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The role of universities in embracing transformation brought about by Fourth Industrial Revolution. A case study of selected tertiary institutions in KwaZulu-Natal

By

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Ethical Statement by the Researcher

I, Mofoluwake Oluwadamilola Uleanya hereby declare that this research work "the role of universities in embracing transformation brought about by 4IR" is my original work and has never been submitted to any other institution of higher education to obtain an academic qualification. All the sources that were consulted in the study have been duly acknowledged both in the text and in the references.

	30 November 2021
Mofoluwake Oluwadamilola Uleanya	Date

Dedication

This work is dedicated to the Alpha and Omega, beginning, and ending, The Almighty God.

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What shall I render unto the Lord for all His benefits towards me? (Psalms 116: 12). Unto you oh lord be all the praises, honour, and adoration. Thank you, Lord, for the grace, strength, wisdom, and encouragement you bestowed unto me throughout this journey to complete this study. Ebenezer!

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Peer Review Conference Presentations

- **Uleanya MO, Naidoo GM & Rugbeer H. (2020)**. E-Learning: Channel of Communication in African Universities During COVID-19 Pandemic Era. Youth International Conference, Indonesia: 15-16 December 2020.
- **Uleanya MO, Naidoo GM & Rugbeer H. (2021).** Digital Learning Awareness Among University Students in Africa. 2nd International Conference on Media and Social Science, Malaysia: 24 - 26 August 2021.
- **Uleanya MO, Naidoo GM & Rugbeer H. (2021)**. Digital Learning Awareness Among University Students in Africa. 5th Teaching and Learning Conference, University of Zululand: 12 – 14 October 2021.

Abstract

The study examined the role of universities in embracing transformations brought about by the Fourth Industrial Revolution (4IR). The level of awareness that students have on digital learning were examined, as well as the plans put in place by policymakers to transform the curriculum for digital learners. The study further examined how the syllabi are restructured for relevance in the 4IR. Literature reviews within this study focused on factors hindering the universities in equipping students for e-learning. Because of the literature review, the blend of the AIDA, as well as the Shannon and Weaver models, were used to design a model which was adopted for this study. Quantitative and qualitative methods were employed in this study. Random and Purposive sampling was used respectively in selecting both students and staff members from the University of Zululand and the Durban University of Technology who participated in this study. Quantitative and qualitative data were collected using questionnaires and interviews respectively. The collected quantitative data was analysed using SPSS version 25.0, while the qualitative data was presented using tables containing the responses of respondents. The findings of the study established the similarities and differences between the two selected institutions of higher learning in terms of their level of awareness on digital learning, plans made by policymakers, restructuring of the syllabi as well as factors hindering the use of e-learning. The findings of the study show that the adoption of digital learning is already in progress. However, the analysed data and responses of participants also indicate that some are still unprepared, thus, more awareness needs to be created for students to assist them in acquiring the necessary digital skills. Finally, the study provides recommendations in areas that need more attention following the findings of the study. The limitations of the study are also indicated, thereafter suggestions for further studies.

Writing Conventions

The following conventions were used in this research.

- The Abbreviated Harvard Style of referencing was used in this study. For example, Páramoa *et al.* (2021) meaning Páramoa, L, García, H., Peláezb, C. 2021. Modelling e-mail marketing effectiveness –An approach based on the theory of hierarchy-of-effects. 21(1): 19-27
- Tables and Figures are recorded as Figures 1-3 and Tables 1-36 in their chronological order.
- Materials relevant to the study of the roles of universities in embracing transformation brought about by 4IR and certain website addresses are included for verification and acknowledgement of the source information. An example of a website is an example of a typical website is: https://www.bizcommunity.com
- The World Wide Web (www) is transient and ever-changing; therefore, one should expect that websites from which information is gathered will be offline or may alter the contents of the website throughout some time.
- In instances where the electronic document has been accessed from a website, the author is mentioned, followed by the year as in Crossman (2017) and
- Also, in instances where corporate websites were accessed, the name of the corporation was mentioned, followed by the year of publication of the document, as in European Commission (2018)
- This thesis uses the South African English writing style.

Acronyms

ADL	Advanced Distributed Learning
AIDA	Awareness, Interest, Desire and Action
AIRP	Ambient Insight Regional Report
BL	Blended learning
CBT	Computer-Based-Training
CHE	Council of Higher Education
CDs	Compact Discs
CSCL	Computer-Supported Collaborative Learning
DL	Distributed Learning
DOE	Department of Education
DUT	Durban University of Technology
DVDs	Digital Versatile Discs
E-LEARNING	Electronic Learning
GETAMEL	General Extended Technology Acceptance Model for eLearning
GCIS	Government Communication and Information System
HEI	Higher Educational Institutions
IBT	Internet-Based Training
ICT	Information Communications Technology
IDT	Innovation Diffusion Theory
1IR	First Industrial Revolution
2IR	Second Industrial Revolution
3IR	Third Industrial Revolution
4IR	Fourth Industrial Revolution
ML	Mobile Learning
NL	Network learning
OECD	Organisation for Economic Co-operation and Development
OL	Online learning
ORBL	Online Resource-Based Learning
PELAM	Pakistan E-learning Adoption Model"
PLATO	Programmed Logic for Automatic Teaching Operations
RL	Remote learning
SPSS	Statistical Package for Social Sciences (SPSS)
TAM	Technology Acceptance Model
UAE	United Arab of Emirates
WBI	Web-Based Instruction
WBL	Web-Based Learning
WBT	Web-Based Training

WEF	World Economic Forum
WIL	Work Integrated Learning
TL	Tele-Learning
UNIZULU	University of Zululand

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CHAPTER 1

ORIENTATION OF THE STUDY

1.1 Introduction

The recent trend in the development of digital technology has advanced rapidly changing the way we communicate and operate in the business world. Technology changes have been embraced and many operations have evolved, and some have become redundant. The Fourth Industrial Revolution (4IR). This has led to several discussions and conferences to prepare for this revolution. However, the World Economic Forum (WEF) mentioned that robust discussions and recent happenings around less-developed nations that are mainly African suggest that the countries seem unprepared for the revolution whereas different advanced/developed western nations are considered to be prepared and fast preparing for the revolution (WEF 2018). Submissions at the forum further suggest that the preparation of western countries for the 4IR is evident in the trend of economic and educational activities in their nations. These activities are seen in the educational and economic sectors amongst others. Schwab (2017) opines that 4IR is categorized following a variety of recent technologies that fuse physical, digital and biological worlds, thereby impacting various disciplines, economies and industries, as well as challenging ideas about humans. This implies that the 4IR is envisaged to affect all sectors of society and spheres of life inclusive of the educational sector. Thus, an attempt to continue with old educational practices in modern societies is envisaged to negatively impact students. According to Lee *et al.* (2018), the 4IR is characterized by innovations that will affect different sectors of society. These innovations are disruptive and sustainable. The disruptive innovations are envisaged to propel new business niche areas (Christensen *et al*. 2015), while sustainable innovations are considered as not having the potency to disrupt existing societies, values, networks, and markets. In other words, while sustainable innovations are expected to enhance current happenings and activities in various sectors, disruptive innovations are envisaged to cause disorder in the way and manner things are done in the different sectors of society.

According to Uleanya *et al*. (2018), the curriculum of any nation's educational sector is a major instrument adaptable for aiding desired changes in society. For instance, following the works of Landes (2003), Rifkin (2011), Rosen (2012), the industrial revolutions which transformed historic societies into modern ones during the first, second and third industrial revolutions, influenced the educational sector. Education plays a great role in the transformation of society and recorded successes in industrial revolutions in different nations. For this reason, Mitra (2011) opines that education is a tool for development in society, Uleanya *et al.* (2018) opine that education is an instrument for change in any society. This implies that for any industrial revolution to successfully take place in a society, the educational sector is expected to play a crucial role. Thus, the purpose of this study is to explore the level of preparedness of South African universities towards digital learning in the 4IR using two universities in South Africa, from KwaZulu-Natal (KZN) Province, namely, the University of Zululand (UNIZULU) and Durban University of Technology (DUT).

1.2 Background of the Study

Azmi *et al*. (2018) explain that in the educational sector, the awareness regarding the 4IR is relatively low because it is a recent aspect that involves the inclusion and use of technologies in teaching. Azmi *et al*. (2018) reveal how in the current era of digitalization, many instructors still use the traditional method of teaching. Meanwhile, it is expedient for instructors to accept and acknowledge the latest method of teaching to ascertain quality knowledge delivery. This implies that while the world is projecting and moving towards a digitalized world of education, some instructors seem to be backward in their approach, thereby hindering the desired new approach for education. It is believed by Sattar *et al*. (2017) that since teaching and learning with technology are combined with technology, it is essential to allow students to participate interactively in the learning experience. However, seeing that the usage of technology without proper pedagogical methods may result in the disruption of learning activities rather than engaging the students, Schwab (2017) notes that designing the proper combination of pedagogical methods, space and technology is vital in guaranteeing that both the lecturer and the students are empowered during teaching.

1.3 Literature Review

Universities are established to satisfy certain needs and demands of local communities which are usually described as their host (Uleanya *et al*. 2020). Universities are situated and made to perform various responsibilities, amongst which is meeting the demands of the community in which they are established and its environs (Gibson, 2012). The major aim of universities includes the enhancement of research output and capabilities; ascertainment of the establishment of collaborative and long-lasting relationships with other institutions of learning; the expansion of resources. These resources include social, intellectual and entrepreneurial (Gibson, 2012).

Universities are established to focus on the development of host communities and their surroundings. This suggests that universities are positioned intentionally at strategic locations in the nation with the target of promoting sustainable development. This can be achieved through supporting, empowering and collaborating with different stakeholders in the field of education, thus suggesting according to Bookin-Weiner (2015) that universities are structured to contribute to taking care of the peculiar needs of the host communities without forgetting the unique nature of the students.

Due to global happenings in the education sector, as well as the abrupt outbreak of the COVID-19 pandemic, the work of Grand-Clement (2017) becomes relevant. Grand-Clement (2017) holds the view that the knowledge of digital learning is lacking amongst policymakers in the field of education across the globe and this seems to be having a negative impact in the education sector, thereby hampering the desired development in societies. Conversely, Conrads *et al.* (2017) state that reviewing and designing policies by contemporary digital education has helped to cater for previous shortcomings while ensuring that provisions are made to overcome challenges experienced in the process of implementing digital learning. This implies that some policymakers remain unaware of digital learning and its technologies, hence, continue to experience challenges in implementing such in the 4IR. Meanwhile, others who are aware of digital learning try to use such to their advantage by ensuring that they are used to overcome previously experienced challenges in the education sector. This is done, however, through the review of existing policies

or designing of recent ones. Conversely, in the African context which includes South Africa, Uleanya and Yu (2019) conducted a study on the level of preparedness of underdeveloped and developing nations in using formal education to enhance development in the fourth industrial revolution. The finding of the study indicates that the knowledge of digital learning is lacking by education policymakers in underdeveloped and developing nations which are predominantly African, inclusive of South Africa. Uleanya and Yu (2019) further opine that the lack of knowledge of digital learning by policy makers in the 4IR has disadvantageously positioned many underdeveloped and developing nations especially those on the African continent. This seems to have affected the level of desired development. The findings of the study of Uleanya and Yu (2019) corroborates the outcome of the summit of the World Economic Forum (WEF) (2018) which suggests that African nations are unprepared for the digital world. Following a review of the currently adopted education policies, the works of Uleanya and Yu (2019), as well as Uleanya et al. (2019), show that South Africa and other African nations are unprepared for the 4IR

It is revealed by Lee *et al*. (2018) how industrial revolutions are usually envisaged to disrupt and influence happenings in the education sector. Meanwhile, the success or failure of the education sector in any industrial revolution is hinged on the duly designed and implemented policies (Uleanya & Yu, 2019). According to Uleanya and Yu (2019), the first three industrial revolutions affected the education sector. This led to a review of education policies by policymakers following their awareness to ensure that the education sector remains relevant during such periods. Furthermore, the submission of WEF (2018), indicates that the education sector is to be affected and influenced by the 4IR. The submission further suggests that the education sectors of different nations are to be adjusted to ensure relevance during the 4IR. This is to be achieved by adjusting existing policies and by designing new policies to cater for the desired outcomes in the 4IR. Surmise to state that the level of awareness of education policymakers in the 4IR is envisaged to influence their decisions in policy review, adjustment, design and implementation during this era (WEF, 2018).

A study conducted by Nyagorme *et al.* (2017) in Ghana was on the awareness and the use of electronic learning platforms, adopting a selected developing nation. The finding of the study

shows that the level of awareness of policymakers on digital learning is low though they seem positive about its need towards ensuring the provision of relevant education and enhancing desired development in the nation. Nyagorme *et al.* (2017) study further indicates that implementation of policies is problematic due to the lack of appropriate pieces of training and resources. Meanwhile, White (2005, cited in Nyagorme *et al*. 2017) holds the view that limited knowledge and awareness unavoidably affects the suitability and quality of learning that can be developed and made available in such nations. This suggests that adequate knowledge on the awareness of digital learning is needed by policymakers towards ensuring the provision of suitable and quality teaching and learning experiences that will ensure and promote the desired outcomes.

In South Africa, Sehuhula-Mooketsi and Chigona (2016) conducted a study on the impact of contextual factors on the implementation of the e-education policy in previously disadvantaged areas. The findings of the study indicate that awareness of education policy makers on the current trend, happenings and desires in the global world is crucial. However, while education policymakers are sometimes aware of the revolution and need to review the policies to suit the demand of the period, they are hindered due to lack of support, resources, amongst other challenges inclusive of financial constraints (Sehuhula-Mooketsi and Chigona 2016**).** As averred by Conrads *et al*. (2017), creating and ensuring awareness for digital learning in the 4IR is the duty of all education stakeholders such as the state (government), students, parents, community, teachers, principals and the Board of Management responsible for education, amongst others.

The three previously experienced Industrial Revolutions (IR) are characterized by different features. For instance, Stearns (1993) opines that the first experienced industrial revolution took place around the close of the 18th century and ended sometimes about the early part of the 19th century. It emanated following a slow period of proto industrialization. According to Stern (1993), the First Industrial Revolution (1IR) saw the commencement and evolution of mechanisation, which is an advancement that led to the distortion of farming. This was because the emphasis was placed on the industry over agriculture. Such emphasis gave rise to novelty which brought about the creation of the steam engine.

The 2IR is also known as the "Technological Revolution." Mokyr (1998) avers that it was experienced between 1870 and 1914. This was the occurrence of World War One which took place between 1939 and 1945. 2IR predominantly catered for growth for pre-existing, while expanding new industries. The industries include electricity, oil, steel and the creation of mass production by using electric power (Landes, 2003). He further states that the second industrial revolution saw improvement and emphasis on the importance of new technologies. It was during this era that internal combustion engines, petroleum, electricity, alloys, chemicals and communication technologies were refined. Rifkin (2011) opines that the Third Industrial Revolution (3IR) was experienced in the 20th century. It was characterised by digital technology which continues to gain dominance across the universe until recent times. 3IR was established on different major pillars described as Shift to Renewable Energy, amongst others (Rifkin, 2011).

The implication of the aforementioned industrial revolutions to education is that each revolution led to a shift and centres for learning such as universities in a bid of seeking relevance adjusted accordingly. The curricula and syllabi of different learning institutions were adjusted and possibly drastically changed for relevance purposes as they are established for such. Uleanya, *et al*. (2018) suggest that the curriculum guiding any institution of learning is a major tool that enhances their relevance and productivity. Thus, for institutions of learning to receive relevance during industrial revolutions including the envisaged 4IR, the curricula and syllabi are expected to be adjusted for relevance. As indicated by Uleanya and Yu (2019), each industrial revolution affects the education sector of various nations. Thus, as the revolutions occurred, there is a need for institutions of learning to adjust their systems, curricula and syllabi to ensure that they were relevant and produced students who promoted the agenda of each industrial revolution. However, the extent to which the curricula and syllabi of universities in South Africa are being adjusted to suit the demand of the 4IR are yet to be fully determined. For instance, the Department of Higher Education (DHET) once touted the idea of online learning and then incorporated COVID-19 into its plans. This implies that the outbreak of the COVID-19 pandemic seems to be making policymakers, as well as universities, accept certain plans, trends, structures and systems of the 4IR.

