been the main theories over a period, theories such as behaviourism are still underpinning learning, as indicated below.

Theories	Founders	Period of Theory	Main principles	Technologies
Behaviourism	Edward Thorndike (1874-1949), John Watson (1878–1958), B.F. Skinner (1904–1990), Ivan Pavlov (1849–1936) and Edwin Guthrie (1886–1959)	Between 1874, 18th and early 20th centuries	1.Instructor Led 2.Learner is a blank slate 3.Behavioural 4.Reward/Punishment 5.Stimulus/Response	Online course presentations, pop quizzes, video presentations, and several other modern technologies such as LMS(Moodle)
Cognitivism	Lev Vygotsky (1896 - 1934) and Jean Piaget (1936)	Between 1896 - 19346)	1.Teacher centred 2.Students come with experience 3.Learner incorporates new Application 4.Deep thought 5.Learner builds and applies	Online games and reinforcement activities, such as sorting games, puzzles, and flashcards. Online communities, self-regulated learning for students (Mukhari, 2016).
Constructivism	John Dewey (1859- 1952), Jean Piaget (1896- 1980) and Lev Vygotsky (1896-1934)	(1859- 1952), (1896- 1980), and (1896-1934)	1.Instructor provides judgement 2.Leaner centred 3.Knowledge is shared 4.Knowledge stored everywhere 5.Social activity provides context 6.Active learning	Videoconferencing, synchronous and asynchronous computer-mediated communication, Web 2.0. social networks, combinations of different systems, and use of the internet
Connectivism	George Siemens (2005) and Stephen Downes (2005)	2005 -	1. Information and knowledge digitally stored across the world (advanced from individual or small group storage)	Lectures may upload the invites on social media tools such as Facebook, blogs, and YouTube, Formal LMS or a college portal is

		2. Instructors focus on providing context, interpretation, and judgment of stored knowledge and help guide students to reputable sources 3. Learning is no longer a classroom-centric activity, and the role of peer networks is even greater in storing, interpreting, and applying knowledge. 4. Collaborative, problem-solving environment which provides scaffolding in the form of hints, clues, and activities that are adapted to the needs of the learner.	used to upload various forms such as pdf, videos, text, animations, audio sound, etc

Table 2. 3 Teaching and learning theories

Source: Own design

In summary, this section dealt with the behaviourist, cognitivist, constructivist, and connectivist theories which each play an important role in ensuring the application of learner effectiveness as well as foundations of the CTML. These teaching and learning theories, particularly connectivism help builds on already-established theories such as the CTML which is to propose that technology is changing (Western Governors University, 2021). The CTML is the overarching theory of the study and among the capability theories offering a variety of perspectives on the use of multimedia technology learning enhancement. Thus, the following is a discussion on Mayer's CTML as a theory of choice, guided by Mayer's 12 principles of multimedia

design (see Chapter 2, Section 2.4.3) to establish why and when to use multimedia in teaching and learning.

2.4 COGNITIVE THEORY OF MULTIMEDIA LEARNING

2.4.1. Background of CTML

The Cognitive Load Theory (CLT) is a schema that explores a student's working memory capacity for suitable learning (Sweller, 1994). The Cognitive Load Theory (CLT) defines how the brain can only process selective incoming sensory data into working memory (Sorden, 2005). This is an important theory that multimedia designers and lecturers may adapt when creating and using instructional multimedia. To reduce cognitive overload on eLearning course design, content should be kept simple, with unnecessary, redundant content reduced, with images placed near the content to which they refer (Pappas, 2014).

Mayer's Cognitive Theory of Multimedia of Learning (CTML) relies heavily on the CTL because it allows students to absorb and retain information effectively, but only if it is provided in such a way that it does not "overload" their mental capacity (Pappas, 2014). Thus, the CTL serves as a reference for the CTML. The underlying premise is that the kind of information encountered during learning leads to one of three different types of processing in the brain (Shaw, 2016).

2.4.2 Cognitive Theory of Multimedia Learning (CTML)

The CTML, founded by Richard Mayer is known as the "multimedia principle" where "people learn more deeply from words (auditory and text) and pictures than from words alone" (Mayer, 2014: 47). Therefore, with CTML, the student possesses a visual information processing system and a verbal information processing, such that auditory narration goes into the verbal system whereas animation goes into the visual system (Mayer & Moreno, 1998). Mayer's CTML draws on several theories, such as Paivio's dual coding theory, Baddeley's model of working memory, Sweller's cognitive load theory, Wittrock's generative theory, and Mayer's SOI (Select, Organize, and Integrate) model of meaningful learning (Irby, Brown, LaraAiecio & Jackson, 2013).

COVID-19 remote work requires the integration of multimedia technologies to enhance learning. With Wittrock's generative theory, which involves linking new with old ideas, to understand the instructed concepts better, students can actively integrate new ideas into their memory to enhance their educational experience (Pappas, 2014a). Mayer's SOI model intends to foster understanding through direct instruction. It is suitable for text-based learning, lecture and multimedia environments, in which manipulation is impossible (Reigeluth, 1999, in Mayer, 1999).

Learning is knowledge construction through the following cognitive processes: (a) selecting relevant information, (b) organising incoming information, and (c) integrating incoming information with existing knowledge (Meyer, 1996). Cognitive science studies refer to the nature of the brain and how it learns by drawing from research in several areas including psychology, neuroscience, artificial intelligence, computer science, linguistics, and biology (Ren, 2019). For sensory representations, 'the function of the ears and eyes is to access the selected elements to convey a visual representation through the sensory functions (O'regan & Noë, 2001).

Since cognitive theory refers to perceiving and knowing, scientists seek to understand mental processes such as perceiving, thinking, remembering, language, and learning (Sorden, 2012). How memory works in instructional multimedia matters, as students start by watching an instructional multimedia piece that ordinarily contains selected elements in the form of words (text and/or auditory) and pictures, with words as the physical representations (De Sousa, Richter & Nel, 2017). Programme design, curriculum design, learning design, and learning development all add up to the building of multimedia visual representation (Güney, 2019). Students get to select and determine what text, audio, and images will be stored in their long-term memory with relevant prior knowledge (West, Swanson & Lipscomb, 2017). The written or visual text that students look at first needs to be held in the working memory as the students look at the second source that was not attended to first (Schmidt-Weigand, Kohnert, & Glowalla, 2010). Additionally, multimedia involves visual and auditory elements such as sensory representations and adaptation of video materials for the visually impaired. Higher learning institutions should ensure that they embark on inclusivity through

various initiatives, such as braille for the visually impaired and sign language for the hearing impaired.

CTML looks at how lecturers structure multimedia development and how to implement effective cognitive strategies to help students learn efficiently (Sorden, 2012). This is a key theory that lecturers and designers should not overlook to avoid deploying multimedia components that might interfere with the learning experience. The core principle of the CTML is finding out how multimedia learning works; therefore, if lecturers and designers are not trained in the cognitive principles and theories of multimedia learning, students' inability to make sense of the instructional material and construct meaningful connections and new knowledge will prevail (Sorden, 2012). Through multimedia learning, students learn to use graphics (graphs, photos, maps, animations, and videos) and print or spoken text, which can be combined into one piece or used separately depending on the goal (Mayer, 2008). The use of device accessibility enables learner enhancement. The students may access audio-visuals from the LMS, such as Moodle, or access the live or pre-recordings of their courses from the cloud. However, simply adding words to pictures is not an effective way to achieve multimedia learning. Furthermore, Mayer (2014) based the importance of learning upon the successful demonstration of the transfer of knowledge.

The goal of CTML is to cognitively show instructional media in the light of how the human mind works (Mayer, 2014: 47). Regarding multimedia learning, the CTML proposes three main assumptions:

- The use of the two separate channels (auditory and visual) for processing information (sometimes referred to as Dual-Coding theory).
- Each channel has a limited capacity (like Sweller's notion of Cognitive Load).
- Learning is an active process of filtering, selecting, organising, and integrating (SOI) information based on prior knowledge (Mayer, 2014: 47).

Therefore, distinct minds must connect to neurological systems to help maximize the use of cognitive infrastructure in teaching and learning for processing auditory and visual information and the overall use of multimedia on various platforms (Mayer, 2009). To further advance the understanding of applying the CTML as well as distinctive thought, Mayer additionally describes the uses of the three memory stores:

- Senses receive stimuli and store them for a very short time.

- Working memory actively processes information to create mental constructs (or 'schema').

- Long-term memory is the repository of all things learned (Mayer, 2009).

An understanding of the above information assists the lecturer in compiling multimedia with the target in mind of what the student will achieve and how best and suitably to create and package the components of multimedia without unnecessarily overloading the student. Working memory is limited in storage and is temporary, whereas long-term memory has no limitations (Schweppe & Rummer, 2014). With the CTML as a chosen framework, the study further establishes how the principles of multimedia design assist the multimedia technologies integrated into ODL teaching and learning.

2.4.3 Principles of multimedia design

We live in a video-driven world where adult students are drawn to instructional multimedia components. Due to the role that lectures, and multimedia designers play in instructional design, the Instructional and multimedia designers must familiarise themselves with the CTML to prevent extraneous processing (see Chapter 2, Section 2.4.1). The CTML has different principles that a lecturer should consider and implement to design effective instructional multimedia pieces (Mahajan, Gupta, Gupta, Kukreja & Singh, 2020). Since instructional multimedia pieces that contain extraneous content can overload the students' processing capacity, lecturers should be guided that students perform better on problem-solving after reviewing a concise lesson rather than an expanded lesson (Ibrahim, 2012:84). COVID-19 has forcefully proven the efficiency of remote online learning, provided there is enough ICT infrastructure, data, and access in place. This would ignite the adaptation of the principles of multimedia design, aiming to ensure that the technologies are intertwined with the pedagogies. Lecturers must facilitate useful instructional methods, whether synchronous or asynchronous. Lecture facilitation must include preplanning of content, recording of the actual video, as well as post-production with an interest in producing quality pedagogical standard videos.

Mayers' research experiments in determining elements in instructional multimedia found that contiguous narration and visual graphics in videos are extremely effective

for entry-level courses, visual students, and for introducing complex topics (Berk, 2009). Lecturers must understand that students generate more meaningful learning when the text is presented visually rather than printed on the screen (Kalyuga, Chandler & Sweller, 2000). Therefore, Mayer created the twelve multimedia design principles to help lecturers balance visual and verbal channels (Mayer, 2009). With the ease of multimedia applications, it is more critical for lecturers and multimedia designers to understand and apply the twelve principles. The principles are the Coherence principle, the Signalling principle, the Redundancy principle, the Spatial contiguity principle, the Temporal contiguity principle, Segmenting principle, the Pre-training principle, the Modality principle, the Multimedia principle, the Personalization principle, the Voice Principle as well as the Image Principle (Mayer, 2009). The Twelve principles of multimedia assist both the lecturers and students regarding multimedia implementation. Thus, the principles below show how each impacts the student's learning.

Principles	Multimedia technologies
Coherence principle	- Humans learn best when extraneous, distracting material is not included. - The Coherence principle is also quite helpful when you're editing your training video or eLearning course.
Signalling principle	- Students can recognize and learn information more easily when callouts, arrows, and highlighting are used for key aspects (Graphic representations of PowerPoint Infographics templates for illustration always works). - Signalling is a technique that can be used and is one of the multimedia principles that can reduce extraneous material such as redundant text, images, diagrams, etc.
Redundancy principle	- The designer should not include interactive animations if a video is being used as it can compete and distract from the student's attention. - Graphics, narration, and printed text should not all be implemented on a slide/frame. Instead, only graphics and narration should be presented.
Spatial contiguity principle	Assisting with the aesthetics of design, multimedia pieces are better designed for the student when words and pictures are placed near each other vs being a distance apart (Sorden, 2012).
Temporal contiguity principle	Students respond better to instructional multimedia pieces that present words and graphics continuously rather than one after another (Sorden, 2012).

Segmenting principle	Students understand the instructional multimedia piece better when the lesson is broken into user-paced chunks rather than an all-in-one multimedia piece (Sorden, 2012). A chapter may be divided into various segments to accommodate students' attention span.
Pre-training principle	Instructional multimedia is more effective when students and sometimes lecturers have pre-training on the objectives and key concepts they will learn.
Modality principle	Graphics and narration are more effective in instructional multimedia than text and graphics on a page. Additional audio recordings on videos may be exported to an audio-visual (video narration).
Multimedia principle	• Instructional multimedia pieces that contain words and pictures are more effective for students than just using words (Bull, 2013). • The designer should ensure at least two modes are present: text, video, graphics, animation, and narration (Bull, 2013).
Personalization principle	Formal-style conversations should not be used. Instead, the instructor should speak in a conversational style (Sorden, 2012). This is an easy approach to getting student attention.
Voice principle	Students are more engaged in learning when the voice in a multimedia presentation is human versus a computer-generated voice. This allows the personalization principle to take effect.
Image principle	The instructor's image on the screen does not generate more meaningful learning than if the image was not present, as the content is important.

Table 2. 4 The Principles of Multimedia (Mayer & Mayer, 2005:6)

Not only should instructional multimedia pieces contain the principles of multimedia, but they should be interactive with the students getting control and allowing them to engage with the content being presented (Darling-Hammond, Zielezinski & Goldman, 2014; Darling-Hammond, Flook, et al., 2020). Instructional multimedia pieces should be engaging, and with meaningful feedback, helping the students apply what they learned realistically (Oud, 2009). Lecturers who develop instructional multimedia components must balance their use of visual and verbal information to effectively engage students in the learning process (Bull, 2013). The multimedia visual and auditory product must include interaction, which will involve a sequence of three actions through initiation, response, and feedback (Evans & Gibbons, 2007; 1149). High-quality videoconferencing, such as Live video streaming on MS Teams, YouTube, Facebook, Zoom, Skype, and other online platforms such as LMSs, allows dynamic interaction and dialogue between lecturers and students.

The multimedia quality evaluation from three popular applications (Zoom, MS Teams, and Cisco Webex) revealed that multimedia mediums are in close agreement with each other (Pal, Vanijja & Patra, 2020). From various multimedia quality evaluations, MS Teams was the less preferred application, whereas other applications varied depending on the objective models used (Pal, Vanijja & Patra, 2020). With so many video conferencing applications in the spotlight, designed with various features, their functionality is not only limited to video conferencing, but other features too are limited, hence some organisations use G Suite or Office 365, Google Meet/Chat and MS Teams, respectively (Sevilla, 2020 & Schurer, 2021). Another main objective of the videoconferencing component is to integrate videoconferencing functionality and provide benchmarks on videoconferencing (Derudder, 2021).

The above multimedia learning technologies have been made possible to ensure effective learning because of digital advancement and evolving technologies. Therefore, their use and application must be distinguished. Mayers' 12 Principles of Multimedia design cater to the consideration of the student comprehension and how the lecturer prepares the multimedia content. Choosing multimedia technology and its tools requires the multimedia principles and platforms of broadcast, storage, and delivery. It must be considered before a deep deliberation of multimedia technology inclusion of DE.

2.4.4 Multimedia technology involvement in DE

Effective teaching with multimedia technology integration has been acknowledged as "complex, multifaceted, and situated" as new, growing technological devices and tools become available (Redmond & Lock, 2019). Tools of trade, such as computers, laptops and other digital devices (tablet/iPad/iPhone), also form an important part of multimedia technologies as they enable filming/photography, uploading, animations, texting, and the audio recording as communication between HEIs, students and lecturers. While educational multimedia technology courses typically help increase or preserve lecturers' confidence in using correct multimedia technologies, they sometimes fail to promote meaningful use in lecturers' practices (Wachira & Keengwe, 2011). Multimedia use (especially tele-and video conferencing) has been considered

an effective form of remote teaching and a major instructional tool, especially in times of COVID-19 (Noetel, Griffith, Delaney, Sanders, Parker, del Pozo Cruz & Lonsdale, 2020). Lecturers have become both designers and instructors, using tools they have often mastered fluently (Rapanta, Botturi, Goodyear, Guàrdia & Koole, 2020).

To address the concern of promoting meaningful multimedia technology, many researchers agreed that technology training for lecturers should be integrated throughout the entire lecturer education programme (Guerriero, 2013). Quality standard devices are required to install and access advanced communication programs such as MS Teams, Zoom, YouTube, LMS, and other important media programmes. As a multimedia compiler by profession at an ODeL HEI, I can attest to a significant increase in the uptake of video online training requests. With the POPI ACT 2013 data privacy law in place, the Higher Learning Institutional responsibility is ensuring that lecturers adhere to the act to mitigate reputational branding and various other risks when utilizing multimedia technologies (DHET, 2018). Multimedia use is an effective form of remote teaching and a major instructional tool. Just like Keegan's six key elements of DE (see Chapter 2, Section 2.2.1), Mayers' 12 principles of multimedia design (see Chapter 2, Section 2.4.3) are mandatory for lecturers to adopt in their teaching (Nel & Marais, 2020). Therefore, multimedia simulations should be more resource intensive and beneficial in teaching and learning than just a video with the capacity to playback controls (Noetel, et al., 2020).

The multimedia quality variations have been evident in various online platforms as users' experiences vary according to their preferences and internet connectivity (Yaacob & Saad, 2020). User acceptance of YouTube as a multimedia learning resource has significantly increased during the COVID-19 pandemic (Yaacob & Saad, 2020). Multimedia adaptations subsequently embraced the emergency remote online pedagogy through videoconferencing, social media technologies, and cloud computing (Chaka, 2020). Within a constructivist context, the relationship with multimedia technology (as discussed in Chapter 2, Section 2.3.3b) reveals how various other platforms with effective two-way communication may be used for teaching and learning. Connectivism (Chapter 2, Section 2.3.4c) is displayed as a theory with a relevant base for higher education's approach to teaching the millennials (McHaney, 2012:164-165).

According to researchers, millennials include people born between 1980 and 2000, and represent a generation who is mostly computer-orientated (Dimock, 2019). The commonalities shared among all the DE generations (see Chapter 2, Section 2.2.4) include features such as pedagogy, curriculum, interaction, medium, production, and storage delivery, which all help towards the media characteristics. Three key media characteristics are particularly important and relevant for teaching and learning and are beneficial guides for lecturers who deal with multimedia for teaching and learning (Bates, 2015). The characteristics are intended to assist lecturers in distinguishing which media are broadcast (one-way) or communicative (two-way) (see Chapter 2, Section 2.2.2). Secondly, for lecturers to establish whether media are synchronous or asynchronous (see Chapter 2, Section 2.2.2), including live (transient) or recorded (permanent) transmissions for teaching and learning. The last characteristics help lecturers identify whether media are single or rich. The following section further elaborates on the three characteristics and respectively.

Broadcast (one-way) or communicative (two-way) media

With the various mediums serving various needs, broadcast (one-way) (see also Chapter 2, Section 2.2.4 on different generations) or communicative (two-way) media depends on what the intention is. While broadcast media is more lecturer-structured/controlled, communicative media affords interactivity from both sides (Bates, 2015). When deciding on the desired balance between 'broadcasting' and 'discussion' or communication, this remains an important teaching practice to consider. This is determined by the targeted intention and also extends to the choice of appropriate multimedia teaching technologies (Bates, 2015). Computers/digital devices remain the technological medium of online collaborations, regardless of choice by the lecturer.

There are various channels of accessibility and viewership for multimedia broadcasting, such as online through digital devices like cell phones, computers, and televisions (Bates, 2015). Storage is another aspect that could be in the cloud, on local drives, on digital devices, on hard drives, or on an LMS. Another aspect is the multimedia deliverable as well as its function. With recent technologies, smartphone advancement provides benefits for producing live video recordings and sending them

synchronously to various compatible online platforms (Mpungose, 2020). The live video recordings afford digital broadcasting for both the lecturer and the student, with students controlling the pace of their learning (Greenberg & Zanetis, 2012). However, the economic and financial impact remains a significant conflict as downloading and uploading multimedia components require data from the user. Whether the media is one-way (lecturer-structured/controlled) or communicative (affords interactivity from both sides), the lecturer should consider both ways (Bates, 2015). Determining whether the media choice is synchronous or asynchronous technologies is discussed next.

Synchronous or asynchronous technologies

With **synchronous or asynchronous** technologies there is an inclusion of live (transient) or recorded (permanent) media that the lecturer needs to identify. There is a difference between asynchronous and synchronous technologies. Synchronous technologies require all to participate simultaneously, but not necessarily in the same place (Bates, 2015a). COVID-19 has effectively ensured that this is applied as remote work has been an efficiently forceful way of working. Thus, live events (such as a videoconference or a webinar) are one example of synchronous media, as they allow everyone to participate in the event remotely from different places (Bates, 2015). Live events, by definition, are transient and cannot be repeated, or if they are, they will be a different experience or a different audience (Bates, 2015). Therefore, repeating the post-live event changes the meaning from synchronous to asynchronous due to the offering being a post-view-live recording. Live events require good quality due to their instant action, inclusive of an instant face-to-face event, such as lectures, seminars, and one-on-one, face-to-face tutorials. The synchronous videoconferences may be more conducive to student–lecturer interactivity (Al-Samarraie, 2019). Live video streaming technologies on various platforms (such as MS Teams, Zoom, and YouTube) can be synchronous or asynchronous, depending on the intention. These live events provide an option of live instant communication and feedback dialogue where necessary.

Asynchronous technologies enable participants to access information or communicate at different points, usually at the participants' time and place of choice. All recorded

media are asynchronous (Bates, 2015a). Asynchronous videos generally afford students more control over their learning and may offer a series of benefits such as improvement of student motivation, as well as self-regulation of their cognitive load as they learn at their own pace, pause, take notes, play and fast forward to mitigate long classes (Abeysekera & Dawson, 2015). Motivational interventions for HEIs are often successful when they aim to increase student autonomy and self-direction (Lazowski & Hulleman, 2016). In addition to motivational benefits, this sense of choice and control has been shown to mitigate actual and perceived cognitive load (Schneider, Nebel, Beege & Rey, 2018). Lecturers can use videos for various reasons, such as a "flipped" classroom setting, planning virtual break-out sessions, allowing live interactivity among students, as well as to prepare their own video content for students to watch at home so that classroom time can be used for discussion and other activities (Van der Meij & Dunkel, 2020).

Overall, educational benefits are associated with asynchronous or recorded media, because accessing information or communicating at any time offers the student more control and flexibility (Bates, 2015). Remote learning provides the flexibility of learning, data, depleted obsolete legacy ICT infrastructure, and connectivity issues constantly reveal the challenges that require urgent mitigation attention (Chan, Bista & Allen, 2021). It is important to elaborate on the forms of recorded media, as they are permanently available to those who possess the recording. These include video/audio books and other print formats that are also recorded media (Best, 2020). YouTube videos, live video streaming on demand, and online discussion forums are all asynchronous media technologies that afford students flexible solutions and, thus, may access multimedia technologies at their preferred time and place (Burns, 2011). The recorded media are necessary for a country such as South Africa, where there are power outages or load shedding, an unstable ICT infrastructure, and dubious internet connectivity.

The difference between live and recorded media is clarified from the above distinguished narration on synchronous and asynchronous offerings. Both synchronous and asynchronous technologies serve as a guide for a lecturer to package appropriate media for each broadcasting purposefully. Therefore, next is a

discussion on preparing lecturers on whether to choose single or rich media for their students.

Single or rich media characteristics

From a teaching perspective, rich media have advantages over a single medium of communication due to its ability to do more. Rich media describes several interactive elements, such as video and audio, to encourage users and may contain a great deal of information compressed into a very short time, with the value depending on the student's level of preparation for interpreting it (Bates, 2015). With voiceover and text/picture/ video synchronisation enabling learning through multiple senses, this approach has been found more effective than learning through a single communication medium (Bates, 2015). However, the lecturers or designers are cautioned against cognitive overload (Mayer, 2009). It may be tempting to look for the simplest medium first and later opt for more complex or richer mediums, should the simplest mediums be unable to deliver the learning goals adequately (Bates, 2015).

Participation in distance learning with integrating various technologies embedded in teaching and learning requires all ODeL providers to increase their online-based support (Ng & Kong, 2012:209). The lecturers require skills training and advancement as their lack of adequate knowledge of the recent multimedia technologies in teaching, and learning hinders the students' full benefit of learning (Snyder, 2009; Zakaria & Daud, 2013). The below table is an overview and a brief summary of the above discussion on three key media characteristics to depict the graphical guide on key media characteristics against the teaching and learning benefits.

Three key media characteristics	Teaching & Learning Benefactor
Media are broadcast (one-way) or communicative (two way)	With recent technologies, smartphone advancement provides benefits to producing live video recordings synchronously to various compatible online platforms (Mpungose, 2020). This effect affords digital broadcasting for both the lecturer and the student, with students controlling their learning pace (Greenberg & Zanetis, 2012). Whether the media is one-way (lecturer-structured/controlled) or

	communicative (affords interactivity from both sides), the lecturer should consider both ways (Bates, 2015).
Media are synchronous or asynchronous including live (transient) or recorded (permanent)	Overall, there are huge educational benefits associated with asynchronous or recorded media, because accessing information or communicating at any time offers the student more control and flexibility (Bates, 2015). Remote learning applies flexibility, however, data, depleted obsolete legacy infrastructure and connectivity issues constantly reveal the challenges (Chan, Bista & Allen, 2021).
Media are single or rich	From a teaching perspective, rich media have advantages over a single communication medium, due to their ability to do more. With voiceover and text/picture/ video synchronisation enabling learning through multiple senses, this approach has been found more effective than learning through a single communication medium (Bates, 2015).

Table 2. 5 The Three Key Media Characteristics (Bates, 2015).

2.5 SUMMARY

The background on DE helped to draw attention to the dynamic transitions between various DE terminologies to better understand how DE definitions were expanded. Even though many look down on it, history has shown that the massive influences of DE have largely contributed to higher education. DE serves as a method of imparting knowledge and skills. DE does not imply the physical presence of the lecturer appointed to teach in lecture rooms. This chapter's discussion of DE generations revealed the different generations as well as model perspectives over generations and, subsequently, how they all feed off each other. The study has adapted the evolution of DE generations according to each generation's dominant technology and its dominant pedagogical perspectives. Like any other movement or action implemented, there will always be challenges and weaknesses, and DE is no exception, therefore, the challenges as well as the weaknesses of DE were addressed.

Discussions on teaching and learning theories included behaviourism, cognitivism, constructivism and connectivism. These, as the study's chosen theories, were addressed. With each theory adding value to the framework, it is apparent that the selected theories all form a substance such that Connectivism, with its principles, serves as an extension of the three theories. Mayer's CTML, which relies heavily on

the cognitive load theory due to how the CTL allows students to absorb and retain information effectively, was discussed. The CTML theory assists lecturers and multimedia designers in creating simple instructional multimedia while minimizing content overload. Mayers' 12 multimedia design principles assist the lecturer when designing multimedia content for students. The multimedia visual and auditory skills produced a design component that allows for interactivity in the form of initiation, response, and feedback. This is relevant after considering the DE, types of cognitive loads, privacy, and cyberspace. The next chapter discusses the use of multimedia in teaching and learning.

CHAPTER 3

THE USE OF MULTIMEDIA IN TEACHING AND LEARNING

3.1 INTRODUCTION

This chapter establishes the use of multimedia in open-distance teaching and learning during the COVID-19 pandemic by investigating the policies relevant to multimedia online teaching and learning in the context of this study. The main objective of this study is to establish the integration of multimedia and ICT in remote ODL teaching and learning during the COVID-19 pandemic. The capabilities represented in the various policies require further attention. Therefore, the White Paper for Post-School Education and Training, the Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-School System, as well as the National e-Skills Plan of Action were analysed as they provide a framework and guidelines for HEIs' ODL in teaching and learning. Furthermore, this chapter focuses on global educational policies and multimedia in education, and it concludes with the benefits and disadvantages of multimedia to help lecturers make better selection and design decisions.

3.2 POLICY SUPPORTING MULTIMEDIA TECHNOLOGIES IN SOUTH AFRICA

Several policies were selected based on their relevance to this study regarding HEI ODL teaching and learning and multimedia technologies in South Africa and how they bring more synergy between the literature discussed. The analysed national policies are all applicable to the study's research topic and thus pivotal as they help drive their practice in HEIs. The reviewed policies are the White Paper for Post-School Education and Training (2013), the Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-School System (2014), and the National e-Skills Plan of Action (2012). The policies and literature discussed in Chapter 2 are pulled through as they add value to the findings and verbatim quotations of participants in chapters 4 and 5. These policies are discussed next, respectively.

3.2.1 White Paper for Post-School Education and Training

According to the DHET (2013), the White Paper for Post-School Education and Training is an important document in developing higher education and training systems. The White Paper on Post-School Education and Training was designed to outline a framework that defines the DHET's focus and priorities and enables it to shape its strategies and future (Department of Higher Education and Training, 2013: vii). The DHET plans include the use of multimedia embedded within ICT infrastructure equitably extended to all post-school students, ensuring sufficient staff and financial capacity, the availability of bandwidth, accessibility, and effective ICT usage, and cloud services (DHET, 2013:53). Additionally, the affordability of end-user mobile devices for fostering online learning in HEIs, including DE institutions, remains a major prioritisation for the future of DHET (DHET, 2013:53).

There have been ongoing interventions, such as conferences and engagements held by the Department of Higher Education and Training to enhance various technologies and invest in the development of staff to use online learning programmes (DHET, 2013: 45–52) necessitated by the fact that COVID-19 enforced remote learning. South African HEIs have integrated various multimedia and ICT technologies to enhance online learning, which must be pedagogically grounded (Zalat, Hamed & Bolbol, 2021). The White Paper for Post-School Education and Training has promoted the expansion of online and blended learning to unhindered learning inabilities (DHET, 2013: 51–52). Such unrestricted inabilities can be ascribed to various factors, such as lack of employment and geographical distance, and aim to improve students' engagement across HEIs through multimedia technologies (DHET, 2013: 51-52).

With the implementation of remote teaching and learning, the HEIs have encountered various challenges with inadequate ailing ICT infrastructures. These required upgrading and various other installations to mitigate the communication barrier in teaching and learning (Reimers & Schleicher, 2020). COVID-19 has proven the inefficiencies and challenges of DHET's commitment to ICT boosting eight years ago, which have remained unchanged. DHET has acknowledged the challenges and is thus committed to developing and facilitating ICT infrastructure for HEIs and people in remote areas (DHET, 2020). The DHET requires provisions based on open learning

principles (as reflected in Section 7 of the White Paper for Post-School Education and Training). The Policy for the Provision of Distance Education in South African Universities is discussed next.

3.2.2 Policy for the provision of distance education in South African universities in the context of an integrated post-school system

The Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-School System should be read in conjunction with other policy documents affecting public HEIs as well as the policy on DE provision (DHET, 2014: 3). This policy forms part of a broader focus on building the capacity of the post-schooling system (DHET, 2014:3). The Policy for the Provision of Distance Education in South African Universities (PPDESAU-IPSS) has been developed in response to two important factors, namely the White Paper for Post-School Education and Training as well as the explosion and affordability of ICTs, which have a seminal impact on the provision of DE in the HEIs (DHET, 2014:6). This policy provides and expands the quality of DE, includes the policy context, and describes the distinctiveness and purpose of distance learning in HEIs.