As shown by various scholars (Unwin *et al*. 2010; Ssekakubo *et al*. 2011; Venter *et al*. 2012; Ajimera and Dinesh 2014; Raspopovic *et al.* 2014; Kisanga 2016) e-learning is important. However, there are several mitigating factors hindering institutions from being able to equip their students. Vis-à-vis, there are other factors hindering students themselves from being equipped with gadgets that promote e-learning (Kisanga 2016). These factors are seen in findings from a study such as Ssekakubo *et al*. (2011) on factors hindering students from being equipped for e-learning. The findings indicate that insufficient technical support, poor internet connectivity and lack of e-learning policies are factors that hinder universities from equipping students for the use of e-learning. In other studies, (Unwin, *et al*., 2010; Venter, *et al*., 2012), findings point to high costs of technology and poor technological infrastructure are factors that hinder universities in equipping the student with the use of e-learning. This implies that the expensive cost of establishing and maintaining technological gadgets in universities hinder students from being equipped.

According to the findings by Adkins (2013), the growth rate of Africa alone in terms of e-learning compared to other continents of the world has increased by 15.2%. Further in the report, it is noted that despite the growth made in the continent (Africa) in terms of e-learning, challenges are still faced that hinder the continent from functioning properly (Adkins, 2013). These challenges include internet connectivity and technological infrastructures. Also, challenges like the availability of developed electronic content that aligns with that of the national curriculum and availability of training and professional improvement for e-learning staff are being encountered by this great continent. Suffice to state that as much as nations in the African continent strive to improve and grow around e-learning, they seem to be experiencing some forms of setback due to various hindering factors.

Ajmera (2014) opines that despite the challenges encountered by Africa, the Higher Institution of Education is still eager to protect its users by providing quality e-learning through the maintenance of its services and products. Raspopovic *et al.* (2014) state that due to the concerns raised on the quality of e-learning, many institutions are looking out on how to manage the situation about quality by highlighting the factors which influence quality e-learning. In the opinion of Kisanga (2016), most institutions of learning continuously attempt to explore hindrances to quality e-

learning. The findings of the work of Kisanga (2016) show that the findings of institutions of learning on factors hindering quality e-learning are used to revitalize and enhance the systems. According to the findings of Kisanga (2016), a quality e-learning system has become a challenge that seems to be continuously experienced across many nations: developed, developing and underdeveloped inclusive. The identified challenges on poor e-learning systems in different nations of the world according to Kisanga (2016) include the following: lack of ICT infrastructure, skills to use e-learning, low internet, administrative support issues, amongst others. Similarly, the studies by Makokha (2016), Raspopovic et al. (2014) as well as Baloyi (2013), point out that lack of funding, issues revolving around policies, low motivated instructors, none/poor training of staff and issues on utilization of LMSs are some of the challenges which hinder quality e-learning system across the globe. This implies that e-learning seems to be faced with various challenges across the globe: underdeveloped, developing and developed nations inclusive. Hence, the reason for this study focuses on exploring the adaptation of universities in KwaZulu-Natal Province of South Africa to the 4IR. The universities are selected based on their location, setting, year of establishment and type and degrees awarded. For instance, while UNIZULU was established in 1960, described as being comprehensive and associated with rurality, DUT is relatively new. It was established in 2002, described as a university of technology that is associated with urbanisation and awards degrees that differ from that of the UNIZULU.

Sequel to the findings of reviewed literature on the issue of awareness of policymakers on digital learning in the 4IR indicates that globally while there are some forms of awareness, various nations especially underdeveloped and developing of which African nations are predominant are least aware. However, the relevance of the education sector in industrial revolutions is dependent on the awareness of policymakers who are empowered to design and implement policies, also revise the designed policies where necessary. Moreover, the reviewed literature suggests that African nations inclusive of South Africa, are unprepared for digital learning due to a lack of awareness of education stakeholders about the subject matter.

1.4 Gap to be addressed the Study

Every study is expected to fill at least a gap. Hence, in attempting to achieve this, a search was made on existing literature as it concerns the study. The search on SCOPUS database which is one of the largest databases in the Arts, Humanities and Social Sciences (Adelaide University, 2014) suggests that there is a paucity of literature in the domain of the role of universities in embracing transformations ushered in by the Fourth Industrial Revolution, especially as it concerns Africa as a continent and South Africa as one of the nations in the continent. The database was used to check the statistics of articles that were published in peer review journals between 2005 to 2019 on the role of universities in embracing transformations ushered in by the Fourth Industrial Revolution as it concerns South Africa as a nation. The search revealed that nothing of such study has been done in KwaZulu-Natal where this study is to be conducted. Also, extant kinds of literature reveal that while many conducted studies on the concept of the 4IR and the universities focus on traditional universities, none has attempted to combine a comprehensive university with a university of technology. Hence, this study aims at filling this gap by contributing to the literature. Additionally, with the outbreak of the COVID-19 pandemic, the Fourth Industrial Revolution seems to have been fast-tracked especially in the education sector with many institutions being unprepared. Thus, this study seeks to assist in possibly helping universities to see, adjust and embrace the transformations ushered in by the 4IR.

1.5 Conceptual Model

Nilsen (2015) defines a "conceptual model" as a conscious adaptation of a phenomenon. Elangovan and Rajendran (2015) describe "conceptual models" as the representation of real-world phenomenon which are portrayed in the form of illustration. The conceptual model is a scientific organisation of ideas. It is established following a review of knowledge tested before on the variables involved and it helps to reduce bias (Sutton & Zubin, 2015). This study adopts the two conceptual models to expatriates and gives a clearer understanding of the causes of low acceptance and preparation rate for the 4IR by South Africans as well as their institutions of learning.

The AIDA model was adopted and can be traced to an American Advertising Advocate named E. St. Elmo Lewis in 1898 (Montazeribarforoushi *et al.* 2017). Furthermore, the AIDA model was developed for structuring sales negotiation. According to Hanlon (2021), the AIDA model is a communication model which is used in transmitting information from the advertiser regarding a product to its consumer. Hanlon (2021) explains further that the AIDA model helps to showcase the various stages which people go through during the process of buying a particular product or service. According to Páramoa *et al.* (2021), the AIDA model identifies attention, interest and desire as the consecutive stages that a potential customer or consumer goes through when purchasing a particular product, and the final stage is the action reflecting the period of purchase. Hence, in this study, the four stages of the AIDA model are adapted to examine the digital transformation brought about by 4IR.

The Shannon and Weaver model is adopted to examine the communication process which occurs from the university community towards the students aiming for students to embrace 4IR educational transformation (digital learning). According to Drew (2019), Shannon and Weaver's model explains how communication can be processed and received. Eke (2020) explains that the model introduces the term "*Noise*" as distort, barrier and hindrance in the communication process that occurs between the sender when transmitting a message, ideas to the heterogeneous audience who are described as the receiver. According to Kapur (2020), every stage in the communication process is essential for perfect communication and obstructed stages lead to noise. Noise can be described as anything that obstructs the message's delivery (Umeozor, 2020). Meanwhile, Dunn and Goodnight (2011) agree that noise is any proposed or accidental spur that disturbs the communication process from the sender of the message to the receiver. Sequel to this study entailing the sending and receiving of messages from lecturers to students, vis-à-vis, students to lecturers with regards to teaching and learning in the 4IR, the Shannon and Weaver model is adopted to examine communication flow and the issue of noise in the process.

In brief, the following conceptual framework is adopted in this study: the AIDA model and Shannon and Weaver model.

1.6 Motivation of the Study

The 4IR is envisaged to affect societies in various ways such as disrupting regular happenings (Lee, *et al*. 2018; Schwab, 2017). As observed by the WEF (2016), the invention of 4IR seems to be affecting the educational sector. Curran (2016) believes that many higher institutions of learning are unprepared for the forthcoming revolution and many institutions are not taking leverage regarding today's technological interruption. According to the founder and the chairman of WEF, Schwab (2017) anticipates a positive future whereby technological innovation and the ability to tackle it become potent enhancing development both socially and economically. Further in the explanation, Schwab posits that 4IR advancements are touching every sphere of life in terms of careers, economics, governments and industries, as well as questioning information on the existence of humans.

The WEF 2016 Reporton the future of work states the following "*by one popular estimate, 65% of children entering primary school today will ultimately end up working in completely new job types that do not yet exist*" (WEF, 2016) Thus, it is clamoured that societies prepare for the revolution. Meanwhile, one way by which societies are expected to prepare for the revolution is through the educational sector as was experienced in previously experienced Industrial Revolutions commonly described as "IR (Industrial Revolution), 2IR (Second Industrial Revolution), and 3IR (Third Industrial Revolution)". However, in many developing nations such as South Africa, the rate of acceptance of and preparation for the 4IR seem relatively low. This accounts for the reason behind this study which intends to explore students' awareness level and the preparedness of Teaching and Learning Centres/academia towards the 4IR. Additionally, the issue of 4IR is relatively new, hence, the reason for the experienced paucity of literature, especially with regards to the context of South Africa and universities in KwaZulu-Natal Province. Also, preparation for 4IR by South Africa as a nation and universities as institutions of learning is cogent. Additionally, the outbreak of the ongoing experienced COVID-19 pandemic seems to have introduced the world into the envisaged 4IR earlier than expected. In other words, the outbreak of COVID-19 has made the global world begin to live and experience the 4IR sooner than envisaged

and under less prepared conditions. Thus, this study seeks to address issues revolving around 4IR as well as its experiences following the COVID-19 outbreak.

1.7 Statement of the Problem

Universities are established to enhance development in strategic locations in the nation. They are established to foster a practical relationship between business owners, organisations and institutions of learning, to promote Work Integrated Learning (WIL) for students (Uleanya *et al.* 2020). This is expected to help satisfy the immediate needs of host communities, empower students, and make society better (Uleanya *et al.*2020). This is done through the curriculum and acceptable practices of both the institutions of learning such as universities and business organizations (Uleanya *et al.* 2019). However, in the advent of discussions around the 4IRs and the envisaged disruptive activities in the society, many African nations, inclusive of South Africa seem not to be working towards 4IR (Uleanya & Yu, 2019). This is reflected in the activities of universities as many of them seem to maintain the status quo. Additionally, the outbreak of the experienced COVID-19 has affected academic activities and forced the global world into accepting and beginning to live in the 4IR earlier than expected. Hence, this study is desired to explore the reasons for the unpreparedness of universities for the 4IR in South Africa with emphasis on two selected universities: UNIZULU and DUT. While UNIZULU is a comprehensive and rural-based university, DUT is a university of technology and urban-based. This aids a representation of diverse types of universities situated in different locations in South Africa. Also, a review of the literature suggests that there seems to be a paucity of literature on the role of the universities in embracing transformations ushered in by the 4IR using rural and urban universities as well as those that are comprehensive and technological.

Based on the findings of various works (Lee, *et al*. 2018; World Economy Forum, (WEF), 2018; Zeleny, 2012), it can be implied that the curricula guiding the educational systems of nations are important during and in the advent of any industrial revolution. This means that a nation's education sector through its curriculum prepares its citizens for the revolution. However, where

the educational sector is yet to be reviewed and designed towards helping people to adjust to the revolution, it seems to pose a greater challenge. Such a challenge is experienced by both the nation and the citizens who are liable to experience difficulties to cope with or adjust where necessary to the industrial revolution. Therefore, the study focuses on exploring the adaptation of universities to the 4IR using selected universities in South Africa from KwaZulu-Natal (KZN) Province, namely, the University of Zululand (UNIZULU) and Durban University of Technology (DUT).

1.8 Aim of the Study

This study aims to explore how universities embrace transformations that are ushered in by the 4IR.

1.9 Objectives of the Study

The objectives of the study are:

1. To explore the level of awareness that students at the selected South African universities have on digital learning.
2. To determine plans that policymakers at the selected South African universities have put in place to transform the curriculum for digital learners.
3. To investigate the restructuring of the syllabi of the selected South African universities for relevance in the 4IR
4. To identify factors hindering the selected South African universities from equipping students for e-learning.
5. To develop a framework to assist policymakers at the selected South African universities to embrace e-learning on an ongoing basis

1.10 Research Questions

1. What is the level of awareness of students at the selected South African universities on digital learning?
2. What plans have policymakers in the selected South African universities put in place to transform the curricula for digital learners?
3. How are the syllabi of the selected South African universities restructured for relevance in the 4IR?
4. What are the factors hindering the selected South African universities from equipping students for eLearning?
5. What is the most suitable framework that can assist policymakers at the selected South African universities to embrace eLearning on an ongoing basis?

1.11 Intended Contribution to the Body of Knowledge

- The study intends to provide awareness to the university, faculties, and department on the level of awareness and preparedness for the 4IR.
- This study creates awareness for the institutions concerning how their people, places, policies, programmes and processes can influence preparation for the 4IR in the university
- This study shall significantly help undergraduate students of the selected universities on how to adapt to the 4IR
- The findings of the study are envisaged to contribute to the pool of professional knowledge on the robust discussion on the 4IR and preparation, especially with regards to universities. Moreover, there are only a few available kinds of literature on the 4IR presently. Hence, the study contributes to the literature in this area of knowledge.
- Recommendations from this work are to give policymakers an alternative towards considering or incorporating proper strategies to the education sector to assist university students and staff members in preparing for the 4IR.

Additionally, the researcher understands that there are quite a several sufficient types of research around the 4IR and the various envisaged transformations that accompany it. Though the transformations may vary from one society to another as well as institutions of learning, it is bound to change statuesque. A good example is the ongoing global COVID-19 pandemic has fast-tracked the activities of the envisaged transformation in the 4IR. Hence, the researcher intends to ascertain the role of South African universities in embracing such transformations ushered in by the 4IR.

1.12 Demarcation and Limitation of the Study

This study is explicit to the awareness and preparation for the 4IR by selected universities in KwaZulu-Natal Province of South Africa. The universities are the Durban University of Technology and the University of Zululand. The study is limited to only institutional perspectives of preparedness of digital learners in South Africa where the research is conducted. The study focused on only two selected South African universities where questionnaires were administered, and semi-structured interviews were conducted. Hence, this may affect the generalization of findings concerning other universities in other African nations.

1.13 Preliminary Chapters

Chapter one	This chapter is directed at introducing the study. It presents issues revolving around the background of the study, the problem statement, aim of the study, research objectives, research questions, amongst others.
Chapter two	This chapter presents the review of relevant literature following the identified research objectives of the study. The identified topics discussed in this chapter amongst others include: (1) Exploring the level of awareness of students on the 4IR. (2) Various ways by which universities prepare themselves and their students for the 4IR. (3) Factors hindering universities and students from preparing for the 4IR. (4) Effects of non-preparation for the 4IR on

	universities, students, and their host communities. (5) Models enhancing the universities and students in the preparation for the 4IR.
Chapter 3	This chapter focuses on the conceptual model. Two models are discussed in this chapter which is used in conceptualizing a new model for the research. It also contains a summary of the chapter.
Chapter 4	Presents the research methodology to be adopted in the study. Hence, the following are presented in this chapter: the research paradigm, the research design; the target population; sampling as well as instruments for data collection, ethical consideration and a summary of the chapter.
Chapter 5	This chapter deals with the interpretation of the data gathered from the research conducted. SPSS is employed for data capturing, thereafter, presented using graphs, charts and tables.
Chapter 6	This chapter presents the summary of the study, with recommendations, limitations and a conclusion following. A summary of the findings of the study and suggestions for further similar research are provided.

1.14 Conclusion

This chapter introduces the entire study on the role of universities in embracing transformation brought about by 4IR. The problem statement, research objectives, research questions, intended contribution to the body of knowledge, scope and delimitation of the study (scope of subject coverage area, literature, and methodology) were all identified and discussed.

In the next chapter, the review of relevant literature which gives detailed information following the objectives of the study will be discussed.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In the previous chapter the background to the study, statement of the problem, research questions, objectives, the significance of the study, amongst other vital subject matters concerning the study were discussed. This chapter presents a review of relevant literature targeted at eliciting information for the first identified objective of the study. This chapter (Chapter 2) relates to the objectives of the study. Thus, relevant literature were reviewed and presented following different headings and sub-headings generated from the identified objectives of the study.

2.2 Digital Learning in Education

Digital learning is a very powerful tool in the dissemination of information and ideas to students in the educational sector. Most universities now adopt the use of digital learning to communicate with their students. Pai and Tu (2011) affirm that digital learning seeks to ensure that students are actively involved in learning activities to attain necessary learning outcomes. Fullan (2013) supports the view that digital learning in education is placed as an intermediary tool to facilitate transformations in our institution of learning and to enhance a better learning environment. Hammond (2013) indicates that integrating digital technologies in institutions is set as a tool for educational redesign through the transformation of lecturers' perspectives and to the realization of digital learning. Dobrovolny *et al*. (2015) argue that digital learning in education has become a means through which descriptions of extensive educational opportunities are made available and possible using digital technologies. Barakabitze *et al*. (2015) note that digital learning has become a mainstream through which diverse teaching courses are disseminated to students. Barakabitze (2014) views that the use of digital learning in the educational sector is developing student-centred learning and at the same time increasing the level of educational changes in institutions of learning. Ravishankar (2018) observes that digital learning in education assists students to become smarter, self-motivated and more accountable. Some studies (Joel and Mussa, 2015; Kisanjara, *et al.*, 2017) show that in recent times the educational sector (primary, secondary and higher learning

institutions) especially in Africa is experiencing significant change through the integration of digital learning. Mbanga and Mtembu (2020) opine that in South Africa, the South African government has incorporated digital learning (DL) into the educational sector to assist teaching and learning at higher institutions of learning. Puentedura (2018) agrees that many higher institutions of learning have recognized digital learning as an essential tool in their teaching and learning activities. Chitkushey *et al.* (2014) view digital learning as an educational tool that is used in higher education institutions to deliver teaching and learning to students. Similarly, the work of Valverde-Berrocoso *et al*. (2020) suggests that digital learning has great potential and in the last decade before 2020, it has been one of the niche research lines of Educational Technology. This implies that digital learning is essential in the educational sector because of its impact on different institutions of learning, students, and society at large. Thus, the need to consider the subject of digital learning becomes a pivot.

2.3 Definition of Digital Learning

The term digital learning has made possible the existence of diverse definitions. Sivaranjani and Prakash, (2014) opine that since the initiation of digital learning in 1999, the educational system has changed through the provision of technology for students for the acquisition of knowledge. Anthonysamy (2020) explains that digital learning has become a motivation for transformation in education, especially in higher education in this twenty-first century. Anthonysamy (2020) states that digital learning is any form of instructional tool which sufficiently makes use of technology to assist students' learning experience. Basak (2018) defines digital learning as an instructional system which effectively makes use of technology to support a student's learning experiences. According to Al-zabun (2015), digital learning involves the use of modern technologies in delivering learning content to students. Ferrari (2012) posits that based on the fact that we are in a digitalized world, therefore, the ability, knowledge, attitudes and skills which are required to become digitally efficient are becoming diverse. Schwab (2017) states that digital learning is an essential shift that has changed various spheres of human endeavours. According to Schwab (2017), the endeavours include economy, education, security, health, amongst others.

Consequently, these have affected all human endeavours. Digital learning is a phenomenon that enhances sustainable development in any society in a digital age (Zagami, *et al*. 2018). Zagami, *et al*. (2018) also opine that enhancing education technological gadgets of the 4IR are to be made available for digital learning and consequently the desired sustainable development to be achieved. According to Conrads *et al*. (2017), digital learning can be explained as a phenomenon that involves the use of the internet and technological devices adopted by teachers, instructors, educators and in the case of this study lecturers in any teaching and learning environment to ensure that the outlined lesson objectives are achieved and students comprehend what is thought. Conrads *et al*. (2017) further posit that technologies available for digital learning include enabling software(s), platforms and services.

Digital learning according to Grand-Clement (2017) is that which aids skills development in a digital world. Anthonysamy (2020) notes that the use of digital learning in higher institutions of learning will provide flexibility, higher engagement as well as suitability for students which allows them to be able to learn with technologies whenever they want. Anthonysamy (2020) opines that digital learning gives control to students which enables them to learn anytime. Ravishankar (2018) observes that digital learning has become a crucial part of teaching and learning and also allows students to learn. Basak (2018) opines digital learning as a tool that is used in addressing diverse challenges which are faced by educational institutions of learning, community leaders and policymakers. Furthermore, Basak explains that digital learning assists students to connect with their remote environment as well as their instructor. Suffice to state that digital learning involves the use of technological devices as an instructional means in delivering teaching and learning to students.

2.4 Digital Learning and Fourth Industrial Revolution

Rahmah (2015) explains that digital learning is not a new approach for university students to acquire relevant knowledge and information but the ability to gain mastery of technological tools and digital skills have become a barrier in digital learning. In other words, digital learning is that which enhances learning in the 4IR. However, a sequel to global happening in the education sector,

Grand-Clement (2017) opines that the knowledge of digital learning is lacking amongst university students in the field of education across the globe and this seems to be harming the education sector, thereby hampering the desired development in societies. Reynolds (2016) states that to give a permanent solution regarding the development of various technologies, universities students need to be encouraged and given awareness with regards to digital learning to have lifelong knowledge, skills and understanding, especially in the learning environment. Conversely, Conrads *et al*. (2017) state that reviewed and designed policies by contemporary digital education has helped to cater for previous shortcomings while ensuring that provisions are made to overcome challenges experienced in the process of implementing digital learning amongst university students. This implies that many university students remain unaware of digital learning and its technologies, hence, continue to experience challenges in implementing such in the 4IR. Meanwhile, others who are aware of digital learning try to use it to their advantage by ensuring that they are used to overcome previously experienced challenges in the education sector.

According to a study by Nyagorme *et al.* (2017) on awareness and use of electronic learning platforms in Ghana, the level of awareness of students on digital learning is low though they seem positive about its need towards ensuring the provision of relevant education and enhancing desired development in the nation. However, Nyagorme *et al*. (2017) indicate that implementation of digital learning is problematic due to lack of appropriate training and resources. Meanwhile, White (2005 cited in Nyagorme *et al*. 2017) holds the view that inadequate or limited knowledge and awareness unavoidably affects the suitability and quality of learning experiences that can be provided and developed in such nations. This suggests that adequate knowledge on the awareness of digital learning is needed by students towards ensuring the provision of suitable and quality teaching and learning experiences that will ensure and promote the desired outcomes.

O'Mara and Laidlaw (2011) point out that as the world advances, so also the demand for digital technologies in schools is growing rapidly. Kucirkova *et al*., (2013) add that in many countries iPods, iPads, and SMART Boards have been implemented in classrooms for easier learning. Laidlaw and O'mara (2015) support the opinion of Kucirkova *et al*., (2013) that portable electronic touch screen devices such as the iPad and iPod have become an increasingly part of technology

tools in modern-day technology, especially in many childhood experiences currently which also include that of schooling because these technological tools have changed the form of instruction with regards to digital learning and the way students learn. The finding of the work of Saine (2012) shows that through digital learning, lecturers have been able to assert that many students have become more creative in their way of thinking. Kucirkova, *et al*. (2013) state that the use of mobile phones and social networking sites examples such as blogs and wikis has become a part of digital technologies. O'Mara and Laidlaw (2011) argued that digital devices have been available for university students who are disabled or having learning challenges because through digital learning, they can easily access information and also be exposed to a variety of new opportunities Additionally, Conrads *et al*. (2017) aver that creating and ensuring awareness for digital learning in the 4IR is the duty of all education stakeholders such as the state (government), students, parents, community, teachers, principals, the Board of Management responsible for education, amongst others. Sequel to the findings of reviewed literature on the issue of awareness on digital learning in the fourth industrial revolution indicates that globally while there are some forms of awareness, various nations especially underdeveloped and developing of which African nations are predominant are least aware.

Having considered the importance of the awareness of digital learning in 4IR on nations, there is a need to reflect on the significance of digital learning in the 4IR in educational institutions of nations, South Africa to be specific. However, before proceeding to explore the significance of the 4IR technologies in higher institutions of learning, there is a need to provide context, by providing a brief historical background of Industrial Revolutions, especially the first, second and third, and how they influenced the educational system. Messe (2018) states that the word 'Industry 4.0' came into existence after being introduced at the world-renown Hannover Messe, Germany in 2011. The World Economic Forum (WEF 2017) describes the 4IR as a widely discussed concept in conferences and business meetings similar to the World Economic Forum (WEF). The submission of the World Economic Forum (WEF) (2017) indicates that the concept '4IR' which is relatively new is bound to reshape the education sector, gender, workplace and other human endeavours.

The first industrial revolution commonly referred to as the 'industrial revolution' spanned between the late 18th century to the early 19th century. It occurred following a slow period of proto-industrialization (Stearns, 1993). The first industrial revolution caused the introduction and rise of mechanization. This took over agricultural practices during that era (Stearns, 1993; Uleanya & Yu, 2019). Meanwhile, the economy of the society was structured on the industry which became the order. By implication, the concentration of the economy of the society was no longer on agriculture but on industry-related practices. According to Steams (1993), the rise in industrial activities led to the invention of the steam engine which was of huge importance. Rosen (2012) avers that the first industrial revolution also led to the creation of the designs upon which the first set of factories and cities were established.

The second industrial revolution, also known as the "Technological Revolution" occurred between 1870 and 1914 (Mokyr, 1998). According to Mokyr (1998) and Uleanya and Yu (2019), the second industrial revolution occurred just before the first World War. The era caused growth for pre-existing industries and expansion of new ones. The thriving industries during the second industrial revolution include oil and electricity as well as steel. This led to mass production through the use of electric power. According to Landes (2003), during the second industrial revolution, the significance of new technologies, especially, in the refining of internal combustion engine and petroleum, alloys and chemicals, new materials and substances, Electricity and Communication Technologies (ECT) were emphasized, consequently, improved. This led to the third industrial revolution.

The third industrial revolution took place sometime in the 20th century (Uleanya & Yu, 2019). The founding theorist of the third industrial revolution is known as Jeremy Rifkin. The third industrial revolution (3IR) occurred when Henry Ford mastered the moving assembly line and introduced the age of mass production (Rifkin, 2011). The third revolution was characterised by digital technology which continues to ravage the global world thereby helping to create a platform for the fourth industrial revolution also known as 4IR. The third industrial revolution was predicated upon five key pillars: Shift to Renewable Energy, Conversion of Buildings to Power

Plants, Hydrogen and Other Energy Storage Technology, Smart Grid Technology, and Plugin, Electric, Hybrid, and Fuel Cell-based Transportation (Rifkin, 2011).

According to Uleanya and Yu (2019), each industrial revolution has affected the education sector of various nations. For instance, as the revolutions occurred, there was the need for institutions of learning to adjust their systems, curricula and syllabi to ensure that they were relevant and produced students who promoted the agenda of each industrial revolution. According to Uleanya and Yu (2019), the first three industrial revolutions affected the education sector. Furthermore, the submission of WEF (2018), indicates that the education sector is to be affected and influenced by the fourth industrial revolution. The submission further suggests that the education sectors of different nations are to be adjusted to ensure relevance during the fourth industrial revolution. This is to be achieved through the awareness of university students on digital learning to cater for the desired outcomes in the 4IR. Surmise to state that the level of awareness of university students in the Fourth industrial is crucial to the development of the educational system during this era. Suffice to state that appropriate teaching and learning activities may turn out to be difficult or impossible for both teachers and students in the Fourth Industrial Revolution (4IR) without due consideration of digital learning as well as enabling technologies. Hence, in this regard, there is a need for university students to have awareness towards ensuring that digital learning is upheld. Conversely, in the African context which includes South Africa, Uleanya and Yu (2019) conducted a study on the level of preparedness of underdeveloped and developing nations in using formal education to enhance development in the fourth industrial revolution. The finding of the study indicates that the knowledge of digital learning is lacking by many university students in underdeveloped and developing nations which are predominantly African, inclusive of South Africa. Uleanya and Yu (2019) further opine that the lack of knowledge of digital learning by university students in the 4IR has disadvantageously positioned many underdeveloped and developing nations especially those on the African continent. This seems to have affected the level of desired development. The findings of the study of Uleanya and Yu (2017) corroborates the outcome of the summit of the World Economic Forum (WEF) (2018) which suggests that African nations are unprepared for the digital world. The works of Uleanya and Yu (2019) as well as

Uleanya *et al.* (2019) show that many African nations inclusive of South Africa are unprepared for the Fourth Industrial Revolution. However, the relevance of the educational sector in industrial revolutions is dependent on the awareness of students regarding digital learning. Additionally, the reviewed literature suggests that African nations inclusive of South Africa are unprepared for digital learning due to a lack of awareness on digital learning amongst students about the subject matter.

On the other hand, industrial revolutions are usually envisaged to disrupt and influence happenings in the education sector (Lee *et al.* 2018). Meanwhile, the success or failure of the education sector in any industrial revolution is hinged on proper awareness of university students on digital learning (Blignaut *et al.* 2010 and Uleanya & Yu, 2019). Saubari and Baharuddin (2016) opine that awareness of digital learning in this modern-day era needs to be given more attention and promoted amongst students of all levels.

Having considered the relationship between digital learning and the Fourth Industrial Revolution (4IR), there is a need to reflect on digital competence in 4IR in educational institutions of nations, South Africa to be specific. Baharuddin *et al.* (2016) believe that for digital learning to be fully achieved, the students need to focus on three frameworks that will assist them in improving their digital skills. The framework areas are highlighted and explained below: Knowledge Performance, Digital technology skills and Technology tools.

2.4.1 Knowledge performance

The existence of the Fourth Industrial Revolution (4IR) has made accessibility to knowledge, digital development possible. This has been adopted and is being used in institutions of learning to make learning easier and for institutions to function properly. Baharuddin *et al*. (2016) explain that in this modern era, through the knowledge acquired by digital learning, information is easily disseminated and accessed through the use of digital technologies. This implies that the adoption and use of digital learning have become helpful to students in the university by giving them easy and fast access to knowledge through the use of advanced technologies. Saubari and Baharuddin (2016) as well as Sahed (2021) state that knowledge can be accessed anywhere and at any time in

this modern-day age due to the presence of technologies. For instance, one can communicate, create and write through the use of blogs. Furthermore, other social media networks can now serve as a form of digital learning like Facebook through which once an account is opened, lecturers and students can communicate together by sharing knowledge, ideas, information and assignment on the platform. Other platforms such as Zoom, Skype, Cisco WebEx Meeting Centre, Microsoft Teams, HighFive, BigBlueButton, ON24 and Zoho Meeting are also useful and can be adapted for learning purposes in various ways. Suffice to state that in this modern era, various technologies are made available to be used to communicate with people and also to access information, thereby making sure that no one is left behind. Goulão and Fombona (2012) explain that in digital learning, one essential point that needs to be reinforced is knowledge performance. Secker (2010) as well as Cakmak *et al.* (2013) state that people of different age groups have diverse perspectives regarding accessing information and research, thereby there is a need for digital learning to assist in their information literacy. Rahmah (2015) believes that education and technology cannot be separated. To be able to improve the knowledge performance of university students through the use of digital learning, skills in digital technology need to be acquired. Hence in this regard, university students need to be exposed to digital learning to acquire and improve their technological skills. The study conducted by Tan *et al.* (2010) on urban Malaysian youths regarding online activities and writing practices indicate that the youth in Malaysia applied their acquired skills through digital learning to improve their social activities and also upgrade their writing skills through the social networking sites such as blogs. Shariman *et al.* (2012) add that digital learning is very important for students of diverse levels in the Fourth Industrial Revolution (4IR) era. Furthermore, various changes are occurring in knowledge practice, for instance, the style of academic writing is changing because the use of graphics, images and media are not incorporated to transmit information. Shariman *et al.* think that digital learning needs to be incorporated into students at an earlier stage through which knowledge performance can increase in the education sector because digital learning seems to be going beyond technical abilities such as the ability to write, present and communicate through the use of a keyboard. Hence the urgency

to improve the digital learning skills in the educational sector to prepare students for the real-life situation becomes a pivot.

2.4.2 Digital technology skills

Baharuddin *et al.* (2016) aver that in the 21st century, one needs to become an expert in digital technology. For instance, the introduction of computers has been able to assist students in the university to improve their digital technological skills. Furthermore, in digital learning, students need to develop their communication skills and searching skills either by going to digital learning classes or learning by themselves online through which they can get familiar with the technological tools

2.4.3 Technology tools

Baharuddin *et al.* (2016) point out that students need to acquire skills on the use of technological tools appropriately. Nevertheless, many of these searching tools might be able to assist the students to make learning easier and fun. For example, through the use of Google Earth, students learn how to build proper vocabulary skills, writing skills through which their style of writing gets improved. They also learn and enhance their skills in the creation of stories and maps. Furthermore, with creation tools, students learn to draw on the map, add photos as well as videos of their choice, state their views over a subject, share and work together with others. Moreover, the studies conducted on digital learning shows that many students become more active in the lecture room and understand easily and faster through the use of digital tools. This is supported following the earlier work of Baharuddin *et al.* (2014) which indicates that if the various institutions can work with their university librarians, students' learning skills will be improved, consequently causing them to gain interest during lectures. Hence, based on these three frameworks explained above, it can be said that digital learning is paramount to be used for students because it can be used in real-life situations to seek knowledge. Through the use of all these technological skills, lecturers will be able to build strengths into students following a good communication practice and seeking information properly.