The PPDESAU-IPSS further identifies mechanisms for steering DE as well as creating an enabling environment for quality DE provisioning (DHET, 2014:3). As the policy advocates for the availability of ICT to enhance higher education that includes DE, the aim was to bridge and embrace communication during the COVID-19 remote learning times (Goldberg, 2021). However, this policy also cautions against using terms such as 'blended', 'flexible' and 'mixed' ICT provision of DE. The policy covers too wide a range of possibilities, and in the use of such terms, the unique possibilities and challenges of DE provision are often overlooked (DHET, 2014:6). The PPDESAU-IPSS informs DE institutions to make informed decisions about the use of ICTs based on their contexts and circumstances (DHET, 2014:8).

The graphic grid representation below, proposed by Strydom and Mentz (2010) as cited in DHET (2014:8), represents educational programmes offered by HEIs in South Africa. Educational programmes vary based on the higher learning institution and the

nature of such an institution. The offerings range from fully online, digitally supported, internet supported, fully online, campus-based, and remote-based learning.
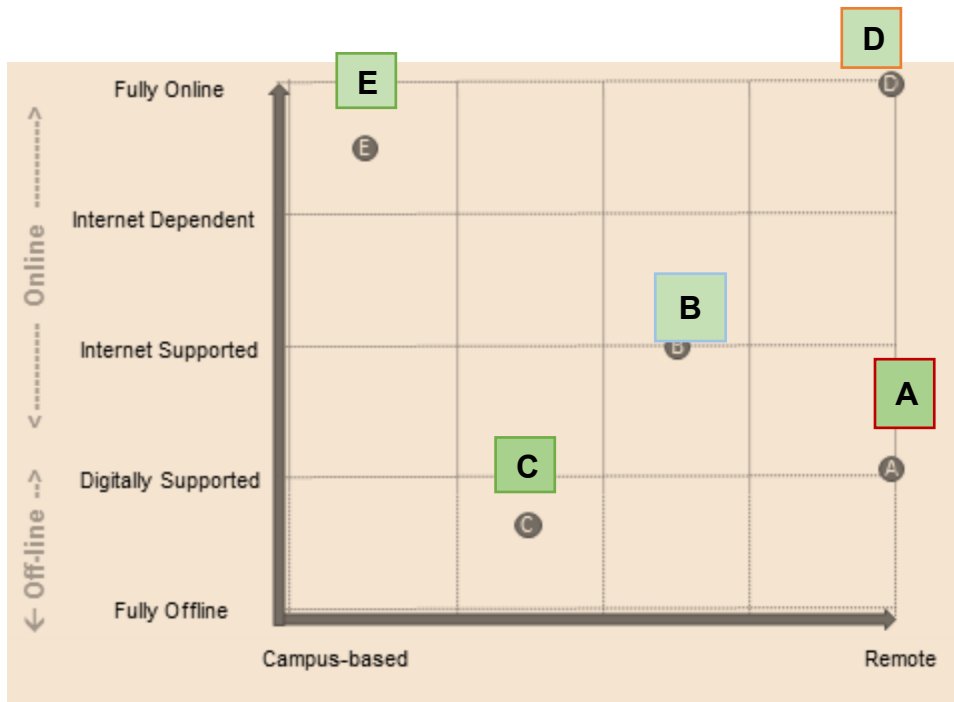
Figure 3. 1 Policy provision grid, Strydom and Mentz (2010) Policy Provision Grid

(Source: Department of Higher Education and Training, 2014)

From the above graphic representation, point A is an interpretation of a distance programme that is offered using various multimedia tools without involving the internet. These programmes may be using DVDs, USBs, and CDs even though there is a decline in the usage of DVDs and CDs. Users also download files and work on downloaded files offline. Point D represents a distance programme offered entirely online (such as accessible programmes from an LMS) for accessible work and remote study from the campus. With the remote learning enforced by COVID-19, point D has been the framework globally adopted, except that the HEIs had challenges with the ICT infrastructure, data, and financial implications (Sutherland, 2021).

Multimedia technology integrates learning needs and student cohorts (Department of Higher Education and Training, 2014:3). Changes may occur over time, as illustrated by point B. As much as there have been possible offerings to a largely online course in campus-based computer labs (point E) for both full-time and part-time students, the size of the circles might also approximate the scale of provision. Thus, point C

represents a large-scale programme in which economies of scale might be possible. Point A represents a small-scale programme; thus, student support will have to be carefully considered to cater to the large numbers of students in such a course (DHET, 2014:8-9).

The PPDESAU-IPSS supports the current CHE process of reviewing the existing criteria and processes to align with the latest international trends in DE, pedagogically sound learning programmes as well as the increased use of ICTs (DHET, 2014:14). However, the imbalanced readiness of staff and students have been revealed by the COVID-19 pandemic, which is far from the policy requirements for the use of suitable ICT learning, the student body and the context of the HEIs (DHET, 2014:15). Almost six years ago, the DE institutions were engaged to assure the availability of the internet, but currently still remains a challenge. Although there is a vast improvement in the upgrading of multimedia technologies and ICT Infrastructure, many requirements must be considered concerning the ability and skills of HEIs students (DHET, 2014:15). Engaging in online environments where the access of multimedia technologies and issues of access for students in remote areas must be made a priority (DHET, 2014:15). The PPDESAU-IPSS has founded the ideas for DE in creating online learning opportunities to benefit the quality of DE.

The Presidential Infrastructure Coordinating Commission (PICC) aims to ensure universal service and access to reliable, affordable and secure broadband services by all South Africans, prioritising rural and under-serviced areas and stimulating economic growth (Department of Communications, 2013:17). The PICC need act effectively, otherwise, it will remain just a promise. The Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-School System gives effect to the Constitution of South Africa by creating the conditions in a modern electronic world aiming at improving the quality of life of all citizens and freeing the potential of each person (Department of Justice, 1996: 1). The Human Rights Council of the United Nations General Assembly also declares that access to the internet is a basic human right that enables equality in the rights, privileges, and benefits of citizenship, including the guarantees of freedom of expression and association in the Bill of Rights (Reglitz, 2020 & Salway, 2020).

With the current endless COVID-19 challenges encountered globally regarding education, positive economic changes would benefit the education sector. The policy lays out the current context of broadband in South Africa by outlining the challenges currently facing the country and envisaging strategies to overcome them (The Presidency, 2020). These challenges include a shortage of reliable bandwidth, which has negatively impacted the country's ability to compete globally. This is coupled with an uneven distribution of access across the country (The Presidency, 2020). The cost of fixed broadband, which is generally high, is a further challenge and has increased the use of mobile broadband, which all use multimedia technologies such as graphics, videos, audio, images, and animations (De Sousa, Richter & Nel, 2017).

The advanced fibre installations across urban areas have assisted with the implementation and accessibility of multimedia in online learning (Yigezu, 2021). However, ICT infrastructure in underdeveloped areas remains extremely poor, thus it remains a challenge for South Africa, which is not considered the leader on the continent in terms of broadband and internet (Department of Communications, 2013). Policy interventions for enhancing broadband access should consider the reach, availability and affordability of the different elements that make up the national broadband landscape (Department of Communications, 2013:26).

Professor David Richard Walwyn and Laurens Cloete of the University of Pretoria mention that, in South Africa, the focus must be on developing universally accessible data and high-speed broadband digital public infrastructure (Walwyn & Cloete, 2020). The high-speed broadband digital public infrastructure will help enable the download and accessibility of multimedia content. The South Africa Connects 2013 vision of connecting South Africans both nationally and globally through an accessible seamless network of networks has developed (Department of Communications, 2013). The National e-Skills Plan of Action below outlines the importance of equipping citizens with sufficient e-skills.

3.2.3 National e-Skills Plan of Action

The National e-Skills Plan of Action explains e-skill as the ability to use and create all forms of ICT to achieve equitable prosperity and global competitiveness to improve

life opportunities across sectors, including higher education (Department of Communications, 2012:10). HEIs are expected to bring innovative use of ICTs in the education sector and various other sectors to address inequalities as well as facilitate ongoing improvement and e-skilling of online learning offerings (Department of Communications, 2012:4). The use of multimedia is enabled and informed by ICT innovations, whether they have a positive or negative impact. The National e-Skills Plan of Action highlights the importance of critically engaging ICT integration into HEI online learning offerings to enrich students for global competitiveness and further improve prosperity for all (Department of Communications, 2012:67). Much integration is, however, required to enrich students for global competitiveness. This section emphasises the importance of ICT integration, which requires careful consideration and planning guided by the needs and contexts of the higher education institution involved.

The genesis of an organised e-skills agenda in South Africa started in 2002 with the realisation of the importance of modern ICT and the shortage of e-skilled people in the country. Thus, a need for an ICT university was announced in the National e-Skills Plan of Action (Department of Communications, 2012:12). The National Development Plan proposed that, by 2030, the South African economy should be close to full regarding employment, providing the resources for investment in human and physical capital with skills dominated by the new forms of ICT (Department of Communications, 2012:68). With drastic changes in communities through digital communications, the institutional arrangements to manage the ICT environment need to be better structured to ensure that South Africa does not fall victim to a "digital divide" (Venter, Craffert, Van Greunen, Veldsman, Candi & Sigurdarson, 2019). Compared to the best international standards, South Africa's ICT infrastructure is extremely poor. It requires various upgrades, such as a stronger broadband and telecommunications network and lower prices, to compete globally and promote economic growth (Department of Communications and Digital Technologies, 2020:36).

To demonstrate and contribute towards e-skilling in the nation for equitable prosperity and global competitiveness, the National e-Skills Plan of Action (NeSPA) has considered the global and South African needs for an effective adoption and socio-economic appropriation of contemporary ICT (Department of Communications,

2012:21). The National Development Plan (NDP) includes a step to increase the number of young, unskilled, and low-skilled workers by drawing on the National Science and Technology Forum (NSTF) series on the NDP's advances (National Science and Technology Forum, 2018: 10). Science and technology, as drivers of development where technology increases productivity and unlocks access to affordable health and education for technological revolutions, remain challenged (NSTF, 2018:10). Thus, developing countries such as South Africa must invest in quality education for the youth, continuous skills training for workers and managers, ensuring shared knowledge as widely as possible across society (NSTF, 2018). The National e-Skills Plan of Action expresses the National Development Plan: Vision for 2030 (see Chapter 3, Section 3.2.3), which focuses on developing the capabilities of South African citizens. The digital strategy presents a vision of a South Africa where citizens can benefit from enhanced digital skills, thereby contributing to a significantly enhanced quality of life, improved education, and higher economic growth (Department of Communications and Digital Technologies, 2020:2). Since ICT is employed, not only in South Africa but globally, the next section discusses education policies on ICTs globally.

3.3 Education Policies on ICTs globally

3.3.1 Introduction

ICT policies differ from country to country depending on the national priorities, the country's level of development, the extent of ICT infrastructure, socio-economic status, geography, demographics, and the importance of regional integration (Bassi, 2011). Education Policies on ICTs serve as a guide on how HEIs should implement ICTs in teaching and learning and how policies help shape their curriculum and pedagogy (Ghavifekr & Rosdy, 2015). Some common principles guiding all good ICT policies and innovations across the globe are highly impactful in moulding policies for education, transforming people's lives for the better, altering learning and teaching to individual needs, and differentiating learning (Snelling & Fingal, 2020). Global ICT frameworks may differ, provided that such frameworks are clear and enable technologies to be integrated, deployed, and used to their fullest potential (King & South, 2017; Roztocki, Soja & Weistroffer, 2019).

Multimedia incorporation in online learning is governed by the various ICT policies across the globe, within the university, and the country of origin of the stakeholders (Montoya & Barbosa, 2020). Therefore, this study benefits from the White Paper for Post-School Education & Training (DHET, 2013). The advancement of multimedia in digital workplaces and the advancement of teaching and learning in various socio-economic, cultural, and educational backgrounds to boost genuine, honest living are becoming prominent (Davidse, 2021). With the variety of COVID-19, unprecedented educational revelations, and amplified inequalities and challenges, Unesco quickly mobilized support to ensure the continuity of learning worldwide by establishing the Global Education Coalition in March 2020. Such coalitions were administered through government, private sector partners, and civil society, employing a mix of technologies to ensure delivery and continuity of curriculum-based study and learning for all (Unesco, 2021). Even though there has been integration, there remains a huge gap regarding ICT and multimedia integration in the higher learning environment.

Engagements on lessons learnt on the greatest risks encountered by education during COVID-19 and drawing strategies to leave no learner behind were elaborated on (Unesco, 2021e). The coalitions further provided spaces for policy dialogue to examine the most pressing challenges, taking into consideration that these coalitions would not replace national responses (Allain-Dupré, Chatry, Michalun & Moisio, 2020). New partner engagements that would not have been obvious partners, such as technology and media organisations, to complement and support national efforts to ensure the continuity of learning would be considered (Unesco, 2021a). Effective distance learning solutions have enabled teachers and policymakers to use multimedia, digital, and technological resources to continue with national lesson plans. In this regard, Unesco has developed several tools that offer best practices, innovative ideas, and recommendations (Unesco, 2021).

With the recent COVID-19 challenges to ICTs in HEIs, such as the non-provision of e-skills since 2012 as proposed by the National e-Skills Plan of Action (NeSPA), the DHET and HEIs must develop feasible significant access to multimedia technologies (DHET, 2013:59). Countries such as China, South Korea, Singapore and India have comprehensive national strategies and initiatives which foster data mining, digital

intelligence, e-commerce, and broadband speeds at 10% (Unesco, 2021). Unesco's education sector studied the policy development process in various countries, inclusive of Rwanda, Namibia, Uruguay, Jordan and Singapore, to assist countries in formulating effective ICT in education policies and, in the meantime, to fortify national limits in the focused-on nations (Unesco, 2015). Countries such as Rwanda, China, and Singapore are visited below:

3.3.2 Rwanda

Intending to improve the quality of education by making ICT an integral part of the curriculum, the University of Rwanda's College of Education integrated ICT skills into its lecturers (Unesco, 2011). The University of Rwanda's College of Education's aim was to help advance and apply their ICT skills, knowledge, and ICT-based pedagogical skills in their practice of distance teaching, learning, and assessment (Unesco, 2021b). ICT skills advancement is vital in the context of a developing country, ensuring that teacher ICT advancement uplifts and benefits schools at large while also benefiting distance learning made possible by COVID-19 disruptions. The University of Rwanda's College of Education Unesco publication, "Ensuring effective distance learning during COVID-19 disruption: guidance for teachers," has reached over 3,700 pre-service and secondary school teachers. A university with advanced ICT skills is critical for multimedia transformation and delivery of teaching and learning, inspiring us to understand the extent to which lecturers enrolled for upskilling, which initially benefits Rwanda's broader society.

3.3.3 China

With the advancement of technologies globally, countries such as China continually develop the advancement of their skills such that Artificial Advancement remains at the forefront of events. The "One College Student Per Village" programme at the Open University of China (OUC) is one of the laureates of the 2020 Unesco King Hamad Bin Isa Al-Khalifa Prize for the Use of ICT in Education. This innovative programme, which was established in 2004 with the Support of the Chinese Ministry of Education, provides an example of how Artificial Intelligence (AI) and associated technologies are successful responses to the shortage of higher education resources and slow

economic development in China's rural and remote areas (Ministry of Education China, 2019 & Unesco, 2021c). Underdeveloped countries can draw inspiration from and reference to this university as it serves as framework for AI integrations, Machine Learning, 3d printing, to name a few. This should be adapted to the benefits of the National Skills plan programme. Recently, it has been confirmed that the University of Johannesburg (UJ) and Tshwane University of Technology (TUT) have intensified AI and confirmed it as compulsory for all registered students (University of Johannesburg, 2022). ViLLE, a collaborative digital learning platform developed by the Centre for Learning Analytics, University of Turku, Finland, is another laureate of the 2020 Unesco King Hamad Bin Isa Al-Khalifa Prize for the Use of ICT in Education (Laakso, 2021). The platform, while ensuring a strong evidence-based approach to utilizing data, learning analytics and AI techniques, supports lecturers and the individual paths of students (Unesco, 2021d).

3.3.4 Singapore

In Singapore, there have been four strategically planned ICT-in-Education Masterplans since 1997, which reflect an evolving plan that better responds to the rapid changes in technology and driving forces affecting education (Chai, Hong & Teo, 2009). The means to implement ICT in Education is strategically aimed at transforming and enhancing ODL teaching and learning and upskilling students for future economies. Four ICT masterplans have been implemented to date, namely Masterplan One (1997 – 2002), Masterplan Two (2003 - 2008), Masterplan Three (2009 – 2014), and Masterplan Four (2015 – present) (Natarajan, Lim & Laxman, 2021). Singapore aims to guide the development of the technological ecosystem and key platforms for learning in primary schools and pre-university institutions (Ministry of Education Singapore, 2021). The Fourth Masterplan for ICT in Education is built on the foundation laid by past plans; thus, it seeks to build and maintain agility in recognition of the emergent and rapid changes in technology from 2020 to 2030 (Ministry of Education Singapore, 2021).

Singapore is the speed champion in the fixed broadband category for June 2019, while South Korea comes in first for mobile bandwidth speed or the 10 top mobile internet connections (Sewnarain, 2019). It is vital that the countries understand the importance

of bandwidth speed, as multimedia audio-visual aspects delivery relies heavily on data and speed (Holslin in Armstrong, 2022). Therefore, as a transitioning bridge from the policies to the multimedia in education, the global multimedia and technology accessibility will be discussed. Additionally, the global multimedia and technology access reveals the influence of various universities that have advanced themselves in enhancements and ICT establishments for their universities.

3.3.5 Global multimedia and technology accessibility

Universities such as the Massachusetts Institute of Technology (MIT), Yale University (United States of America), The Open University (United Kingdom), Open University of Hong Kong and Khan Academy offer free opportunities for interested students to positively benefit from a genuine experience of DE (Armstrong-Mensah, Ramsey-White, Yankey & Self-Brown, 2020). The multimedia framework for ODL in teaching and learning during COVID-19 was inspired by the Ministry of Education and Training (MET) of Tonga that developed a framework for fully utilizing the new fibre optic network infrastructure distributed in the 45 islands enabling the delivery of online learning to Tongans (Abeywardena, Uys & Fifita, 2019).

The India University set up 5000 digital learning centres utilizing the broadband network created by the government to connect one million villages in the Department of School Education and Literacy in India (Ministry of Human Resource Development, Government of India, 2020). To increase the outreach and promotion of ICT-enabled learning, the Indira Gandhi National Open University (Ignou) set up a network of over 200,000 centres with ICT infrastructure across India. Such ICT infrastructure has increased the outreach of TVET through the open university, its digital learning initiatives, and other services (Balakrishnan, Sheshadri, Nagarajan, Unnikrishnan, Kongeseri & Bhavani, 2019). There are multiple relevant, long-established models to guide the selection of media and technologically advanced changes. The significance of multimedia in teaching and learning, as well as higher education research, ensures the provision of answers as required and stipulated in policy documents (Reimers, Schleicher, Saavedra & Tuominen, 2020). Global universities that employ digital means of learning to enhance teaching and learning have inspired the discussion of multimedia in education, which is discussed next.

3.4 Multimedia in education

Multimedia in education requires policies that help guide the practices, otherwise, practices with no governing legislation will have no directive as reference is necessary to lead and support the ideologies that are presented by the practices. Multimedia in education is worldwide integrated, thus drawing from other countries' legislation that is useful for benchmarking purposes. It is vital that the introduction section discusses the subheadings.

3.4.1 Introduction

Multimedia in education discusses substantial reasons for the necessity to use different media for teaching and learning in ODL, where in-depth descriptions of multimedia are elaborated and put in context. Further from the descriptions is the discussion on different tools and media and their applications to address current teaching and learning theory and practice in ODL. This section discusses the advantages and disadvantages of using multimedia.

3.4.2. Definition and descriptions

As discussed in Chapter 1, Section 1.11, multimedia is the use of a computer to present and combine text, graphics, audio, and video in an integrated way with links and tools that let the user navigate, interact, create, and communicate (Hofstetter & Fox, 1995). Multimedia is the use of a computer which enables the content to be structured and presented differently (De Sousa, Richter & Nel, 2017). Multimedia definitions vary depending on technology, but texts, graphics, animations, video, and sound remain common (Smeda, Dakich & Sharda, 2014). Multimedia requires computer hardware and software to ensure an effective user experience when reviewing and working on a multimedia presentation, an interactive web product, or a live lecturer (Abdulrahaman et al., 2020). With COVID-19 enforcing remote online distance teaching and learning, many multimedia presentations are broadcast remotely by way of live video recordings on various live video streaming platforms and delayed broadcasted media platforms or websites (Miao, Huang, Liu & Zhuang, 2020).

Since educational multimedia can be used as effective learning objects, learning with multimedia can foster different aspects of learning to the benefit of both the lecturer and the student. Multimedia foster cognitive aspects of learning, a deep approach to learning, and it increases motivational collaborative or social-cognitive aspects of learning (Schneider, Beege, Nebel, Schnaubert & Rey, 2021). With multimedia use in education, the purpose of multimedia and its use must be established to provide a didactic approach towards teaching strategies by lecturers for students' cognitive benefits (Puspitarini, & Hanif, 2019). This indicates that multimedia is beneficial for various aspects of education, such as interactivity, knowledge construction, and learning, which remain vital. As HEIs have struggled to adapt to online teaching, they should invest in the professional development of their faculty teachers (Knoster, 2021; Rapanta et al., 2020:942). Lecturers must be updated on effective pedagogical methods with or without using online technologies (Knoster, 2021; Rapanta et al., 2020:942). With the collaborations and access to information using multimedia technologies, the next section discusses different multimedia tools and their applications to HE.

3.4.3. Different multimedia Tools and their applications in HE

Multimedia technologies vary according to their offering, target market, purpose and intention. Multimedia such as audio-visuals, graphics, animations and simulations may be accessed on different platforms such as social media (Facebook and YouTube serve as examples), open educational resources (OER), and various other platforms on the internet (Department of Communications, 2011:7). The various other means to access all these multimedia technologies and formats are through the use of digital devices such as mobile smartphones, tablets, and e-readers, as well as mobile devices, to enable instructors and students to access and apply knowledge in a wide variety of ways (Valizadeh, 2022). The advancement of multimedia technologies empowers and enhances students, giving the end user much more control over accessibility and knowledge creation and sharing, which is essential for HEIs (Alam, 2022). This is particularly important as employment work changes and advances in various forms, more global networks and supply chains emerge, and the need for skills development and learning on the job becomes clear (del Carpio, Cuesta, Kugler, Hernández & Piraquive, 2022). Work advancement includes the following: more

project-based work and new human-to-technology relationships that flatten organisational structures such as Artificial Intelligence (AI), Augmented Reality (AR) and digital gamification, drones, audio-visuals, and 4IR. These, in general, require skills development and advancement (Paolo & Bobrova, 2022).

This study envisions DHET and the HEIs boosting the ICT infrastructure capacity, multimedia training, and constant upgrades to afford installations to alleviate data costs and allow accessible education globally. In a world dominated by ICTs, the shortage of e-skills and digital ICT infrastructure enabling multimedia technologies to thrive is vital to affect competition in a global world (Department of Communications, 2012:3). As a means of promoting ICT-based learning, upgrades of multimedia and ICT infrastructure, training the trainer on ICT and multimedia skills, and pedagogy are all essential to ensure effective ICT adoption (Balakrishnan, Sheshadri, Nagarajan, Unnikrishnan, Kongeseri & Bhavani, 2018). The United Nations Sustainable Development Goals (SDGs) reiterated the urgent need for improved inclusion in skills development among socially and economically vulnerable groups to strengthen the prospect of decent employment and income generation (United Nations, 2015). The next section discusses the advantages and disadvantages of using multimedia.

3.4.4. Advantages and disadvantages of the use of multimedia

Employing multimedia technology as a means of enhancing online learning is appropriate and good, but its adaptability, innovation, and implementation require understanding from the user (Rapanta, 2020). Thus, e-skilling becomes a major necessity as the inability to make use of available multimedia technologies proves wasteful (Muthuprasad, Aiswarya, Aditya & Jha, 2021).

An educational program's strength and quality will be determined by its educational pedagogy, not by the incorporation of ICT innovations such as multimedia videos, which can sometimes be used inadvertently or as a gimmick (DHET, 2013:53). Implementation of multimedia into teaching and learning requires further probing, such as understanding the environment, data, location, skills regarding students, lecturers, the HEIs, and the DHET in any country (Rapanta, 2020). It is continuously practical to understand the advantages and disadvantages before implementation, to particularly

consider the consequences, and to mitigate risks where possible. Another fundamental responsibility of the lecturer applying multimedia technologies is ensuring that they follow correct pedagogical approaches; otherwise, it would just be making use of flash animations and technologies with no depth of pedagogical gains for the students (Fry, Ketteridge & Marshall, 2008).

Lecturers need to further search for participants' different approaches and perspectives on educational multimedia learning (Andresen, & van den Brink, 2013). The advantages and disadvantages of multimedia further guide the choice of multimedia. Therefore, the characterizing content to be learned from the advantages and disadvantages and which didactic methods to employ are discussed next (Andresen & van den Brink, 2013). Below are the advantages of using multimedia.

Advantages of multimedia usage in education

Multimedia products can be used to represent and process various types of knowledge and foster students' construction of their knowledge. Multimedia products help students and lecturers develop skills related to various subjects by accessing or producing digital representations of knowledge and other core competencies (Abdulrahaman et al., 2020). Through multimedia products, students can develop skills in developing, designing, producing, programming and motivating learning activities, communication abilities, social competencies, as well as learning competencies, values and ethics (Khvilon & Patru, 2018; Sword, 2020). Often, it is visually appealing to utilise educational multimedia presentations with images or animations above static texts, evoking emotions to complement the information presented (Abdulrahaman et al., 2020).

Multimedia provides flexibility for HEIs, where students can adjust their learning processes according to their abilities, preferences, pace, and interests. The use of multimedia can be tailored to the students' differences in interests, social and cultural backgrounds, learning preferences, and rates (Andresen & van den Brink, 2013). Another benefit is how multimedia creates effective teaching and learning environments through flexibility, particularly in applying inclusivity for students with special needs where computer devices offer diverse flexibility to improve student

access to information noticeably (Darling-Hammond, et al., 2020). Multimedia is motivated by the DE component of being self-directed and aligned to ODeL, which enables students to discover their own strategies for learning (Bergamin, Bosch, Du Toit, Goede, Golightly, Johnson, Johnson, Kruger, Laubscher, Lubbe & Olivier, 2019).

Multimedia can be used to address interactivity and feedback, which come in three forms which differ in user control (Rhodes, & Azbell, 1985). The first form is the Reactive interaction, where there is little learner control of content structure with program-directed options and feedback for basic stimulus-response interactions (Rhodes, & Azbell, 1985). The second form is the Proactive interaction, where the learner controls the structure and content. The third form is the Mutual interaction providing learner control for sequence, pace and style (Rhodes & Azbell, 1985). Multimedia provides student/lecture interaction through various platforms, such as online discussions, allowing for different ways of working for lecturers and students using interactive and collaborative tools with feedback options (Reimers, Schleicher, Saavedra & Tuominen, 2020). The interactivity and feedback aspect of multimedia relates to a Constructivist approach (see Chapter 2, Section 2.3.3), where lecturers and students both play an active role in the teaching and learning process. Multimedia applications can be used as one out of many learning environments, such as different learning situations where students are pondering over the subject matter and engaging in a dialogue with peers and lecturers concerning their learning experiences (Mohabier, 2017). Although both student and environmental factors are considered important by behaviourists, environmental conditions receive the most significant emphasis (Ertmer & Newby, 2017).

Learning is done through personal experiences with suitable learning materials, whilst the lecturer's role is interactive and through dialogue with students (Shah & Khan, 2015:357). Lecturers use new and effective modes, and ways, and designing thoughts into multimedia teaching practice (Shah & Khan, 2015:357; De Sousa, Richter & Nel, 2017). Since Constructivism allows students to construct knowledge rather than just passively taking in information (see Chapter 2, Section 2.3.3), Multimedia allows lecturers to employ knowledge construction, ensuring the construction of meaningful and understood knowledge (McLeod, 2019). Multimedia additionally allows the application of knowledge and knowledge about learning (McLeod, 2019).

Multimedia products and online services provide many opportunities for effective learning through several perception channels during the learning process and hereby anchor information processing with several senses (Andresen & van den Brink, 2013). Such senses are simulations, and visualisations, stimulating students' cognitive structures and interpretations by embedding the content in the broad environmental context and fostering collaborative learning through online discussions (Peterson, Dumont, Lafuente, & Law, 2018). Most learning concepts agree that two factors, such as social contacts and relationships with people, as well as learning objects such as videos, audio, and graphics/text, are essential to learning (Peterson, Dumont, Lafuente, & Law, 2018). Behavioural theories imply that teachers ought to arrange environmental conditions so that students respond properly to presented stimuli (Ertmer & Newby, 2017). With the teaching and learning theories feeding off each other in the context of this study, Connectivism is about connections between students (humans) and media (non-humans), whilst Cognitive theories emphasize making knowledge meaningful and helping students organize and relate new information to existing knowledge in memory (Ertmer & Newby, 2017). From the advantages and accessing multimedia products or even engaging in online discussions, there are huge obstacles. These include the self-regulation of students, limited bandwidth in rural areas, affordability, and lack of access. Thus, multimedia disadvantages are discussed next.

Disadvantages of multimedia usage in education

Even though COVID-19 remote learning enforced the increase in interactivity between the learner and the lecturer through multimedia applications, feedback is still restricted compared to the elaborated human-human interactivity (Atiku, 2021). A remote online facilitation approach assists in student-confidence-building strategies that could be transferred into everyday practice (Reimers, Schleicher, Saavedra & Tuominen, 2020). Even though multimedia can be read and accessed everywhere, it is not always user-friendly to read massive notes on computer or other device screens (Halamish & Elbaz, 2020). Additionally, creating/producing multimedia can be time-consuming, and some lecturers and students might be unable to configure hardware and software (Gattupalli, 2019).

Scholarly research has proven that online distance learning compels adult students to be "self-directed, self-regulated as well as self-motivated" (Organisation for Economic Co-operation and Development, 2020). However, some students cannot handle the self-regulated learning freedom provided by hypertext-based multimedia (Seufert, 2018). Because lecturers are constantly trying to enhance the strength of their teaching, experiences and research reveal the constant challenges they often encounter towards deciding which multimedia programme is the best and appropriate deliverable to employ (Moore & Kearsley, 2012: 81). Most multimedia programmes are suitable for various courses; hence, it is important for the lecturer to decisively incorporate a multimedia product for a specific course or programme deliverables (Moore & Kearsley, 2012: 81). Multimedia technology performs many of the cognitive operations previously performed by students. In many moments, performance is needed without complete understanding but also requires specific hardware devices that might be costly (Mattar, 2018). Non-linear structured multimedia and a massive amount of cognitive load of information provided by multimedia applications may cause distraction during learning (Buchner, Buntins & Kerres, 2021).

To conclude, the table below is a summary indication of both the advantages and disadvantages of multimedia in education. Lecturers need to understand which forms of media to employ for ODL in teaching and learning. With these advantages and disadvantages, lecturers should be able to identify multimedia best practices to utilise particularly in an ODeL context.

Multimedia Advantages	Multimedia Disadvantages
1. Multimedia provides student/lecture interaction.	1. Feedback is still considered restricted compared to the elaborated human-human interactivity.
2. Multimedia is used for learning and knowledge construction.	2. Multimedia is not always user-friendly to read massive notes on Computer/Device screens than reading from hard-copy.
3. Multimedia products help students and lecturers develop a variety of skills for various benefits.	3. Some students are not able to handle the self-regulated learning.
4. Multimedia provides flexibility for HEIs, lectures and students.	4. Creating/producing multimedia can be time-consuming.
5. Multimedia products assist with developing, designing, producing, programming and motivating.	5. Lectures/students are not always able to configure hardware and software.