2.5 Significance of the 4IR Technologies to Educational Institutions

Having seen that the first three industrial revolutions were significant stride in the global world and had an impact on the education sector of different nations, there is a need to consider the importance of the 4IR technologies in the education sector and institutions. Digital learning empowers people to become potential contributors to sustainable economic vigour and development of a nation and society (Zagami *et al.* 2018). They further posit that such significance demands crucial work for educational policymakers, researchers and practitioners who are expected to have a re-think of the processes, structures, support systems and role of technology that enhance learning. In other words, 4IR technologies in educational institutions enhance digital learning. Suffice to state that without the provision of technologies of the 4IR, digital learning remains difficult and some worth impossible. Uleanya and Gamede (2018) describe this experience as pedagogic malpractice. Hence, for pedagogic malpractice to be avoided and appropriate teaching and learning to be experienced in the 4IR, digital learning is of huge essence. However, digital learning is impossible without the availability of the education technologies of the 4IR.

The fourth industrial revolution technologies in educational institutions are crucial as it proposes to support and lead nations toward their digital future (Zagami *et al.* 2018). This is envisaged to enhance innovations at various levels: grassroots inclusive. In other words, for nations to survive through the digital age in the nearest future, digital learning is important and needed.

2.6 Factors Promoting Students' Awareness of Digital Learning

A review of the works of some scholars (Agostini and Nosella, 2020; PR Newswire, 2019; Eze *et al*. 2018; Economides and Jeziorski, 2017; Awa *et al*. 2011; Maldonado *et al*. 2011; Chuang *et al*. 2009) suggest that in this 21st-century era, the continuous development in Information Technology (IT) has given institutions of learning the opportunity to advance their teaching and learning skills and activities through the adoption and use of digital learning. According to Nuryyev *et al*. (2020) and Daukilas and Vaisnoriene (2009), digital learning is a device adaptable by students in Higher Education Institutions (HEIs) to enable them to learn logically regardless of time and space. Digital learning helps students to create and develop their human capabilities. For instance, if lecturers

and students in the HEIs are well trained on how to use digital learning tools for delivering lectures, their innovative skills get to improve (Loogma *et al*. 2012; Agostini, and Nosella, 2020). However, the benefits of digital learning as explained by various scholars and extant literature reviewed and presented above cannot be harnessed without the creation of appropriate awareness. Thus, the need to identify ways by which awareness of digital learning can be created for students becomes crucial. El-Masri and Tarhini (2017) as well as Alksasbeh *et al*. (2019) explain that digital learning can be promoted to create awareness for students at the institution of learning by ensuring that the university studies its adoption thereby allowing understanding the students' needs and also enduring successful implementation. Following the findings of the extant reviewed literature, below are some identified ways by which awareness of digital learning can be created in students. They include: orientation, seeking guidance and advice from others, workshops, seminars, self-exploration through the web, amongst others

- **Orientation**: According to Fazli (2016), students are to be made aware of the reliability, benefits and risks involved in online activities inclusive of digital learning. Such awareness, however, can be done through a proper orientation session. The works of Uleanya and Rugbeer (2019), Muhuro and Kang'ethe (2016), explain some of the key benefits of orientation which can help to eradicate ignorance for students. This is inclusive of ignorance in the area of digital learning. Fazli (2016) further states that once awareness of digital learning is created for students, they get to know how to determine trustworthy articles or websites.
- **Guidance and Advice from Peers, Parents, Mentors, Lecturers, amongst others:** Fazli (2016) holds the view that digital awareness can be created for students by making them explore the option of seeking guidance and advice from other people. Amongst these people are parents, peers, lecturers, mentors, experts in the field, amongst others (Fazli, 2016). Meanwhile, according to Uleanya, Uleanya, Naidoo and Rugbeer (2020) in support state that parents, peers, lecturers influence students. This implies that students' awareness of digital learning can be enhanced through the influence of different people.

- **Workshop:** Following a review of the work of Wiroterat (2013), workshops can be organised for students to create appropriate awareness over a subject matter. In this regard, workshops can help to create a platform for students to become aware of digital learning, its use, benefits, advantages, disadvantages, benefits, and how it works. In this case, students get to improve their level of information, exposure to, as well as skills on digital learning. This will enhance their digital learning, consequently their academic performance, especially as it applies to the online activities during this period of the outbreak of the COVID-19 pandemic.
- **Seminars:** Periodic seminar is another way by which students can be exposed to the importance and use of digital learning (Wiroterat, 2013). Hence, this implies that institutions of learning through the appropriate offices and departments can afford to organise seminars where students are made aware of the usefulness of digital learning as well as the need for such.
- **Self-exploration through the web**: This is another means by which students can become aware of digital learning. According to Fazli (2016), students should be allowed to explore the web on their own to get the necessary information. In this regard, students get to learn on their own.

2.7 Factors Hindering Students' Awareness of Digital Learning

Various scholars such as (Akinnuwesi *et al.* 2016; Ali *et al.* 2016; Khan *et al.* 2012) have identified different factors that influence and hinder students' awareness of digital learning. Some of these factors include lecturers, lack of funding, lack of good infrastructural facilities, poor awareness, limited resources, lack of adequate training, lack of adequate internet facilities, restriction of students to the use of digital technologies, poor style of integrating digital skills, lack of essential digital skills and lack of commitment from the students, amongst others.

- **Lecturers:** It is revealed by several authors (Mac Callum, *et al.,* 2014; Mooeketsi and Chigona, 2014; Ndlovu and Lawrence, 2012) that lecturers are one of the contributory factors which hinder the creation of students' awareness of digital learning. This is due to

the underutilization of their digital skills or not integrating ICTs in their adopted style of teaching. Mac Callum *et al*. (2014) further state that the belief systems of lecturers on digital learning affect students' awareness of digital learning.

- **Lack of Funding**: The work of Prause (2019), shows that funding is a major concern in the running and functioning of institutions of learning. According to Prause (2019); Eze *et al*. (2018) and Bukhari (2010), lack of funding hinders the creation of students' awareness of digital learning. In the first instance, funding is essential in the purchase and installation of digital facilities.
- **Poor Awareness:** Eze *et al*. (2020) state that inadequate knowledge affects the creation of the level of students' awareness of digital learning. Suffice to state that lecturers and other relevant stakeholders in the field are to possess the right and adequate knowledge of digital learning to be able to assist students in creating the right awareness of such. In other words, poor awareness of digital learning on the part of lecturers and other relevant stakeholders hamper students' awareness.
- **Limited Resources**: According to Eze *et al*. (2020) as well as Greer *et al*. (2016), adequate resources are needed for digital learning to be made possible. This also affects students' awareness of digital learning. This implies that limited resources can hamper students' awareness of digital learning.
- **Lack of Adequate Training:** Digital learning demands adequate exposure and training. Hence, a review of the works of Bhuasiri *et al*. (2012) and Greer, Koran and White (2016) suggests that a lack in the training needed for digital learning to thrive can hamper the creation of students' awareness on the subject of digital learning.
- **Lack of Adequate Internet and Infrastructural Facilities**: Internet facilities are needed for the promotion of the creation of digital awareness. Most writers (Abdulhamid *et al*. 2017; Allen and Seaman 2003; Okundaye *et al*., 2019) opine that lack of adequate internet facilities affects students' level of awareness of digital learning. Prause (2019); Eze *et al*. (2018) and Bukhari (2010) describes this as a lack of proper infrastructural facilities. This implies that there is a need for internet and infrastructural facilities to be made available

for the creation of students' awareness of digital learning. The infrastructural facilities can include libraries, laboratories, amongst others (Uleanya *et al.*2020).

- **Restriction of Students to the Use of Digital Technologies:** Attempting to prevent students on the use of digital technologies hinders their level of awareness. Oguzor (2011) and Ostund (2005) explain that hindering students from the use of digital technologies hamper students' level of awareness. Thus, students are to be encouraged to use digital technologies.
- **Poor Style of Integrating Digital Skills:** Oguzor (2011) and Ostund (2005) explain that poor style of the integration of digital skills can hinder the level of students' awareness of digital learning. This implies that for the awareness of students on digital learning to be well-created and harnessed, there is a need for the appropriate style of integrating digital learning to be well adapted and appropriately utilized.
- **Lack of Students' Commitment**: Lack of commitment from students can affect and hinder their level of awareness of digital learning (Eze *et al*. 2018; Kizito & Bijan, 2006). In this regard, it means that students' commitment towards becoming aware of digital learning is necessary. Thus, the work of Fazli (2016) becomes relevant that there is a need for students to explore the web to become aware of digital learning. This accounts for some levels of commitment from the students.
- **Lack Required Skills:** Some writers (Asogwa, 2011; Asongu and Le Roux, 2017; Ciechanowski, *et al*., 2019; Eze, *et al*., 2018) hold the view that lack of the skills needed for creating digital learning awareness amongst students in higher institutions of learning is one of the factors hindering the successful creation of awareness of digital learning in students. Kizito and Bijan, (2006); Eze *et al*. (2018) further describe this as a lack of essential digital skills. This implies that for students to become aware of digital learning, there is a need for the necessary skills to be put in place by the institutions of learning.
- **Anxiety:** This is another identified factor that hampers students' awareness of digital learning. Greer *et al*. (2016) explain that anxiety of ICTs and other related resources affects students' awareness of digital learning. This implies that students are to be discouraged

from being anxious in their use of digital facilities. In this way, they become exposed to technological facilities, and in turn their level of awareness increases.

- **Limited Time**: Greer *et al*. (2016) (2016) opine that limited time contributes to students' awareness of digital learning. Thus, time is a major factor that needs to be considered in the creation of digital awareness for students.

2.8 Digital Learning in South Africa

Mashau and Nyawo (2021) as well as Heng and Koemhong (2020) explain that the recent outburst of novel Coronavirus (COVID-19) around the world has shown uncertainty and South African Higher Education Institutions (HEIs) have not been spared in this unforeseen circumstance resulting in complete closure of universities. Furthermore, the exploration of opportunities and transformation brought about by 4IR has proved to be a challenge to many organisations inclusive of students.

The complete closure of institutions in South Africa has proved the level of unpreparedness of higher education institutions to conduct learning through online platforms and the adoption of digital technologies which has resulted in many students struggling or being challenged in their use of computers and also connecting to the internet (DHET, 2020; Heng and Koemhong, 2020; OECD, 2020). Ruxwana and Msibi (2018) as well as Al-Khalifa (2010) note that the continuous changes in technology brought about by 4IR and the inception of advanced teaching and learning tools have a significant impact on how information is communicated to students and how students learn.

Mawere (2021) explains that the recent outbreak of COVID-19 has revealed the need for the educational system in South Africa to be reshaped especially in higher education institutions. Campbell (2013) argues that reshaping the educational system of learning is significant. Alruwais (2018) indicates that the use of technology has been of great assistance to education and as a result of the recent trends in technological development, most universities now adopt technology for teaching and learning. Mashau and Nyawo (2021) in support of Alruwais (2018) state that the recent events in educational technology have led most higher institutions of learning into the

utilization of digital learning for teaching and learning purposes. Eljinini *et al.* (2012) add that the current changes in the developments of technology have created an avenue for most universities to employ the use of digital learning for students. This implies the need to embrace digital learning.

From the foregoing, it can be stated that in this present digital age, many higher education institutions in South Africa are experiencing challenges concerning the effective use of digital learning for teaching and learning purposes. These challenges include lack of digital learning awareness, digital competence, educational inequalities, lack of adequate infrastructural facilities, Inadequate ICT skills, technological factors, lecturers' attitudes as well as students' unpreparedness for higher educational institutions (Mashau and Nyawo 2021; Isabirye and Dlodlo 2014; OER Africa 2014 Venter et al. 2012). Mashau and Nyawo (2021) explain that as universities in South Africa work towards the same aim and objectives as regards educational transformation globally, it is of great significance to create awareness on digital learning for students as well as make more use of digital learning in teaching and learning activities. Van de Heyde and Siebrits (2019) views that the introduction of digital learning to students can assist them in becoming computer literate. Furthermore, Van de Heyde and Siebrits (2019) view that introducing digital learning and other educational technologies to both students and academics can improve teaching and learning processes. Ng'ambi (2013) argues that it is important to align digital technologies to teaching and learning. Suffice to say that introducing digital learning to students may not be sufficient, there is a need to align the use of digital learning or digital technologies to teaching and learning.

The adoption of digital learning or digital technologies can promote educational practices as well as increase the issue of digital inequality or division (Ferlazzo, 2020; Young & Noonoo, 2020; Tichavakunda & Tierney, 2018; Edyburn, 2013). The introduction and use of digital learning in some areas may lead to digital inequality or divide Hence the need to discuss the subject of the digital divide. The role of government and institutions in promoting digital learning.

2.9 Digital Divide

Ercikan *et al.* (2018) define the digital divide as a social inequality that exists in society as regards the use of technology as well as access to ICT. Hidalgo *et al.* (2020) note that the digital divide centres on inequality regarding the use of ICT. The digital divide implies an existing gap between regions with quality access to contemporary Information Communications Technology (ICT) and those with less or restricted access (Steele, 2019; Sahed, 2021). Soomro *et al.* (2020) explain that the digital divide focuses on access to diverse sections of ICT which includes skills, motivation and the use of digital technologies. Following the review of the work of Steele (2019), the digital divide can be viewed on an individual basis. It is used to mean the existing gap amongst persons with access to contemporary Information and Communication Technologies (ICTs), as well as individuals who experience a shortage in access. Chisango *et al.* (2019) observe that gaining access to ICT facilities does not necessitate that the people have acquired digital skills. The digital divide is considered to be experienced amidst socioeconomic groups; amongst more and less economically developed nations, and between the educated and uneducated population of various nations (Steele, 2019)

Kajee & Balfour (2011) explains that the majority of the people from disadvantaged environments such as scarce facilities or lack of access to those facilities are from under-resourced sociocultural backgrounds. Steele (2019) and Sahed (2021) believe that the digital divide is in existence in both urban-based communities as well as rural settlements. Davids (2020) argues that for most students in rural areas, access to online learning remains a mirage to them and the issue of the COVID-19 pandemic has revealed the gravity of this digital divide in South Africa. Mhlanga and Moloi (2020) note that most of the students from the rural environment are challenged with situations such as poor internet connectivity and poor infrastructural facilities. Chisango and Marongwe (2021) argue that the recent outbreak of COVID-19 has worsened the situation of the digital divide because most people who have no access to ICT facilities are situated in rural areas in developing countries. The studies conducted by Yen (2020) as well as Zhou (2020) indicate that with the outbreak of COVID-19, most educational institutions are adopting digital technologies for teaching and

learning purposes, however many of the students from lower-income families have limited access or lack access to online learning due to digital inequalities. Suffice to say that there is an issue of the digital divide between people from urban environments and those from rural environments.

Czerniewicz *et al.* (2020) opine that South Africa's digital divide in terms of its income and wealth inequalities is gradually affecting students' digital skills as the students struggle to adopt technological facilities. Chen (2015) believes that the more ICT is being used in the educational sector, the more the digital divide will be experienced in schools as well as higher institutions of learning. Studies from previous research on the digital divide show the imbalance arising from the use of digital technologies and have integrated several socioeconomic factors, such as gender, age, race, educational level, income, and habitat (Hasan & Bao, 2020, Czerniewicz *et al.* 2020). This implies that the digital divide is a common phenomenon across categories of people, sectors and nations of the world. Steele (2019) further explains the various impacts of a digital divide on different sectors and systems. The impacts of the digital divide include the following as explained below:

2.9.1 Impact of the Digital Divide

The digital divide has created distinctions amongst societies across the globe. Some of the visible outcomes caused by the digital divide include: impact on the economy, impact on social lives of people, impact on the society, and impact on education. The impacts of the digital divide on the different systems are as explained below.

2.9.1.1 Impact of Digital Divide on the Economy

Information Communication Technologies (ICTs) and Telecommunication services aid economic growth. Thus, the more the use of internet facilities in a nation, the more economic growth such a nation is likely to experience. This is owing to the online engagement of individuals. This can be in the area of online shopping thereby eradicating the hurdle of travelling. Similarly, the convenience of paperless transactions helps to contribute to economic empowerment. Meanwhile, the economic gap expands especially with developing nations which tend to be inadequate in ICT integration.

2.9.1.2 Impact of Digital Divide on Social Spheres

Access to the internet promotes communication which is a major tenet for the growth of social activities. Social media platforms which comprise Facebook, Instagram, WhatsApp, Skype, amongst others create meeting platforms, build contacts, grow relationships, and connect people. Information can easily and quickly be accessed with the use of social media platforms created by ICT, rather than reliance on traditional systems such as the use of newspapers, amongst others. Conversely, in the world of art and music, drastic and revolutionized changes have been experienced as a result of the influence of technology. Thus, societies with poor internet facilities tend to be disadvantaged in benefiting from the aforementioned advantages of technologies. Hence, eradication of the digital divide becomes crucial to enable developing countries.

2.9.1.3 Impact of Digital Divide on Society

The digital divide has immensely contributed to discrimination in various ways. The work of Dolan 2016; Puigjaner (2016) as well as Gorski (2005) indicate that the digital gap regarding digital facilities and adequate information on how to use those facilities to assist learning needs to be prioritized. This is supported by Uleanya (2020) who opines that technology has contributed to the disunity experienced by people within a common space. It has separated individuals in the society including age, ethnicity, gender and race. Technology helps to create new alignments among individuals with access to the internet and those without access. Hence, nations with limited access are likely to continue to lag in their growth and development.

2.9.1.4 Impact of Digital Divide on Education

The internet functions as a substantial library of information. In recent times, especially with the global outbreak of the COVID-19 pandemic, there are various educational platforms where teaching and learning activities are conducted. Thus, access to ICT has been linked to academic success and the good academic performances of students. Suffice to state that while education empowers the mind, and ICT aids such, it is a pivot for people and nations to be abreast and continue to keep up with the dynamism in the sector for significant success to both individuals and

the society at large. By implication, where the digital divide is experienced in the education sector, it makes some people continuously increase in knowledge while others remain deficient and outdated.

Moldavan (2021) opines that to be able to address the issue of the digital divide and its barriers which often affect both the urban and rural environment, there is a need to prioritize and implement equality. Furthermore, Moldavan explains that this can be done through proper digital competence skills for both lecturers and students. Martínez-Bravo *et al.* (2020) state that digital competence such as ICT skills, communication skills and technical skills are part of essential proficiency needed for lifelong learning. Hence the need for the next sub-heading.

2.10 Digital Competence

Cazco *et al*. (2016) describe digital competence as a set of principles, ideas and the ability to use technology appropriately to acquire knowledge. Tomte *et al.* (2015) view digital competence as the lecturer's proficiency in the use of ICT towards its delivery in teaching and learning activities. Scuotto and Morellato (2013) refer to digital competence as the ability to explore, select and analyse new technological facilities to acquire more knowledge. Ilomäki, Kantosalo and Lakkala, (2011) describes that digital competence not only consists of digital abilities but also comprises the social and emotional parts in the usage of digital devices. Ferrari (2012) defines digital competence as a set of skills, abilities, knowledge and attitude which is fundamental to be used in a digital environment. European Commission (2010) reveal that digital competence includes the usage of computers to access information, retrieve information and exchange information. Stewart (2011) suggests that digital competence is needed to be able to access information, keep information and communicate efficiently in a digital environment. Suffice to say that for a person to be able to communicate efficiently in a digital environment, digital competence is needed. This section aims at reviewing literature relevant to the second objective of the study: To determine plans that policymakers at the selected South African universities have put in place to transform the curriculum for digital learners.

2.11 Policymakers

Gbollie and Gong (2018) explain that in the educational sector ' policymakers are the people who are involved in the making of policies: how, when and why they are made. 's policymakers are considered as very important people in the education sector, thus their roles are essential (Gbollie & Gong, 2018). Suffice to state that policymakers in education are the people who provide guidelines on how educational practices are carried out and achieved in various schools and institutions. Gbollie and Gong (2018) further hold the view that in many nations, the department of education is the people involved in the formulation of policies. However, Smith *et al.* (2019) hold the view that policymakers should comprise different people from various sectors, not only the Department of Education. This is to ensure that the inputs of different sectors are experienced within the education sector since it caters for different sectors of the society at large. Suffice to state that policymakers are very essential or significant when it comes to making policies.

2.12 Curriculum

Campbell (2020) explains that both curriculum and education are interrelated, and they both share a relationship for them to strengthen. Thus, the need to briefly explain the term education as identified by Campbell (2020). Education is viewed as the basis for an excellent and successful career as well as financial freedom through which human beings have the ability or the potential to think carefully and critically about issues to make informed decisions in life (Campbell, 2020). This implies that education aids the raising and empowering of an individual towards building a successful career in life. However, such may not be achievable without a duly designed, planned and implemented curriculum targeted at such (Smith, Gamede & Uleanya, 2019). This indicates that curriculum and education function together. Thus, the need to consider the term curriculum becomes crucial. Meanwhile, Hlebowitsh (2004) had earlier explained that the term ‘curriculum’ originated from the Latin word "Currere" which means the sequence of activities and experiences that children go through which mould them into becoming mature adults’. This means that the term curriculum is used for the learning and training of children in the formal education system.

According to Musingafi *et al*. (2015), the curriculum is considered as a well-defined course of study which is significant for students to complete to ascertain the certifiable completion of a particular level of education. Meanwhile, Khwaja, *et al.* (2014) had earlier viewed curriculum as a contract between the society, the state and educational professionals regarding the educational activities that students are expected to go through at different stages of their lives in school to acquire knowledge, develop skills and become relevant in the society. This means that curriculum is the backbone targeted at catering for the learning experiences of students at the different phases of their school experiences. Campbell (2020) opines that curriculum is a set of learning guides, topics or objectives put in place by the school board or policymakers designed with the motive to tackle students' educational needs as well as to facilitate teaching and learning processes. This comprises activities that take place between lecturers and students targeted at enhancing the learning abilities of students (Campbell, 2020). In this regard, relationships between lecturers and students are established. Meanwhile, according to Uleanya (2020), the learning abilities of students, and consequently their academic performances are to an extent hinged on the existing relationships with their lecturers.

Uleanya and Yu (2019) hold the view that a curriculum is a useful tool used to determine the learning experiences of students. For instance, during the first, second and third industrial revolutions, the curricula of different nations continued to adjust to cater for the current needs of the societies (Uleanya & Yu, 2019). This suggests that the curriculum of a nation is used to determine what students learning in schools within the country would be taught, consequently, expected to learn. Thus curriculum is used to cater for the needs of societies by ensuring that students are made to learn relevant items capable of proffering solutions to the challenges of the society and possibly aiding development in such areas. Meanwhile, according to Smith, Gamede and Uleanya (2019), the curriculum is expected to be well designed and implemented with the involvement of the necessary stakeholders for it to achieve the desired aim. Surmise to state that curriculum is the set of learning that takes place within and outside the institution of learning under the supervision of such institution. Suffice to state that with a well-planned, designed and implemented curriculum, a society can experience some forms of advancement through the impact

made by institutions of learning. In other words, the curriculum can be viewed from the perspective of being a tool. Hence, the need to consider the roles of curriculum transformation in education.

2.12.1 The role of Curriculum Transformation in Education

Curriculum transformation is otherwise known as curriculum change or reform (Smith, Gamede & Uleanya, 2019). According to Shay (2015), as well as Mendy and Madiope (2020), curriculum transformation refers to the process of changing the content of teaching and learning. Meanwhile, in a review of the work of Uleanya and Yu (2019), the curriculum of various nations and societies were transformed at different times during the first, second and third industrial revolutions. Uleanya and Yu (2019) further state that this was in an attempt for the schools and societies to be relevant following each revolution. This implies that curriculum transformation in education occurs mostly for schools to become relevant by ensuring that the most suitable content for each dispensation is made available. Thus following the advent of the 4IR, curriculum transformation for education is desired just as the case was with the earlier industrial revolutions commonly described as 1IR, 2IR and 3IR. For instance, in 4IR, the curriculum is largely expected to be transformed to accommodate digital learning and other related areas. For instance, according to the findings of the works of West (2014), as well as Watson *et al*., (2011), the issues of transformation of curriculum for digital learners has become a global matter.

Waks, 2003; Yin, 2013; Sparapani *et al*. 2014; Dhlomo and Mawere 2020 add that curriculum transformation has resulted in a global trend due to globalization. UNESCO (2017b) explains that the present curriculum in terms of its roles, subject structure, technological impact and sustainability have been criticized for not meeting up to the necessary standard in this 21st century. Ramrathan (2016) opines that after apartheid in South Africa, despite the changes made to the higher education curriculum, significant transformation regarding the curriculum is still missing within higher education. Alderuccio (2010); Webb (2017) opines that much of the research conducted on curriculum transformation has centred on ways or methods on how to handle these situations whether locally or globally. Pollard *et al*., (2013); Hogg, (2016) views that many higher institutions of learning have benefitted through these researches and have taken positive steps on

how to redeem the image of the nation through these transformations. Mendy (2018b) and Spaull (2013) observe that the transformation of the curriculum and the process of balancing teaching and learning has developed to be an educational crisis and has obtained minimal attention. UNESCO (2018) indicates that the current situation regarding the curriculum can be resolved by employing flexibility in the curriculum in which students' diverse needs, interests and goals are thoroughly achieved.

The report by CHE (2013a) shows that the higher education curriculum was recently modified through a proposal for the introduction of a flexible curriculum for undergraduate programmes offered across higher institutions of learning. Ramrathan (2016) adds that the higher education curriculum proposal for a flexible curriculum aims to address the limitation in education by making changes to the undergraduate curriculum. Menon and Castrillon (2019) support CHE and Ramrathan's assertion above that for higher institutions of learning to effectively deliver education to students and prepare the students for the demands and challenges of the Fourth Industrial Revolution (4IR), it is essential to have some new flexible curricula. Phillips *et al*., 2013; Mendy and Madiope (2020) argue that when significant transformation occurs to the curriculum, proper and positive teaching and learning content are accomplished. Reis (2018) suggests that the transformation of curriculum for digital learners by policymakers needs to be in a clearer vision and mission, proper selection of educational standards and attention to culture, context, politics and stakeholders. Dhlomo and Mawere (2020), Raselimo and Wilmot (2013) mention that curriculums are guided by policies and the level at which the policies' expectations are clear enough will have an impact on the level of the educators' understanding.

Grand-Clement *et al*. (2017) opine that the education and training stakeholders are the main people in the integration and implementation of the curriculum in the educational sectors. Tritz (2015) argues that there should be cooperation or collaboration between curriculum reformers and technology experts at the initial stage in curriculum design. Hughes and Acedo (2016) opine that it is essential for policymakers during the period of curriculum transformation to highlight the significance of integrating necessary school materials at an early stage and age through the

cooperation of teachers and school management. Tritz (2015) states that higher institutions of learning need to amend and develop the curriculum for digital learners to suit the current changes in the pedagogy. Heick (2019) adds that institutions do not only need to know how technology can be used but also how different and diverse styles of teaching and learning can come up and also be explored. Fadel *et al.* (2015) suggest that the curricula are required to be transformed in the aspect of information, ability and character which is referred to as Meta-Learning Framework. Gencel and Saracaloğlu (2018) state that the aim of the student to learn and work efficiently in a digital environment and the ability to use the provided information to solve problems on their own are all connected to the standard of the curriculum. Menon and Castrillon (2019) indicate that in this period of 4IR, for proper education to be delivered to students at higher institutions of learning and also the society, new curricula and teaching approaches will be required.

2.13 Fourth Industrial Revolution (4IR) and Curriculum Redesign by Policymakers

The fourth industrial revolution has played a significant role and shift in every sector of the world (Schwab, 2015). Moreover, a review of the work of Uleanya and Yu (2019) show that the curricula of different nations were redesigned during the era of the first, second and third industrial revolutions to make them relevant in the periods. Similarly, it is expedient that the curricula of nations are transformed to suit the demands and needs of the 4IR era (Uleanya & Yu, 2019). Furthermore, Penprase (2018) had earlier explained that South Africa during the 4IR era needs to restructure its higher education curriculum to suit the changes in the 4IR to be able to deliver the necessary skills and knowledge needed by students at higher institutions of learning to compete and contribute effectively in this 21st century.

Fomunyam (2020) opines that the fourth industrial revolution in this present era combines both digital, physical and biological information and as a result of this, many African nations are lagging. In addition, for many of the African nations to compete in this present era, it is important to carefully prepare for the future by improving their educational practices (Uleanya & Yu, 2019). On the other hand, Penrose (2018) opines that the curriculum in the educational system needs to be adjusted to suit the 4IR. Penrose (2018) further states that such can be achieved by focusing on

how the curriculum stresses perspectives from multidisciplinary and cultural perspectives over static swathes of disciplinary content that will assist students who will meet the demands of the workplace. Meanwhile, a review of the finding of the work of Smith, Gamede and Uleanya (2019) indicates that curriculum design or redesign remains impossible without the involvement of policymakers who are also considered as stakeholders in the field of education.

According to a report from UNESCO (2020), in this present era of the 4IR, technology has become of great significance and in high demand in various sectors, inclusive of education. On the other hand, a review of the work of Aristovnik *et al*. (2020) shows that the outbreak of the global COVID-19 pandemic tends to have pushed many institutions of learning across the globe to embrace education practices to be experienced in the 4IR. This is evident in the shift from onsite to online teaching and learning practices. For instance, during the outbreak of the COVID-19 pandemic, many schools had to be shut down and technology was embraced to continue the educational exercise for the students by engaging in distance learning programmes (UNESCO 2020). Kamanetz (2020), as well as Sun et al. (2020), adds that based on the unforeseen circumstances during the COVID-19 pandemic, many schools and institutions of learning resulted in offering education through diverse means remotely like the use of media such as radio, social media, television, amongst others. According to a statement by the United Nations (2020), during the outbreak of the COVID-19 pandemic, educators were proactive in their response. Thus in this regard, they showed somewhat great support following their adjustments in the shift of the lesson delivery from onsite to online (United Nations, 2020). The submission of the United Nations (2020) further shows that the crisis caused by the outbreak of the COVID-19 pandemic tends to have led to some forms of advancement and innovation in the education sector of various nations across the globe.

Diaz and Lee (2020) opine that the issue of the COVID-19 pandemic, for instance, demands the strengthening and securing of the global network by the government and policymakers to adapt to the social, economic and technological changes taking place in this 21st century. Brynjolfsson and Collis (2020) argued that situations taking place around the world have revealed that human beings

are living in a period where uncommon changes take place. Furthermore, people tend to be facing various challenges due to the advancement in technologies such as artificial intelligence (AI), robotics, machine learning, amongst others which result in changes to society thereby affecting people's jobs. This is in alignment with the works of Christensen *et al.* (2015) as well as Ab Rahman *et al.* (2017) who hold the view that during the era of 4IR, disruptive technology is likely to cause changes in different sectors. Meanwhile, according to Ab Rahman *et al.* (2017), disruptive technology is the second type of innovation in addition to sustainable technology which is to be prevalent in the 4IR era.

Ford (2015) reveals that in this present era of the 4IR, millions of people or workers especially in low-skilled occupations have lost their jobs. WEF (2020) adds that although many people are losing their jobs as a result of this technological change, many jobs are also being created which never existed before. WEF (2016) corroborates this assertion stating that 65 percent of children who are entering elementary school today will occupy jobs that are not yet in existence. A study conducted by the Organisation for Economic Co-operation and Development (OECD) (2020) shows that many higher institutions of learning are equipping students for a world that is no longer in existence based on the changes that occur between the scope of jobs in demand which existed and the level of people awareness regarding the changes in the labour market and its new possibilities. (Mann *et al*. 2020). Suffice to say that, in this present era of 4IR, institutions are required to equip students with the necessary skills due to the advancement in technologies, which will assist them to be able to compete in the world at large. The information from various scholars above shows students need to be prepared adequately with the required skills needed for the labour market to withstand the diverse changes occurring around the world.

The study conducted by Nakagawa (2015); Beard (2018) as well as West (2018) reveals that even with the recent technological changes, many educational sectors are not ready for the changes to assist students and equip them with the necessary skills needed for this digital period and the world at large. Cabrol (2019) argues that many higher institutions of learning are still adopting the 20th-

century style of teaching by training or developing their students for jobs that cannot accommodate the present developments in technology.

Cabrol (2019) explains further that higher institutions of learning need to equip and develop their students for the digital era. This can be done by making changes to their educational focus and accommodating the new styles and skills of teaching and learning (Cabrol, 2019). In other words, transformation is to be desired in the education sector for students to be relevant in the Fourth Industrial Revolution (4IR) era. Moreover, according to Uleanya and Yu (2019), education played an important role in making individuals adjust to each of the first, second and third industrial revolutions. Uleanya and Yu (2019) further state that the use of education to aid adjustments to each of the first three industrial revolutions was achieved through the curricula which were reviewed, designed and implemented. This implies that for the individuals to somewhat successfully adjust to practices in the 4IR era in various sectors, the role of the education sector cannot be overemphasized. However, the success of the role of the education sector would be largely dependent on the transformation of the curricula to suit happenings and expectations in the era.