6. Multimedia presentations are relatively visually appealing for educational resources

7. Multimedia products and online services provide many opportunities for effective learning through several perception channels

8. Multimedia emphasises environmental conditions, provides engagement and gives rise to related teaching strategies

9. Multimedia emphasises dialogue, interactivity and collaborative tools with feedback options

10. Multimedia provides many opportunities for effective learning

6. Multimedia applications may cause distraction during learning.

Table 3. 1 Multimedia advantages and disadvantages in Education (Ertmer & Newby, 2017)

3.5 SUMMARY

The chapter introduced the policies supporting multimedia technologies in South Africa, guided by the White Paper for Post School Education within the South African government context. Since the provision of DE in South African universities in the context of an integrated post-school system policy provides and expands the quality of DE, it was imperative that this DE teaching and learning and multimedia study employ it. Contextually, it provides the distinctiveness and purpose of distance learning in HEIs. As this is a multimedia study in an ODL environment, it is fitting that the National e-Skills Plan of Action serves as a guide for all forms of ICT to achieve equitable prosperity and global competitiveness to improve life opportunities across sectors, including higher education.

This study refers to the COVID-19 disruptions, in which the Rwanda solution-driven university provided effective academic solutions. Having experienced how ineffective data and network issues are in rural areas, China inspired this study with solutions towards Artificial Intelligence integrations, Machine Learning, and 3D printing, which most HEIs should adapt to for ODL teaching and learning purposes. The importance of data, Wi-Fi, and its affordability draw interest to the study, as Singapore is on a path to ensuring all citizens have access. Multimedia in education defines why multimedia is needed in education and how different tools can help add value while highlighting

the disadvantages and disadvantages that come with it. Even though the multimedia is expanded on, data collection helps figure out the participants' views on it, whether they see the value, require upskilling, and their ability to effectively adapt it in an ODL teaching and learning format. Therefore, all the exploration is established within the next chapter through the research design and methods relevant to the study.

CHAPTER

4 RESEARCH DESIGN AND METHODS

4.1 INTRODUCTION

Since the preceding chapters discussed the theoretical framework and literature related to the study, this chapter focuses on research methodology and design. Research design and methods entail a plan to answer research questions and strategies to implement such a plan, and their value in educational research remains vital. This chapter discusses in depth the research design and methods for gathering quality data, ensuring that the methods match the aims and analysis of the data to answer research questions. Research design and methods add impact by utilizing credible sources and drawing valid and trustworthy conclusions, which add value to broader educational research. This chapter describes the aspects of research design and methods starting with the rationale for empirical research, where the research questions are visited to bring the vision to why the study was conducted. Research paradigms are briefly visited and are followed by the relevant research design, research approach, and research type that this study employed in selection and sampling. Data collection is also discussed, including the document analysis of open-ended questionnaires and semi-structured interviews. The analysis of all the collected data is described. Finally, ethical measures and trustworthiness are elaborated on prior to concluding the chapter.

4.2 THE RATIONALE FOR EMPIRICAL RESEARCH

COVID-19 accelerated the rationale for the use of multimedia and ICTs to support teaching and learning in HEIs in an ODeL context, thus enhancing the standard of education globally. This study is not only about the literature but also about hearing the voices of relevant participants on the use of multimedia in education to develop a multimedia framework. Remote working in various HEIs demonstrated flexible education as an option to promote equitable, accessible, and creative education (Ali, 2020). However, remote working requires an ICT upgrade and a redefinition of the teacher training model to encourage learning anywhere, anytime (Valverde-Berrocoso, Fernández-Sánchez, Revuelta Dominguez & Sosa-Díaz, 2021). The

COVID-19 pandemic's experiences, challenges, and opportunities aided in the pursuit of advancement and strategic development plans for the successful implementation of multimedia and ICTs towards positive evolution and change (Zalat, Hamed, & Bolbol, 2021).Thus, grounded in theory, this research study is aimed at developing a post-COVID-19 pandemic multimedia framework for teaching and learning in Open Distance eLearning in South Africa to answer the following main and sub-research questions:

How can a post-COVID-19 pandemic multimedia framework be developed for teaching and learning in Open Distance eLearning in South Africa?

Secondary questions

- What are the experiences of lecturers in ODL regarding teaching and learning with multimedia during COVID-19?

- How has multimedia online impacted pedagogy during COVID-19?

- How is multimedia supporting teaching and learning at ODL in South Africa?

- What are the recommendations for the inclusion of multimedia in teaching and learning in ODeL post-COVID-19?

- What are the key elements of a post-COVID-19 pandemic multimedia framework for teaching and learning in ODeL in South Africa?

In the next section the elaborative description of the research paradigm is provided.

4.3. THE RESEARCH PARADIGM

Thomas Kuhn (1962 in Flick, 2009: 69) described the paradigm as "an integrated cluster of substantive concepts, variables and problems attached with corresponding methodological approaches and tools…". According to Olsen, Lodwick and Dunlop, (1992:16), a paradigm implies a pattern, structure, framework, or system of scientific and academic ideas, values, and assumptions that add to how the world is viewed

(Olsen, Lodwick, & Dunlop, 1992:16). Research paradigms define approaches to social science research (Taber, 2013:287).

All paradigms are underpinned by certain ontological, epistemological, and methodological assumptions (Guba & Lincoln, 1994:107). Ontological assumptions deal with the form and nature of reality, as well as what can be known about it. Ontological assumptions seek to know "how things really are" and "how things really work" (Guba & Lincoln, 1994:108). Epistemological considerations deal with conducting a qualitative study where researchers try to get as close as possible to the participants being studied with the intention to strengthen the relationship between the inquirer and the participants to fulfil the phenomenon (Guba & Lincoln, 1994:108).

The research paradigms are classified into three main paradigms: positivism, interpretivism, and critical social science (Okesina, 2020). There are three common key features of these three paradigm perspectives: the worldview, the nature of knowledge pursued, and the different means by which knowledge is produced and assessed within each paradigm or worldview (Thomas, 2010). As indicated in Chapter 1, Section 1.6, this study used an interpretivist paradigm to particularly seek an understanding of the world in which the participants of this study live as well as revealing their perceptions and experiences (Creswell, 2007:2). The participants' experiences were employed to construct and interpret the researchers' understanding, seeking situational distinctiveness and comprehension to interpret the meanings constructed throughout the collected data (Nieuwenhuis, 2007: 59). As indicated in Chapter 1, Section 1.6.1, below is the elaboration of what Interpretivism entails.

4.3.1 Interpretivism

Interpretivism gives insights into addressing the aims and objectives of the research and is guided by the questions (see Chapter 1, Section 1.5) such as 'why' and 'how' particular technological trajectories are created (Deetz, 1996). The characteristics of interpretivism, as used in this study, are categorised into the purpose of the research, the nature of reality (ontology), nature of knowledge and the relationship between the

inquirer and the inquired-into (epistemology) and the methodology used (Cantrell, 2001).

Interpretivism allowed me to gain an in-depth understanding of the phenomenon and its complexity in its unique context instead of trying to generalise the base of understanding for the whole population (Creswell, 2007). This paradigm addresses essential features of shared meaning and understanding (Thomas, 2010). The table below provides an overview of how the study has adapted the characteristics of Interpretivism.

Interpretivism Characteristics	Adapted Characteristics of Interpretivism
Ontology	• Since reality can be explored and constructed through human interactions, this study sought such multiple realities and meaningful actions through the selected four colleges and three support departments to establish participants' knowledge, views, interpretations and experiences. • The researcher discovered how the participants made sense of their social worlds in the natural setting using daily routines, conversations and writings (either in text or visual representation) while interacting with others.
Epistemology	• Events are understood through the mental processes of interpretation that are influenced by interaction with social contexts. • The researcher collected data, which added to this progress of the research study, and was socially constructing knowledge by experiencing real life or natural settings. • The researcher focused on each participant and applied a more personal, interactive mode of data collection approach being interactively interlocked into an "Inquirer and the inquired-into" an interactive process of talking and listening, reading and writing.
Methodology	• Processes of the data collection approach were interviews, document analysis, and open-ended questionnaires.

Table 4. 1 Adapted Characteristics of Interpretivism (Cantrell, 2001).

In this research, the interpretive approach encouraged me to engage in the activities and discern the meanings of actions expressed by participants within specific social contexts (Carr & Kemmis, 1986: 88). The next section focuses on the research design.

4.4 THE RESEARCH DESIGN

There are five research designs applicable to qualitative studies: narrative research, phenomenology, grounded theory, ethnography, and case studies. This study incorporated a single case study involving one ODL HEI to establish multimedia integration in ODL during the COVID-19 pandemic (Yin, 2003). The purpose of case study research is to capture "a thick description" while considering the social context of the phenomenon and the individuals being studied (Kuper & Kuper, 2004: 92; Yin, 2011: 4). Thus, the case study and participants in this study gave insight into the phenomenon of multimedia in ODeL during the COVID-19 pandemic.

As is typical of a case study, open-ended questionnaires, virtual and face-to-face interviews, and document analysis were employed to collect data for a detailed understanding of multimedia and ICT integration in an online DE teaching and learning environment (Yin, 2009:101-106; Creswell, 2012: 465). The study, as a qualitative approach study employed a qualitative case study which was instrumental in this research, as it enabled different sources and approaches to information collection (Stake, 2005:445). The qualitative case study also supported exploring the multimedia and ICT integration in ODeL HEIs during COVID-19 (Stake, 2005:445). This study employed open-ended questionnaires, semi-structured interviews, and document analysis for data collection, as is characteristic of a case study (McMillan & Schumacher, 2010:345–346). Data was collected with the intention of exploring the main principle of utilising and integrating multimedia in an ODeL environment (Stake, 2005:45). This phenomenon was achieved by interrogating the participants who utilised the multimedia in an ODeL perspective during COVID-19. Data collection was achieved through participant interaction and consistent reflection on data (Stake, 2005:45).

4.5 THE RESEARCH APPROACH

Qualitative research requires educating readers about the intent of qualitative research, mentioning specific designs, and carefully reflecting on the researcher's role in the study (Creswell, 2018:179). There is an ever-expanding list of types of data sources using specific protocols for recording data in qualitative research (Creswell,

2018:179). Analysis of the information through multiple steps and documentation of the methodological integrity or accuracy of the data collected is a vital component of qualitative research (Creswell, 2018:179). This qualitative study aims to research and reveal unknown issues about the problem (Domegan & Fleming, 2007). I employed data collection methods when interacting with participants in fieldwork to understand the participants' experiences of multimedia and ICT integration in online DE teaching and learning during COVID-19 (Denzin & Lincoln, 2005: 3–4; McMillan & Schumacher, 2010: 12). With the study confirmed as qualitative, naturalistic, and interpretive, I wanted to personally build understanding and relationships with the research participants (Snape & Spencer, 2003:3). Interpretivism is deemed to understand the world in which the participants of this study live as well as allowing their perceptions and experiences (Creswell, 2007:2).

Qualitative research expands on the data analysis steps and methods used for presenting the data, interpreting it, validating it, and indicating the potential outcomes of the study (Creswell, 2018:180). In contrast to other designs, the qualitative approach includes comments by researchers about their role and their self-reflection, as well as the qualitative strategy they employed (Creswell, 2018:180). Qualitative research also involves discussing the study's sample and the overall data collection and recording procedures. Chapters 5 and 6 reveal how the findings were documented and how patterns emerged from the collected data as characteristics of qualitative research (Yin, 2011:8). The following section elaborates in detail on the research methods.

4.6 THE RESEARCH METHODS

Qualitative research methods encompass all the strategies, processes, or techniques used for data collection in order to discover new information and better understand the topic under consideration. The in-depth analysis of how the participants were selected, sample size, interviews, questionnaires, and document analysis are all part of the strategies and process to uncover the enquiry. This section describes and reveals how interviews with participants were conducted, allowing for flexibility in their responses while being intentionally immersed in their worlds and studying their contextual conditions (Yin, 2011:8). The section presented all the various data collection methods

that this study explored and participants' views and experiences on how remote learning was impacted by the COVID-19 pandemic in a manner that reflected their realities (Yin, 2011:8).

4.6.1 Selection of participants

As the researcher in this study, I am employed at Unisa as a media compiler and is also a student, which granted me an opportunity to engage with the participants, who were academics, and support administrative staff members from Multimedia, Tuition Support & Facilitation of Learning/Instructional Support Services (Continuous Professional Development (CPD Office)) as well as ICT. I was also able to access participants' contacts through the Unisa Institutional Search Directory with the approval of Unisa's Research Permission Subcommittee (see Appendix G) and employing the gatekeeper option. Gatekeepers are members of the research site who could be in senior positions and would play a crucial role in securing and locating suitable participants at the research site (Hammersley & Atkinson in Creswell, 2012:211).

In qualitative sampling, the choice of the participants is based on their understanding of the research phenomena and how they would provide information on the topic of investigation (McMillan & Schumacher, 2010:326). For this study, information-rich participants were identified to answer the study's main and sub-research questions using purposive sampling. On consolidating the list of participants for interviews and questionnaires, the participants were contacted by email. The participants from the four selected Unisa colleges and three Unisa support departments were purposefully chosen based on the inclusion criteria, which is ordinarily referred to as snowball purposive sampling (Cohen et al 2011:158). Purposive sampling entails contacting participants who meet the criteria for inclusion in the study (Polit & Beck, 2017:741). The purposive sampling was based on selected staff members' knowledge of the context of the systematic investigation as indicated in Chapter 1, Section 1.7.1 (Cohen, Manion & Morrison, 2011: 218–221). Purposive sampling entails contacting participants who meet the criteria for inclusion in the study, where knowledgeable people have in-depth knowledge about particular issues (Cohen, Manion & Morrison, 2018:219). With purposive sampling, researchers use their discretion to select suitable

participants for the study based on their knowledge of the context of the systematic investigation. Participants meet the criteria for inclusion in purposive sampling based on their professional roles, power, access to networks, expertise or experience (Cohen, Manion & Morrison, 2018:219).

Much went into the selection process to avoid choosing the nearest neighbour to serve as a participant (Cohen et al., 2018:218). The selection criteria applied were the participants' level of experience and skills, their qualifications, their role, their challenges, and the solutions they used to mitigate the difficulties encountered when employing ICT and multimedia during the emergency COVID-19 remote learning. I selected four Unisa Colleges for this study, which were: The College of Education, the College of Human Sciences, the College of Science, Engineering, and Technology, as well as the College of Economic and Management Sciences.

This study employed three questionnaires from the College of Education, where two participants participated in interviews on MS Teams whilst the third participant only completed the questionnaire. At the College of Human Sciences, one participant opted for an online interview on MS Teams, while another opted for a questionnaire. The Acting College Dean at the College of Human Sciences also opted for an online interview with MS Teams. From the College of Science, Engineering, and Technology, only one participant and the college's acting Dean agreed to the interview on the MS Teams online platform. Other CSET participants were not available for the requested time slots. The College of Economic and Management Sciences had one participant who responded to the questionnaire, while the Dean agreed to the MS Teams online platform interview. Additionally, after seven interviews from the four colleges, the study reached saturation as the interview phase of the data collection intensified. There were fifteen participants inclusive of support and academic staff in total for this study. There were four Lecturer participants, four college deans as well as three support staff member participants. Deans were referred to as D1, D2, D3 and D4, respectively, with the common alphabet D, which stands for Dean, before each number, with no mention of the colleges they represent due to the protection of their identities and anonymity.

The lecturers, as participants, were selected to share their experiences during COVID-19 when they had to work remotely and online whilst utilising the ICT infrastructure of

unfamiliar multimedia technologies they needed to adapt to. The specific academic staff participants were selected from seven college lecturers who were actively involved in modules that involved online activities or modules that they facilitated. Secondly, the study selected six college lecturers with at least three years of experience in online teaching. Thirdly, seven selected college lecturers are computer literate. Lastly, the study established how the selected seven college lecturers adapted to recent technologies, remote work teaching, and their experiences in teaching.

Additional interviews were held with participants from the three support centres, where each centre had one participant interviewed (interview schedules on Appendices A, B, C, and D). From the Multimedia (one participant) and Tuition Support & Facilitation of Learning/Instructional Support Service (CPD Office) (one participant), participants were selected. The ICT infrastructure participant was selected, as were four college deans representing the selected colleges. Support divisions remain vital within HEIs due to the role they play within the context of remote ODL as well as teaching and learning support. The COVID-19 pandemic impacted the vital roles played by support divisions, particularly Multimedia, Continuous Professional Development (CPD Office), and ICT. The following reasons applied when interviewing administrative support staff and Deans of Colleges.

1. The college deans were selected for interviews to explore how management supported the academics during the COVID-19 remote learning and how they supported the multimedia implementation/ integration into teaching and learning. Since the secondary questions mostly seeks to establish the academics challenges, insights and particularly lecturers' experiences on ODL, it made sense that the deans were also interviewed to review their perspective executive overviews even though there is no secondary question directed to management.

2. The ICT infrastructure representative selection was due to the role ICT plays in the academic project and ICT responsibility for appropriate ICT Infrastructure upgrading within the institution and its implementations/integration at Unisa.

3. The multimedia representatives were selected as they have either dealt with technology in terms of exploring service provision for multimedia content creation and audio-visual specification or trained the lecturers with appropriate

technologies to enhance online remote teaching and learning during COVID-19.

4. The Curriculum Professional Development (CPD) Office representatives were selected as they have either dealt with technology in terms of exploring or training the lecturers with appropriate technologies to enhance online remote teaching and learning during COVID-19. Since the secondary questions seeks to establish the value, challenges and overall insights of academics around teaching and learning, the questions are also inclusive of CPD due to the multimedia and technology support point they render to the academics and teaching and learning at large.

The next section substantiates my research site of choice.

Research site: Four selected colleges as well as three Unisa support departments

The study's research site are the four selected colleges as well as three Unisa support departments. At Unisa, an ODL institution, lecturers use online teaching and learning, moving away from a blended approach. Thus, all four of Unisa's colleges and its three support departments were deemed suitable as research sites. Within the changing context of working remotely, it became apparent that multimedia and ICT integration in teaching and learning remain a top priority globally (Organisation for Economic Co-operation and Development, 2020). The following section will explore the data collected on the research site and how the study dealt with it.

4.6.2 Data collection

This study employed open-ended questionnaires, semi-structured interviews, and document analysis as the three methods to collect data. The instruments this study used were questionnaires (see Chapter 4, Section 4.6.2.1), interviews (see Chapter 4, Section 4.6.2.2) as well as document analysis (see Chapter 4, Section 4.6.2.3). The questionnaires and interviews were used simultaneously. Document analysis followed for cross-reference purposes. In qualitative studies, data are often collected and analysed before moving to the next participant; however, due to inevitable challenges and constraints, this study chose the multi-stage and simultaneous data collection

protocol (Yu, Abdullah & Saat, 2014). This study simultaneously collected data from questionnaires with open-ended questions and conducted individual online interviews, with document analysis followed later for cross-referencing and triangulation (Schoonenboom & Johnson, 2017).

To explore the research questions, I interacted directly with the participants, who could relay their social world experiences regarding their multimedia and ICT integration in ODL during COVID-19 (Snape & Spencer, 2003:3; Yin, 2011:8). For data collection, the choice of employing questionnaires and interviews remains the main preferred characteristic of qualitative research (Yin, 2011a:8). This liberated participants to express their views and experiences freely and openly (Yin, 2011:8). For interviews that were relevant to the study, as mentioned in Chapter 1, Section 1.6.2, and Chapter 4, Section 4.5, I allowed participants the freedom to respond and provided flexibility on emerging unplanned topics that were not reflected on the initial interview schedule (Yin, 2011:8).

4.6.2.1 Open-ended questionnaires

Although questionnaires and interviews were data collection instruments, there was a difference between the two. Where questionnaires are more rigid, interviews are open and flexible, allowing participants and the interviewer to explore more follow-up questions and probing (see Chapter 1, Section 1.7). Questionnaires can be sent to larger numbers of participants; they give the participant time to respond remotely and serve as the most affordable and efficient form of data collection instruments (Ozil, 2021). All the data that were received from the different instruments differed and complemented each other in such a way that questionnaires and interviews could both be conducted remotely with the flexibility of remote online meetings (Ozil, 2021). Interview questions could be altered, whilst the questionnaire questions could not. An in-depth discussion of the data from the interviews and the questionnaires is discussed in Chapter 5, Section 5.2.2. The study's questionnaires (see Appendix E) took the form of mainly open-ended questions, which Creswell (2013:138) points out as a form of questioning when collecting qualitative data (Creswell, 2013:138). The purpose of closed questions in this study meant getting biographical data for the lecturer participants, obtaining facts, and focusing on specific information (Canals, 2017).

Open-ended questions allowed the participants to respond in a manner they felt suitable; however, a suitable sequence of questions for one participant was less suitable for another (Cohen et al., 2018: 273). The open-ended questions can be regarded as an attractive strategy for smaller-scale research or for those sections of a questionnaire that invite honest, personal comments from participants in addition to ticking numbers and boxes (Cohen et al., 2018: 478).

The nature of the questions further allowed participants to freely express their views and experiences of online teaching and learning in DE. Open-ended questions enabled important but unanticipated issues to be raised, thus enabling the participants' responses to display depth and authenticity as their responses were based on their realities of online remote learning in DE. This is in line with qualitative research (Cohen et al, 2018: 273). The selection criteria varied based on a questionnaire, establishing the lecturer participants' level of experience and skills, their qualifications, their encounters, and how they mitigated challenges (see Chapter 1, Section 1.7.1 & Chapter 4, Section 4.6.2.1). Additionally, questionnaires revealed how this study's participants' experiences were and what best practices were applied when employing ICT and multimedia during the emergency remote COVID-19 phase. Questionnaires were sent to twenty academics/lecturers from the four selected colleges, with only seven lecturers responding to the questionnaires; three lecturers could not conduct follow-up interviews, citing their busy schedules. Therefore, the three lecturers opted to respond to the questionnaires online, fill them out, and send them back without engaging in an interactive interview online or physically. Four lecturers opted for interviews and filled out the questionnaire during the interview session. I conducted a pilot study for the questionnaires, as explained below.

Piloting and administering the questionnaire

Piloting and pre-testing a questionnaire is key to the success of the study. This study's success is guided towards ensuring the validity, clarity, and effectiveness of the questionnaire instructions and items regarding the main and sub-research questions (Cohen et al., 2018:570). The wording of the questionnaires was of paramount importance, and pre-testing was crucial to the success of this study. The piloted questionnaires are regarded as fundamental to the questionnaire's success for further

exploration of the phenomenon to provide clarity and greater depth (Cohen et al., 2018:96). Employing the questionnaire piloting mitigated repetition as well as redundant or irrelevant questions, leading questions, commonly misunderstood questions, and non-completed questions (Cohen et al., 2018:161 & 496). However, as a researcher, I had to be wary of the tendency to dismiss the questions as irrelevant and to accept deception as a matter of course (Cohen et al., 2018:132).

The questionnaire was piloted with two participants within few days apart who met the study's inclusion criteria but did not become part of the study. The pilot study improved my data instruments (Yin, 2011a:37). Changes were required after the pilot study. Furthermore, there were required amendments and improvements to the questionnaire after the sequential reformulation of questionnaires regarding the biographical information of lecturer participants and teaching and learning information employing multimedia tools. There were improvements based on the feedback from participants; the questionnaire was deemed final and ready for redistribution to the relevant participants. There were no changes in anticipated outcomes from the piloted questionnaires.

From the onset, the questionnaires were distributed and coordinated by email as I requested interview participation from various college lectures. The final questionnaire (see Appendix E) was sent to each participant who accepted the invitation to participate in the study. As stated in Chapter 4, Section 4.6.1, the study reached saturation and did not receive a hundred per cent anticipated response rate from participants. Due to a variety of reasons, such as research commitment or busy schedules, some participants returned the completed questionnaires, whilst some participants opted to be interviewed online to allow conducting further probing where necessary (see Chapter 4, Section 4.7).   The following section discusses semi-structured interviews.

4.6.2.2 Semi-structured Interviews

All the interviews provided an in-depth representation of the participants' beliefs, perceptions and accounts of online learning in their respective disciplines (Greef, 2005:296). This study conducted interviews for lecturer participants, deans, and

support staff members with the intention w to get the impact of how multimedia has impacted teaching and learning.

The intention of conducting semi-structured interviews was to gain an understanding of support from a teaching and learning perspective (Greef, 2005:296). Additionally, the intention was to establish the processes underpinning the use and training of multimedia and ICT usage at the research site. The study employed an interview schedule (see Appendices A, B, C, and D) that was used during the interview session. The interviews serve to provide for the discussion of any unscheduled, unplanned and unforeseen topics relating to the research questions. While drafting the interview schedule, research questions served as a basis to cover a broader perspective that would contribute towards the open-ended questions (Holsten & Gubrium, 1995 in Greef, 2005:296). The interview schedule was developed to give myself as the researcher sufficient time to review it, avoiding encountering challenges such as sensitive or improper wording (Greef, 2005:296).

4.6.2.3 Document analysis of Unisa policies

Organisational policies are analysed in Chapter 5, Section 5.3. Policies analysed included the curriculum policy, tuition policy and CT policy. The policies across all HEIs are guided by the DHET policy framework, which this study refers, with specific targets determined at an institutional level (Department of Higher Education and Training, 2020-2025). The selected documents provided a thorough understanding of how Unisa was guided in teaching and learning, particularly with multimedia and ODeL, towards remote online teaching and learning during the COVID-19 pandemic. The selected documents highlighted the obstacles, challenges, and best practices for online learning by implementing multimedia and ICT integration (Bowen, 2009:29–33).

Unisa policies are guided by the DHET policy framework, with specific targets determined at an institutional level (DHET, 2020). All documents used were employed due to their significance in HE policy frameworks and ODeL and how they would add value in establishing post-COVID-19 ODeL frameworks for HEIs (Du Plessis, Jansen van Vuuren, Simons, Frantz, Roman, & Andipatin, 2022). These documents were

obtained from Unisa's public and internal web browsers. The following is a list of all of the policies discussed in the study.

Selected policies
• **Curriculum Policy**
• **Tuition Policy**
• **ICT Policy**

Figure 4. 1 Selected policies

Employing what McMillan and Schumacher (2010) refer to as "skimming" whilst analysing documents, I skimmed through the selected policies seeking an overall understanding of what each policy entailed and, subsequently, how the participants understood and implemented the policies (Bowen, 2009:32). All the read paragraphs were carefully divided and segmented noting the valuable ideas that were highlighted in various colours and labelled in the margins of the documents as codes stemming from the segments (Bowen, 2009: 32; McMillan & Schumacher, 2010: 370–371).

The exercise allowed me to confirm my list against the tools the participants mentioned in the questionnaires (see Appendix E). All the important information from the ideas was highlighted and labelled as codes (Bowen, 2009:32; McMillan & Schumacher, 2010:371). Upon completion of the coding process for the policies, the codes were written in list form using columns to compare the codes for duplication and overlapping descriptions (McMillan & Schumacher, 2010:372). Similar codes were grouped and became categories (McMillan & Schumacher, 2010:374). The categories were interpreted into categories by studying the codes and referring to the policies and interpreting the highlighted sections of the policies in relation to the primary theories that underpin this study (see Chapter 2, Section 2.4). While analysing and interpreting the categories, the study established whether to merge some categories or group them as secondary categories under the primary categories. The findings of the document analysis as well as the Interpreting and making sense of the categories are presented and further explored in Chapter 5.

4.6.2.4 Triangulation

Triangulation was employed in this study by combining various data collection methods, as advised by Rothbauer (2008:892). This is important as a case study gains credibility and objectivity using triangulation (Stake, 2005:443). By combining different methods of data collection for triangulation, this research was able to get the participants' perspectives on their lived experiences (Nieuwenhuis, 2007:55). Collecting data using various methods enabled me to view online learning in DE from different angles, thereby gaining an in-depth understanding of the collected data (Rothbauer, 2008:892). Moreover, various data collection methods helped minimise my biases and subjectivity, as the various methods might yield different perspectives. In this way, the interpretation of online learning in DE and the data findings were strengthened (Rothbauer, 2008:892). The next section discusses the data analysis of all data collection instruments.

4.7 DATA ANALYSIS

This section addresses the data analysis of all data collection instruments this study employed. Qualitative case studies interpret the data the first time they are encountered, and the interpretation recurs (Stake, 2005:450). Data analysis can be seen as a continual occurrence in research studies, where data analysis occurs or persists during and after fieldwork (McMillan & Schumacher 2010:367; Stake 2005:450). This study data analysis adopted Braun and Clarke's (2006) six process thematic analysis.

There were steps taken to comprehend the nature and extent of data acquired, as well as the gaps in the data: (a) the data collection was read and studied in preparation for the forthcoming data collection; (b) MS Teams audio recorded data were listened to, and studied for the same purposes (Yu, Abdullah & Saat, 2014). I analysed the questionnaires and the interviews in the same manner. In both instruments, thematic analysis was used in this study to analyse the data described and add the steps needed to be taken to analyse the data below. Thematic analysis is a relevant qualitative research method used when analyzing large qualitative data sets (Nowell,

2017). A thematic analysis strives to identify patterns of themes in the interview data (Mortensen, 2020).

Thematic analysis is a method for identifying, organising, describing, and reporting themes within a data set (Braun & Clarke, 2006 in Nowell, 2017). It is a powerful yet flexible method for analysing qualitative data that can be used within various paradigmatic or epistemological orientations (Kiger & Varpio, 2020). Themes are actively constructed patterns (or meanings) derived from a data set that answer a research question instead of mere summaries or categorizations of codes (Kiger & Varpio, 2020). Thematic analysis is an appropriate method for understanding experiences, thoughts, or behaviours across a data set (Kiger & Varpio, 2020). According to Payne, Walton and Burton (2020), a thematic approach allows emerging themes to be contextualised with data transcripts and findings from existing literature. The analysis explored how participants interpreted their contexts, which involves an interpretation process expected to provide meaning to individually attributed experiences or events (Mukuna, 2021). I followed the following six steps (Caulfield, 2019) as depicted in the figure below.

Figure 4. 2 Six phases of thematic analysis

(Source: Braun and Clarke, 2006)

Applying the above analysis step by step resulted in flexibility, and diversity was influential (Braun & Clarke, 2006). I collected all the data to adapt to the accepted framework for conducting thematic analysis to familiarize myself with the data I gathered from interviews, questionnaires, and documents. After this data gathering, I ensured that the generation of initial codes that would make sense to me while being mindful of protecting participants was necessary. Another task that consumed the study was searching for the themes, as they needed to make sense of the study's aim and framework in conjunction with the types of data collection employed. I reviewed the themes continuously and thoroughly, whilst ensuring I was defining and naming them for the flow of the study's aims and the production of the report findings. This proved to be the last part of the research that adds value to the academic landscape (Kiger & Varpio, 2020). I amended the codes and themes that emerged due to the verbatim participants quotations which would compromise the anonymity of the participants. Thus, there were required modifications.

I also used inductive reasoning to search for patterns in the collected data and generalise them (Antwi & Kasim, 2015). Employing what McMillan and Schumacher (2010) refer to as "skimming" whilst analysing documents, I browsed through the selected policies, seeking an overall understanding of what each policy entailed and, subsequently, how the participants understood and implemented the policies (Bowen, 2009:32). All the read paragraphs were carefully divided and segmented, noting the useful ideas that were highlighted in various colours and I made labels in the margins of the documents as codes stemming from the segments (Bowen, 2009: 32; McMillan & Schumacher, 2010:370-371). The following is a discussion on ethical measures and conduct, which forms a very crucial part of the study.

4.8 ETHICAL MEASURES

This study employed ethical guidelines to ensure the research's success by continually evaluating my conduct in the study (Strydom, 2011:114). As a researcher, I ensured ethical behaviour to ensure an understanding as well as general agreements regarding proper or improper usage in scientific research (Babbie, 2010:64; McMillan & Schumacher, 2010:338; Strydom, 2005:56). These aspects include gaining access to the HEI research site as well as the procedures that were followed to obtain informed

consent from the participants. Additionally, there was the avoidance of harm in how confidentiality and anonymity were practised. I considered the role that I undertook to ensure ethical behaviour and the approach taken to release the research findings. These aspects are discussed in more detail below.

4.8.1 HEI Research site Access

I received official permission for research and ethical clearance from the University of South Africa. In the application for both the permission for the research to be undertaken and the ethical clearance, I outlined the scope and outcomes of the research (Cohen et al., 2018:591). Once the intention to be granted both permissions to carry out the research and ethical clearance were received, the study advanced. This study's ethical clearance has been obtained from the Ethics Committee (see Appendix I) under the College of Education at Unisa to conduct the study. It followed the necessary procedures for seeking permission (see Appendix J) from all the selected Unisa four colleges as well as from three Unisa support departments' respective participants through the RPSC committee.

I have worked with Unisa staff members, such as the academics and the support staff, and communicated with them through emails I accessed from the Unisa Institutional search directory (see Appendix G). I informed the participants that their participation was voluntary, and they would be sent an informed consent letter to sign.

4.8.2 Informed permitted consent

Informed consent was obtained from participants as it is regarded a necessary condition of research (Hakim, 2000 in Strydom, 2005:59). The informed letter was provided to the participants by email informing them about the purpose of the study. Additionally, participants were informed of the methods for gathering data, advantages and risks, and the activities and expected time participants would be required to spend whilst being interviewed for this study (Strydom 2005:59, McMillan & Schumacher 2010: 339). From the participants' responses, I scheduled their interviews at their convenient times using their preferred models of correspondence, such as the MS Teams platform or emails, and their offices. As a researcher, I expected time

rescheduling and rejection due to the participants' schedules, and I rescheduled meetings as per their requests. On the permission form, I elaborated on the envisioned time allocation per participant, which amounted to about 30-45 minutes. The participants' responses were reviewed as per the information they shared during the questionnaires or interviews. The kind of information shared by participants gave an overview of how multimedia in the COVID-19 phase impacted the selected participants.

4.8.3 Harm avoidance

During a research undertaking, it was anticipated that participants could be exposed to danger, physical or emotional harm (Strydom, 2005:58); thus, I took it as my responsibility to check all the possible harm to see that there were no foreseeable risks associated with the completion of the interviews. The probability or magnitude of harm or discomfort anticipated in the research was not greater than that ordinarily experienced daily (Resnik, 2005). There were no vulnerable adult participants, and non-sensitive information was not envisioned. Also, no additional steps were taken as no harm was anticipated.

Concerning the withdrawal of the participants from the study, I informed them of the flexible opportunity to withdraw from the research if they wished to do so (Strydom, 2005:58). The informed letter highlighted how participants could withdraw from the study at any stage and all the foreseeable risks involved.

4.8.4 Confidentiality and anonymity

For confidentiality purposes, I carried out the study strictly following the approved proposal and Unisa's Policy on Research Ethics. I maintained the confidentiality of all data collected from or about the research participants and imposed strict controls for the maintenance of privacy (Unisa, 2016). To guarantee confidentiality, I informed the participants about accessing the results' findings and reviewing the final report to ensure their happiness with the report/feedback report (McMillan & Schumacher, 2010:339). I recorded all data captured during interviews, following the ethical guidelines outlined and ensuring the confidentiality and comfort of the participant. I

transcribed the data but requested the editor sign a confidentiality agreement for confidentiality (Strydom, 2005:61). The data collected was stored on a password-protected device. Additionally, I used pseudonyms such as CHS L1, ICT S1, CEDU AD 1 to avoid using identifiable participant names (Mitchell & Jolley, 2010).

All information provided by the Unisa participants was considered confidential. The participants' names will not appear in any publication resulting from this study, and any identifying information will be omitted from the report. I ensured not to be biased nor influenced in undertaking this research by being professional in how I conducted the research.

4.8.5 Researcher role

As a researcher, I carefully considered every aspect of the fieldwork, maintaining the confidentiality of all data collected from or about the research participants, and imposing strict controls on the maintenance of privacy (Strydom, 2005:63). I recorded all data captured during interviews, following the ethical guidelines outlined in the study's' proposal. Sampling procedures were selected intentionally to safeguard participants' identification regarding the study's inclusion criteria (Casteel & Bridier, 2021). The data collection methods used were well established in qualitative research, and the findings were written up truthfully in a way that best represented the realities of the participants. In carefully considering the fieldwork (Strydom, 2005:63; Yin, 2011a:42) and making choices based on what was suited to the study, as opposed to making convenient choices, I displayed research integrity (Yin, 2011:39).

4.9 TRUSTWORTHINESS OF THE STUDY

Trustworthiness refers to the "degree of confidence in data, interpretation, and methods used to ensure the quality of the study" (Connelly, 2016: 435). As the researcher, I enabled protocols and procedures to ensure that readers consider the study of consideration and ensure the findings are highly trusted. In addition, the researcher had to ensure that participants were convinced of the high quality of the study and that the findings were worth paying attention to (Moon, Brewer, Januchowski-Hartley, Adams & Blackman, 2016: 13). Trustworthiness has been

divided into credibility, transferability, dependability and conformability which corresponds roughly with the positivist concept of internal validity (Gunawan, 2015). Additionally, I employed dependability, which relates more to reliability; transferability, which is a form of external validity; and confirmability, which is largely an issue of presentation (Gunawan, 2015). Because the study is qualitative and to ensure rigour and trustworthiness, I considered member checking, triangulation, detailed transcription, a systematic plan, and coding (Gunawan, 2015). This study elaborates on the trustworthy aspect below.

4.9.1 Credibility

This study's research procedures were dealt with in detail to ensure credibility (see Chapter 4, Section 4.6). I followed this approach to achieve transparency, accessibility and an easily understood study (Lincoln & Guba, 1985 in De Vos, 2005:346; Yin, 2011a:19). Credibility depends on the richness of the data and analysis. It can be enhanced by triangulation (see Chapter 4, Section 4.6.2.4) rather than relying on a sample size aimed at representing a population (Patton, 2002). Ensuring credibility with the definite representation of the participants from the selected four Unisa colleges and three Unisa support departments, I embarked on member checking and provided a thorough description of the phenomenon under investigation (Shenton, 2004:68–69). Ensuring credibility in a qualitative study, the participants, the themes, and categories (see Chapter 4, Section 4.6.2), which stemmed from the data analysis (see Chapter 4, Section 4.7), were described in rich detail (Creswell and Miller, 2000:128).

4.9.2 Transferability

Transferability in qualitative research is mainly the responsibility of the individual seeking to transfer the findings to a different situation or population than the investigator of the initial study (Stumpfegger, 2017). Transferability was achieved in this study by implementing triangulation in the data collection methods (see Chapter 4, Section 4.6.2) as suggested by Lincoln & Guba, 1985 in Devos (2005:346). Triangulation enabled me to corroborate the research findings, thereby strengthening the study's usefulness to other settings (Lincoln & Guba, 1985 in De Vos, 2005:346).

How the data analysis, the theoretical framework (see Chapter 2), and the literature review (see Chapter 3) relate was employed as a means of transferability. Lincoln and Guba (1985 in De Vos, 2005:346) point out that linking the data analysis to the theoretical boundaries of the study enables other researchers who do research using the same theoretical boundaries to decide whether the cases can be transferred to other settings to enable the reader to make the transfer (Shenton, 2004:70).

4.9.3 Dependability

Dependability relates to the primary challenge that research must be consistent across time, researchers, and analysis techniques (Nowell, Norris, White & Moules, 2017). Additionally, Lincoln and Guba (in Schwandt, 2007:299) state that dependability focuses on the inquiry process, where the inquirer ensures an appropriately documented, logical, and traceable research process. This study followed this guide by documenting the research process across Chapter 4, ensuring the study's traceability where necessary. The collected data consisted of MS Teams' recorded videos and audio files, with the content transcribed to ensure that the inquiry audits could be established at any time (McMillan & Schumacher, 2006:326).

4.9.4 Conformability

Conformability was achieved in this study, by checking and rechecking the data (Trochim & Donnelly, 2008) as well as discussing and comparing all these findings from multiple sources of data (Seale, 2000:45). Confirmability in qualitative research was founded on the acknowledgement that research is never objective. Confirmability deals with the main issue that "findings should signify, as far as possible, the specific situation being investigated as opposed to the beliefs, theories, or biases of the researcher" (Shenton 2004, in Makoelle & Somerton, 2021:322). As the researcher of this study, I ensured that the findings accurately captured the true reflection and interpretation of participants' responses (Lincoln & Guba (1985) in De Vos, 2005:346).

4.10 SUMMARY

The research design and methods that guided the empirical research were meaningful because they effectively obtained answers, and they followed the 'research paradigm and research approach used in the study. The empirical research aims to develop a post-COVID-19 pandemic multimedia framework for teaching and learning in Open Distance eLearning in South Africa. All the study questions needed to answer the following main and sub-research questions are expanded. The research methods were dealt with in detail by elaborating on the selection of participants, the sampling size, and the research site where the selected participants were sampled and interviewed. Through permissible approval from Unisa, I collected data, which proved to be an exploration and information-seeking activity filled with discoveries from various participants.

All the gathered information and discoveries required validation. Thus, triangulation through document analysis was applied using Unisa policies, whose relevance added value to the multimedia technologies and the study framework. Participants from four Unisa colleges (lecturers, deans, and acting deans) and three Unisa support departments (ICT, CPD, and MMC) were interviewed. Even though the interviews and conducting of the questionnaires were schedules, these did not always go according to plan as some participants were not available at times. Thus, a flexible approach was applied. For the legitimacy of the study, it needed to expand on how ethical measures were conducted to ensure transparency and adherence to the research site. It was important to maintain trustworthiness by ensuring credibility, transferability, dependability, and conformability. After all the research methods were identified and it was determined how the implementation would take place, the study needed to address the findings of the empirical research.

CHAPTER 5

DATA ANALYSIS AND INTERPRETATION: RESEARCH FINDINGS

5.1 INTRODUCTION

This chapter discusses the empirical research findings and how they occurred in three phases. Phase 1 begins with conducting and administering the questionnaire that contained open-ended questions. Phase 2 details the process of conducting interviews with the participants where the ICT support, tools of trade, staff upskilling, and assessment authenticity were indicated. The questionnaires and the interviews were concurrently conducted, depending on the availability of the participants. Phase 3 details how the document analysis was done. This involved analysis of institutional policies where some themes, such as support, student-centredness and responsiveness became apparent. The participants at the research site clearly required this. Where there was a need follow-up interviews with some participants who completed the questionnaire were held.

The figure below illustrates the data collection methods this study employed in its empirical phase.
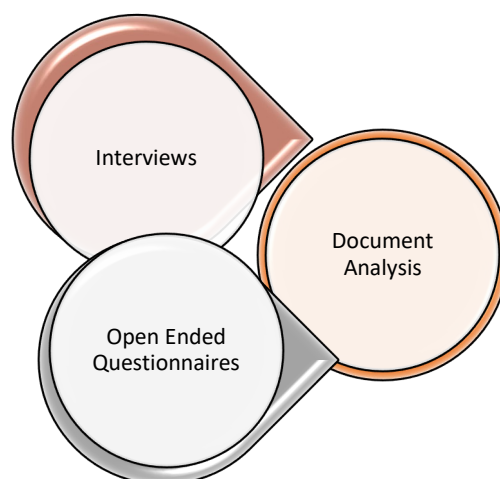
Figure 5. 1 Data collection summary

I began administering the open-ended questionnaires whilst simultaneously conducting the interviews. This was dependent on the availability of the participants.

Some participants would agree to conduct the study interviews and later cancel due to work commitments; thus, this forced me to be flexible in my data collection approach. I therefore conducted the interviews depending on the availability of the participants. The simultaneous conducting of interview phases of data collection was chosen to mitigate time delays between the questionnaires and conducting the interviews. I received some questionnaires from participants, kept on with interviews, and conducted data analysis of the research site. I conducted the empirical research by analysing the institutional policies related to the research topic (see Chapter 4, Section 4.6.2.3).

5.2 FINDINGS

This section presents the findings stemming from the questionnaires, the interviews and the document analysis of the study. This study presents the findings as themes and supports direct information from the data to help illustrate the theme. This section continues with an overview of the questionnaires and the interviews. Thereafter, the themes that stemmed from the three data collection methods will also be discussed. The document analysis is discussed after this. The section determines the lecturers' multimedia experiences in HEIs regarding teaching and learning during and post-COVID-19. Thus, recommendations for including multimedia in teaching and learning have been established. The aim is to design a post-COVID-19 pandemic multimedia framework for teaching and learning in Open Distance eLearning in South Africa.

5.2.1 Biographical information of the lecturer participants

The participants interviewed in this study varied in terms of gender, age, qualifications, college, module name, years of experience as a DE lecturer, as well as the number of students they teach. Three female participants (excluding the Dean) at CEDU are responsible for Short Learning Programmes, Undergraduate students, and Postgraduate students. For CHS, there was one male and one female participant between the ages of thirty (30) and forty (40), both with six years of work experience. They were responsible for undergraduate and postgraduate modules and short learning programmes. CEMS had one male participant who holds a Doctoral Technology degree with three modules and has students above 400 in each module.

CSET has one male participant who holds a PHD in Chemistry and is currently supervising one student and co-supervising four. Most of this information is provided in the table below, along with a brief overview of the discussion.

Participant	Gender	Age	Qualifications	College	Years of DE Experience	Number of students
CSET L1	M	30–39 years old	PhD in Chemistry	CSET	4 years	Currently, supervise 1 student and co-supervise 4.
CEDU L1	F	50–59 years old	B.Prim.Ed), B.Ed Hons (Inclusive Education), M.Ed (Inclusive Education) & D.Ed socio-education	Department of Early Childhood Education (CEDU)	2 years, 10 months	3 890 Undergraduate students (CHL2601). 4 309 Undergraduate students (LSP1501). 6 Postgraduate students (M & D)
CHS L1	M	30–39 years old	PHD in Linguistics	CHS	6 years	112 Undergraduate 63 Undergraduate 55+- Undergraduate 15 Postgraduate
CEDU L2	F	60 years and older	PhD in Education	CEDU	4 years & 3 months	32 Postgraduate, coming to an end on 31 Dec 2022 33 Postgraduate, coming to an end on 31 Dec 2022
CEMS L1	M	40–49 years old	DTECH	CEMS	10 years	450 Undergraduate 600 Undergraduate 400 Undergraduate
CEDU L3	F	60 years and older		CEDU	10 years	3 Short Learning Programme 2 Undergraduate 24000 Undergraduate
CHS L2	F	30–39 years old		CHS	6 years	230 (Level four theoretical module 14 (Short course) (SLP) 758 (Level one theoretical module)

Table 5. 1 Summary of Lecturer Participant Biographical Profiles

5.2.2 Overview of questionnaires

All the participants were invited to complete the questionnaire (see Appendix E). As mentioned in Chapter 4, Section 4.6.2.1, questionnaires were sent to twenty academics from the four selected colleges. Only eight academics responded to the questionnaires, with three of them unable to conduct follow-up interviews due to their busy schedules. The questionnaires assisted in exploring the demographic information about each participant and how the participants were employing multimedia technologies for online teaching and learning. The questionnaires additionally assisted me in exploring the overall challenges and experiences that the academics encountered while employing multimedia technologies during COVID-19 teaching and learning.

5.2.3 Overview of interviews

Not all participants who completed the questionnaire were invited to participate in a follow-up interview (see Chapter 4, Section 4.6.2.2). Some questionnaires provided sufficient data without follow-up interviews needed, whilst some participants preferred just to be interviewed, ignoring the questionnaires sent to them and citing their preference for an interview. I had the opportunity to probe further into the responses received from the participants, thus enabling me to gather all the needed information and rich data. Below is an in-depth discussion of the data from the interviews and questionnaires.

5.2.4 Overview of the interviews and questionnaires

Regarding the interviews and questionnaires, the table below provides information on the interview participants for data collection. Data collection instruments indicate the interviews conducted in each college and the participants who completed the questionnaires, as well as those who could not participate in the interviews or

questionnaires. There are three support divisions, namely one for Continuous Professional Development (CPD) and one for the Multimedia Centre (MMC) as well as one for Information Communications Technology (ICT)) with participants who conducted the interviews remotely on MS Teams. The overview refers not only to college participants but also to support staff members. Four deans, representing the College of Science, Engineering and Technology, the College of Education, the College of Human Sciences and the College of Economic Management Science took part of the interview sessions. All of them chose to participate in interviews on MS Teams.

For thematic data analysis, the study followed the steps for thematic analysis as discussed in Chapter 1, Section 1.7.3, as well as Chapter 4, Section 4.7, where after data is familiarised, codes are generated, themes are generated, themes are reviewed, defined, named, and written up (Caulfield, 2019). Therefore, for ease of reference, the participants were name-coded by the college or support abbreviations with a numerator and alphabet indicator of the discipline, such as D for Dean, L for Lecturer, and S for Support, to help differentiate them. The College of Human Sciences had two participants (CHS L1 and CHS L2), the College of Sciences, Engineering, and Technology had one participant (CSET L1), and the College of Education had three (CEDU L1, CEDU L2 and CEDU L3), whilst CEMS had two (CEMS L1 and CEMS L2). The naming of questionnaire data referred to the participants according to the college abbreviation and numeric abbreviations. Therefore, this meant that these participants had additional numbers after the college abbreviation. An example of naming abbreviations of participants is cited in the table below as CEDU L1, CEDU L2 and CEDU L3, with the common alphabet L, which stands for lecturer, before each number and after the college abbreviation. Deans were referred to as D1, D2, D3 and D4, respectively, with the common alphabet D, which stands for Dean, before each number, with no mention of the colleges they represent due to the protection of their identities and anonymity. The support departments are referred to as ICT S1, MMC S1, and CPD S1, with the common alphabet S standing for support before each number, after the support department abbreviation.

The table below is a presentation of the above discussion.

College of Education	
Participant	**Participation in interview**
CEDU L1	Yes
CEDU L2	No Interview, but responded to the Questionnaire
CEDU L3	Yes
CEDU L4	Referred to others due to Research Focus
CEDU L5	Referred to others due to Research Focus
CEDU L6	No response
CEDU Acting Dean	**Interview**
College of Human Sciences	
CHS L1	Yes
CHS L2	No Interview, but responded to the Questionnaire
CHS L3	No
CHS L4	No
CHS Acting Dean	**Interview**
College of Sciences, Engineering and Technology	
CSET L1	One
CSET L2	No response, out of the office until next year
CSET L3	Could not be available due to a time schedule
CSET L3	No response
CSET L4	Could not be available due to a time schedule
CSET L5	Could not be available due to a time schedule
CSET Dean	**Out of office until next year, but was referred to the acting executive Dean**
CSET Acting Dean	**Interview**
College of Economics Management Sciences	
CEMS L1	No Interview, but responded to the Questionnaire
CEMS DEAN	**Interview**
Information Communications Technology (ICT): Infrastructure	
ICT S1	**Yes**
Information Communications Technology (ICT): MMC	
MMC S1	**Yes**
Tuition Support & Facilitation of Learning/Instructional Support Services *(Continuous Professional Development (CPD))*	

CPD S1	**Yes**

Table 5. 2 Interview participants

5.2.5 Themes stemming from the interviews and questionnaires

The overview of themes stemming from the interviews and questionnaires are reflected in Table 5.4 below as they emerged from the data collection instruments.

In the questionnaires and the interviews, participants were allowed to express their challenges and experiences encountered with regards to ODeL, ICT, and multimedia for HEI online teaching and learning. A thematic analysis was used to seek themes and patterns (Mortensen, 2020; Creswell and Creswell, 2018; 189). Most of the themes were consistent across all two data instruments. However, two themes did not appear across all the data collection methods and are noted as such.

THEMES	SUB-THEMES	THEORIES/THEORETICAL FRAMEWORK
Policy Amendments	Online teaching and learning Policy upgrade/renewal necessity	• DE Generations encountered different challenges • Teaching and learning theories (behaviorism, cognitivism, constructivism and connectivism)
Support	• Academic support • Student support • Training Support • Service Support (Information Communication Technology) • Support (Multimedia)	• Keegan's six key elements of DE • Mayer's 12 principles of multimedia design are mandatory for lecturers to adopt in their teaching of visual narrative and ICT support • DE: Challenges and weaknesses require support
Pedagogical strategies	• Assessment and Evaluations	• Distance Education: Challenges and weaknesses • Constructivist thinking builds knowledge whilst evolving with the DE generations, DE Pedagogies and industrial revolutions in education. • Cautions lecturers of the three types of cognitive load: intrinsic, extraneous, and germane. • Emphasis on what builds up the multimedia visual representation (Güney, 2019). Mayers 'twelve principles

COVID-19 Experience: multimedia innovations	• Lecturers' experience in multimedia innovations • Lecturers 'experience with Student Computer literacy	• Cognitive Theory of Multimedia Learning, Cognitivsm, Connectivism
COVID-19 Experience: ICT Perspective	• LMS Moodle COVID-19 Experience • Discussion Forums & Announcements • Tools of Trade • Data Allocation, Wi-Fi Connectivity and Electricity load-shedding • Social media/*WhatsApp* • Microsoft Office Package • Open Educational Repository (OER)s	• **5th generation of Distance Education** Online delivery – multimedia interactive telecommunication media as well as rich interactive media on • Behaviourism • Cognitivism • Constructivism • Using device accessibility enables learner enhancement and LMS accessibility to their courses from the cloud using tools of trade supplied by ICT.

Table 5. 3 Overview of themes stemming from questionnaires and interviews

The discussion below discussed policy amendments, support, pedagogical strategies, COVID-19 experience on multimedia innovations, and COVID-19 experience from an ICT perspective. All these themes stemmed from the questionnaires and the interviews.

5.2.5.1 Policy amendments

Data collected from the participants revealed that the participants needed the institution to update their policies, particularly the documents shown in Chapter 5, Section 5.3, as they were implemented before COVID-19. Constructivist thinking builds knowledge whilst evolving with the DE generations, DE pedagogies, and industrial revolutions in education (see Chapter 2, Section 2.3.3). Therefore, online distance teaching and learning require strategies on how lecturers can be empowered to construct knowledge and understand the institutional mandate of online teaching. Chapter 2, Section 2.2.5, addresses the DE education challenges encountered across DE generations. This meant that policy strategies had to be reviewed, because of how COVID-19 erupted in the world and HEIs globally, regardless of how change always brings discomfort. An academic staff participant indicated that,

> "*there is a necessity of enforcing the key performance areas which cover the academic excellence in online learning integration*" (D2).

This is to ensure staff competency levels against the policies, which make it mandatory. An academic staff participant expressed how,

> "*all higher learning institutions should be mandated to hire staff members who hold a postgraduate certificate in higher education to help ensure both the academic and support staff members understand institutional strategies*" (D1).

An academic staff participant adds that,

> "*the online M&D portfolio required to change from hardcopies in all their submissions regardless of it would be the examination reports, Supervisor's report or assessment processes*" (D2).

All these submission reports require updated policies that reflect current processes affecting the ICT and multimedia integration teaching and learning. Additionally, the academic staff participant further shared his/her disgruntlement regarding,

> "*the inflexibility of Unisa bureaucratic policies as well as contracting of ICT staff on fixed contracts which do not add value to the organisation and university where ICT is at the centre*" (D1).

Adding to the required update on policy, the proctoring tool requires regulation, as it has since occurred that some students feel it is a violation of their privacy rights. In a lawsuit against Cleaveland University in Ohio, a student cited that the proctoring scan functionality in his room surroundings that was meant to ascertain study materials in the room was an unreasonable search, as it scanned his documents (Young, 2022). Therefore, U.S. District Judge J. Philip Calabrese ruled in favour of the student and against Cleaveland University, citing the unlawfulness and visual intrusion conducted through remote technology (Schwartz, 2022).

5.2.5.2 Support

Most participants in the interviews and questionnaires predominantly mentioned support, whether available or not, and how the support overcome challenges. The required support refers to the academic, emotional, student, and training support from the Continuous Professional Development (CPD) office, service support (ICT), and the

Multimedia Centre (MMC). The support was experienced through the availability and non-availability of ICT infrastructure challenges, or both. A discussion of the subthemes follows below.

Academic support

During COVID-19, HEIs worldwide encountered the lockdown effects of lockdown. This meant remote working and drastically urgent transformational changes in teaching and learning that required adequate upgrades in academic support. Adequate academic support meant upgrading outdated ICT through upgraded tools of the trade, data allocation for staff members, incident management, reports, remote VPN authentication, connectivity, password resets, and cyber security (see Chapter 5, Section 5.3.3), examination assistance, and MS Teams training. An academic participant confirmed that,

> "The *challenges with digital devices as many of them were old and outdated devices*" (D1).

An ICT support staff participant expressed that,

> "*Data Centre access was done through VPN, and Unisa provided cloud access for staff members by ensuring authentication of staff profiling. Each staff member was allocated a limited amount of data by Unisa….. some processes allowed data top-up for academics where necessary, as most of them requested more data due to depletion. The university encountered more challenges regarding ICT support on utilising and accessing the ICT systems*" (ICT S1).

An academic staff participant added that,

> "*Device allocation took a long, long time during COVID-19*" as an obstacle, whilst another academic indicated how they "*benefited from online course attendance, and I obtained a certificate in online teaching*" (CEDU L2).

Academic support has academics sharing their experiences from various perspectives. Another academic participant shared her experience of COVID-19, as she started OERs where she,

> *"Taught teachers critical skills on how to teach in an online space, which yielded more than 300 subscriptions by the end of June 2020" (D1).*

Where colleagues lacked critical technical skills and could not access ICT or campuses, some academics managed to progress with the help of collegial support, ICT, DIA, MMC, and online offerings. A CPD support staff member confirmed how she,

> *"Arranged meetings where various stakeholders would meet and discuss how to tackle MS Teams related problems they encountered during that time"* (CPD S1).

All this was to equip staff members with recent technologies and its uses they were battling with at the time.

Student support

A CEDU academic staff participants shared that,

> "*During the COVID-19 pandemic, students encountered problems such as accessing the campus and not being able to reach their lecturers even though Unisa is a distance learning institution*" (CEDU L2).

Most academics have indicated how students needed their support during the COVID-19 pandemic, such that they used social media to communicate and significantly drive student engagement. CHS academic staff participants indicated how,

> "*Social media platforms such as WhatsApp were used as secondary technologies that complemented the Unisa LMS" (*CHS L1).

Additionally, CHS academic staff participants added that they*,*

> *"Created support videos for Teaching & Learning, and we would use Youtube to upload them. We also would take the links and upload them as additional information on the LMS. We would use WhatsApp for specific*

content…For general communication, we used Facebook. For module-related content, WhatsApp was the main platform we used for announcements to lead to myUnisa…. Students used WhatsApp to access my Unisa" (CHS L1).

Even though social media had restrictions, academics employed WhatsApp to publicise the links they had posted on the LMS. Regarding the WhatsApp messaging, a CHS academic staff participant stated that,

"*By accessing and using the link on WhatsApp, students gave consent to be part of the Terms and Conditions of the group… Students would ask permission to contact fellow students directly where they sought information. There were no complaints of students asking each other without consent*" (CHS L1).

Students were also receiving data. CT Support staff participant expressed that,

"*One of the successful deals in terms of the so-called 'data must fall' movement by students was to request Mobile Network Operators (MNOs) to lower their pricing from R100 to R75 for 10 Gigs. They also provided 20 Gig a night surfer option for both staff and students*" (ICT S1).

One of the academic staff participants noted that the students,

"*Are very knowledgeable and resilient, but they need support and motivation*" (CEMS L1).

<u>*Training Support*</u>

During COVID-19, Continuous Professional Development (CPD) prioritized training lecturers on the use of various tools, starting from MS Teams, as well as putting more emphasis on the LMS Moodle navigation. A CPD support staff participant expressed how,

"*It has always been our wish to witness academics using various teaching and assessment tools*; thus, *Continuous assessment was encouraged in terms of pedagogy*" (CPD S1).

Additionally, the CPD department collaborated with the Academic Development Open Virtual Hub (ADOVH) project, which was responsible for enhancing student support and 4IR readiness in an ODEL environment (Unisa ADOVH, 2022). Through ADOVH, students were well prepared for examinations in the form of workshop interventions held online on MS Teams for all the students. The workshops provided support for accessibility as well as the usability of the following: Proctoring Apps (Invigilator App and IRIS Invigilation (IRIS)), the academic integrity of examinations and students with special needs, examination online assessment intake, and technical navigation skills around Moodle (Unisa ADOVH, 2022).

The CPD support staff participant mentioned that,

> "*At CPD, we were highly instrumental in terms of training support of proctoring tools as well as IRIS Invigilation (IRIS)*" (CPD S1).

IRIS Invigilation (IRIS) is a software program that helps provide educators assurance of assessment integrity during online and remote assessments. IRIS records audio, video, and computer screen activity for a test/examination (Iris Invigilation, 2022). CPD support staff participant added that,

> "*To analyse and understand where academics require training, CPD employed the Microsoft Power Business Intelligence (BI) application*" (CPD S1).

Microsoft Power Business Intelligence (BI) helps turn sources of data into coherent, visually immersive, and interactive insights (Microsoft, 2022). Academics also expressed the need for the institution to realise the valuable impact of multimedia technologies as

> "*Lecturers require critical upskilling as they are not well trained. Not all lecturers are comfortable making videos or vodcasts*" (CEMS L1).

Another academic participant indicated that,

> "*Through CPD training sessions, I learnt that I could record my lessons as well as produce videos for their lessons such that I requested ICT to assist*

with the downloading and installing of Camtasia on my work laptop" (CEDU L3).

Service Support (Information Communication Technology)

COVID-19 has revealed the importance of equipping staff members with ICT skills, as most of them could not cope with the fully online learning approach. Some challenges involve the obsolete legacy ICT Infrastructure and outdated software and technologies. D2 revealed that,

> "*We engaged with ICT management requesting dedicated ICT staff allocation for the Colleges for quick, efficient turnaround time on challenges they timeously experience as opposed to the long turnaround times they currently experience with ICT*" (D2).

The ICT Digitalisation Strategy, therefore, commits to a partnership engagement model with colleges and an understanding of the academic project through designing technology solutions that address key academic priorities (Unisa ICT Digitalisation Strategy, 2022). ICT Support participants addressed the challenges ICT encountered and how ICT brought solutions and innovations, such as Moodle, to support the Unisa academic project. An ICT support participant revealed that,

> "*Just like any other institution, Unisa's ICT department had embraced the challenges, especially during the COVID-19 period as the storm hit them because COVID-19 came unannounced*" (ICT S1).