Diaz and Lee (2020) argue that although education is significant however the policymakers need to transform the curriculum to develop digital learners through the acquisition of relevant foundational skills which will assist the students to be able to compete in the labour market and to achieve greater heights in life. To support this assertion, Ford (2015), as well as Nakagawa (2015), suggest that to succeed in this 21st century, the policymakers, as well as the higher institution of learning, need to develop and equip students with the needed skills for human interaction such as communication skills, creativity skills, problem-solving skills, negotiation skills, critical skills and analytical thinking skills to compete in this digital era. The submission of the World Economic Forum (WEF) (2015) shows that to assist students to become digital learners, the policymaker in the educational sector needs to restructure the curriculum to incorporate new ways on how students can learn, update lecturers' diverse roles as well as their teaching and learning styles. Also, the policymakers need to adjust the curriculum to suit the advancement in technology in this 21st

century to acquire the necessary basic skills like literacy and numeracy as well as foundational or transversal skills which is the basis for any human means of development WEF (2015). This suggests that the role of policymakers is also crucial. Moreover, a review of the work of Aristovnik *et al*. (2020) shows that policymakers have important roles to play in the adjustment and transformation of the curriculum to suit the education practices in the 4IR era.

Furthermore, Diaz and Lee (2020) believe that for policymakers to be able to effectively transform the curriculum for digital learners, the transformation needs to put learning at the centre. This can be achieved if the curriculum is created around skills that are needed by the students and how institutions can assist the students to develop these skills. Diaz and Lee (2020) further explain that for policymakers to be able to redesign the curriculum, it is essential to bridge and narrow the digital divide gap through the provision of internet connectivity and provision of ICT infrastructure devices in institutions. Following the submission of the president of Plan CEIBAL by the name Miguel Brechner in 2019, "having connectivity and technological infrastructure in schools is like having water and electricity. No one questions their value or need (Brechner 2019)." Diaz and Lee (2020) in furtherance of the steps that can be followed by policymakers in enhancing the transformation of the curriculum hold the view that having centralized the curriculum, and attempting to bridge the digital divide, the next step is to have and promote a national vision based on the realities of the nation.

The next step according to Diaz and Lee (2020) is to design and implement strategy and institutional architecture. In this regard, policymakers are expected to have distinct strategies on how to achieve the set national vision. However, the place of education in this regard would be needed. Diaz and Lee (2020) state that following the pivot role of the education sector, there would be the need for all education stakeholders to buy into the national vision and strategies. In this regard, the possibility of education stakeholders to play their roles becomes a reality. The next stage after making education stakeholders buy into the vision and strategies is to adjust the way and manner students learn (Diaz & Lee 2020). This according to Mateo and Becerra (2019) can be done, by updating teaching and learning practices in the modern world. This suggests the recent

trend in the education sector, following the transformation from onsite to online teaching and learning being experienced.

The next stage according to Diaz and Lee (2020) is to change the content of what students learn. Diaz and Lee (2020) opine that the content of what students learn can be changed by ensuring an update of the designed and planned curriculum which is expected to be done following the skills that would be relevant during the era and for the century. Having updated the content of the curriculum guiding education, Diaz and Lee (2020) state that teachers are to be empowered. Suffice to state that the implementation of an updated or transformed curriculum remains impossible without teachers who are the implementers of the curriculum. In the case of this study, the role of lecturers in ensuring the implementation of the curriculum which is to make students relevant in the 4IR) is a pivot. Hence, by inference, lecturers are considered as agents of change in ensuring relevance in the 4IR era (Diaz & Lee, 2020).

Diaz and Lee (2020) add that the succeeding stage would be to ensure proper monitoring and due evaluation of the progress. At this stage evidence on the success of the plan and implementation is to be collected to help policymakers reach an informed decision in their policymaking. In other words, policymakers can adjust policies were necessary to ensure that the national vision is being achieved as well as relevance during the 4IR era. The final stage according to Diaz and Lee (2020) is to ensure that ethical issues are appropriately addressed. This is expected to help in minimally reducing or possibly eradicating mishaps in the process of ensuring curriculum transformation for relevance in the 4IR era.

Additionally, in the South African context, Beliz *et al. (*2019) opine that there is a need for institutions of learning such as universities to inculcate in students the desirous and needed high-tech abilities that would make them relevant in the future workplace. This is expected to enhance the increase in the rate of employment. Meanwhile, Eberhard *et al*. (2017) had earlier stated that higher education institutions like universities intend to prepare students to be able to function in different sectors. In this regard, students are to be equipped with multidisciplinary knowledge (Eberhard *et al*. 2017). A review of the work of Eberhard *et al*. (2017) suggests that success in a

career path in the 4IR era would majorly be hinged on the capacity of higher education institutions of learning to prepare students to be able to put innovative practices to use. In this regard, higher education institutions of learning are desired to ensure the combination of abilities and interdisciplinary knowledge that are relevant in workplaces (Beliz *et al*. 2019). This is expected to help higher institutions of learning in aiding and managing the knowledge needed in the continuous evolving future career conditions (Beliz *et al*. 2019). This section entails the presentation of findings from the reviewed literature relevant to objective three.

2.14 An Overview of E-Learning

The concept of E-learning has brought a wide development in our educational system. Kirkwood and Price (2014) believe that the integration of e-learning into the educational system has brought a great change and improvement in the style of course or module delivery at the higher intuition of learning. Browne (2014) notes that e-learning has become a major part of the educational system and has been able to transform the educational system from the traditional pedagogical way of teaching to a digital one. Bagarukayo (2015) asserts that e-learning is an insightful advancement in the educational institution. Ndlovu and Mostert (2014) affirm that due to the increase in the use of technologies around the world, e-learning has gained access to become an essential part of our learning activities, especially at higher institutions of learning. Yakubu and Dasuki (2018) as well as Tossy and Brown (2017) argue that e-learning is assisting the higher institution of learning by enhancing the quality of education provided and also minimising various educational costs. John (2010) agrees that e-learning has become part of the educational revolution by focusing on how to redesign the educational process to accommodate quality education for students.

Furthermore, Darawsheh *et al*. (2016), as well as Masa‘deh *et al.* (2016), indicate that e-learning has become very helpful to the educational system by making teaching and learning more attainable. Hasanah & Malik (2020); Hajir *et al*. (2015) mention that e-learning provides a supple and appropriate learning environment. Salter *et al*. (2014) support this view that e-learning makes provision for a conducive learning environment that can accommodate each student's demand at whatever time and location. Tiase (2015) views that the integration of e-learning into the

educational system presents assistance to students whether present or outside the lecture room. Pham *et al.* (2019) opine that the adoption of e-learning at higher institutions of learning has the potential of assisting the institution by creating solutions to the problem of limited lecture space and also allowing students to earn at their convenience to digital course content. Moravec *et al*. (2015) view that e-learning has the possibility of reducing the price of educational resources. E-learning can provide significant benefits to ensure productive and successful performance in the higher institution of learning (Arkorful and Abaidoo 2014). The use of e-learning in higher institutions of learning has the potency of increasing the productivity and value of teaching and learning. Nevertheless, e-learning makes provision for effortless and inexhaustible access to educational information and devices to both lecturers and students anywhere (Tatweer 2014). In addition, the integration of e-learning into the higher education system requires certain skills from students such as analytical skills, digital skills, media skills and providing solutions to problems (Ristanto *et al.*, 2020; Cahyani & Azizah, 2019; Rasouli, 2016). Suffice to say from the views and discussion of the previous scholars, it has shown that e-learning is significant to the growth of the educational system and can't be without it in our institution of learning. Furthermore, in this 21st century, based on the earlier assertion, it is of necessity for students to acquire the necessary skills to be able to compete and meet the demands from the outer world most especially because we are in a globalised society.

2.15 Definitions of E-Learning

E-learning has diverse definitions and can mean different things to different people. Sander (2020) as well as Oblinger and Hawkins (2005) believe that there is no certain or specific definition regarding the term e-learning. Sangrà *et al*. (2012) add that the term e-learning has various definitions and sometimes it is defined based on the target audience and the form of information to be disseminated to the audience.

The word E-learning was first invented by Jay Cross in 1998 (Cross 2004). E-learning according to various scholars has several connected terms which share related features. Some of these terms include Internet-Based Training (IBT), Web-Based Instruction (WBI), Web-Based Learning

(WBL), Web-Based Training (WBT), Online Resource-Based Learning (ORBL), Blended learning (BL), Advanced Distributed Learning (ADL), Tele-Learning (TL), Computer-Supported Collaborative Learning (CSCL), distributed learning (DL), Online learning (OL), Mobile Learning (M-learning or ML), Remote learning (RL), Network learning (NL) as well as Technology-Based Learning (TBL). (Gremu, 2012; Liaw and Huang, 2011; Kirkwood, 2009; Li *et al*., 2009; Ellis, 2009; Anderson, 2008; Liao and Lu 2008; Shee and Wang, 2008; Sun *et al*. 2008; Shih *et al.* 2007; Mason and Rennie, 2006; Lee and Lee, 2006; Khan, 2005; Bermejo, 2005; Rosenberg, 2001, Khan 2005).

In the words of Chitra and Raj (2018), e-learning contains more than just web-based learning, distributed learning, virtual learning but accommodates all educational enterprises which are been carried out by groups of people or individuals whether online or offline. Rodrigues *et al.* (2019); Christie and Ferdos (2004) describe e-learning as a technique made possible to boost learning experiences and to teach students through computerised media with or without involving their instructors. Asad *et al.* (2021) define e-learning as the application of ICTs to upgrade and promote both teaching and learning procedures. Other authors observe e-learning as an electronic system of learning which makes use of electronic devices accessible to both lecturers and students for teaching and learning reasons (Mpungose, 2020; Arkorful and Abaidoo, 2015; Samsuri *et al.* 2014; Anderson, 2008). Anwar, 2016; Samir *et al.* (2014) as well as Panda and Mishra (2007) posit e-learning as a form of learning that aids the teaching and learning process through the incorporation of diverse ICT devices which includes Compact Discs (CDs), Digital Versatile Discs (DVDs), internet, videotapes, television, radios, mobile phones and e-learning platforms. Abdullah *et al.* (2019) consider e-learning as a teaching and learning technology that is sustained by various forms of media like radio, television, intranet, internet and extranet. Aljawarneh (2020) defines e-learning as a web-based system that does not consider time or geographical factors in its delivery and accessibility of information to its users. Ojo and Adu (2018) define E-learning as the act of using ICT to improve and aid learning exercises. Islam and Azad (2015) define E-learning as a web-based software employed in the distribution, tracking and management of online courses on the internet. Tarus *et al.* (2015) define e-learning as a learning process that is promoted and

strengthened through the use of information and communications technology (ICT). Aparicio (2016) explains that the concept of e-learning consists of two things (learning and technology). The learning aspect is the cognitive process that is used in obtaining information while the technology aspect is the device used in enabling the process of learning.

E-learning according to Lee *et al*. (2011), is a system that has the possibility of incorporating various teaching tools whether audio, video or written through channels such as e-mail, Zoom, online classes and assignments. Anwar & Climis, (2017); Taha (2014) posit that e-learning is a learning system reinforced by the use of ICT devices that permit students to attain new information and ideas and also to assist in the teaching and learning process, the delivery of information and to complement an interactive learning session amidst students and lecturers. In addition, e-learning makes use of ICTs in its mode of teaching and learning delivery (Anwar & Abd Zebari, 2015). This is to say that via the use of e-learning, lecturers can gain access to teaching material easily as well as some assistance to students (Anwar & Louis, 2017; Oye *et al.* 2012). According to Valverde-Berrocoso *et al*. (2020), e-learning is an approach to learning which is predicated on the adoption and use of technology to release great potential from the educational perspective. Valverde-Berrocoso *et al*. (2020) further state that in the last ten years, e-learning has been one of the major research lines of Educational Technology. This indicates the importance of e-learning as a tenet for teaching and learning in different institutions of learning across various levels. Other scholars define e-learning as a style of learning which occurs via internet-based communication and devices which can be interacted with to ensure that education is made easier and accessible to students at any location and time (Mardiah 2020; Albusaidi and Alshihi, 2012; Zanjani *et al*., 2012; Carvalho *et al*., 2011 as well as Mott, 2010;).

From the earlier definitions, it shows that the main side to e-learning is the use of ICT, audio-visual tools, CDROM, radio and television (Altawaty *et al.* 2020; Anwar, 2016; Anwar & Abdullah, 2021 and Anwar & Abd Zebari, 2015). Similarly, Anwar and Climis, (2017); Shih *et al.* (2007) are of the view that it is quite obvious that e-learning has quite extensive definitions in the literature and therefore making it difficult to have a common definition regarding this term which

shows that this concept is lacking a collective definition. Similarly, Anwar and Ghafoor (2017) view that based on the lack of uniformity regarding the definition of e-learning which has influenced the interpretation of e-learning among e-learning scholars, Sangra *et al*. (2012) classified e-learning into four categories which are:

- **Technology-Driven:** In this category, e-learning highlights the use of technology involved in the teaching and learning process.
- **Delivery-System-Oriented:** This category explains the delivery process associated with teaching and learning by the use of electronic methods.
- **Communication-Oriented**: This part deals with the communicative, interactive and participatory aspects of e-learning via digital devices.
- **Educational-Paradigm Oriented:** This section describes e-learning as an advanced means of improving the way students learn.

In this study, e-learning is defined as an electronic device that is used in delivering information to its users and also improving the teaching and learning process.

2.16 History of E-Learning

E-learning has no common definition likewise its history. Anwar and Surarchith (2015) think that the history of e-learning corresponds with the development of computers and the internet. Anwar & Shukur (2015); Al-Khasha (2006) explains that the word e-learning was discovered in the late 19th century, when radio communication was used to communicate. The term e-learning was used for the first time in the late 1990s even though the evolution of computer came into existence a long time ago and this computer-based technology is used in language education since the 1960s after the birth of commercial mainframe computers in the 1950s (Corbeil and Corbeil 2015; Davies 2012a; Davies 2012b). At this period, educational researchers started showing their interest regarding their potential in this field (Peterson 2013). Meer (2003) explains that educational researchers from the University of Illinois were among the first pioneers to utilize a mainframe computer system in the field of education. Suppes (1966) predicted saying: “In the future, it would be possible for all students to have access to the service of a personal tutor in the same way that

ancient royals were once served by individual tutors, but this time the tutors would be in the form of a computer". Instead of the current trend in E-learning, the prediction of Suppes (1966) tends to have come to pass, as E-learning has created the platform for different students from various backgrounds, classes and levels to have access to the service of a computer that functions as a personal tutor. Meanwhile, according to the works of Association (2010) and Fletcher (2002), it is indicated that the astute work of Patrick Suppes at Stanford, as well as Don Bitzer at the University of Illinois, serve as the foundations for e-learning which is adopted in both the business and education world while people like Porter and Uttal also added their expertise to this field. In addition, with the recent outbreak of the COVID-19 pandemic, the foundations for e-learning which is adopted in the business and education world seems to have been adopted in other spheres of human endeavours such as politics, economy, amongst others as various meetings, conferences, seminars, symposia, amongst others are being held online using various platforms like Zoom, Skype, Cisco WebEx Meeting Center, Microsoft Teams, HighFive, BigBlueButton, ON24, Zoho Meeting, amongst others (Chaka, 2020).

In the early 1960s, Patrick Suppes at Stanford as well as Don Bitzer at the University of Illinois invented the computer-aided instruction system called Programmed Logic for Automatic Teaching Operations (PLATO) which contains literacy programmes (Bitzer *et al*. 1962). The Programmed Logic for Automatic Teaching Operations (PLATO) system was designed in such a manner that it permitted both the students and lecturers to use graphics terminals and TUTOR which is an educational programming language to illustrate, converse and relate with other users through the use of electronic notes. Woolley (1994) adds that PLATO was the first universal computer-aided instruction system which was developed by the University of Illinois and its communication features were revolutionary because it is the basis for online discussions and messaging in this 21st century. Furthermore, Blackboard and ANGEL are e-learning systems that are the successors of PLATO. Van Meer (2003) adds that the PLATO project integrated course materials into larger unified conceptual packages. Peterson (2013) states that PLATO is used in language education and allows diversification of language-learning activities. Nevertheless, in the late 1970s, new evolution sprang up in the area of language-learning software through the integration of personal

computers. Although many of these programmes are created to protect text-based activities because many microcomputers lacked audio-visual services (Peterson 2013). Later in the 1980s, microcomputers developed things such as sound cards and digital storage capacity which resulted in multimedia CD-ROMs specifically developed to be used in language education (Peterson 2013). In 1989, the worldwide web (www) surfaced and marked a new stage in the evolution of language education. For instance, students and lecturers can access a variety of communication devices at the same time and in diverse locations (Kern *et al*. 2008). Through the introduction of the world wide web, the four language skills were incorporated into language education (Peterson 2013). In 2004, the term web 2.0 evolved and was designed to be utilized for a collaborative effort and effective network which facilitated the integration of e-learning (Choudhury and Pattnaik 2020; Reilly 2006; Graham, 2005). Brown and Adler (2008) in the early 21st century explained that in recent times, e-learning is now associated with the World Wide Web and is becoming notable to a certain extent to cause a change of name to e-learning 2.0 which is referred to as a new style of intelligence. Downes (2005) and Rosen (2006) add that the evolution of web 2.0 brought about e-learning 2.0 by technology experts.