As a means of staff support, ICT offered training on platforms such as MS Teams, VPN access and Java-Router(J-Router), which mitigated the challenges encountered by the staff members. The Java-Router(J-Router) is an open-source Java method processing system router based on object-method architecture to facilitate the on-screen marking of assessments. It was developed in-house to route assignments from students to lecturers and back to students after the marking process (Unisa, 2022l). The training was offered in collaboration with other support departments, such as CPD, DIA and the Multimedia Centre, especially MS Teams online live video streaming to enable events to continue aided by using new technologies. Additional to

the training there were also self-help services to reset the passwords as staff members could not log calls when away from the campus. An ICT support staff participant added that,

> *"ICT was responsible for additional staff equipment (such as laptops/tools of the trade), Mobile Network Operators (MNOs) negotiations for both students and lectures, hardware and software licensing, as well as online exams, to mention a few"* (ICT S1).

Additionally, the ICT provisions for staff and students were to boost efficiency and functional collaborations between colleges, students and support departments. The ICT Support staff participant alluded to the fact that,

> *"Unisa is an ODEL institution, so it was easy to adapt to being fully online. The available technological software and support at Unisa were very helpful"* (ICT S1).

Unisa ICT sees value in collaborating with the Unisa Department of Institutional Advancement (DIA), to further apply the customer network behaviour strategies in the digitalisation of engagement and customisation (Rogers, 2016 in Unisa ICT Digitalisation Strategy, 2022:17). From a dean's perspective, the expression around the digital devices allocation from ICT brought challenges as some deans felt that,

> *"ICT could have advanced their strategies around device allocation"* (D1 and D2).

However, the deans and academics eventually appreciated the device and data allocation. Some academics were against the Moodle LMS integration due to its limitations in some offerings. They also stated how it was designed and structured for blended learning and not fully for the online offering. Another academic support noted that,

> *"Moving from Sakai to Moodle is frustrating since the support from Unisa is lacking! Adapt ICT says some functionalities are not there. Sakai had sign-up, dropbox, and proper announcement, which Moodle doesn't have. Moodle was developed for blended learning"* (CEDU L3).

Multimedia technologies vary according to their offering, target market, purpose and intention, which means it is imperative for the user to understand the intended usage (see Chapter 3, Section 3.4.3). ICT also collaborated with the CPD and the Multimedia Centre through Camtasia video editing software installed on laptops, training lecturers on Camtasia efficiency. There were remote Camtasia workshops which were conducted on MS Teams. Additionally, an MMC Support participant added that,

> "*There were plenty of multimedia solutions provided such as the training of academics through Camtasia video editing software…the multimedia centre would also help procure audio-visual tools of the trade such as podcast equipment for remote working for accessibility of staff members*" (MMC S1).

Regarding the procurement of audio-visuals as well as provision of technical support for audio-visual specifications, the multimedia centre serves as an audio-visual broadcasting and hybrid visual communications service provider for the institution.

The Multimedia Centre assists academics with content enhancement through graphic design skills, animation and other video production value-adds, identifying relevant tools. Academics may benefit from accessing this service offering on demand (Unisa ICT Digitilisation Strategy, 2022:21). The Multimedia Centre enables the lecturer's understanding of the three key media characteristics that are particularly important for education (see Chapter 2, Section 2.4.4). The Multimedia Centre collaborates with lecturers through scripting, recording, editing and delivering a video or audio product for them to upload. An MMC support staff participant added that,

> "*Live Video Streaming through social media, video conferencing platform such as MS Teams was another support offered by the multimedia centre as there was a maximum amount of restriction at the venues during the COVID-19 lockdown*" (MMC S1).

The Multimedia Centre ensures that simulations are more resource intensive and beneficial in teaching and learning (see Chapter 2, Section 2.4.4). The academic participant added that,

> *"Innovative multimedia technologies used are podcasts, videos, as well as blogs that are shared with students through various social media platforms"* (CHS L1).

These innovative multimedia technologies serve students and lecturers in effective ways of teaching and learning in a 5th generation of DE Online delivery – which offers interactive rich telecommunication media (see Chapter 2, Section 2.2.4).

The Multimedia Centre collaborated with the ADOVH team to ensure the installation of an efficient self-recording studio where lecturers could independently record their videos, store and upload them on a USB device or the cloud as well as LMS, depending on their needs. This collaboration process of ensuring the innovative technological adaptation forms part of the Unisa ICT Incremental Innovation principles (Unisa ICT Digitalisation Strategy, 2022). According to a multimedia support staff participant,

> *"The Multimedia studios afforded lecture recordings to send to students in many formats, regardless of the platform such as social media, or streaming apps where students may access the videos using their digital cellphone devices or laptops"* (MMC S1).

This self-recording studio was benchmarked from a UC San Diego Self-Service recording studio where academics self-record content to be delivered to students (Chetty, 2022 & ADOVH, 2022). Unisa's Curriculum Policy encourages benchmarking the use of e-learning/m-learning in HEIs and other organisations internationally, whilst considering distinctive differences in student profiling and context (Unisa, 2012:18). Recently, MMC benchmarked a hybrid visual communications audio-visual innovative solution from the University of Witwatersrand (Wits) School of Business for the sustainability and the upgrading of the outdated synchronous video and teleconferencing systems which do not integrate with the current systems. Additional to the benchmarking is iNanoWS virtual studio lab compromising of 4IR elements to which the academic staff participant indicated that,

> *"It is benchmarked against the Delft University of Technology in the Netherlands"* (D3).

All these benchmarked strategic solutions add value to a world of remote cloud work-and-save mode. Supporting teaching and learning through various disciplines such as ICT, staff and student support, and multimedia training were general requirements from the participants. Therefore, the study reveals other themes that stemmed from participants' answers and is discussed next, starting with pedagogical strategies.

5.2.5.3 Pedagogical strategies

From a pedagogical strategy point of view, the participants were from the CEDU, CEMS, CHS, CSET, and support structures within the institution. Thus, not all of these academic and professional staff from support structures hold education degrees. Only lecturer participants have academic status, as revealed in their biographical information (see Chapter 5, Section 5.2.1). This indicates that their pedagogical backgrounds would differ based on their disciplines; however, the participants share common challenges that they encountered during COVID-19. Academic staff participants mentioned the importance of enforcing that all the staff members in HEIs should have an education degree. This academic staff participant further felt that,

> "*Most HEI employees require a basic foundation in the principles of pedagogy in higher learning; thus, they felt it should be mandatory regardless of whether they are academic or support staff*" (D1).

Academic staff member alluded that,

> "*One of our major problems is that when people are employed, they are new in the space. They don't get trained to assimilate into the space. There's no training system. We do have a series of workshops. You all know that it's not proper training if you go to workshops. We don't have programmes that assist people in assimilating into this space*" (D1).

Therefore, universities must enforce staff professional development through various means, such as signature modules. Continuous staff development of lecturers and multimedia designers helps equip them towards understanding and applying pedagogies of various principles, such as Mayers' twelve principles emphasising what builds up the multimedia visual representation (Güney, 2019). The assessment

proctoring tool stemmed from the participants' pedagogical strategies. The issue led to the assessment and evaluation subtheme, which is discussed next.

Assessment and evaluations

Previously, students' written examinations were conducted at examination halls where there would be hard copy submissions; however, due to COVID-19 restrictions, there was a move towards online examinations. The institution transitioned to online teaching and learning evaluations, including assessments, which meant that,

> "*Academics would submit the reports, the examination reports, as well as the supervisors' report online*" (CHS L1 and D2).

With the innovative multimedia technologies on the market, the institution has embarked on complementary assessment applications such as the J-Router. The J-Router on-screen marking tool updates the student system with a mark once the marking process is finalised, and the Moodle routing and marking tool replaces it (Unisa, 2022l). However, the institution embarked on other means of assessments which would help mitigate assessment challenges, such as incremental cheating incidents from students. To help mitigate cheating, Moodle brings a proctoring tool already loaded on the official Assessment Shells in the examination sites (Unisa, 2022c). As much as the proctoring tool is used as an assessment tool than used for teaching and learning, the policing of proctoring brings questions to the study. Questions such as:

- Is there a need for it as an assessment tool?
- How is it legalised, regulated, and commercialised?
- How does it bring the authentication factor?
- What value-adds does the proctoring tool bring to an ODeL HEI post covid-19?

Proctoring is a technologically innovative tool that helped to deal with teaching and learning challenges encountered during the Covid 19 remote phase of assessments.

According to another academic staff participant,

> "*Proctoring solution is a software monitoring assessment to avoid cheating of students during assessments. Iris is more accurate. This is to guard on the authenticity*" (D3).

The invigilator app and IRIS applications are suitable for "Mitigating online assessment risk through only a mobile application", ensuring immediate feedback (Unisa, 2022d).

This proctoring assessment initiative meant collaboration between CPD and ICT departments. Students must be notified which modules will be invigilated/proctored and what they need to do to implement invigilation/proctoring from their side well in advance (Unisa, 2022c:2). At Unisa, some modules use Randomized MCQ examination assessment type (Unisa, 2022a & Unisa, 2022b). The Invigilator App is a mobile application used to proctor MCQ and Take-Home examinations as well as make the student to confirm their identity by taking selfies and pictures of their surroundings, by uploading the photos, recording and uploading audio files and doing scans during final examinations (Unisa, 2022d; Unisa, 2022c:2). The Invigilator and Iris Applications were used to ensure that the verification and authentication process is adequately adhered to. Assessment Monitoring Systems such as the Proctoring and Invigilator Apps, which help monitor the authenticity and legitimacy of assessments, are necessary, but policy and legal instructions must be followed (Unisa, 2022).

> "*To avoid not being able to identify them, ghost-writers and identify the authenticity of the person who submitted the assessment*" (CHS L1).

The ADOVH project, in collaboration with the CPD, was highly instrumental in assisting with the proctoring tool. ADOVH also assisted with assessments for student support enhancement and collaborating with CPD (Unisa ADOVH, 2022). Another academic staff participant notes that,

> "*Colleagues found it difficult to guard on authority and authentication; thus, some colleges decided to use a proctoring solution*" (D3).

Some academics do not particularly agree with the proctoring tool stating that,

> "*It is not academic*" (D1).

The argument behind the disapproval of the proctoring tool is regarding designing the material and assessment in such a way that it is formative.

One academic further supported the argument by stating that,

> "*To allow students to grow in the process, we will not need proctoring because each response will differ from the next person's response. And then at the end, when they come to us, they're doing masters and PHD… the proctoring is not aligned with the Tuition policy*" (D1).

The Tuition Policy aims at ensuring that "opportunities for individual inquiry, promote higher level thinking skills, present evaluating opinions as well as theories and ideas from different perspectives and ask students to engage in complex and authentic tasks" (Unisa, 2013:4). The need remains to revisit the strategies regarding what technologies are implemented and at what context they add value to the policies.

5.2.5.4 COVID-19 Experience: multimedia innovations

Below are the experiences shared by the lecturers regarding the use of multimedia innovations and the experience they gathered from students' computer literacy.

Lecturers' experience in multimedia innovations

Most academics confirmed how the incorporation of multimedia technologies in their modules benefitted their lessons for their students, thus substantially enhancing teaching and learning. The training in multimedia and ICT tools is mostly offered through CPD; however, one CEDU academic participant confirmed how she,

> "*Individually enrolled on various other platforms online*" (CEDU L1).

to equip herself with technology advancement. Academics confirmed how they were required to produce work from home during the COVID-19 lockdown restrictions, even though they had limited equipment to produce multimedia work and thus were

> "*At a risk of improvising the quality of multimedia output*" (CHS L2).

According to the MMC staff participant,

"Some academics made use of the low-quality camera recordings for videos and graphics, yet there were standards that were compromised in terms of branding as the quality was bad" (MMC S1).

Regarding the use of multimedia technologies, another academic confirmed how

"Multimedia technologies through announcements and discussion forums integrated with the LMS can foster student engagement and interaction" (CHS L2).

Among other innovations that academics have used was MS PowerPoint conversion into video with embedded sound or alternatively using Camtasia Video Software. According to CHS academic staff participant,

"PowToon animation can also be used to enhance teaching and learning, especially for the visual students" (CHS L1).

A CSET academic staff participant shared how,

"Academics advanced in the use of technology, particularly MS Teams, as they were able to share calendars and create meeting requests with their students and colleagues" (CSET L1).

Another positive aspect shared by the CSET academic staff participant was the

"Benefit of attending conferences online without the expense of international travel for face-to-face conferences" (CSET L1).

Additionally, the virtual labs helped strengthen relations and collaborations, producing the drafting and signing of MOUs and the ability to interact with international researchers remotely. On sharing how beneficial the multimedia online MS Teams was for teaching and learning, a CSET academic staff participant added that,

"For attending international conferences, the financial implication is no longer an issue as we would just join the links instead of booking the flights" (CSET L1).

Most academics could not adjust easily to the Moodle LMS, but through training offered by relevant departments, the approach was made easier, so lecturers found it

easy to integrate technologies such as MS PowerPoint. A CHS academic staff participant indicated that,

> "*When we started working remotely, that is when I started to use software such as Camtasia, Audacity, as well as YouTube to facilitate my teaching and learning*" (CHS L1).

The CSET Institute for Nanotechnology and Water Sustainability (iNanoWS) is a strategic research niche that addresses current and emerging issues relating to water quality and water scarcity (Unisa, 2021). The iNanoWS website has interactive virtual labs that are rich interactive media (see Chapter 2, in Section 2.2.4) where a simple click navigation depicts the physical labs virtually and therefore,

> "*Acts as an advertising tool for collaborations* and *student research interest which subsequently gives potential funders an interest*" (CSET L1).

Regarding the live video multimedia streaming services that afforded remote online access to staff members, the MMC support staff member noted that,

> "The *inauguration of the vice-chancellor was streamed online due to the maximum restriction of 50 people who physically attended at the venue*… *This way, all staff members could log in via the shared lin*k…*it was not always the case at the beginning of the COVID-19 lockdown, as there were maximum restrictions of 350 participants on MS Teams and thus, not all members could join the principal's first meeting, initially*" (MMC S1).

There was a lot of ICT connectivity backlash, which required resolutions such as the proposal to configure and upgrade the outdated legacy ICT infrastructure.

<u>Lecturers' perspectives/assessment of student computer literacy</u>

Student computer literacy remains one of the major needs the HEIs need to rectify. In engagement with various academic participants, it became apparent that most academics require training in computer literacy, as even email etiquette requires attention. Regarding the student computer literacy competency levels, one CEDU academic staff participant confirms that,

"Some students send you emails with the whole message in the subject line. We have proposed compulsory credit-bearing modules for all students who register with Unisa for the first time. Such a module should cover basic computer literacy, how to use the online LMS, as well as academic reading and writing (academic literacy)" (CEDU L1).

Unisa's Curriculum Policy encourages signature modules to deal with specific foci like computer literacy, reading, writing, communication and studying skills and using institutional focus (Unisa 2012: 18). Such modules should be made compulsory, as they would add value to the student advancement and contribute to the definition of graduateness of the institution (Unisa, 2012: 18).

A CHS academic staff participant confirmed that even though they have basic computer literacy,

"Some students struggle using certain functions on the MS Word document such as the icons and the shapes as well as the certain symbols on the symbols tab" (CHS L1).

To mitigate these challenges, CHS academic staff participants recommend,

"A crash course for students on how to navigate MS Word" (CHS L1).

Lastly, CEDU academic staff participant confirms that,

"Students also struggle with computer literacy" (CEDU L2).

CSET academic staff participants confirmed that,

"Before COVID-19, students didn't know how to use these platforms, but now they are more experienced, better than us. Students are young and have time on their side. They are always on their computers, studying and interacting with their lecturer. Computer literacy has improved" (CSET L1).

From the COVID-19 experience shared by participants regarding multimedia innovations, the study must share the COVID-19 experiences regarding ICT perspectives from participants, which is discussed next.

The COVID-19 experiences shared by participants varied on which ICT tools they utilised and how they experienced them. Therefore, the section discusses several tools and resources that are crucial for open distance learning, including the LMS Moodle, discussion forums on the LMS as well as announcements, tools of the trade, data allocation, Wi-Fi connectivity and electricity loadshedding, social media experiences, MS office experience as well as OERs and access to the learning management system (LMS), open educational resources (OERs), and streaming platforms. Good planning and assigning of activities to the students are necessary to enable learner engagement in discovery learning and collaboration (Coman et al, 2020). These experiences are either challenges or success stories that helped strengthen the understanding of using ICT in teaching and learning.

LMS Moodle COVID-19 Experience

A CPD support participant reveals that,

> *"With the previous LMS(Sakai), Interactive teaching online was not interactive online" (*CPD S1).

A CEDU academic participant confirmed LMS benefits, such as

> "*Assessments, forums, announcements, lessons, additional resources, statistics, marking, scheduler for online classes…I use video links in my lessons, and in my assignments, I give video links (employing the LMS) in assignments and base practical application questions on the videos. I use video links in my lessons to better explain concepts*" (CEDU L1).

A CEDU academic staff participant additionally indicated that

> "*Before we migrated to Moodle, I was actively teaching on the SAKAI LMS platform. My Multiple-Choice Questions assessment was available online on the Samigo Assessment tool (for the quizzes). Before we used Moodle, having your multiple-choice questions online was optional; however, now it is mandatory. I have used forum discussions and lesson tools with both Sakai and Moodle. I had online classes on MS Teams, and our assessments were submitted and marked online. Our take-home exams were online,*

using the Invigilator app as a proctoring tool. I recorded lessons with Tippy Tube (YouTube platform) and uploaded recorded PowerPoint presentations. With the move to Moodle, I kept doing the same on the new LMS" (CEDU L1)*.*

The LMS served as the

"*Standard tool for the teaching and learning at institutions where assessments, announcements, discussion forums as Additional Resources for Students supplementary are allowed. Announcements also serve a great deal as sometimes, if lecturers pick up errors in their tutorial letters, they announce the errors and rectifications*" (CHS L1).

Additionally, CHS academic staff participant adds that,

"*When we post additional resources, we use the announcements to assist students*" (CHS L1).

Regarding how lecturers-student engagement strengthening was during COVID-19, CEMS support academic staff participant noted that academics,

"*Post all learning materials and respond to student email enquiries or chats on the LMS to address student learning needs and specific questions*" (CEMS L1).

On the LMS platform, there are also discussion forums and announcements tab that participants referred to and which are discussed next.

<u>*Discussion Forums and Announcements*</u>

Most of the participants (college lecturers) made use of discussion forums as well as announcements as a way to create collaboration and engagement. The participants cited how their students' discussions and engagements encouraged collaborations towards making progress in teaching and learning. Academics indicate the reasons they chose to use discussion forums. A CHS academic staff participant adds that,

"*We use discussion forums for topics that might be troublesome for other students. What we do from previous semesters we use questionnaires where we require information to come up with…. We check the patterns, and then we use that as a discussion. Sometimes students will initiate a topic on the discussion forum where they need something. Sometimes as lecturers, we will assist*" (CHS L1)**.**

A CEDU academic staff participant indicated that,

"**Previously, students would want to come to physical offices. The discussion forums and announcements promote student engagements via the discussion forum*" (CEDU L2).

A CHS academic staff participant noted

"*The benefit of how everyone can post a topic or activities helps create and start engagement between students. They can upload activities or MS PowerPoint slides and activate student discussions by setting the theme and being aware of reluctant students*" (CHS L2).

The academics agreed on how beneficial it was to stimulate students' thinking and to address concerns raised regarding their modules. In the CHS an academic staff participant confirmed how they,

"*Create different discussion forums for purposes of getting to know students, discussions on module assessment methods, etc*" (CHS L2).

A CEMS academic staff participant added that they,

"*Post relevant questions and monitor students' responses. Students engage in the discussion, and I clarify and close the engagement to move to the next question*" (CEMS L1).

A CHS academic staff participant added that,

"*When presenting during workshops, mark online, I've created various discussion forums to respond to students' different needs*" (CHS L2).

For participants to access the LMS, there is a vital need for tools of the trade, which is discussed next.

Tools of Trade

Most staff members complained about the tools of the trade, causing a lot of panic among academics and professional administrative staff members across the institution. Some staff members, including support staff and lecturers, could not take their workstations home during COVID-19, which meant they had to wait for the allocation of tools/digital devices. Additionally, there was a system of contracting temporary laptops with service providers to advance the effective and efficient work ethic of lecturers. An academic staff participant confirmed that

> "*Data and bandwidth challenges were encountered by academics who lived in the areas with no fibre installation... the data allocation then became a positive incentive from the institution. Additional to ensuring support to lecturers were various virtual MS Teams online meetings, regular feedback sessions, and presentations offered by outside industry experts*" (D4).

A CEMS academic staff participant confirmed that,

> "*Constant technological glitches required academics to prepare their lessons in advance and ensure they had the correct tools at the right time to minimize panic during sessions*" (CEMS L1).

A CEDU academic staff participant expressed frustrations regarding home connectivity versus office connectivity.

> "*Mostly, it was because of the lack of connectivity and our machines were used to work on a campus where we had powerful connectivity. But at home, I would struggle to connect or even change my password. That was the most challenging and frustrating experience I have ever had*" (CEDU L2).

The CEDU academic staff participant shared some positive benefits produced by COVID-19.

"*The pandemic has enabled me to have various options in using electronic devices (such as a computer, tablet, smartphone, or landline) or any electronic format (including the internet, social media, online chat, text, video, or email) to teach students and interact with colleagues effectively. I learned to embrace the integration of technology in my day-to-day work activities to create inclusive teaching and learning. It was my responsibility to ensure that students easily adapt and receive information about what is happening around them using online platforms*" (CEDU L2).

CSET academic staff participant adds that,

"*COVID-19 experience was an eye-opener as it exposed us to new things and showed us that the world is very small. We got to interact with people from different continents. Online interactivities exposed us to skills as we were exposed to other researchers globally. We gained much experience, even though COVID-19 took so many lives. We gained new techniques and styles of teaching as I could work from home for the whole month. I come to campus when I do some research*" (CSET L1).

Chapter 2, Sections 2.4.2 and 2.4.4 confirm the use of device accessibility enabling the learner enhancement and LMS accessibility to their courses from the cloud using tools of trade supplied by ICT. There is a need for data/Wi-Fi/internet connection and electricity to gain access to the LMS through the tools of the trade; thus, participants shared their views in the next section.

<u>Connectivity for teaching and learning</u>

Data allocation had challenges, particularly for the rural areas with no fibre installation and weakened connectivity. Thus, academic staff participants recognized the positive impact of fibre installation to enable online learning. An academic staff participant confirmed that,

"*Wi-Fi Connectivity enabled remote online teaching and learning as well as pedagogical engagements between lectures and students through MS Teams as there were videos shared through the Wi-Fi connectivity*" (D4).

Academic staff participants and ICT support staff participants added that even though ICT ensured that there was data allocation for students and staff members, many students who enrolled at Unisa were not self-disciplined to use the data for its intended purpose. Secondly, even though data was allocated, rural students who lack fibre installation and connectivity still battled to access Unisa online platforms. Another academic staff participant mentioned that,

"*Getting students from deprived areas where network connectivity is very poor is another challenge*" (D4).

Adding to the poor Wi-Fi connectivity and data allocation was electricity load-shedding as teaching and learning support deficiency and challenges where,

"*You would find that people could not connect due to internet disconnection caused by electricity load-shedding*" (CSET L1).

Unisa encountered a system downtime power failure during the 24th of June 2022 examinations in the Muckleneuk and Groenkloof areas. The maintenance issue occurred when generators malfunctioned for 13.3 hours, resulting in 38 examination papers being rescheduled (Unisa ICT Digitalisation Strategy, 2022:3). The internet connectivity and electricity afford participants the capability to communicate with fellow staff members, students and general communications. Consequently, social media/WhatsApp is discussed next.

Social media

Various lecturers confirmed the use of social media as a means to get their students to access the LMS. The lecturers would share the link on all social media platforms, such as Facebook and WhatsApp. The lecturers confirmed that using WhatsApp and Telegram messaging was valuable and increased student engagement. Even though these social media platforms were not Unisa's official means of communication, lecturers found it easy to engage students or observe student interaction, which substantially leads to engagement on the LMS. With Unisa's Open Distance Learning Policy, "communication between the student and the lecturers, students and peers,

student and courseware, student and administrative support and student and the institution" are largely encouraged (Unisa, 2018a:6). With social media and various other forms of media outlets such as television, radio and print media accessible to students, the ODeL Policy outlines the importance of student exposure to a variety of growth opportunities. Such growth opportunities help with student engagements, critical arguments, peer reviews as well as student-tutor feedback through various accessible and appropriate media" (Unisa, 2018a:6).

As articulated by the Tuition Policy, encouraging engagement, lecturers "must promote student communication and articulation in presenting and evaluating opinions, theories and ideas from different perspectives" (Unisa 2013:4). Therefore, an academic staff participant articulated the reason for choosing WhatsApp

> "*For fast communication, as normally, everyone is always on WhatsApp*"
> CSET L1).

Additionally, a CHS academic staff participant articulated the purpose of WhatsApp

> "*For specific content, whilst we use Facebook for general communications.*
> *For module-related content, WhatsApp was the main platform we used*"
> *(CHS L1).*

The participants also used social media to decoy students through the LMS, the official Unisa means of teaching and learning. Most lecturers have indicated that WhatsApp is the social media platform used for their teaching and learning support. As much as social media proves to be a quick and effective way of communication between students and lecturers, confidentiality and the POPIA Act must be considered. A CHS academic staff participant indicated that,

> "We *cautioned students about the POPIA Act and its lecturers*" (CHS L1).

Unisa uses the social media platforms, such as Facebook and YouTube, to focus on graduations and key events. Connectivism recognizes that more information exists than one person can access and digest. Therefore, many technologies related to implementing this learning theory involve managing interactions with the internet (McHaney, 2012:194-197). With Connectivism, lecturers can upload relevant information on social media platforms such as Facebook, blogs and YouTube. MS

Teams, as the online platform the participants use most often, is elaborated on in the next section.

<u>*Microsoft Teams (MS Teams)*</u>

Among the packages staff members used most during COVID-19 was Microsoft Office (Including Microsoft Word, Microsoft PowerPoint (PPT), Microsoft Excel, Microsoft Outlook emails, Microsoft Teams, and Microsoft Viva Insights). The participants found MS Teams easy to navigate and thus conducted meetings, lectures and conferences with a video benefit, file sharing, and re-visiting all the pre-recordings. Another benefit cited by the academics is the benefit of asynchronous recording of their lectures and replaying it for later usage (see Chapter 2, Section 2.4.4).   CSET academic staff adds that,

> "There are benefits of using *online meetings as well as presentations and conduct progress reports meetings with students…. the ability for MS Teams participants to raise their hands and show their videos simulating a physical face-to-face class… the benefits of Online teaching as it mitigates nerves and affords the nervous teacher to teach very well and refer to their notes without the audience noticing"* (CSET L1).

A CPD support staff participant whose responsibility includes staff training shared another benefit,

> "*Excel Spreadsheets reports that can be exported to Power BI Simulation to detect the staff member attendance….ability to record teaching and learning training through producing either a podcast or a video using MS PowerPoint*" (CPD S1).

<u>*Open Educational Resources (OER)s*</u>

When asked what multimedia innovations and ICT advancement/enhancement were identified to be implemented by the college, participants revealed how they employed OERs as effective value-adds relevant to teaching and learning. An academic staff participant indicated that,

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"During COVID-19, the University management realised that some colleagues were struggling. Therefore, they used OERs by the end of June, when they had more than 300 visitors using Mobile devices. These OERs taught lecturers how to use YouTube innovatively, ensuring they keep their online classes "short, very live"- as well as teaching principal administration and strategies" (D1).

Participants added that their experience in remote multimedia teaching brought about by COVID-19 was easily adjustable as they had initially started with online educational resources (OERs), even before COVID-19. OERs serve to teach and learn as academics employ them mainly to expand open resources, adding value to teaching and learning. Due to the openness and easy reach of OERs, Unisa commits itself to critically evaluating the appropriateness and availability of OERs before prescribing textbooks (Unisa, 2012:16).

Some lecturers made use of OERs published on Unisa's Institutional Repository, as it benefits the students to access OERs through the zero-rated website, unlike accessing from YouTube, which requires students to incur costs. According to a CHS academic staff participant,

"When we share the OERs, we share the link to the Institutional Repository. That platform allows us to see which country and province and how often our OER has been used. We get the statistics" (CHS L1).

Mayer's 12 principles of multimedia design (see Chapter 2, Section 2.4.3) mandates lecturers to adopt visual narrative and ICT support in their teaching. With expensive data, lack of affordability, as well as lack of accessibility and ease of use, a CHS academic staff participant confirmed that,

"Videos are loaded on the intranet as it is on a zero-rated platform, and all these videos are outside the MyUnisa firewall to afford students or staff members free accessibility" (CHS L1).

From the participants' shared experiences, COVID-19 revealed the need for pedagogical strategic upgrades and policies to strengthen the ODL teaching and learning capability and staff competence. These also add value to the policy making

of any higher education institution. For this reason, the document analysis of all policies overviewed is discussed next.

5.3 DOCUMENT ANALYSIS: POLICIES REVIEWED

This policy overview section briefly describes each policy analysed for the study. The policy overview's purpose is to present each policy's content concerning multimedia and technology and to place them contextually. Various policies directly speak to the participants' responses and the research questions, making the policies relevant and important for further discussion. Such policies speak to the study's objectives and include the Curriculum Policy, Tuition Policy and ICT Policy. Documents were employed due to their significance in HE policy frameworks and ODeL. Document analysis was also employed to establish post-COVID-19 pandemic ODeL frameworks for HEIs. This study applied inductive thinking, as it enabled investigations and constructed general conclusions from individual cases (McMillan & Schumacher, 2006: 41). The discussion of each policy follows below.

5.3.1 Curriculum Policy overview

The Curriculum Policy outlines its validity in an HEI context regarding the principles that help Unisa achieve its curriculum development guided by its mission and vision (Unisa, 2018a:4). The implementation of curriculum principles elevates Unisa's curricula towards meeting good international practices in curriculum design and being responsive and student centred (Unisa, 2018a:2). The Curriculum Policy implementation further provides clear principles to which colleges, schools and departments can refer in determining the validity of the increasing demands on higher education curricula.

Six broad principles guiding curricula at Unisa are responsiveness, student-centredness, accountability, curriculum structure, quality assurance and Impact (Unisa, 2012:9). For triangulation purposes, this study seeks to understand whether the adaptation of these principles during the COVID-19 pandemic added value for Unisa, its staff and its students. Unisa's curricula are context-based curricula addressing a variety of contexts, from the institutional context to the national context

with its priorities and the international context. Each mentioned context is characterised by several trends, opportunities and challenges (Unisa, 2012:9).

Unisa places the student at the centre of the entire learning process, ensuring that the student's current epistemologies and prior learning should form an integral part of planning the curriculum. Curriculum development should take cognisance of the life worlds, experiences and expectations in structuring a student-inclusive curriculum that regards the epistemological foundations and outcomes of the curriculum (Unisa, 2012:13). Such a curriculum must include multimedia methods that advance student workmanship in a globally competitive world. The "distance" in DE has never been easy to bridge, and over the years, various media have been used for this purpose. Thus, Anderson and Simpson (2012) argued that the increased opportunities for interaction have led to the recognition of educational activities, enhancing their importance in DE. Institutions must structure curricula in such a way that it can improve students' appraisal by an increasingly critical, global higher education landscape and students' ability to serve humanity (ContactNorth, 2020). Regarding pedagogy and technology, the different colleges, schools, and departments must evaluate and adopt approaches that foster active learning to advance teaching and learning (Sanger, 2020). COVID-19 has helped advance the institutional support of teaching and learning, which requires consideration of the student profile through embedding e-learning, m-learning and a range of ICTs as far as possible at the centre of the student experience (Unisa, 2012:17).

HEIs face far more intense demands to contribute directly towards innovation and economic development and to produce graduate attributes and research relevant to the modern knowledge economy (Unisa, 2012:8). With societal challenges, high rise of unemployment rate from graduates, industrial actions, economic challenges, and the negative impacts of students' poor backgrounds; this study challenges the responsiveness of multimedia technology to the recent COVID-19 epidemic (Unisa, 2012:8). Societal changes revealed by COVID-19 on teaching and learning necessitate knowledge decolonization and the 4IR requirement for HEIs to continually develop pedagogical changes introspecting curriculum upgrade (Sinha & Motala, 2022). The curriculum learning experience includes what is meant to be learnt (content), the rationale for the multimedia learning, as well as the processes by which

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the learning takes place. Additionally, curriculum learning includes the structure of the learning process, which must include multimedia technologies and how the learning is assessed, the Tuition Policy must be discussed next. (Unisa, 2012:15).

5.3.2 Tuition Policy overview

The Assessment Policy supports the Unisa Tuition Policy, whose standards and criteria must be consistently met across different tuition periods. Regarding validity, tuition and assessment are equitable when they consider the instructional context and the special background of students (Unisa, 2019a:4). Since students should show through the submission of formative assessment activities that they are actively learning throughout the tuition period, ICT must ensure that the Moodle LMS is up to standard. The reason is to ensure the active learning required for students' tuition is not negatively affected (Unisa, 2019a:6). Unisa's commitment towards continuing professional development facilitates the offering of high-quality DE (Unisa, 2013:3-6).

Unisa's purpose and role include positioning itself regarding the basic values underlying open and democratic society, being responsive to national policy, being responsive to the educational and research concerns and needs of the country, the region and the African continent and other international trends (Unisa, 2012 & Unisa, 2013:2). Unisa fulfils its obligations to students, the subsidising government and society by endeavouring to improve student through-put rates and graduate capability, and to facilitate and encourage graduateness and self-employment (Unisa, 2013:3). Unisa's tuition is guided by making use of open and distance learning principles and approaches based on sound research and scholarship when developing and teaching programmes and courses (Unisa, 2013:4). Among the fundamental principles is Unisa's provision for the integration of ICTs in learning programmes, by making effective and innovative use of technology and offering programmes and improving teaching methods (Unisa, 2013:1). Such innovative ICT integrations are further explored in the next discussion on ICT Policy.

5.3.3 Information Communications Technology (ICT) Policy overview

The intentions of Unisa's ICT Policy are not to impose restrictions that are contrary to Unisa's established culture of openness, trust and integrity but to protect its employees, partners and the institution from illegal or damaging actions by any person, either knowingly or unknowingly (Unisa, 2020a: 1). The ICT Security Policy determines how Unisa's ICT systems and infrastructure should be used following ICT industry standards and to comply with strict audit requirements (Unisa, 2020a: 1). The ICT Service Management and Operations Policy helps ICT staff, or any other persons otherwise affiliated but not employed by Unisa, who may utilise its infrastructure and/or access its applications and all equipment/infrastructure that is owned, rented or leased by Unisa (Unisa, 2020b:5-12). Among the principles that the ICT Policy covers are the electronic devices that should provide and support teaching and learning materials, their provision, selection and use, to expand students' knowledge and challenge their abilities and with due reference to the outcomes of the module and the programme (Unisa, 2018b:3).

There are principles that help Unisa staff use, configure, and report on various systems that support the operations of the University (Unisa, 2020b:5-12). The ICT Service Management and Operations Policy help with the configuration of ICT equipment/infrastructure at Unisa to protect both the users and the higher learning institution. ICT Acceptable Use Policy sets out the rules governing the use of Unisa's ICT systems and services, including hardware, software, and transmissions going out from or entering the computer network. Therefore, the inappropriate use exposes Unisa to risks, including virus attacks, compromising of network systems and services, intellectual property and legal issues (Unisa, 2019b:5). The purpose of the ICT Security Policy outlines the security aspects of ICT and to ensure that appropriate measures are put in place to protect institutional information and its ICT systems, equipment, and associated infrastructure which is extremely crucial in the current times of extreme cyber-attacks and cyber-fishing (Unisa, 2020a:1).

With online assessments came the major risk factor of cyber security as a primary focus, with reports of student data leakage increasing and resulting in, among other things, a POPIA breach. Unisa is an ODEL institution that employs advanced

synchronous digital technologies, such as audio/video and texting facilities, interactive assessment, to simulations and virtual reality. Therefore, there is a provision of e-devices for e-Learning at Unisa for employees and students who have to compete in a knowledge-driven globalized society (Unisa, 2018b:1). Among the incident management and monitoring are designing management and implementation of data management standards and frameworks in consultation with relevant key stakeholders (Unisa, 2019b:10).

5.4 FINDINGS OF THE DOCUMENT ANALYSIS

The document analysis revealed findings which are presented as themes.

5.4.1 Themes stemming from the document analysis

The themes from the document analysis are discussed to help reveal how they can add value to teaching and learning in ODL. Each theme will have a discussion revealing how each policy represents it. Accompanying the themes below are overview tables (Tables 5.2 to 5.3) that explain how they are extracted from each policy and analysed. The table below represents the overview of the themes.
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THEME
Student-Centredness
Student Support & Engagement
Responsiveness
Technology
Teaching and learning
Collaboration
Multimedia professional development

Table 5. 4 Themes from the document analysis

An overview of the listed themes will be provided, as well as a discussion that will reflect the narrative in the context of the policies revealed above. Therefore, the table below portrays each theme against the policy and how it was represented. From the document analysis, it became clear that student-centredness, student support, and responsiveness were major themes across most of the policies. What is also noted is

how the institution prioritises the quality of successful teaching and learning throughout the policies.

THEME	POLICY terms associated with		
	Curriculum Policy	Tuition Policy	ICT Policy
Student Centeredness	YES	YES	YES
Student support and engagement	YES	YES	YES
Responsiveness	YES	YES	YES
Technology	YES	YES	YES
Teaching and learning	YES	YES	YES
Collaboration	YES	YES	YES
Multimedia professional development	YES		

Table 5. 5 Policy and Theme Reference

5.4.1.1 Student-centredness

Student-centredness and student support seemed to be the major themes in the policies. The Unisa students range from rural areas to urban areas, locally and internationally. Various students have different needs based on their capabilities and abilities. Unisa's ODL Policy states that Unisa places the student at the centre of the entire learning process from the moment the student intends to register through graduation and continuing through to its alumni, who play a vital role in evaluating impact and serving as ambassadors for the institution. Students are, therefore, invaluable stakeholders in the development of curricula (Unisa, 2012:13). Student-centredness remains one of the broad principles guiding curricula at Unisa (Unisa, 2012:9). Student-centredness requires students to be seen as the main focus of the educational process and to be supported to take progressive responsibility for their learning and research (Unisa, 2018:3).

5.4.1.2 Student Support and Engagement

Student support stemmed from the participants' data collected in themes in Chapter 5, Section 5.2.5.2, as well as being revealed in most policies (such as the Curriculum Policy, the Tuition Policy and the ICT Policy) due to the role and depth it entails.

Student support is a generic term that is applied to a range of services offered by Unisa to assist students in meeting their learning objectives and gaining the knowledge and skills they need to be successful in their studies (Unisa, 2018: 3). The Tuition Policy employs a systematic process for the design and development of quality ODL materials. This is a complex process involving designing a learning strategy consistent with the delivery mode, as well as an assessment and a student support strategy (Unisa, 2013: 5). According to the Open Distance Learning Policy, as a critical factor for teaching, learning, and research in open distance e-learning, student support takes into consideration the diverse needs of students, such that it is integrated into each learning programme and implemented by various stakeholders as outlined in the Student Support Framework (Unisa, 2018a:4). This Framework provides guidelines for learning and teaching, assessment, student support and quality assurance in the programme generally (Unisa, 2013:5).

5.4.1.3 Responsiveness

Unisa's context-based curricula address a variety of contexts, from the institutional context to the national context to the international context, with each context characterised by several trends, opportunities, and challenges (Unisa, 2012: 9). Unisa's' ODL Policy commits to ongoing, responsive interaction with current and emerging national and international imperatives and developments with relevance to quality ODeL provision. Additionally, Unisa's purpose is to be responsive to the vision and mission of Unisa, national educational imperatives, and societal and employment needs (Unisa, 2018:2-4). Unisa's Tuition Policy further states how Unisa is responsive to the educational and research concerns and needs of the country, the region, the African continent, and other international trends (Unisa, 2013:12).

The Assessment Policy posits that mark adjustment procedures by internal and external moderators must be ethical, responsible, and responsive to the rights of Unisa students for fair and reliable assessment (Unisa, 2019a: 11). Responsiveness remains one of the broad principles guiding curricula at Unisa (Unisa, 2012: 9). The five ICT Digitalisation Strategy principles are aligned to the Unisa 2030 mission and the values of innovation and excellence, as well as responsive student-centredness (Unisa ICT Digitilisation Strategy, 2022:15). Furthermore, these principles support the Unisa

Business Model by positioning ICT to deliver technology solution lifecycle management that advances student success rates, grows research output, and supports the curriculum. Through these principles, ICT will digitalise and support the Unisa value propositions. These principles actively drive Strategic Focus Area Three (3): To build an organisational ICT capability to transform learning and knowledge creation to enable high performance, service, and quality to all its communities (Unisa ICT Digitilisation Strategy, 2022:15).

5.4.1.4 Technology

Most policy documents emphasized the appropriate use of ICTs for teaching and learning. The document analysis revealed that while ICTs are important, the overall reason for using ICTs should be to improve learning (see Chapter 5, Sections 5.2.5.2 and 5.2.5.5). Technology is at the centre of teaching and learning. There is an urgent need to transform the Unisa business model into one driven by technology platforms (Unisa ICT Digitilisation Strategy, 2022: 4). To this extent, the policies outline the importance of ICT investment in new technologies and how their impact benefits the students and affords them the ability to compete from an international perspective through Unisa's enablement. The Curriculum Policy states that "while the effective use of technologies is one of the key characteristics of graduates, the use of technology at Unisa is in the service of more effective teaching and learning" (Unisa, 2012:17).

In supporting teaching and learning, Unisa considered the impact of its student profile competing in a global space by embedding e-learning, m-learning, and a range of information and communications technologies (ICTs) as far as possible, putting them at the centre of the student experience (Unisa, 2012:17). The Tuition Policy states that the university provides for the integration of ICTs in learning programmes and makes effective and innovative use of technology in developing and offering its programmes and improving its teaching methods (Unisa, 2013:1). Unisa relies on well-defined processes, procedures, and robust organisational systems supported by ICT. Additionally, Unisa continuously reviews and develops its governance, management, and technology infrastructure to give effect to its institutional vision and ODeL mission (Unisa, 2018a:4-5).

5.4.1.5 Teaching and learning

Teaching and learning at Unisa are integral parts of each learning programme. It is governed by the Teaching and Learning Policy such that Unisa's Curriculum Policy aims to "critically analyse and evaluate the credibility and usefulness of information and data from multiple sources in a globalised world with its ever-increasing information and data flows and competing worldviews" (Unisa, 2012:10) (see Chapter 5, Section 5.3.1). The aim is to achieve teaching and learning and produce students that "effectively act ethically as citizens" (Unisa, 2013:2). The Open Distance Learning Policy aims at producing students who "engage with the learning materials and construct new knowledge" (Unisa, 2018a:5). The Curriculum Policy similarly states that students should be able to have "active learning experiences" (Unisa, 2013a:7) (see Chapter 5, Section 5.3.1).

5.4.1.6 Collaboration

Unisa's' Assessment Policy facilitates collaborations with professional and vocational bodies, preparing students for registration as professionals and practitioners in their specific fields (Unisa, 2013:2). Additionally, Unisa collaborates with DE institutions in South Africa, Africa and globally to produce opportunities available for employees and students (Unisa, 2018: 6). Encouraging the rising prominence of collaborative research regarding pedagogy and technology, the Unisa Curriculum Policy (see Chapter 5, Section 5.3.1) states that an approach of active, authentic, collaborative intellectual engagement will guide the development of such materials (Unisa, 2012: 8–17). Additionally, organisations recognise the power of collaborating with ICT to build more innovative, secure, reliable, and scalable capabilities and continuously receive ICT technical advice and support (Tyler & Hill, 2021).

Regarding the Tuition Policy, Unisa uses a team approach in curriculum and learning development and consults and collaborates with relevant stakeholders when developing and offering programmes (Unisa, 2013:1) (see Chapter 5, Section 5.3.2). Internally, the departmental collaborations confirmed by the participants help facilitate ICT, colleges, various departments, and Continuous Professional Development (CPD) by Unisa academics, ensuring LMS effectiveness for Unisa academics and students.

In collaboration with other Unisa stakeholders, Unisa's academic focus and student-centric principle aim at ensuring that student engagement is enhanced through student-centric technology solutions that provide much needed student support and have an ear for the student voice (Unisa ICT Digitalisation, 2022:17). Regarding the composability principle, the ICT team will collaborate with the various portfolios to identify, vet, and automate business and IT processes employing various existing and, where required, new technologies, tools, and platforms, including various applications of artificial intelligence such as machine learning (Unisa ICT Digitalisation, 2022:18).

5.4.1.7 Multimedia professional development

After analysing the policy documents, it became clear that the institutional investment is in helping prepare students for the professional world. By the time students fully complete their degrees, there should have been evident skill acquisition, ranging from content knowledge to the application of knowledge. Even though there is preparedness for the professional world, data collected from participants revealed the need for multimedia development through collaborative efforts with support departments. The Curriculum Policy (see Chapter 5, Section 5.3.1) stamps the understanding of the outcome of the qualification to include knowledge and understanding of a subject, as well as cognitive, general, and professional skills and values. "These factors should be explicitly stated for each module and qualification, and they should be the pivot point around which the module or qualification is developed" (Unisa, 2012:11). As part of professional development, Chapter 5, Section 5.2.5.4 proposes the compulsory staff course enrolment to a postgraduate diploma in higher education to advance the staff and professional development in higher education. Regarding student computer literacy, in Chapter 5, Section 5.4.1.7, where multimedia technologies must be incorporated, the suggestion is compulsory computer enrolment to assist staff and students' computer efficiency.

The Tuition Policy posits that students should possess "discipline-specific knowledge, skills, and competencies, as well as broader attributes which equip graduates to be innovative and effective in the workplace and behave as active, informed citizens" (Unisa, 2013:2). In addition to these competencies, adequate pedagogies that

strengthen and equip the student's competency for the real world are required. Multimedia technologies must form part of these additional competencies, as the world has gone fully online. Polishing and preparing for the real corporate geographic global world, the Tuition Policy further alludes to the preparation of Unisa students to connect between what they learn and how they relate to the workplace "as well as the broader community" (Unisa, 2013:4). Students' relatable workplace competencies include multimedia incorporation because it is critical that employees have adequate skills to use ICT and multimedia even in the workplace. The focus on transferring "knowledge to new contexts and applying knowledge in specific contexts" remains central to Assessment Policy" (Unisa, 2015:2). At the University of Johannesburg (UJ) and Tshwane University of Technology (TUT), an Artificial Intelligence (AI) course in the Fourth Industrial Revolution (4IR) has become compulsory for all students, regardless of their qualifications. The reason for this compulsory course is to help upskill and reskill people for current and future jobs (University of Johannesburg, 2022).

The Curriculum Policy brings to the fore the issue of "preparing students for local and international application contexts" (Unisa, 2012:12). From all the themes that stemmed from the document analysis, a discussion of the questionnaire findings, the interviews, and the document analysis follows.

5.5 REFLECTION ON THE FINDINGS OF QUESTIONNAIRES, THE INTERVIEWS AND DOCUMENT ANALYSIS

The findings of the questionnaires, interviews, and document analysis of the policies have sparked a conversation, as there have been similarities and differences identified between themes. From the questionnaires and interviews, themes emerged that stemmed from the participants. Similar themes and characteristics also stemmed from the document analysis of the policies. Therefore, the themes that emerged from the questionnaires, interviews, and data collection are given below. Themes stemming from Chapter 5 include policy amendments.

Themes from questionnaires & interviews	Themes from document analysis
Policy amendments	Student centredness
Support	Student support and engagement
Pedagogical strategies	Responsiveness
COVID-19 Experience: Multimedia innovations	Technology

COVID-19 Experience: ICT perspective	Teaching and learning
	Collaboration
	Multimedia professional development

Table 5. 6 Themes stemmed from policy amendments

With COVID-19 came a lot of experience and change, and the themes from the questionnaires and interviews required policy updates in terms of online teaching integration. The support required by the academics emanates from various aspects, such as ICT, CPD, and MMC support. The support required ranges from ICT Training and ICT Tools of Trade, CPD training on relevant and current software and hardware, multimedia use of audio-visual equipment or hardware, software, and how to integrate all these to enhance teaching and learning to ensure an academic focus and a student-centred approach. Regarding the themes from the document analysis, Unisa policies reveal how, as an ODeL higher learning institution, they prioritise their students at the centre of their focus. Unisa commits to student support and engagement through lecture-student observation. The importance of the lecture-student engagement commitment by Unisa on either social media or the LMS announcements and discussion forums is covered in Chapter 5, Section 5.2.5.5. The required staff training and upskilling, as well as the ICT infrastructure upgrade, produce a high-performing institution and yield a successful student throughput (see Chapter 5, Sections 5.3.2 and 5.3.3) if they are appropriately structured. Participants felt there is a necessity for compulsory staff upskilling by the HEI to produce highly competent staff members and quality products.

Student support and technological intervention for teaching and learning enhancement are revealed in most themes gathered from questionnaires, interviews, and document analysis. Both student support and technological intervention come through strongly as a means of supporting student success incrementation and equipping them with the necessary knowledge, capacities, and capabilities to obtain their qualifications and compete globally efficiently. The findings from the interviews require assessment activities that prioritise authenticity and student-centred infrastructure. An assessment tool that invigilates and ensures secure assessment helps govern the authenticity of assessments through its configured proctoring tool (Unisa, 2022e).

Interviews, as well as document analysis, revealed the importance of equipping students and academics technologically as well as pedagogically. Some participants are against this proctoring assessment system, citing its misalignment with the Tuition Policy (see Chapter 5, Section 5.3.2) and its profitability from a commercialization aspect rather than a pedagogical benefit factor. Referring to the policy amendments in Section 5.2.5.1 for the assessment integrity of Unisa, there are additional legal amendments required for policy strategies for the benefit of the academic project, students, staff, and the DHET.

Unisa's ICT and multimedia support departments constantly benchmark the latest technologies to ensure that the infrastructure upgrade adds value to the university and its employees (see Chapter 5, Sections 5.2.5.3 and 5.2.5.4). Therefore, the procurement and upgrading of tools of the trade help apply and upload content and engage students with the assistance of stakeholders within the institution. Professional development, as described in Chapter 5, Section 5.4.1.7, is crucial for the institutional staff regardless of the discipline.

5.6 CONCLUSION

The findings of this research study emerged from the data collected from questionnaires, interviews, and document analysis. Themes revealed by document analysis such as student-centeredness, revealed how HEIs must customise their products for students. The support for this theme seems to stem from interviews and document analysis due to the functionality and requirements this theme has for either students or staff members. Such technological assistance is required for responsiveness and the enhancement of teaching and learning for both the lecturer and the student. Collaboration is encouraged by all these collected data because of how much value it adds should the support departments collaborate for either training, innovative multimedia technologies, or tools of the trade and ICT infrastructure. Policies revealed how important it is for the HEIs to update their policies to best fit the current ways of teaching and learning and to safeguard against possible pedagogical strategies that neither the HEI nor the academics are aware of. The multimedia experience and innovative ways of implementation during the COVID-19 experience

revealed the resilience of staff members and also the weaknesses, such that the HEIs can solve all challenges tabled by the participants.

The overview of themes stemming from the interviews and questionnaires was presented as they emerged from the data collection instruments. The policies and ICT infrastructure require updating, and pedagogical strategies also require staff upskilling through support departments' collaboration efforts. Additionally, the themes of the document analysis shared commonalities with the interviews and questionnaires of this study, as it was revealed that ICT infrastructure support is outdated and requires upgrading. The summary and recommendations in the next chapter will evolve from the data collection findings.

CHAPTER 6

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 INTRODUCTION

The previous chapter shared the discussion and analysis of findings summarised following the sub-research questions while trying to update the research aims and the study aims to develop a post-COVID-19 pandemic multimedia framework for teaching and learning in Open Distance eLearning in South Africa. Thus, through data collection, it was established how multimedia had impacted pedagogy during COVID-19. This study also determined the multimedia experiences of lecturers in ODL regarding teaching and learning during and after COVID-19.

Chapter 6 discusses the research design and methods, exploring the research design, approach, methods, data analysis, ethical measures, and trustworthiness applied by this research study. The study used data and triangulation to explore multimedia technologies supporting teaching and learning at an ODL HEI in South Africa. All of these objectives were pursued in order to develop recommendations for the use of multimedia in online distance teaching and learning. The study sought to propose key elements of a post-COVID-19 pandemic multimedia framework for teaching and learning in ODeL in South Africa. The proposed framework emanates from key issues identified from established theories. The key elements of the proposed multimedia framework that the study proposes has explored the CTML with the essential capabilities of learners through the teaching and learning theories, Siemens' principles of connectivism (see Chapter 2, Section 2.3.4), and Mayers' 12 principles of multimedia design. All the research findings and discussions in the form of interviews, questionnaires, and document analysis stemmed from empirical research. The study was able to present recommendations given in line with its aims. To conclude, each chapter overview is discussed from the inception of the proposed framework to its limitations and recommendations. Subsequently, the study's suggestions for further research conclude the study.

6.2 SUMMARY OF LITERATURE REVIEW

The literature review for this study was divided into two chapters: Chapter 2 that presented the theoretical framework, and Chapter 3 that discussed the conceptual framework on which this study was founded. The conceptual framework (see Chapter 2) guided this study as it began by presenting DE (see Chapter 2, selection 2.2) as the core foundation of the study, from the terms of reference as a correspondence education to its definitions. The history and background of DE date back to the 1800s, so much so that (Keegan, 1980) sought to identify six key elements of distance education. With ever-evolving technologies, it is clear that DE is becoming inseparable from technology; thus, different generations of DE are revealing more in-depth knowledge through organisational lenses, technological lens perspectives, and pedagogical lenses of different generations of DE (Chapter 2, Section 2.2.4).

Chapter 2 delves deeper into an in-depth discussion of the teaching and learning theories (see Chapter 2, selection 2.3) chosen as a key focus for this study. This study selected four guiding theories: Behaviourism, cognitivism, constructivism, and connectivism. Due to the nature of the framework that this study develops, the three traditionally selected theories (behaviourism, constructivism, and cognitivism) feed the connectivism theory as a digital learning theory, which helps add value to the ODL, multimedia, and teaching and learning aspects. Teaching and learning theories help develop instruction sessions that lead to better learning and information gathering, encourage people's engagement, and, lastly, examine what motivates people to learn or hinders their learning (Saunders & Wong, 2020). To conclude this chapter, we discussed the CTML, which is based on the Cognitive Load Theory. The chapter went on to discuss the Multimedia Design Principles and the role of multimedia technology in DE.

Chapter 3 deliberated on policies supporting multimedia technologies, thus resuming with South African policies. The DHETs' legally published White Paper for Post-School Education and Training is discussed as it provides guidance and governance reference for HEIs and other structures that deal with higher learning (see Chapter 3, Section 3.2.1). From the White Paper discussion comes the Policy for the Provision of DE in South African Universities, which is considered in the context of an Integrated Post-School System as it is beneficial for ODL teaching and learning to draw guidance

from the policy and legislation makers. Also included in the Policy Supporting Multimedia Technologies is the National e-Skills Plan of Action in Chapter 3, Section 3.2.3. The section on education policies on ICTs globally (see Chapter 3, selection 3.3) engages Rwanda, China and Singapore on how they adapted ICTs in their education policies, how multimedia and technology impacted education and how it is accessed globally. Lastly, the last section in Chapter 3 defines and describes multimedia in education. The different multimedia tools and their applications in higher education are also discussed. Additional to the use of multimedia is how multimedia technologies are adapted to educational advantages as well as disadvantages. All these sections sum up the enhancement of teaching and learning from a higher education perspective. The summary of the research and methods is next.

6.3 SUMMARY OF RESEARCH DESIGN AND METHODS

In Chapter 4 the summary is discussed, and the research design and methods are elaborated on, from the rationale for empirical research to the research paradigm, which entails the interpretivism chosen for the study, to the research design, research approach, and research methods, where the selection of participants and data collection process are dealt with in depth. Data analysis (see Chapter 4, Section 4.7), and ethical measures are discussed next. In this section, the study expands on how the site is accessed, informed consent for research is gained by the organisation to mitigate disrepute, and unauthorized ethical leakage of information is considered. Chapter 4, Section 4.8.3 expands on the avoidance of harm, as the safety of the participants and their confidentiality and anonymity take priority. My role as the researcher for the participants and the release of findings are all stipulated, as these are important for further clarity on navigating the study. Chapter 4, Section 4.9, addresses the trustworthiness of the study, where credibility, transferability, dependability, and conformability subsections are elaborated upon to prove the worthiness of the study. The summary of findings and discussions from empirical research are dealt with next.

6.4 SUMMARY OF FINDINGS AND DISCUSSIONS OF EMPIRICAL RESEARCH

The empirical study is aimed at providing insight into "a post-COVID-19 pandemic multimedia framework to be developed for teaching and learning in Open Distance eLearning in South Africa." Table 4. 1 referred to as Adapted Characteristics of Interpretivism in Chapter 4 describes and fundamentally summarises the study's empirical research. Since Ontology affords exploration of reality and is constructed through human interactions, this study sought multiple meaningful realities through engaging the participants of the selected four colleges and three support departments, seeking to establish the participants' knowledge, views, interpretations, and experiences. Applying epistemology, I focused on each participant and applied a more personal, interactive mode of data collection that was interactively interlocked. I was socially constructing knowledge by experiencing participants in real-life settings. Lastly, with methodology, I employed processes of the data collection approach through interviews, document analysis, and open-ended questionnaires. All these activities were motivated by an interpretive approach that encouraged me to engage in the activities while discerning the meanings of actions expressed by participants to gain an in-depth understanding of the post-COVID-19 pandemic multimedia framework for teaching and learning in Open Distance eLearning in South Africa.

Chapter 5 discussed the findings stemming from the questionnaires, interviews, and document analysis of the policy documents analysed and revealed. The lecturer participants' biographical information (see Chapter 5, table 5. 1 in Section 5.2.1) revealed a wide range of qualifications, multimedia readiness, ODL teaching and learning, and professional development status. The overview of questionnaires and interviews in Chapter 5, Sections 5.2.2 and 5.2.3, respectively, revealed how the questionnaires assisted in exploring the demographic information about each participant and how the participants were employing multimedia technologies for online teaching and learning.

The table in Chapter 5, Section 5.2.4, with interviews, reveals the quantifiable structure of the interviews per college as well as support staff and how much stemmed into various themes. From Chapter 5, Section 5.2.5, it is clear that most themes were consistent across all two data instruments. However, two themes did not appear

across all the data collection methods and are noted as such. Policy amendments in Chapter 5, Section 5.2.5.1, and pedagogical strategies in Chapter 5, Section 5.2.5.3, reveal the need to update policies and employ appropriate theories to best suit the current ODL, multimedia teaching and learning, and assessment policies. The support theme (see Chapter 5, Section 5.2.5.2) reveals the need for the staff support from upskilling, ICT, and multimedia to be able to expand on the following: how to implement objectives revealing Mayer's 12 principles of multimedia design, cognitivism, constructivism and connectivism, which appear throughout the themes, whilst behaviourism sometimes does not. Despite plenty of challenges encountered, DE generations, particularly the 5th generation of DE, also have a recurring framework that is applicable through most themes of the study. The COVID-19 experience in Chapter 5, Section 5.2.5.4, reveals the lecturers' experiences with various multimedia innovations. The COVID-19 experience reveals how some academics were innovative and proactive in finding solutions, while others sought training to cope with multimedia technologies during COVID-19. Chapter 5, Section 5.2.5.5, further shows the participants' overview of ICT, where they expressed challenges regarding the LMS Moodle functionalities, ICT network connectivism, and how social media, MS Teams and OERs saved the day.

The themes that stemmed from the document analysis were the policies overviewed (see Chapter 5, Section 5.3), the participants' views in depth, which added value, and the direction of the study. The policies overviewed in Chapter 5, Section 5.3, were only those that reflect teaching and learning, ODL and, subsequently, Multimedia Technologies. The Curriculum Policy guided by any HEI's vision and mission draws from any country's White Paper. The Curriculum (see Chapter 5, Section 5.3.1) must include multimedia methods that advance student workmanship in a globally competitive world. The Curriculum Policy and the Tuition Policy require updating. Unisa's Tuition Policy in Chapter 5, Section 5.3.2, is guided by using open and distance learning principles and approaches based on sound research and scholarship when developing and teaching programmes and courses. A provision of e-Devices for e-Learning at Unisa is mentioned in Chapter 5, Section 5.3.3, for employees and students who have to compete in a knowledge-driven globalized society. The ICT Policy outlined how ICT upgrades must be carried out. The ICT infrastructure, network issues, and tools of the trade must be prioritised and essentially

guide the user on the authenticity, privacy, and confidentiality of multimedia, as well as the sharing of and general upkeep of the organisation.

Chapter 5, Section 5.4.1, revealed themes from document analysis where student-centredness, student support and engagement, responsiveness, technology, collaboration, and multimedia professional development are prioritised. From the questionnaires and interviews, themes emerged that stemmed from the participants. The overview of themes arising from the interviews and questionnaires was presented as they emerged from the data collection instruments. The policies and ICT infrastructure require updating, and pedagogical strategies also require staff upskilling through support departments' collaboration efforts. Additionally, the themes of the document analysis shared commonalities with the interviews and questionnaires of this study, as it was revealed that ICT infrastructure support is outdated and requires upgrading.

The process of the empirical study is vital to proving the tangible aspect of it through findings from the collected and analysed data. The empirical study includes how the study addressed the aim, which was to establish the multimedia framework during COVID-19. In order to establish that, as the researcher, I came up with questions inquiring about my quest to seek knowledge. With my aim, I established the data collection methods, employing questionnaires and interviews. I also established a conceptual framework to draw on previous theories and a theory that served as the study's foundation. DE was an important part of the study as it sought to develop a multimedia framework for ODeL and teaching and learning. As a result, the study of DE was established in depth, from history to generations, as well as strengths and weaknesses to shape the study. From the DE came the teaching and learning theories (behaviourism, cognitivism, constructivism and connectivism) on Chapter 2, section 2.3 that supported the design and development of the study. The Cognitive Theory of Multimedia Framework was chosen as the theory. Chapter 3 dealt with the relevant literature and policies supporting multimedia technologies locally and globally. Multimedia in Education was discussed as vital because its definitions, multimedia components, advantages, and disadvantages add value to the framework. The research methods defined a strategy for conducting this study's research, where data

collection methods were questionnaires, interviews, and document analysis. Data analysis was the most important part of the study as it addressed the research questions. The questions developed in Chapter 1 are crucial, as they help develop the study's aims. The research findings are discussed and summarised, reveal the framework, and thus can bring suggestions and recommendations for further studies and add value to the academic space.