2.17 Classification of E-Learning

Negash and Wilcox (2008) classified e-learning into six groups which include face-to-face, self-paced learning, asynchronous, synchronous, blended asynchronous and blended synchronous. Abubakar *et al,* (2017); Khan and Badii (2012) divided e-learning into two parts: real-time also known as synchronous and flex-time known as asynchronous. However, in the case of this study, the focus would be on Asynchronous E-learning, Synchronous E-learning as well as Blended E-learning which is a combination of the former and the latter.

2.17.1 Asynchronous E-learning

According to Shahabadi (2015), asynchronous learning is a form of learning which is not bounded by time and space. It is a form of e-learning that can occur anywhere at any time using discussion boards, blogs and email. Majeski *et al.* (2016) explain that asynchronous e-learning is a type of learning which makes it possible for students or learners to enter any e-learning environment at

their own choice of time either to download or send information to their instructor. Students spend more time processing their involvement in their work compared to synchronous communication. Jiang (2017) believes that in asynchronous learning, the students have the possibility of accessing the course anytime and learning at their own pace. Burns *et al.* (2020) posit that in this system of delivery, there is no virtual delivery of information between lecturers and students which allows the students to view the information at their convenience. Kim *et al.* (2018) state that asynchronous e-learning provides flexibility, in the sense that it gives opportunity to students to learn at their own pace and location.

A review of a study conducted by Tarus *et al.* (2015) states that asynchronous learning is a form of learning which is a web-based version of computer-based training (CBT), usually obtained on a CD-ROM or from a local area network. Furthermore, asynchronous learning enables students to access course information at any given time. Mardiah (2020); Garrison and Randy (2011) indicate that asynchronous learning is an internet-based version of computer-based training (CBT) which is provided on a CD-ROM. The findings of the works of Kashorda and Waema (2014) and Azawei (2016) show that most developed countries have implemented asynchronous e-learning which is being supported by Learning Management Systems (LMS). In asynchronous, the type of learning materials used include pictures, diagrams, videos, audio or the integration of all these elements to facilitate learning to be much easier and more interesting to students (Mardiah 2020; Gremu, 2012). Wodlab (2014) indicates that students in asynchronous e-learning can feel lonely or isolated due to lack of interaction, lack of real-time experience and lack of ability to ask questions and get feedback. Strang (2011) notes that in asynchronous e-learning, students may feel less motivated to download the course material or complete the course due to a lack of real online activity.

2.17.2 Synchronous E-learning

Mardiah (2020) and Hrastinski (2007) states that synchronous e-learning is often enhanced through media like chats or video conferencing which has the possibility of assisting students or learners to develop their skills. Synchronous e-learning is enabled through the use of devices like chat, whiteboards, video conferencing which is usually provided by learning management systems

known as Moodle (Mardiah 2020; Rice, 2011). Shahabadi (2015) explains synchronous learning as a learning environment that provides real-time interaction between the people involved. For example, video conferencing and group chat are different media that provides an opportunity to both instructor and the student by making them present simultaneously. Rehn *et al.* (2018); Snart (2010) argued that this type of e-learning allows lecturers and students real-time presence online irrespective of the location. Tarus *et al.* (2015) add that synchronous learning makes use of a learning model which is been initiated in the classroom to conduct lectures or meetings through the use of the internet. Furthermore, synchronous learning makes the interaction between the lecturer and the student conscious; in the sense that both participants are required to avail themselves at the same time (González-Lloret, 2020; Peachey, 2017).

Rehn *et al.* (2018); Garrison and Randy (2011) note that synchronous learning is life and makes use of the Internet through which lecture or meeting commences and requires the parties involved to be online at the same time. González-Lloret, (2020) and Snart (2010) adds that this kind of e-learning is beneficial to both lecturers and students due to easy access to online interaction and rapid feedback. Peachey (2017) and Hrastinski (2007) asserts that in this type of e-learning, frustration is avoided because students and lecturers have the possibility of asking questions and receiving feedback. Pappas (2015) synchronous e-learning is majorly based on the use of technology. Thus, both the lecturer and students need to acquire some computer skills to function without this could lead to discouragement, frustration and a high drop-out rate. The study conducted by Ssekakubo *et al*. (2011) shows that synchronous e-learning has high-cost implications with regards to the necessary infrastructural facilities by ensuring adequate bandwidth. Pappas (2015) and Gremu (2012) argue that in synchronous e-learning, good bandwidth is needed because it can constrain and weaken the quality of video and audio media materials thereby causing setbacks and lack of student understanding of the course. Owusu-Fordjour *et al.* 2020; Negash and Wilcox (2008) indicates that in synchronous e-learning when online classes are going on, interference can happen such as poor connectivity, system malfunctioning thereby causing distraction or postponement of lectures.

2.17.3 Blended E-learning

Saragih *et al.* (2020) and Graham (2013) describes blended e-learning as the combination of face-to-face learning, synchronous and asynchronous. Harahap (2019) and Martin-Blas (2009) indicates that this kind of e-learning is used in the facilitation of efficient and effective delivery of courses through the combination of the use of digital technologies and face to face teaching techniques. Medina (2018); Negash and Wilcox (2008) explains that with regards to this type of setting, both the face-to-face and online presences happen continually amidst lecturers and students. Kristanto *et al.* (2017); Garrison and Vaughan (2008) define blended e-learning as the combination of traditional learning and online learning to redesign the teaching and learning structure. Medina (2018) and Wang (2011) indicate that blended learning involves the incorporation of traditional ways of learning and online way of learning.

Furthermore, diverse educational experts have reported that blended learning is an efficient method of learning because it incorporates both traditional methods of learning and online learning style (Tang & Chaw 2016; Chen and Lu, 2013; Jeffrey *et al.* 2014). Shu & Gu, (2018); Jeffrey *et al.* (2014) observe that the combination of traditional face-to-face instruction, asynchronous e-learning and synchronous e-learning will assist lecturers to gain access to interactive communication between lecturers and students through the use of communication devices. According to Lestari *et al.* (2019); Dwiyogo (2018) and Tsai (2017) shows that blended learning assists students to develop both their digital skills and communication skills which enables them to search and download online materials by themselves and communicate freely with other classmates. Anthonysamy *et al.* (2019) and Poon (2013) add that since blended learning comprises the mixture of online and face-to-face learning, this will assist and interest students to learn at their speed and on their own time. Sahni (2019) and the University of Central Florida (2015) notes that if blended learning is appropriately integrated, it is an alternative form of learning which will enhance students' academic excellence and student retention. Blau *et al.* (2020); Chen and Lu, 2013; Arkorful and Albaidoo (2014) believe that blended learning presents students with diverse learning materials which can be used to communicate and share information with lecturers and classmates. However, this can result in plagiarism. Nevertheless, Jeffrey *et al.* (2014) note that

blending learning can add to lecturers' work schedule thereby making it difficult for lecturers to choose the proper learning style.

2.18 Common Characteristics of E-Learning

As the sequel to the review of the work of Sahed (2021), some common features of e-learning areas are identified below:

- Texts, sounds, images, videos can be digitalized as multimedia information for adaptation targeted towards the enhancement of teaching and learning exercises.
- Various sorts of information can be accessed any day, anytime, anywhere across the world timeously, possibly within the space of seconds.
- Digitalized forms of information are easily accessible, stored, move, processed and very interactive.
- E-learning creates a platform for students to be actively involved in teaching and learning activities.
- It is also self-directed as students can learn on their own and at their pace in the E-learning space.
- E-learning makes educational prospects close to the home of students, rather than in the school environment only.
- It exposes students to telecommunication technologies that enhance teaching and learning.
- E-learning gives students access to a rich internet learning environment.
- It allows students to create and enhance their competencies in the world of technology.
- Students can be easily contacted regardless of their locations.
- E-learning gives room for students to participate, contribute and learn in local and international events within and outside their nation of residence.
- Strong relationships can be developed by students with their colleagues and lecturers.
- Place and time of learning can be determined and controlled by students with e-learning platforms.
- Students get access to international experts and resources to enhance their learning abilities.

2.19 Benefits of E-Learning

The invention of e-learning in the educational sector has brought diverse benefits. Mardiah (2020) and Naveed (2018) states that e-learning has become a recognised phenomenon in all sectors, especially in the educational sector due to its ability in transforming people's awareness, skills and to assist them to perform better in their educational pursuit. Saragih *et al.* (2020) add that since the introduction of E-learning there has been a significant shift in the educational pedagogy from the traditional style of teaching to a modern style which is the electronic form. Nuryyev *et al.* (2020) and Dublin (2003) opine that the invention and introduction of various e-learning tools have brought numerous developments in higher education with regards to its system of educational delivery and support processes. Eze *et al.* (2018); Lee and Hsiao (2014) as well as Vovides *et al.* (2007) state that most institutions in recent times tend to use e-learning to provide quality information delivery through face-to-face communication to the student to ensure the proper delivery of course content. The works of Nuryyev *et al*. (2020); Islam and Azad (2015) as well as Andersson and Grönlund (2009) shows that many higher institutions of learning use e-learning to provide information regarding the contents of various courses to learners across different geographical locations around the globe. A study was conducted in Zimbabwe by Maramba & Mazongonda (2020) as well as Chitanana *et al.* (2008) on the use of e-learning platforms and the factors hindering its usability. The finding of the study shows that e-learning has become a vital phenomenon that is very important in Zimbabwe. A review of the study conducted by Mtebe (2018), Thanji and Vasantha (2016); Naveh, *et al.* (2010) shows that chat rooms, discussion forums, whiteboards, quizzes, polls, are being used in e-learning to allow the free flow of communication and sharing of course material from the instructors to the students. E-learning has become an essential concept in the educational sector most especially in Higher Educational Institutions (HEI) and as a result has enlarged the participation of students (Saragih *et al.* 2020; Jones & Man, 2010). They further posit that e-learning has given students more access to information as well as teaching and learning activities over some time. The study conducted by Eze *et al.* (2019) as well as Khan and Badii (2012) shows that e-learning is specifically focusing on higher educational institutions through which it has created some dynamic ways of providing

educational opportunities to students. Khoza (2019) and Perveen (2016) opine that the concept of e-learning provides students with an online environment that makes learning instantaneous, convenient, flexible. E-learning benefits both students and lecturers in different ways such as providing easy access to and making available information, self-usage, a wide range of comprehensive information, convenience, interactive, understandable, cost-effective and constant delivery of information (Eze *et al.* 2020; Al-Marabeh and Mohammad, 2013; Al-Harbi, 2010).

2.19 Advantages of E-Learning

E-learning has brought numerous advantages through its adoption in the educational sector, especially higher education. Akoi *et al.* (2021); Raspopovic *et al.* (2017) and Algahtani (2011) believe that e-learning has a wide range of advantages compared to the traditional mode of learning if it is used properly. Govender and Khoza, (2017); Anwar (2017) reveals that e-learning is significant in the educational sector because it centres on the necessities of each student as an essential factor in the activity of learning instead of the instructors or the institutional needs. Ismael *et al.* (2021); Holmes and Gardner (2006) maintain that many of the advantages of e-learning are centred on students. Azzi-Huck and Shmis (2020); Shahzad *et al.* (2020ab) opines that e-learning has surfaced as an essential and crucial influence in academic institutions of learning and institutions should endeavour to shift to this learning service. Al Rawashdeh *et al.* (2021); Anwar & Surarchith (2015) and Wagner *et al.* (2008) add that e-learning ensures the availability of interactivity between the lecturer and student during the process of delivering the course content. Willis (2007) notes that e-learning assists learners or students to remember information after a long period. Further in the explanation, Willis believes that "When memory and retention brain research are applied to the classroom, they not only drive the learning process but also allow educators to energize and enliven the minds of students".

Islam *et al.* (2015) and Vanderbilt (2005) as cited by Yusuf and Al-Banawi (2013) point out that e-learning enables students to have prior information about the course content enabling them to acquire a deeper understanding of the course. Al Rawashdeh *et al.* (2021) and Anwar (2016) state that e-learning produces a student-centred environment where students can create their ideas

through a conducive environment for a better understanding of the course materials. Furthermore, a study conducted by Anwar, (2017); Chang (2016) and Yusuf and Al-Banawi (2013) shows e-learning enables lecturers to create a learning environment by engaging students to participate in the class discussion which improves their desires to learn the course. Hamza *et al.* (2021); Gautam and Tiwari (2016) and Brown *et al* (2008) indicate that e-learning offers a variety of ways for lecturers to interact with their students and to receive a prompt response. Joshua *et al.* (2016) opine that e-learning assists students or learners to become dependent on themselves to become their instructor. According to Al Rawashdeh *et al.* (2021), Anwar, (2016) and Smedley (2010) explain that e-learning adoption process provides both the institution of learning as well as the students or learners the flexibility of time and also the place of information delivery. Rodrigues *et al.* (2019) and Joshua *et al.* (2016) think that e-learning can take place anywhere as long as the necessary information is accessible to the users. Pande *et al*. (2016) opine that e-learning encourages the improvement of knowledge and experience proficiency through easy access to acquire quality information. Songkram *et al.* (2015) point out that e-learning enables flexibility of time in the learning process.

Jamal *et al.* (2021) and Pande *et al.* (2016) note that e-learning provides a discussion forum between the lecturer or student thereby eliminating the barrier of inferiority complex amidst learners or students. Top and Ali (2021); Arkorful and Abaidoo (2014) state that e-learning increases the potency of knowledge acquired through easy access to a wide range of information. Al Rawashdeh *et al.* (2021) and Raba (2005) affirms that through the use of e-learning, goals are achieved quickly with limited use of energy. E-learning enhances the society to become globally efficient in their communication with other nations (Anwar and Ghafoor 2017; Zeitoun, 2008). Ali and Anwar (2021) and Songkram (2015) view that e-learning with regards to institutions saves it from the high cost of spending in terms of learning structure. Ali *et al.* (2021); Andavar *et al.* (2020) and Chimbwanda (2010) gave a list of advantages of e-learning which are

- E-learning creates communication activities and enhances the interaction between lecturers and students.

- ❖ E-learning permits information to be shared concurrently.
- ❖ E-learning promotes convenience
- ❖ E-learning promotes acquiring new skills and intelligence to stay relevant in this digitalized world.
- ❖ E-learning allows students to experience self-teaching and self-administered learning

Furthermore, a review of the work of Pande *et al.* (2016) on e-learning indicates that it is advantageous to students and institutions. Some of the identified advantages of e-learning according to the findings of the work of Pande *et al.* (2016) are as enumerated and explained below:

- ❖ E-learning creates and provides platforms for learners/students to interact with one another. Pande *et al.* (2016) consider online discussion forums where students express themselves with one another over specific subject matters as a crucial e-learning platform. In this regard, Ali *et al.* (2021) opine that potential challenges such as lack of a venue for gatherings, shyness on the part of students, fears experienced by students when having physical contacts and conversation with people, amongst others are eliminated through the use of e-learning. Suffice to state that in the advent of the recent COVID-19 outbreak, e-learning in this instance helps to ensure health and safety of lives as physical contacts which are capable of allowing transmission of the Coronavirus disease from one person to another are avoided.
- ❖ E-learning helps to motivate and encourage students to interact with one another, thereby expressing their opinions and exchanging views over issues. In this regard, Jamal *et al.* (2021) explain that the interaction between learners and teachers, in the case of this study, students and lecturers are duly encouraged. Students get to freely express themselves over the subject of discourse, especially those who tend to struggle when interacting with their lecturers. In the same vein, lecturers get to easily communicate with their students as barriers such as classroom management are avoided in this instance.

- ❖ The cost of e-learning is effective. E-learning enables students to avoid travelling long distances. Uleanya *et al.* (2019) consider the distance between students' homes and campus as learning challenges that hamper the learning abilities and academic performances of students. However, with the use of e-learning, such challenges would be avoided. Similarly, distance to campus also poses a challenge to lecturers. Thus, with e-learning, lecturers can overcome such challenges. Also, e-learning enables the institutions to the cost and expenses in erecting structures for teaching and learning. Moreover, Yelkpieri *et al.* (2012) view large class sizes which are not commensurate with the available resources and number of students as a major challenge facing the education sector in underdeveloped and developing nations that are predominantly African countries. This is possibly due to a lack of funds. However, with e-learning, such challenges would be catered for, without the nation having to bother so much on required physical facilities and resources.
- ❖ Additionally, Pande *et al.* (2016) opine that e-learning caters for the individual differences of students. It creates a platform for students to listen to lectures over again, pause, makes notes, follows at their pace (Andavar *et al*. 2020; Algahtani, 2011 and Amer, 2007). For instance, some students who assimilate fast can afford to review an entire course in days while others can do the same in months.
- ❖ E-learning helps to ensure that the issue of lack of lecturers to handle certain modules are well handled. For instance, a lecturer with the use of e-learning can afford to engage students of different institutions of learning. In this regard, e-learning provides more income for some lecturers.