6.5 RESEARCH CONCLUSIONS

The main research question stemmed from the problem statement, which also resulted in developing the sub-research questions for the study.

Secondary questions

- What are the experiences of lecturers in ODL regarding teaching and learning with multimedia during COVID-19 at a specific higher learning institution?
- How has multimedia impacted online pedagogy during COVID-19?

- How is multimedia supporting teaching and learning at ODL in South Africa?

- What are the recommendations for the inclusion of multimedia in teaching and learning in ODeL post-COVID-19?

- What are the key elements of a post-COVID-19 pandemic multimedia framework for teaching and learning in ODeL in South Africa?

The secondary questions are answered first, followed by a discussion of the main research question.

6.5.1 What are the experiences of lecturers in ODL regarding teaching and learning with multimedia during COVID-19?

The findings revealed that participants were using multimedia technologies to complement teaching and learning enhancement, in which some lecturers initially required training. Lecturers found that with pre-recorded, virtual presentations or teaching, students could learn at their own pace and time as they could always replay and pause the recorded, asynchronous approach.

Cognitivism (see Chapter 2, Section 2.3.2) acknowledges the unique and diverse levels of cognitive abilities of the leaners. While also acknowledging that the recordings could be played as audio or video, regardless of the student's location. It was found that some lecturers were utilising multimedia components even before the COVID-19 period, but these, however, intensified during COVID-19, and those lecturers whose experiences didn't exist required upskilling to compensate for their teaching and learning abilities (see Chapter 5, Sections 5.2.5.2 and 5.2.5.4). The lecturers who needed training indicated that their classes were held and attended virtually. Even though behaviourism (see Chapter 2, Section 2.3.1) may be critiqued, virtual learning still affords individual learning with the ability to administer assessments. The findings showed that lecturers have experienced the recent assessment of authentic means and engagements through various interactive assessment approaches (see Chapter 5, Section 5.2.5.3), social media, and announcements on the LMS. Giving feedback and applying interactive quizzes are the behavioural components the lecturers have employed in their teaching and learning during COVID-19 through LMS/WhatsApp interactions (see Chapter 5, Section 5.2.5.5).

Connectivism as defined in Chapter 2, Section 2.3.4, as a technological theory, embraces any network and is not limited to any area. It enhances the idea of lecturers working virtually and creating dialogue. Constructivism in Chapter 2, Section 2.3.3, enables and promotes learner knowledge experience and information gathering; therefore, the lecturer's experience in using multimedia technologies to enhance teaching and learning is a constructive approach. The outdated ICT infrastructure and the inability to allocate data and trade tools negatively impacted participants' teaching and learning (see Chapter 5, Sections 5.2.5.2 and 5.2.5.5). For all the theories of teaching and learning to effectively work, the lecturer must primarily design the multimedia technological content in the context of behaviourist theories, but a combination of behaviourism, cognitivism and connectivism may be used to satisfy each learner's distinctiveness. Other shared experiences include not being able to reach the students because of various obstacles, such as online virtual platforms, data limitations, and unstable network connectivity. Connectivism requires stable and updated ICT infrastructure, digital devices, and stable network connectivity to afford

sharing, storage, and interactively accessible multimedia content. Communication with students through the correct platforms is also concerning and should be established, regulated, and governed. ICT Support (see Chapter 5, Section 5.2.5.2, Section 5.4.1.2, and Section 5.4.1.4) proved to be the most concerning requirement in these themes. How multimedia has impacted pedagogy is discussed next.

6.5.2 How has multimedia impacted online pedagogy during COVID-19?

The findings of the study revealed how multimedia influenced pedagogy enabled by online MS Teams teaching. The ability to present virtual multimedia boosted colleagues' confidence, and some academics even confidently presented their lessons online without being as nervous as in the physical classroom. Participants also confirmed how the accessibility of online virtual labs influenced the marketing of the physical iNanoWS lab facilities (see Chapter 5, Section 5.2.5.4). With the means of only teaching online, students could refer to the online pre-recorded video files at their convenience. The abilities that MS Teams have brought forward include the chat components, where students can ask questions in chat or mute and unmute without the restrictions of the physical class. The teaching and learning theories (see Chapter 2, Section 2.3) employed by this study are revealed through file sharing, question and answer sessions, and flexibility among students or between students and lecturers. This process was deemed beneficial and advantageous for students. The use of WhatsApp social media platforms as an informal student-lecture engagement or student-to-student engagement approach added value as social media provides instant responses (see Chapter 5, Section 5.2.5.5). ICT messaging apps like WhatsApp build student-to-student and student-to-lecturer relations with connections and knowledge-sharing benefits, the provision of informal and formal learning opportunities, and increased access to academic and community resources (Venturino & Hsu, 2022). Videos pre-recorded and uploaded to the LMS were another benefit that helped staff members and their students.

6.5.3 How is multimedia supporting teaching and learning at ODL in South Africa?

It was found in this study that multimedia supports teaching and learning synchronously or asynchronously (Chapter 2, Section 2.4.4), affording the opportunity to teach and learn through lectures and classes at their convenience. It may be argued that one of the significant remote virtual benefits for lecturers and students is that videos are uploaded online for their access at their leisure, with the ability for students to pause, rewind, and play lessons. Students can always rewind to the missed pre-recorded sessions when affected by load-shedding, as the pre-recordings are made available. For students with backup Uninterrupted Power Supply (UPS) or generator systems, the effect of re-checking the footage is not affected. There are no physical boundaries, as students can work and study remotely. The upgraded ICT and audio-visual systems across the institutions afford the means of streaming the teaching and learning to students through virtual platforms. The ICT Policies explain the significance of ICT and multimedia incremental innovation for online distance teaching and learning while maintaining academic focus and student centricity. This crucial incremental innovation safeguard the importance of the ICT and multimedia components and serves as an important support method needed by the participants.

6.5.4 What are the recommendations for the inclusion of multimedia in teaching and learning in ODeL post-COVID-19?

It was found in this study that the participants recommended the fast tracking of the procurement process of appropriate multimedia-inclusive tools and train staff members on the effective use of multimedia software and hardware. An additional recommendation is to prioritise staff upskilling for effective ICT support, upgrade the outdated ICT legacy infrastructure, and acquire adequate knowledge on accessing and navigating MS Teams. Staff upskilling is beneficial for navigating MS Teams, and utilising multimedia in an LMS system is an improved advantage. Academics are encouraged and recommended to embark on research and implementation of relevant multimedia learning methods to assist with the effective automation of teaching and learning for the benefit of Africa and the world. Lecturers must research the latest technologies to ensure the credibility of their work as well as to assess the student success rate. Universities are encouraged to set benchmarks against other advanced

HEIs in order to advance and standardize their facilities and appropriate infrastructure. Another priority of recommendations is upgrading HEI policies to incorporate remote working using multimedia technologies.

Additionally, government involvement in recruiting and engaging service providers to install fibre and internet connectivity is recommended, even in the most rural geographic areas, for the advancement of the technology. There is a required recommendation for zero-rating all the sites with teaching and learning to ensure accessibility of data and T&L for all students. The unreliable bandwidth issues negatively impact the country's global competence. This is coupled with an uneven distribution of access across the country (The Presidency, 2020). The COVID-19 pandemic forced change management in teaching and learning environments; thus, the question in Chapter 1, Section 1.4, must be utterly understood as the recommendations will help advance the world.

6.5.5 What are the key elements of a post-COVID-19 pandemic multimedia framework for teaching and learning in ODeL in South Africa?

A multimedia framework can be designed for teaching and learning in ODL by strengthening an effective, easy-to-navigate LMS that reaches all staff and students and always accommodates the influx of users within the LMS. Connectivism, constructivism, and cognitivism (see Chapter 2, Sections 2.3.4, 2.3.3 and 2.3.2) are employed through the LMS, which stores, shares, and allows dialogue around multimedia interventions, whether synchronous or asynchronous. Staff and students' training on the LMS and MS Teams has created MOOCs around student support, which benefits teaching and learning. When designing a multimedia framework, it is critical to consider multimedia technologies that improve student pass rates. The introduction of a verification proctoring assessment tool is necessary due to an increase in cheating incidents that compromise the integrity and authenticity of assessments and evaluations (Unisa ICT Digitilisation Strategy, 2022:4). The assessment tools require standardisation, governance and approval to update and align with assessment, tuition, and curriculum policies. Another important key element is the allocation of sufficient data for staff and students.

With the history of DE dating back to the 1800s, it is critical to determine the current living times and which applicable DE generation (see Chapter 2, Section 2.2.4) should be used as a guide on the multimedia framework. As a result, the 5th generation has a connection to the present. The key elements of a post-COVID-19 multimedia framework for teaching and learning in ODeL in South Africa are the applicable learning theories that the study employed. Such theories are behaviourism, cognitivism, constructivism and connectivism with Siemens' principles of connectivism due to their role in teaching and learning, ODL and multimedia in a digital era. With ODL teaching and learning in a digital era, as multimedia is shared, stored, and developed through various sources, lectures are cognisant of consistent changes and upgrades. Thus, their decisiveness in the choice of multimedia constantly affects their designs. The Cognitive Theory of Multimedia Learning, as the groundwork for this framework, establish the important aspects to draw from the multimedia framework that the study proposes. CTML pays attention to how memory stores information and cognisant of how some students are auditory while others are visual or dual in their comprehension. Lastly, Mayer's 12 principles are also discussed, as they bring value to the decision-making process of what multimedia component to employ. This aims to ensure that lecturers balance visual and verbal channels, as students generate more meaningful learning when the text is presented visually rather than printed on the screen. The above sub-research questions will discuss the main research question below.

6.5.6 How can a post-COVID-19 pandemic multimedia framework be developed for teaching and learning in Open Distance eLearning in South Africa?

According to the findings, multimedia technology plays a critical role in ODL, and its support improves and expands teaching and learning. A post-COVID-19 pandemic multimedia framework developed capacities and facilities that meet the technological standards fit for teaching and learning for ODL within the 4IR environment. Another priority is to ensure that HEIs are fully capacitated and able to employ and upskill lecturers to teach and adapt multimedia technologies in their teaching content. Therefore, when deciding on the mode of delivery, academics and their HEIs are guided by the students' requirements, as they remain the determining factor (Bates,

2015a). To respond to this main research question, the discussion below aims to address the issue.

6.5.5.1 Overview of the framework

This framework is the result of what this study produced to establish how multimedia technology is integrated in teaching and learning during and post-COVID-19. This framework overview will help guide lecturers in the effective use of multimedia technologies. The multimedia framework approach is suitable for HEIs when adequate support and equipment become available (Müller & Goldenberg, 2021:27). Virtual classrooms include more diverse student-student and teacher-student collaboration, engagements, and exposure to different worlds, which might challenge and broaden their perspectives. Additionally, students continue to access their learning where they could have missed a specific lesson due to various reasons (Müller & Goldenberg, 2021:27). DE comprises two categories, namely, synchronous and asynchronous (see Chapter 2, Section 2.4.4), where synchronous instruction affords all students and lecturers to participate simultaneously, and asynchronous instruction does not afford all students and lecturers to participate simultaneously because the latter is pre-recorded and not instantly live (Perveen, 2016). With COVID-19 affecting and hastening online teaching and learning, the depleted, obsolete legacy ICT infrastructure demonstrates its inability to meet ODeL needs and intentionally impedes the progression of innovation at HEIs (Mhlanga & Moloi, 2020). As a result, each generation must be observed, as technologies must address current teaching and learning needs.

The teaching and learning theories and the appropriate use of multimedia technology underpin and support a successful DE pedagogy. Although the pedagogies could also be usefully applied to campus-based education, the need to practise openness and explicitness in DE content is relevant, especially to DE designers, lecturers, and developers (Anderson, 2011). Since technologies influence and define usage, lectures should be inclined towards technologies and strongly influence and support different models of learning to be developed and used (Anderson, 2011).

Pappas (2014) advises lecturers to be mindful and apply bite-sized learning by dividing content into smaller lessons and encouraging students to only move forward with the course when they have fully grasped the current material (see Chapter 2, Section 2.4.3). DE characteristics, such as self-directedness and adult learning, exist in an online learning environment (Blaschke, 2012). With DE characteristics, lecturers are advised of the three types of cognitive load: intrinsic, extraneous, and germane (Sweller, Van Merrienboer & Paas, 1998). Intrinsic cognitive load is the inherent complexity of certain tasks or materials that has the potential to cause intrinsic cognitive overload (Sweller, 1994). The extraneous cognitive load consists of non-relevant, unimportant elements, such as activities or instructional materials, that make the students use their mental processes. Cognitive load theory recommends the extraneous load be reduced by re-engineering learning activities when the intrinsic complexity of a task remains fixed (Sweller, Ayres, & Kalyuga, 2011; Curum & Khedo, 2021).

Extraneous cognitive load is also based on material outside the content, such as presentations or activities that force the user to pay attention to multiple sources of information (Sorden, 2005). Lecturers and instructional multimedia designers must prevent extraneous processing. The more energy the student spends on processing information, the less cognitive capacity they will have for engaging in the learning experience (Mayer & Johnson, 2008). If the lecturer provides a lot of text from a textbook without a visual conceptualisation, this will delay the student's processing of such information. This also applies when the module contains visuals or animations but lacks the established appropriate content. Lecturers should invent engagements such as interactive quizzes where getting badges breaks the monotony for students.

Germane cognitive load allows the students to devote their cognitive mental resources to the learning process and contributes to the development a student's knowledge base (Pappas, 2014). Germane cognitive load is also based on enhancing the learning experience and results in resources being devoted to schema acquisition and automation (Sorden, 2005). Video learner control options regulate the intrinsic load of the task, inherent in the task itself, to ensure the effective application of the CTML. This allows students to manage germane cognitive load better as they invest resources in constructing schema or developing automaticity (Van Merrienboer &

Sweller, 2005; Chi & Wylie, 2014). Lecturers must ensure that information is relevant to the curriculum's content and concepts, as well as that it is visually appealing, in order to avoid losing students as they construct meaningful knowledge from the multimedia content produced. Lecturers should also ensure to employ engaging activities to assess the student cognitively and their behaviour to constructively bring their understanding into action.

6.5.5.2 The multimedia framework

Since knowing how to use multimedia technology is not the same as knowing how to teach with it, developing educational technology is difficult, as it requires a detailed understanding of contextually bound pedagogies, especially in today's context (Mishra & Koehler, 2006). This section reveals the role of multimedia in supporting teaching and learning in ODL. When designing and using multimedia, it is critical to consider students' challenges and weaknesses, access to technologies, and cognitive level (García & Weiss, 2020). For example, considering the length of a video, for example should a video be too long, it could result in a delay in downloading it and this impacts badly on students who rely on data connectivity. The inability of lecturers to employ recent technologies results in the content not being designed for a conducive curriculum and instructional design methodologies, which brings the brand into disrepute (Bleeker & Crowder, 2022). Lecturers' roles further include the responsibility for ensuring they understand the theories and methodologies, which are multimedia-inclusive, as well as guiding the curriculum and learning outcomes (Saunders & Wong, 2020). Connectivism's principle requires lecturers to constantly be aware of updating their content to avoid keeping outdated information on their servers or cloud systems. Students must always receive up-to-date information for references. Multimedia makes the physical separation between the student and the lecturer bearable through its characteristics, ensuring effective DE teaching and learning in different places. The physical distance between the student and lecturer is achieved using at least one appropriate medium, such as videos, text, or audio (O'Rourke, 2003:13; Wong & Chiu, 2020). HEIs must ensure that they implement student-centred remote teaching and learning to align with purposeful DE (Wong & Chiu, 2020). The flexible method of teaching used by DE is an exciting era in education. Blended or hybrid modes of

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delivery afford almost everyone an option to advance their knowledge in a flexible manner (Keegan, 1993; Heydenrych & Prinsloo, 2010).

The use of multimedia needs to be underpinned by learning theories, as explained in Chapter 2, particularly in Sections 2.3.3 and 2.3.4, where the discussion is about constructivism and connectivism theories, respectively. In a world of tech-savvy millennials, various technologies are better suited to supporting certain learning approaches (McHaney, 2012:175). Constructivism (see Chapter 2, Section 2.3.3) deals with students' knowledge acquisition, while connectivism is informed by the digital information age (see Chapter 2, Section 2.3.4). Constructivism focuses on students' learning experiences, making sense of their experience-learning, and serving as a journey rather than an end result (Merriam & Bierema, 2013:36; McHaney, 2012:164–166). Students are not seen as empty vessels waiting to be filled but rather as active organisms seeking meaning (Merriam & Bierema, 2013:36). With constructivism, lecturers are guides and facilitators. With connectivism, decisions are based on rapidly altering foundations and continually acquiring new information. Knowledge, according to behaviourism and cognitivism, is external to the learner, and the learning process is the act of internalizing knowledge (Siemens, 2005). Connectivism is an information-packed world which requires an exploration of all the acquired information (McHaney, 2012:164-165).

Mayer's CTML which relies on Sweller's cognitive load theory (CTL)framework (see Chapter 2, Section 2.4.2) presents the idea that the brain does not interpret a multimedia presentation of words, pictures, and auditory information in a mutually exclusive fashion (Moore, Burton & Myers, 2004). Choosing a cartoon animation that does not directly relate to the material can hinder a student's learning rather than help them (McGraw, 2019). Instead, such elements are selected and organized dynamically to produce logical mental constructs, hence Mayer's SOI (Select, Organize, and Integrate) model of meaningful learning (Irby, Brown, LaraAiecio & Jackson, 2013). Students have different channels in their brains for processing visual and verbal material separately (Mayer & Moreno, 2003). The student will select relevant words for processing in verbal working memory and relevant images for processing in visual working memory (Toh, Munassar & Yahaya, 2010). CTML,

together with Mayers' 12 Multimedia design principles, guides the lecturers' decision-making on the final design of their multimedia product.

According to the 12 principles of multimedia design (see Chapter 2, Section 2.4.3), it is critical that lecturers use multimedia technologies that have visual and auditory appeal to convey the content, making it easy for students to construct meaning. How the delivery is implemented, organized, and packaged matters for students to create meaningful knowledge information. The 12 principles of multimedia design help lecturers to create multimedia products for the various needs of their students or for the goal they wish to achieve. For example, the coherence principle (see Chapter 2, Section 2.4.3) helps minimise extraneous processing because people learn better with extraneous words. On the other hand, the Temporal Contiguity Principle allows people to learn better when corresponding words and pictures are presented simultaneously rather than successively. Even though this section does not discuss all of Mayers' 12 multimedia design principles, Chapter 2, Section 2.4.3, does. People learn better from words and pictures than from words alone. All the 12 multimedia design principles (see Chapter 2, Section 2.4.3) have their definitions and guides, such that the voice principle allows people to learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than by a machine voice. With the image principle, people do not necessarily learn better from a multimedia lesson when the speaker's image is added to the screen.

Conscious of all the innovations and changes that should be adapted, the ICT challenges, threats, and weaknesses encountered during COVID-19 were notable. This includes the breach of data and the institutional documentation exposed, which may hamper the institutional brand damage (Wrońska, Lew-Starowicz and Rywczyńska, 2020). Various digital communication platforms, as well as HEIs, and policymakers, such as government offices, continue to bear a great deal of responsibility in addressing the difficult issues of privacy and cyberbullying. Such responsibility includes regulation, governance, standardisation and moderation of online discussion spaces to equip the lecturer and student with thriving capabilities within online learning environments (Caprara & Caprara, 2021). HEIs must strengthen their ICT infrastructure and online platforms, as well as review and update their ICT

policies (see Chapter 5, Section 5.3.3), to help ensure progressive, safe working, and well-regulated systems for teaching and learning capabilities.
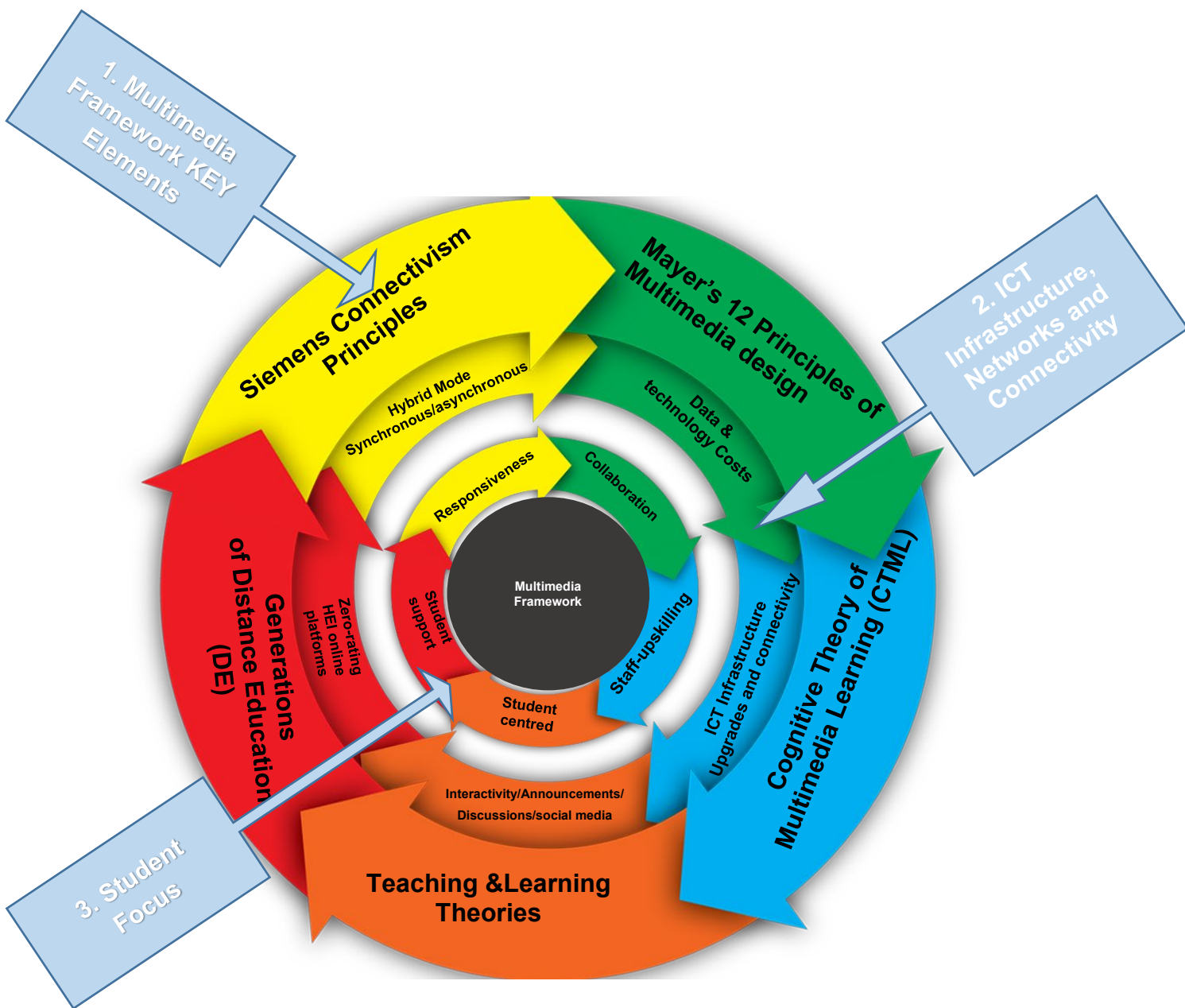
Figure 6. 1 Multimedia framework

The above multimedia framework is coloured to give reference to the layers and segments they each represent. Despite the fact that the segments are intertwined and communicate with one another, the segmented multimedia framework in Figure 6.1 covers the three layers separately, with no colour-coordination correlation provided on the design. The framework focuses on three design components which are:

- Multimedia framework key elements,

- ICT infrastructure, networks and connectivity, and lastly
- the student focus.

The **multimedia framework's key elements** are the **first outside bigger-sized layer** around the framework that draws from the DE generations, teaching and learning theories, CTML framework, as well as Siemens' principles of connectivism, and Mayer's 12 principles of multimedia design.

The **ICT infrastructure, networks and connectivity** form the **second middle layer**, which ensures that the content structured through implementing the multimedia framework key elements are connected on a stable ICT infrastructure. Implementing zero rating on all HEIs and providing data to students, whether synchronous or asynchronous, remains critical. The second segment focuses on the ICT infrastructure and ensures that the data and technology costs are affordable for staff and students. This segment seeks to ensure that the ICT infrastructure is well upgraded to improve interactive engagements, dialogue, and interactivities between the lecturer and student, accommodating the theories that the study has chosen. The segment seeks to encourage the practical provisioning of zero-rating of HEI online, as the hybrid mode is beneficial, whether synchronous or asynchronous.

The **Student Focus** of the Framework is the **third** and **smallest layer inside**, which aims at prioritizing student centredness where all the ICT systems installed by the ICT infrastructure (second middle layer) are effectively responsive. The participants and the document analysis revealed ICT and student support as one of the major requirements that all HEI should abide by. Therefore, in efforts to ensure responsiveness and the possibility of support for the students, ICT, multimedia and CPD collaboration and staff upskilling are vital for the academic project. The HEIs, MNOs, DHET, corporate institutions and communities at large require collaboration for the multimedia framework to be effective.

All the above-mentioned three layers reflect the multimedia framework. The layers and segments are further discussed below on the various aspects they bring to the framework.

Multimedia framework key elements

This framework is guided by **DE generations, the teaching and learning theories, CTML, Siemens' principles of connectivism** in Chapter 2, Section 2.3.4, and **Mayer's 12 principles of multimedia design** (see Chapter 2, Section 2.4.3). To feed the visual and sensory representations, the choice or combination of media will need to be determined by the DE pedagogy (as students want to acquire knowledge) behind the teaching and the subject matter or content (Bates, 2015a). A thorough adaptation of a multimedia framework in a COVID-19 remote online teaching and learning era will produce a user-friendly guide and add value to online distance education. In terms of pedagogy and technology, lecturers should be aware of students' life worlds, experiences, and expectations when designing a responsive, inclusive curriculum that will improve students' appraisals and ability to serve in an increasingly critical global higher education landscape.

This multimedia framework is designed to support ICT and multimedia. As experience has shown, consideration for multimedia technologies and appropriate ICT infrastructure is required for adapting and appropriately using multimedia technologies for teaching and learning purposes. Therefore, with the mode of delivery being ODL, students' lessons are conducted synchronously or asynchronously. There is a contrast in academics and students' perceptions of using multimedia; thus, this section substantiates the importance of teaching and learning theories in structuring learning outcomes (Mayer, 2005). The multimedia framework requires appropriate adaptation of learning theories and questions by academics, students, HEIs, and society at large to construct and situate them in the appropriate instructional context based on the learning objectives (Hung, 2001 & Manqele, 2012).

This study has employed four teaching and learning theories (see Chapter 2, Section 2.3), which are highly connected to successful multimedia technology integration. Behaviourism, cognitivism and constructivism were developed when learning was not impacted by technology. Connectivism is built on technology and network dependence, not secluded to a classroom environment, and relying on input from non-humans such as a computer, networks, cloud storage, and social media to access multimedia created by humans (Siemens, 2005). Behaviourism's positive

principles, concerning the teacher-student approach, student expectations of immediate feedback and student-centredness, are effectively integrated through multimedia technologies to yield positive outcomes (Hendricks, 2019 & Schunk, 2015). With behaviourism in the multimedia framework, the lecturer assumes that knowledge exists independently, and that learning is an act of internalising knowledge acquired through conditioning (Ertmer & Newby, 2017).

Effective working during COVID-19 required computer efficiency and multimedia knowledge; therefore, connectivism, cognitivism and constructivism theories of 21st century meet those Criteria (Siemens, 2005). Lecturers can design and develop multimedia components employing cognitivism theory, which encourages independent and self-paced learning and includes little if any peer-to-peer interaction. The chosen theories must complement each other for the multimedia framework to be effective. Cognitivism requires connectivism to encourage remote-delayed or instant dialogue and the interactivity and social presence of others (Downes, 2017). With cognitivism, how the content is structured is given emphasis; thus, cognitive theory motivates the multimedia to be pre-planned and designed sequentially as humans prefer concrete multimedia designs for understanding (Sorden, 2005; Rudolph, 2017). It is vital to construct clear objectives and navigation when designing content for student accessibility (Kirschner, Park, Malone & Jarodzka, 2017).

Constructivism acknowledges that real-life learning is messy and complex, and Constructivist classrooms (whether physical or online) teach big concepts using student activity, social interaction, and authentic assessments (Shah, 2019). Multimedia designs and development require Constructivism as it encourages and believes in lecturers' capabilities to attempt to understand their experiences by creating new knowledge (Clark, 2018). Constructivism combines new information with existing knowledge and experiences through multimedia, including video, pictures, audio, and other formats (Hausknecht, Vanchu-Orosco and Kaufman, 2019). For a constructivist multimedia framework, the multimedia designer needs to have appropriate knowledge of construction and computer skills to increase desirable multimedia outcomes; otherwise, the multimedia framework will not be effective (Shah, 2019).

With COVID-19 and how technology has changed how we "live, communicate, and learn" and conceptualise our world, Connectivism is an appropriate theory to address the knowledge explosion through multimedia (Siemens, 2005). For the framework to effectively work, it is vital to engage in multimedia when designing the content and to adapt and employ Siemens' principles of connectivism (see Chapter 2, Section 2.3.4). The academics must examine which of the 12 Mayers' principles and learning theories to apply, establish, design, develop, and evaluate a multimedia framework with a theory of a multimedia learning environment in mind (Mayer, 2005 & Samat & Chaijaroen, 2012). In Chapter 5, Section 5.3.3, the ICT Policy elaborated on acceptable ICT policies, the use of ICT property, and incident management to protect students and staff from cyber-attacks. Therefore, the following discussion expands on how beneficial the theory is for HEIs, which have student-centred, institutional ICT infrastructure and pedagogies, and employing highly skilled and competent staff they continually upskill and upgrade.

ICT Infrastructure, networks and connectivity

The benefits of a multimedia framework through chosen media such as gamification, videos, and live lectures will motivate student engagement. This student engagement benefit is through the fun **interactive and engaging multimedia content,** providing pedagogical benefits and substantially enforcing student-centeredness (Marcial, dela Peña, Montemayor & Dy, 2021). Student engagement forms part of behaviour, constructivism, cognitivism and connectivism theories as it encourages **student activities, feedback, and dialogue**. The interactive use of social media often refreshes students on the LMS through discussions and feedback sessions on Announcements and discussion forums (see Chapter 5, Section 5.2.5.5).

Since multimedia includes text, audio, video, computing and social media components, it is important to understand that they serve different roles as they all have unique characteristics that make them useful for teaching and learning (Bates, 2015b; Fen, 2018). With the obvious **data** and **technology costs** as a challenge, HEIs, in conjunction with the government, are expected to collaborate with mobile network operators to maintain zero-rating of all educational sites and free unlimited data allocation for students. The *zero-rating of Unisa platforms* adds value to the

proposed multimedia framework. Efficient **electricity back-up**, **network connectivity**, **data allocation** compensation, and substantial **upgraded ICT infrastructure** will enable flexible uploads/downloads, successful streaming, and interactivity by students/lecturers (Muthuprasad, Aiswarya, Aditya & Jha, 2021).

Support on Chapter 5, Section 5.2.5.2, shows how COVID-19 revealed the unreadiness of Unisa's outdated legacy ICT infrastructure. Unisa's' unreadiness was reflected from the perspective of tools of the trade (hardware and software capabilities), unreliable internet access and unstable Wi-Fi, data allowances for staff and students, an ICT support system (most staff were fixed), and a lack of adequate knowledge and skills by staff to use recent technologies. Institutional upgrade required adaptation and change management from several perspectives, such as the following: the executive management through the policies, ICT infrastructure, operational policies, assessment, tuition, curriculum design, ICT policies, staff professional development, internal and external collaborations, research for the latest technologies to help enable curriculum through recent theories and systems integration for the advancement of successful teaching and learning.

This framework proposes that academics design **hybrid** accessible content that is easily accessible in both physical and online environments to bridge the students' affordability gap. Whether **synchronous or asynchronous**, students must be able to access the content at their own pace. As academic integrity remains the core essential quality aspect of all HEIs, the HEI fraternity requires a more agile approach and strategic policy thinking. The use of multimedia technologies remains a convenient and reliable functionality, as **synchronous and asynchronous** video recordings can help with validity and credibility where necessary (Lee, Arthur & Morrone, 2017). However, the recordings and discretionary use of room scans do not permit true reflections or the effective, unique preserved test integrity for any evaluation or evidence (Schwartz, 2022).

With the exposure and danger of cyber-attacks and cyberbullying by users (both students and lecturers), this framework proposes risk mitigations with sufficient infrastructure, enabling restrictive access from unacceptable phishing sources. The

ethics of artificial intelligence issues and initiatives discussed in the study question the ethical implications and morality arising from developing and implementing artificial intelligence (AI) technologies. More complex and less certain implications of AI, such as those regarding human relationships, are being studied (European Parliamentary Research Service, 2020). All the **ICT Infrastructure, Networks and Connectivity** efforts by HEIs and academics are meant to benefit the learner-centred approach; thus, this multimedia framework is concerned with the focus on students, which is discussed next.

Student Focus

The above multimedia framework aims to curb the multimedia challenges that lecturers experience by providing guidelines for integrating multimedia in ODL for teaching and learning during and post-COVID-19. The above multimedia framework (Figure 6.1) prioritises *student-centredness* and the sufficient provision of *student support* through various means of Multimedia tools. The multimedia framework proposes an improved curriculum for student success rates and high-performing educational institutions.

Student-centredness is a major commitment at Unisa, as reflected in almost all its policies as of this HEI. Thus, all the strategies are guided by the idea that the student takes priority and is at the forefront of the decisions of the institution. As stated in Chapter 5, Section 5.3.1, the Curriculum Policy assessment and the ICT Policy and student-centeredness remain major. Therefore, this study proposes the multimedia framework to guide the inclusion of free access and student engagement through various technologies that require students' abilities to navigate digital devices and multimedia technologies to advance the pass rate. Augmented Reality (AR) and digital gamification, drones, 3D printing, gamification, announcements, and discussions on the LMS Moodle platform, emails, and social media such as YouTube, WhatsApp messaging and Facebook are such engagement multimedia technology tools (Claros-Perdomo, Millán-Rojas & Gallego-Torres, 2020). The institutional provision of tools of the trade, data allocation during examination time, constant uploads and activities, roadshows on recent developments, sessions on how to write examinations, game lab integrations, and other activities all help equip students' engagement and digital

literacy, which subsequently leads to their graduation rate. Learning merit should be evaluated before the beginning of learning to ensure an effective cognitive load (McHaney, 2012:164-165).

The hybrid Unisa and ICT-Multimedia Centre's **collaboration** for live streaming graduation ceremonies enables remote viewership for extended family members who cannot reach the venue, all of which forms part of student-centredness. Social media visibility is planned through the Department of Institutional Advancement so that students are at the institution's centre. Student-centeredness also includes the requirement for lecturers to plan their learning outcomes using curriculum and instructional design principles, as well as their use of multimedia in teaching and learning.

George Siemens' principles of connectivism note the ever-changing technologies and how valuable continuous **staff upskilling** is. Therefore, efforts encouraging responsiveness are enabled by the various stakeholder collaborations for the enhancement of the academic project. **Staff upskilling** in multimedia technologies enables HEIs and their lecturers to create multimedia content while keeping cognitive overload on students in mind. Equipped staff advances and prioritizes their teaching, which benefits the student-centred approach and **responsiveness,** which are fundamental to student focus. When creating content, lecturers should consider cognitive load as well as the use of multimedia to ensure student engagement. Therefore, the HEIs should ensure they employ sufficient staff capacity to help afford to produce quality content for their programmes, subsequently enrol staff for **upskilling**, and sufficiently adapt to multimedia design (Allain-Dupré, Chatry, Michalun & Moisio, 2020).

Staff competency determines the success and performance of the institution. Therefore, **staff upskilling** (lecturer and administrative professionals) is a major requirement in professional development where there is a vast awareness and thorough understanding of multimedia technology. This is part of pedagogy to enhance teaching-learning, student-centeredness and student support. As much as multimedia technology enhances teaching and learning, lecturers need to understand that it is not replacing the curriculum but complementing it and that multimedia technology

integration is intended to improve teaching and learning rather than merely using technology as an add-on. Lecturers require skills training in learning with multimedia to integrate with learning outcomes, including knowing which software to use and how to ensure that they use and upload multimedia materials and tools for the pedagogical benefits of teaching and learning (Chapter 5, Section 5.2.5.2).

Professional administrative staff are required to understand which software to use and for what purpose to identify and establish the multimedia product and outcomes, conduct research, and propose solutions. Lecturers must be able to identify how to adapt and design learning activities in different forms for their students. Such dedication necessitates ongoing updates on cutting-edge technologies and theories such as the multimedia framework, TPACK, connectivism, and the Community of Inquiry. Understanding innovative theories helps develop suitable courses and modules as they help guide the methodology of the modules, research, videos, gaming labs, virtual labs, digital recording studios, OERs, and Moocs that are developed and installed. These tools should equally serve the pedagogical aspect of learning; otherwise, they are just fancy videos. Awareness of the operational virtual roadmap is necessary to work on how users can adapt to new ways of using multimedia.

6.5.5.3 Operational Virtual Roadmap Awareness

To help establish how to navigate institutional upgrades to compete globally by being aware of student-centredness and lecturer upskilling or upgrading, the Operational Virtual Roadmap presents the following:
- DE Pedagogies (see Chapter 2, Section 2.2.4),
- For teaching and learning theories (see Chapter 2, Section 2.3)
- Multimedia policies (see Chapter 3, Section 3.2)
- and documental analysis on Policies (see Chapter 5, Section 5.3).

To achieve the awareness that helps to upgrade institutional operations, student-centredness, as well as staff upskilling, there is a need for an operational virtual roadmap led by ICT in collaboration with the Department of Institutional Advancement (DIA) as well as Teaching, Learning, Community Engagement, and Student Support (TLCESS), where all the colleges fall. Academic staff members require upgrading and upskilling as they form the operational success of the institution (Chun, Comyn &

Moreno da Fonseca, 2021). Questioning, listening, assessing, and advising are thought to enable teaching presence to be developed and maintained when students are learning remotely (McAleavy & Gorgen, 2020).

The Operational Virtual Roadmap Awareness should be collaborated on and facilitated by Human Resources, ICT, Multimedia, and DIA, where the digital signage on campus helps showcase the steps on how to navigate the LMS Moodle system, how to reset passwords, how to access the library, and how to register, to name a few. All these how-to videos should also be uploaded on the LMS for students, on social media, and on internal and external Unisa websites. There must be teams that embark on virtual sessions, whereby accessing the links from a user experience point of view will allow knowledge session accessibility. The institution's leading technology solutions will help advance student success rates and enable a strong curriculum and high research output, which are critical components for the gradual rise of Unisa rankings both globally and locally. When ICT delivers technology solutions that add value to teaching and learning, this creates an opportunity for ICT to contribute towards growing enrolment numbers, combating dropout rates, and removing system instability.

The rapid advancement of technology has made it necessary for all staff members, whether academic or administrative professionals, to be well equipped to navigate multimedia systems, research and write papers on multimedia technology solutions, and enable the institution, its employees, and students to use multimedia technologies with efficiency and ease. Through collaborative efforts of ICT and DIA communications internal, external, and social media capabilities, HEIs should prioritize the gradual means of communication and engagement of staff and students. Training of staff members through ICT collaboration with the Continuous Professional Development office for all recent technologies must be made a priority. HEI should enforce staff training and personal development as part of the performance agreement and assessment to prioritise staff upskilling in recent technologies. HEIs must require a dedicated marketer, CPD specialist, multimedia specialist, and ICT specialist to help prioritize the functionalities of the institutional calendar and those of the college. The limitations of the study are discussed below.

6.6 LIMITATIONS

This study's limitation applies to how there was only one research site, which is the use of one institution, being the main ODL in Africa that is understudied. Even though the study's gathered data was sufficient and reached saturation, it would have taken a different approach if other institutions were included. The study was limited to only four colleges with a limited number of lecturers whose views and experiences related to COVID-19 and online distance eLearning. The other limitation was how some participants would postpone the interviews, citing their schedules as the reason for their unavailability. Even though there were only three colleges, fifteen participants, and institutional policies for document analysis, the research questions could be answered. This study provided in-depth data and an overall view of the participants' experiences of multimedia innovations in teaching and learning during COVID-19. The study was a qualitative study that reached saturation. Even though there are references as to what the participants could produce during the COVID-19 period, the privacy and protection of themselves and their belongings hinder sharing such multimedia interventions for their sharable benefit.

6.7 RECOMMENDATIONS

In terms of the study's findings, the study recommends competent ODL HEIs that prioritize ICT infrastructure investments, staff upskilling, and a student-centred approach where quality interactive technological engagement remains a high priority. HEIs require urgent action to mitigate staff resignations due to their frustrations with delivering competent, quality products to students. HEIs need a strategy for incremental student throughput. Therefore, the following are the specific recommendations:

6.7.1 Institutional recommendations

HIE with registered students across the global competency level require a reliable, stable, and the latest ICT infrastructure to function globally in all seasons (from the peak season of examinations and registration to any other time of assignments, announcements, and discussions).

HIE are recommended to invest in ICT upgrades as well as procurement of appropriate tools of the trade, digital studio integrations needed because outdated legacy systems delay universal progress and subsequently lead to institutional brand damage.

The study recommends adequate and reliable ICT support with a 24-hour turnaround time as well as professional development upskilling should be further made mandatory and prioritized multimedia and ICT technologies to ensure institutional high performance and global competitiveness for all higher institutions.

The study recommends an institutional end-to-end operating model for a digital service channel where all the staff servicing is met with vigour and urgency by a team of talented marketing, ICT, CPD, and multimedia specialists is a recommendation. Additionally, there is a need to employ Mayer's 12 multimedia design principles (see Chapter 2, Section 2.4.3) and Siemens' connectivism (see Chapter 2, Section 2.3.4). There should also be a committee responsible for the mandatory training of necessary hardware and software.

It is recommended that HEIs ensure they additionally produce scannable or barcoded "how-to-navigate" videos and manuals for ease of access across all online platforms, both internally and externally, for staff members to be able to find efficient solutions. Installation of monitoring systems such as Power BI, which can track, help give feedback, and check and account for staff members for training, is necessary and should be mandatory.

Lastly, HEIs worldwide are encouraged to collaborate with government entities, non-governmental organisations, and network service providers to help install fibre across the country, zero-rate all HE websites, and supply affordable tools of the trade. The following recommendations are for the lecturers and how they should be upskilled for teaching and learning enhancement.

6.7.2 Staff upskilling: multimedia and ICT aid

Lecturer and administrative staff upskilling remains a major concern for HEIs, particularly in teaching and learning, as they form major components and serve as the biggest value-adds in integrating multimedia and ICT technologies into the curriculum and adequately informs the incremental student throughput. Multimedia integration in teaching and learning requires planning, strategy, resources, and ICT infrastructure upgrade, capacity, and capabilities.

This study recommends that HEIs must ensure that all students have access to online assessments, understand the instructions, and own appropriate technologies to complete their assessments. Therefore, all activities that the lecturers include should be interactive and creatively and purposefully designed to portray and project multimedia technologies while being mindful of the curriculum integration.

This study recommends that lecturers be upskilled to enable the development of activities such as simulations, gamification, and state-of-the-art gaming labs that can be used by academics to explore the integration of gaming for learning. Lecturers must be able to incorporate the latest technologies, such as gaming, for learning and stream sessions from the lab across the country. Continuous staff professional development is an ever-growing process that requires competency etiquette and is regulated by all HEIs to ensure students get a quality product from competent staff members. Thus, the next section discusses student focus.

6.7.3 Student focus

The study recommends that HEIs should commit to reaching out to students across regions with high-performing ICT infrastructure and connectivity, supplying digital devices, data, and zero-rated web access. The study recommends that the HEIs ensure they alleviate trustworthiness, ethics, and student success rates.

The ICT Policy cautions against unacceptable use of ICT infrastructure that poses risks to the networks or abuses the devices (see Chapter 5, Section 5.3.3). Therefore,

it is recommended that lecturers consider threats to ICT networks with third party access such as WhatsApp messaging and social media platforms such as Facebook. Integrating WhatsApp into Microsoft as a quick and easy chat solution without user profile exposure of their names to comply with the POPI Act is a potential possibility to explore.

Regarding student activity, engagement and peer review feedback, Student focus requires student engagement and collaboration by officially incorporating WhatsApp messaging as a form of learning aid tool for students to share knowledge, class materials, and general learning opportunities. Mitigating a potential failure for students in digital online classrooms, this study recommends AI spotlight detector cards designed to help lecturers identify and differentiate attention to support students who show early signs of disengagement or change in activity.

The risk of students learning remotely in isolation cannot be ignored; thus, it is necessary to check on the student's well-being while providing emotional support through shared tips, online psychological interventions, or referrals to area specialists through the office of the Department of Tuition, Support, and Facilitation of Learning (DTSFL). Depending on the student's individual needs and preferences, counselling and career development tips are highly recommended. Remote, 24-hour Artificial Intelligence-based student counselling is recommended to ensure students' wellbeing.

There is a recommendation for the allocation of data for students, not only during peak examination times but throughout the year. There is a required recommendation for solar systems' integration to curb electricity load-shedding obstacles, which will support the multimedia technologies enhancing teaching and learning for ODL.

6.8 SUGGESTIONS FOR FURTHER RESEARCH

It is recommended that further research should be conducted on a broader scale in other universities that are using a hybrid mode of teaching and learning.

The study encourages and recommends inclusive multimedia approaches ensuring all students are well catered for, regardless of their capabilities and inabilities. This is aimed at curbing the inefficiencies.

A collaborative effort between government and HEIs regarding data allocation, zero-rating, and deployment of fibre installations across rural geographical areas to improve accessibility, as well as device management systems, would help alleviate the learning accessibility problem, ensuring ODeL enhancement is highly recommended.

The study recommends the adaptation of this multimedia framework to DHET policies post-COVID–19. The study further recommends compulsory multimedia training and the development of academics and students to enhance teaching and learning.

The study recommends that HEIs conduct a necessary multimedia technology skills audit of the following:

- Staff and students should establish how they can aid in the upskilling and upgrading of students and staff.
- The use of WhatsApps and considering officiating and formalizing the use of WhatsApps as a formal means of communication to reach students.

Because of the world's changing remote communication, the study recommends that HEIs reconsider their curriculum design policy, effectively proposing and amending its multimedia framework components.

Enabling international hybrid broadcasting for universities, the study further proposes a 24-hour online TV Broadcast station for instant student engagement, dialogue/feedback accessibility to online teaching and learning necessary for an academic project as well as constant verbatim instant content upgrades. The following section concludes the study.

6.9 CONCLUSION

During the COVID-19 period, HEIs faced numerous challenges that provided opportunities for change. Therefore, this study sought to investigate how HEIs globally require support to create, develop, and upgrade all multimedia technologies and ICT infrastructure to best improve ODeL teaching and learning post-COVID-19.

The conceptual framework adequately addressed appropriately DE, teaching and learning theories, a CTML framework where the pedagogical lens is discussed to professionally develop, prepare and form the basis of the research study. Mayer's 12 principles are promoted for lecturers to generate more meaningful visual multimedia content, enhancing ODeL teaching and learning. The data from policies supporting multimedia technologies was expanded from three national policies which supported the scope of research whilst the education policies on ICTs stretched globally were fitting to draw reference from the study.

This qualitative research study employed semi-structured interviews, questionnaires, and document analysis of the policies under study, which helped build an understanding and interpretation supporting the empirical research. The participants in the study were academics, deans, and support staff whose roles added value to exposing the institutional challenges and adequately representing the qualitative study. The research methods were aimed at addressing the study's aims and objectives.

This study proposes and produces a multimedia framework (Figure 6.1) to add a unique contribution to the body of knowledge in the technologically global academic field of open distance and e-learning (ODeL). The study's findings reveal valuable insight into the broader academic community, particularly ODL HEIs, for training, development, and the advancement of HEIs. Teaching and learning theories employed in this study encourage policymakers, decision-makers, and academics to invest in the study's findings for accumulating knowledge in online distance learning to stimulate further dialogue and engagements in ODL teaching and learning.

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APPENDICES
Appendix A: Interview schedule for support staff member working in ICT

1. Good day Mr M*** how are you doing?
2. What is your role in your directorate regarding online learning?
3. What is the role of your directorate regarding online learning? Same as above
4. What have you experienced in your department regarding teaching and learning online during COVID-19? The whole university relied on Collaborative Infrastructure Solutions
5. How has online ICT infrastructure impacted teaching and learning during COVID-19?
6. What ICT online support services were made available for lecturers during COVID-19?
7. How did the lecturers access such support services?
8. What was the turnaround time to resolve lecturer queries regarding online learning?
9. How did you cope with lectures enquiries with online technical challenges during COVID-19?
10. What ICT practices did you share with lecturers?
11. What were your encounters/difficulties with ICT technologies and how did you manage them?
12. What are the recommendations for the inclusion of ICT in teaching and learning in ODeL post-COVID-19?
13. What was regarded useful and not useful ICT technologies during the COVID-19 pandemic?
14. What ICT interventions were brought forward by your division to the institution?

15. What were common problems that staff members, lectures as well as students encountered with using ICT when learning online? If there are any, how were such problems addressed/resolved

16. How did your department collaborate with other directorates such as *Multimedia, Marketing*, *Tuition Support & Facilitation of Learning/Instructional Support Services* as well as COD regarding issues relating to online learning?

17. Based on your experiences are there any issues that need to be addressed to improve ICT infrastructure to accommodate online learning within the institution? If yes, please tell elaborate more

Appendix B: Interview schedule for support staff member working in Multimedia Centre

1. Good day Mr M****, how are you doing?

2. What is your role in your directorate regarding online learning?

3. What is the role of your directorate regarding online learning?

4. What have you experienced in your division as well as Unisa regarding teaching and learning with multimedia during COVID-19?

5. What multimedia support services were made available for lecturers who teach online?

6. How did the lecturers access such support services?

7. How did you cope with multimedia service requests during COVID-19?

8. What were your encounters/difficulties with multimedia technologies and how did you manage them?

9. What are the recommendations for the inclusion of multimedia in teaching and learning in ODeL post-COVID-19?

10. What was useful and what were not useful multimedia technologies during the COVID-19 pandemic?

11. What was the turnaround time to resolve lecturer queries regarding multimedia services?

12. What were the most common multimedia requests by various divisions and how did you solve them?

13. What multimedia interventions were brought forward by your division to the HEI?

14. What were common problems that staff members, lectures as well as students encountered with using multimedia when learning online? If there are any, how were such problems addressed?

15. How did your department collaborate with other directorates such as *ICT, Tuition Support & Facilitation of Learning/Instructional Support Services* as well as the *selected Colleges* regarding issues relating to online learning?

16. Based on your experiences are there any issues that need to be addressed to improve multimedia online learning within the institution? If yes, please tell elaborate more

Appendix C: Interview schedule for support staff member working in Department: Tuition Support & Facilitation of Learning (DTFSL)CPD

1. Good day Dr M*****, how are you doing?

2. What is your role in your department regarding online learning?

3. How has your department as teaching and learning support impacted pedagogy during COVID-19?

4. How has DTSFL supported teaching and learning at your HEI during COVID-19?

5. What innovations/practices of multimedia did you incorporate in your training during this time?

6. As you also serve as academic trainers, what were your encounters/difficulties with various technologies particularly multimedia technologies during COVID-19 and how did you manage them? Difficulties were not directly with the technologies, we had the major issue of Data allocation (it was too expensive) and Tools of Trade(Laptops).

7. What would be your recommendations regarding the inclusion of multimedia in teaching and learning in ODeL post-COVID-19?

8. How did your department collaborate with other directorates such as ICT, selected colleges, multimedia, marketing regarding issues relating to online learning?

9. Based on your experiences are there any issues that need to be addressed to improve online learning within the institution?

Appendix D: Interview schedule for College Dean or Acting Executive Dean staff member working in selected Colleges (COE/CHS/CSET/CEMS)

1. Good day Prof, how are you doing?
2. What is your role as a dean of your college as well as the college regarding online learning?
3. What were the challenges that lecturers encountered with multimedia technologies during COVID-19 period and how did your college manage them?
4. What means of multimedia innovations and ICT advancement/enhancement have you identified to be implemented by the college?
5. How has multimedia supported lecturers' teaching and learning at your COVID-19 during COVID-19?
6. What multimedia technologies would you recommend for academics to be able to compete globally?
7. How did your lecturers in your college cope with multimedia interventions during COVID-19?
8. From a leadership perspective, what support could be implemented by the college as well as the HEI for lectures ICT advancement? Already responded
9. From a leadership perspective, what support could be implemented by the college as well as the HEI for lectures multimedia incorporation in teaching and learning?
10. What were common problems that your college students encountered with using multimedia when learning online?
11. How did your department collaborate effectively with other directorates such as *ICT, Marketing, Tuition Support & Facilitation of Learning/Instructional Support Services* as well as multimedia regarding issues relating to online learning?

Appendix E - Questionnaire

Dear Dr

This questionnaire forms part of my doctoral research entitled: **A post-COVID-19 pandemic Multimedia Framework for teaching and learning in Open Distance eLearning in South Africa** for the degree Doctor of Philosophy in Education (Curriculum Studies (90019 – CUS) at the University of South Africa. You have been selected by a purposive *sampling* strategy thus, I invite you to take part in this survey. The findings of the study may benefit the academics, administrators and specialist's multimedia and ICT workers within the HEIs and other practitioners of Distance Education with guidance as to the effective integration of multimedia online learning in Distance Education.

You are kindly requested to complete this survey questionnaire, comprising of 2 sections as honestly and frankly as possible and according to your personal views and experience. No foreseeable risks are associated with the completion of the questionnaire which is for research purposes only. The questionnaire will take approximately 30-45 minutes to complete.

You are *not required* to indicate your name or organisation and your anonymity will be ensured; however, indication of your age, gender, occupation position etcetera will contribute to a more comprehensive analysis. All information obtained from this questionnaire will be used for research purposes only and will remain confidential. Your participation in this survey is voluntary and you have the right to omit any question if so desired, or to withdraw from answering this survey without penalty at any stage. After the completion of the study, an electronic summary of the findings of the research will be made available to you on request.

Permission to undertake this survey has been granted by the University of South Africa and the Ethics Committee of the College of Education, Unisa. If you have any research-related enquiries, they can be addressed directly to me or my supervisor. My contact

details are: 073 5xxxxx, e-mail: mxxxy@unisa.ac.za and my supervisor can be reached at 012 429 xxxx/082xxxxx771, Vxxxrg@unisa.ac.za as well as Dr Mudau 012 429 xxxx Cell: 082953 xxxx mxxxxk@unisa.ac.za respectively in the Department of Curriculum and Instructional Studies College of Education, Unisa.

By completing the questionnaire, you imply that you have agreed to participate in this research. Please return the completed questionnaire to me before the 18th of July 2022.

Section A: Biographical information
INTRODUCTION
- Introduction of myself as an interviewer
- The purpose of conducting the interview

BIOGRAPHICAL INFORMATION OF THE PARTICIPANTS
Lecturers' response to gender, qualifications, module name, years of experience at Unisa, as well as years of experience with screencasts.

Participant	Gender	Qualifications	College	Module Name	Lecturer Years' experience at Unisa	Years of teaching experience with Multimedia	Years of teaching experience with ICT
RESPONSE(R):	R:	R:		R:	R:	R:	

INTERVIEW QUESTIONS
Lecturers' response to all questions I asked.

1. Indicate the gender?
2. Which is your age range in the below table? kindly respond with an (x)

Age	Participant response
21–29 years old	
30–39 years old	
40–49 years old	
50–59 years old	
60 years and older	

3. Please indicate the name of the college you currently work in?

Response:

4. For how many years/months have you been a Distance Education lecturer?

Response:

5. How many modules do you currently teach?

Response:

6. How many years' experience being of actively involved in online modules?

Response:

7. Please indicate, the number of students registered for the module and indicate whether it is a postgraduate or undergraduate module. Kindly fill your responses in the table below

Response:

Number of students	Postgraduate/undergraduate

End of section A

Section B: Teaching and learning information employing multimedia tools

*This section deals with your multimedia practices and approaches to online learning. In this questionnaire **online learning** refers to utilising multimedia technologies to support and enhance teaching and learning in distance education.*

1. Approximately how many hours do you spend using multimedia technologies in teaching your students online? Kindly mark your response in the table below with an (x).

Time spent teaching with multimedia integrations online	Participants response
0–5 hours a week	
6–10 hours a week	
11–15 hours a week	
16–20 hours a week	

2. Please indicate the **tools** (e.g. LMS, podcasts, videos, social media platforms, streaming on various platforms, discussion forums) you make use of to teach your students online and explain **why, its benefits and how** you use it? Type your answers in the table below.

Tool	Why did/do you use it?	Is it beneficial for COVID-19 remote learning?	How did/do you use it?

3. Based on your experience with COVID-19 remote learning, do your students have sufficient computer literacies to learn and use online learning to their benefit?
Response:

4. Do you experience language as a barrier between you and your students when teaching online?

     Response:

5. Were there any self-esteem issues whilst navigating on multimedia technologies whilst teaching remotely? If YES, how did you overcome them?

Response:

6. What challenges do you encounter when teaching your students using multimedia online technologies?

Response:

7. From your experience which factors contribute to your students' success to learn online?

Response:

8. Are there any benefits on employing multimedia technologies in online learning? If yes, please elaborate.

Response:

9. Based on your experience, which multimedia practices do you find work best for teaching your students online?

Response:

10.What have you learnt from your students using multimedia technologies during COVID-19?

Response:

11. What experiences do you have, if any with Multimedia Technologies?

Response:

12. What qualifications do you hold in your respective field?

Response:

13. How did remote work affect your teaching?

Response:

14. How did you adapt and incorporate multimedia technologies in your teaching?

Response:

15. What were the difficult encounters with regards to remote teaching using multimedia?

Response:

16. What were the difficult encounters with regards to remote teaching using ICT?

Response:

17. Do you feel you were adequately equipped to handle remote teaching at such an enforced COVID-19 approach?

Response:

18. How was your COVID-19 experience in remote multimedia teaching?

Response:

19. How would you adapt it differently?

Response:

End of questionnaire

I appreciate your commitment to the full completion of this questionnaire.

Appendix F – Approved ethics clearance access permission

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UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2022/02/09

Ref: **2022/03/0** 4/AM
Name: Ms KY Twabu
Student No.: 4

Dear Ms KY Twabu

Decision: Ethics Approval from
2022/03/09 to 2027/03/09

Researcher(s): Name: Ms KY Twabu
E-mail address: a.ac.za
Telephone: 073

Supervisor(s): Name: Prof Geesje Van den Berg,
E-mail address: .za
Telephone: 012 4

Name: Dr P K Mudau
E-mail address: a.ac.za
Telephone: 012 4

Title of research:

A post-Covid-19 pandemic Multimedia Framework for teaching and learning in Open Distance eLearning in South Africa

Qualification: PhD Curriculum Studies

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2022/03/09 to 2027/03/09.

The **low risk** application was reviewed by the Ethics Review Committee on 2022/03/09 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.

2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.

4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.

6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.

7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.

8. No field work activities may continue after the expiry date **2027/03/09**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2022/0**[   ]**4/AM** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
ac.za

Prof Mpine Makoe
ACTING EXECUTIVE DEAN
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Approved - decision template – updated 16 Feb 2017

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Appendix G – Approved permission to conduct research involving UNISA employees, students and data 2022

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RESEARCH PERMISSION SUB-COMMITTEE (RPSC) OF THE SENATE RESEARCH, INNOVATION, POSTGRADUATE DEGREES AND COMMERCIALISATION COMMITTEE (SRIPCC)

14 June 2022

Decision: Research Permission Approval from 14 June 2022 until 13 June 2024

Ref #: 202
Mrs Khanyisile Yanela Twabu
Student #
Employee #:

Principal Investigator:

Mrs Khanyisile Yanela Twabu

Department of Curriculum and Instructional Studies

College of Education

UNISA

maye_____0187

Supervisor: Prof Geesje van der Berg; vdberg@unisa.ac.za; 0020219771

Co-Supervisor: Dr P Mudau; mud_____ 2090

A post-Covid-19 pandemic Multimedia Framework for teaching and learning in Open Distance eLearning in South Africa

Your application regarding permission to involve Unisa staff, students and data in respect of the above study has been received and was considered by the Research Permission Subcommittee (RPSC) of the UNISA Senate, Research, Innovation, Postgraduate Degrees and Commercialisation Committee (SRIPCC) on 14 June 2022.

It is my pleasure to inform you that permission has been granted for the study. You may invite the following groups of Unisa employees to participate voluntarily in interviews: Three (3) Lecturers and one (1) Head of Department from each college (CEDU; CHS; CSET and CEMS); one (1) Multimedia representative, one (1) ICT Infrastructure representative, one (1) Tuition Support &

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Facilitation of Learning/Instructional Support Services as well as the four (4) CODs, one of each College Dean (COD) representative.

You may also obtain access to each college (CEDU; CHS; CSET and CEMS) Moodle page.

Adherence to the National Statement on Ethical Research and Publication practices, principle 7 referring to Social awareness, must be promoted: " Researchers and institutions must be sensitive to the potential impact of their research on society, marginal groups or individuals, and must consider these when weighing the benefits of the research against any harmful effects, with a view to minimising or avoiding the latter where possible."

The personal information made available to the researcher(s)/gatekeeper(s) will only be used for the advancement of this research project as indicated and for the purpose as described in this permission letter. The researcher(s)/gatekeeper(s) must take all appropriate precautionary measures to protect the personal information given to him/her/them in good faith and it must not be passed on to third parties. The dissemination of research instruments through the use of electronic mail should strictly be through blind copying, so as to protect the participants' right of privacy. The researcher hereby indemnifies UNISA from any claim or action arising from or due to the researcher's breach of his/her information protection obligations.

You are requested to submit a report of the study to the Research Permission Subcommittee (RPSC@unisa.ac.za) within 3 months of completion of the study.

Note: The reference number 2_____8 should be clearly indicated on all forms of communication with the intended research participants and the Research Permission Subcommittee.

Kind regards,

Dr Retha Visagie – Deputy Chairperson
Email: vi_____78

Prof Lessing Labuschagne – Chairperson
Email: lla_____..