As sequel to the foregoing, e-learning has immense advantages both to students and lecturers. However, it has certain disadvantages. Hence, the need to consider some disadvantages of e-learning is seen following the review of the findings of the work of Pande *et al.* (2016) and other scholars.

2.20 Disadvantages of E-Learning

A review of a study conducted by Al Rawashdeh *et al.* (2021) as well as Yusuf and Al-Banawi (2013) shows that e-learning has some disadvantages such as students having low motivation towards study. Favale *et al.* (2020) note that students who have bad study habits or are slow in assimilation may fall behind in their academics. Furthermore, some students might get confused regarding the course content or class activities when there is no proper class situation. Gillett-Swan (2017) as well as Yusuf and Al-Banawi (2013) believe that e-learning can cause some of the students to feel isolated or neglected from their lecturer or classmates during class activities. According to Dhawan (2020) as well as Yusuf and Al-Banawi (2013), another disadvantage of e-learning is that most lecturers or instructors may be unavailable when they are needed by the student. E-learning, according to the work of Pande *et al.* (2016) has been known to have some disadvantages to students as well as institutions. Some of the identified disadvantages by Pande *et al.* (2016), areas enumerated and explained below:

- E-learning is capable of creating laxity on the part of students who may be less interested in following. Dhawan (2020) opines that physical contact in a teaching and learning setting have a way of ensuring the participation of students regardless of their disposition at that very moment. However, in the case of e-learning, this tends to be difficult or impossible in some instances. For example, a tired and sleepy student may easily be motivated to stand and take part in-class activities in a physical contact setting, compared to an e-learning setting. Also, it may be easy for a lecturer to spot students who are emotionally stressed and fail to participate in class activities especially in small classes compared to what is obtainable in an e-learning platform.
- Time management may be difficult during e-learning compared to physical contact classes. The lecturer in an e-learning platform can afford to easily lose track of time, unlike in a physical class where other lecturers are waiting to use the class or lecture the same students.
- E-learning methods of teaching according to Pande *et al.* (2016) may not be as effective as the usual traditional method of teaching and learning. For instance, when students need

clarifications and explanations over certain subjects, it is easily done using the usual traditional face to face approach. Also, in developing and underdeveloped nations such as South Africa and many other African nations where the exposure to e-learning is limited, traditional methods may still be preferred over e-learning.

- Additionally, e-learning negatively affects students who may be academically knowledgeable and sound but poor in the use of online communication skills. This adversely affects the learning abilities of such students and puts them in a disadvantaged position. Similarly, Rucker & Downey (2016) as well as Schmidt *et al.* (2016) opine that lecturers may be knowledgeable and well-grounded on the subject to be taught but may lack the skills to teach using e-learning platforms.
- Assessing students using e-learning in some instances may be difficult or impossible. For instance, assessing students on practical courses may be difficult or impossible where they are expected to role-play in class or perform certain activities which require physical contact with others. Pathak and Vyas (2019) view that e-learning tends to create room for students to cheat compared to when they are assessed through the traditional face to face method.
- E-learning hampers the institution from performing its role as an agent of socialization. This is because there is a limitation with the usual contacts that are likely to be made between the students and staff members: academic and non-academic of the institution. One of the findings of the work of Uleanya (2019) suggests that the relationship that exists between students and lecturers contributes to their learning abilities, self-esteem, consequently a possible increase in their level of socialization. Dhawan (2020) notes that certain emotions are not easily expressed or seen through e-learning platforms. Hence, it may be difficult or impossible for lecturers to relate with and help their students in certain instances, especially when the students fail to come forth to seek help. Moreover, in the face to face contacts, some gestures are spotted by lecturers who follow up by requesting that their students come to see them for them to be assisted. However, with the e-learning platform, such would be difficult, if not impossible.

- ❖ E-learning platforms may be difficult, if not impossible for certain disciplines or fields of study. For instance, in courses in the art department where performances are needed, there is a limit to what can be done using e-learning platforms. Dhawan (2020) explains that in many science-related fields where laboratory activities are needed especially in the case of practical, e-learning platforms become difficult or impossible to be adopted.
- ❖ E-learning in some instances leads to congestion or heavy traffic in the use of certain websites. Such situations according to Mutisya and Makokha (2016) may cause more unforeseen costs in funds and timing for both students and lecturers.

Also, Almaiah *et al.* (2020); Dhawan (2020) and Chimbwanda (2010) listed some disadvantages of e-learning which are:

- ❖ In e-learning, technical devices are required such as computers or internet connections. Meanwhile, many students who require these devices are unable to acquire them for their learning due to various reasons. The principal of these reasons is a financial constraint as the cost of these devices can be high, thereby posing a challenge to many of the students.
- ❖ To be able to effectively use these devices, there is a need for both the academics and students to be trained which could pose a challenge. The works of Evans and Mutula (2014) shows that many academics are not computer literate and are not ready to avail themselves of training.
- ❖ The rate of transformation linked to e-Learning is swift to maintain and as a result has proceeded as a challenge for maintenance
- ❖ In e-learning, not all technological tools are compatible with the available applications and software Favale *et al.* (2020).

As sequel to the reviewed literature, it is apparent that e-learning has quite many advantages rather than disadvantages and this has contributed to the continued use of e-learning in this digital age. In support of this, a review of the works of Dhawan (2020) and OECD Policy Responses to Coronavirus (COVID-19) show that despite the disadvantages of e-learning, it still has a lot of advantages that inspires users to continue its usage and also to limit its disadvantages.

2.21 Mitigating Factors Hindering Universities from Equipping Students for E-Learning

Review on relevant literature such as Akoi *et al.* (2021); Saragih *et al.* (2020); Nuryyev *et al.* (2020; Raspopovic (2017); Govender and Khoza, (2017); Anwar (2017); Kisanga (2016), Muuro (2014), Ajmera (2014), amongst others on e-learning indicate its importance. However, there are several mitigating factors hindering institutions from being able to equip their students. Vis-à-vis, there are factors hindering students themselves from being equipped with gadgets that promote such. For instance, Almaiah *et al.* (2020) conducted different studies on factors hindering universities and students from being equipped for e-learning. The findings of their studies show four factors that hinders e-learning and these are technological factors, individual factors, cultural factors and course factors. The studies conducted by Dhawan (2020) as well as Aung and Khaing (2015) indicate that insufficient technical support, poor internet connectivity and lack of e-learning policies are factors that hinder universities from equipping students for the use of e-learning. The integration of e-learning into schools could face various challenges such as lack of student readiness, attitudes of teachers towards e-learning, attitudes of students towards e-learning, lack of ICT infrastructure, lack of support from schools (Almaiah and Al-Khasawneh 2020; Almaiah *et al.* 2019a; Almaiah *et al.* 2019b and Suresh (2018). Furthermore, some of the challenges hindering e-learning are associated with less awareness, lack of motivation and attitude, lack of internet connectivity, limited ICT infrastructure, lack of technical facilities (Dhawan 2020; Mulhanga and Lima 2017; AL-Fadhli, 2011; Zewayed *et al*. 2011). Similarly, Almaiah and Alyoussef (2019) as well as Malik (2010) indicated some factors hindering e-learning which are: lecturers, type, of course, course design, students and technical factors.

Additionally, following the findings of the work of Meriem and Youssef (2019); Alkharang and Ghinea (2013), some of the challenges hindering the integration of e-learning include the following: time allocation, lecturers and students' attitude, awareness on e-learning, cost factor, technology, support from school and language of communication. Furthermore, Ameen *et al*. (2019) as well as Bhuasiri *et al*. (2012) note that the factors hindering e-learning include: the quality of information, lecturers' characteristics, learners' characteristics, learners' motivation, the

quality of institution services and the quality of infrastructural facilities. Mohammadi *et al.* (2021) as well as Al-Adwan and Smedley (2012) mention the following factors regarding the implementation of effective E-Learning: lack of proper infrastructure ICT structure, cultural belief, lack of support from the school, lack of technological skills, and lack of motivation. The work of Meriem and Youssef (2019); Rhema and Miliszewska (2010) reveals the following barriers: language issue, approach to e-learning, cultural barrier, awareness on e-learning and student motivation. Similar studies were conducted by Aldowah *et al.* (2019) as well as Venter *et al.* (2012). Their findings point out that high costs of technology and poor technological infrastructure are factors that hinder the universities in equipping students for the use of e-learning. Maatuk (2021) as well as Kwofie and Henten (2011) report that some of the challenges hindering the implementation of e-learning are associated with the cost of implementation. This is because according to Maatuk (2021) as well as Kwofie and Henten (2011), e-learning is cost-effective. After all, it requires technical expertise and abilities, academic dependence, social support and motivation and secure technical infrastructure. This implies that the expensive cost of establishing and maintaining technological gadgets in universities hinder universities as well as students from being equipped towards embracing and adapting to the use of e-learning for knowledge acquisition and empowerment.

The Ambient Insight Regional Report (AIRP) (2011-2016) points out that Africa alone has an improved growth rate of 15.2% in terms of e-learning compared to other continents of the world. Further in their report, it is noted that despite the growth made in the continent (Africa) in terms of e-learning, they still face challenges that hinder them from functioning properly. These challenges include internet connectivity and technological infrastructures. Also, challenges like the availability of developed electronic content that aligns with that of the national curriculums and availability of training and professional development for its e-learning staff are being encountered by this great continent. Ajmera (2014) opines that despite the challenges encountered by Africa, the Higher Institution of Education is still eager to protect its users by providing quality e-learning through the maintenance of its services and products. Taat and Francis (2020) as well as Raspopovic (2017) states that due to the concerns raised on the quality of e-learning, many

institutions are looking out on how to manage the situation about quality by highlighting the factors which influence quality e-learning. In the opinion of Muuro (2014) as well as Kisanga (2016), most institutions of learning continuously attempt to evaluate the factors hindering quality e-learning. The findings of the works of Muuro (2014) and Kisanga (2016) show that the findings of institutions of learning on factors hindering quality e-learning are used to revitalize and enhance the systems. According to the findings of Azawei *et al*. (2016) as well as Kisanga (2016), quality e-learning systems has become a challenge that seems to be continuously experienced across many nations: developed, developing and underdeveloped inclusive. The identified challenges on poor e-learning systems in different nations of the world according to Azawei *et al*. (2016) as well as Kisanga (2016) include the following: poor ICT infrastructure, lack of ICT skills to use e-learning, e-learning support, low internet, poor administrative support. Similarly, the studies by Makokha (2016); Baloyi (2013) as well as Raspopovic (2017), point out that lack of financial support ambiguous policies, low motivated instructors, lack of training and lack of full utilization of LMSs are some of the challenges which hinder quality e-learning system across the globe. This implies that e-learning seems to be faced with various challenges across the globe: underdeveloped, developing and developed nations inclusive. Suffice to state that as much as nations in the African continent strive to improve and grow in the area of e-learning, they seem to be experiencing some forms of setback due to various hindering factors.

Furthermore, following the review of the works of Almaiah and Alismaiel (2019); Shawai and Almaiah (2018); Almaiah and Jalil (2014), for an e-learning system to be successful, it all depends on the students' preparedness and adoption of such system. However, the lack of using e-learning systems tend to obstruct its actualization and may result in wasting the resources of universities and other related institutions of learning (Almaiah and Al-Khasawneh 2020; Almaiah *et al*. 2019a; Almaiah *et al*. 2019b). This results in an unsuccessful system and is a waste of universities money (Naveed *et al*. 2017). Eltahir (2019) opines that the challenges hindering the adoption of e-learning in many developing countries which are predominantly African nations have become a phenomenon due to the digital divide within the countries.

Taat and Francis (2020) as well as Almaiah and Man (2016) conducted a study in Malaysia. The study was targeted at investigating factors affecting the use of e-learning systems among Malaysian students. The study adopted the use of the Technology Acceptance Model (TAM) and the Innovation Diffusion Theory (IDT). The findings of the study show that factors such as perceptions, lack of acceptance of the system, and affinity are factors that affect students' use of e-learning systems in Malaysia. Likewise, in the research conducted by Mwakyusa and Mwalyagile (2016) for the past two decades in Tanzania on the challenges involved in the integration of e-learning systems in Tanzania's higher institution of learning includes the use of technologies, lack of support, cost-effective, institutional matters and the development of the curriculum. Meanwhile, Alhabeeb and Rowley (2017) conducted a study using selected Saudi Arabian universities. The findings show that the digital skills of staff, student skills on computer and proper technical infrastructure were factors influencing the acceptance of e-learning in Saudi Arabian universities. Similarly, Almaiah and Alyoussef (2019) conducted a study on the adoption and usage of e-learning in Saudi Arabian universities. The analysed data collected from the study reveal four major factors affecting the adoption and use of e-learning. These factors include the course outline, course content guide, course appraisal and lecturers' characteristics.

Salloum *et al*. (2019) using the Technology Acceptance Model (TAM), conducted a study to explore how students accept and embrace or discard e-learning. The study adopted the use of a quantitative method which involved 435 respondents who were selected from across five universities in the United Arab of Emirates (UAE). The findings of the study showed that students' acceptance and embracing of e-learning is dependent on certain factors. These factors include the following: students' self-competence on the use of computers, organizational quality, content quality, and perceived satisfaction. These factors were seen to have effects in different ways on students' use of e-learning systems for learning purposes both within and outside learning environments.

Abdullah and Ward (2016) developed a General Extended Technology Acceptance Model for ELearning (GETAMEL) intending to investigate the factors that affect undergraduate students' behavioural intention (BI) to use e-learning in Azerbaijan for educational purposes. The study was

conducted using a sample size of 714 students studying in Azerbaijan. The study sample comprised both undergraduate and masters' students. The study employed the use of a convenient sampling technique and was analysed using Structural Equation Modelling (SEM). The findings of the study show that subjective norm, enjoyment, self-efficacy and computer anxiety are the significant factors that affect and impact the use of e-learning.

Kanwal and Rehman (2017) researched the critical factors affecting the adoption and acceptance of e-learning in developed countries like Pakistan. A conceptual model was developed named "Pakistan E-learning Adoption Model" (PELAM) which was proposed concerning higher education. The sample size for this study was 354 learners from the virtual University of Pakistan and Structural Equation Modelling (SEM) was used to analyse this data. The result shows that computer self-efficacy, enjoyment, internet experience, and system features are the significant factors hindering the successful adoption of e-learning in Pakistan. A similar study was conducted in Kenyan public universities to investigate the challenges hindering the effective implementation of e-learning. The sample size of this study was 148 staff members from three Kenyan public universities. The data for the study was collected through the use of questionnaires, in-depth interviews and document analysis. The findings of the study indicated that lack of proper ICT infrastructure, lack of technical competence and cost are the factors influencing the successful implementation of e-learning (Tarus *et al*. 2015). Meanwhile, Mulhanga and Lima (2017) had earlier conducted a similar study in Libya. The study focused on the failure of the E-learning initiative. The result shows that cultural factors, political factors, and economic factors are the constraints for the effective and successful adoption of e-learning in Libya.

Sequel to the findings of the aforementioned reviewed relevant literature for this studies shows that various factors affect the implementation of e-learning in institutions of learning. These factors range from student-centred, staff-related, as well as institution institution-based, which affect the acceptance of e-learning. Following the focus of this study which centres on South Africa, there is a need to explore the trend of E-learning in South Africa. Hence, the next sub-heading gives a brief on e-learning in the nation: South Africa.

2.22 E-Learning in South Africa

According to the report from the Department of Education (2002ab), South Africa is trying all its efforts to become one of the leading countries in Africa in the use of ICT. Government Communication and Information System GCIS (2002) explains that the South African government sees e-education as an important approach to become competitive in this global world. As a result of this, the South African government adopted the white paper on an e-Education policy which was instituted into schools to implement ICT in transforming teaching and learning (DoE 2004). South Africa's e-Education policy states that "*Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICT confidently and creatively to help develop the skills and knowledge learners need to achieve personal goals and to be full participants in the global community) by 2013.*" (DoE, 2003:19).

The works of Bagarukayo and Kalema (2015) as well as Venter *et al*., (2012) show that South Africa like many other nations within Sub-Saharan Africa have adopted the use of e-learning systems and platforms. A review of the work of Naidoo *et al*. (2019) shows that the student population in South Africa is rapidly changing and there are an increased number of students that are considered digital learners. These students tend to crave digital applications; thus, any other older method or process of learning seems to be very reluctantly embraced. Hence, this makes the task of the DoE (2004) on the implementation of ICT in transforming teaching and learning crucial. The work of Naidoo *et al*. (2019) further indicates that students enjoy learning that has a seamless and uninterrupted flow of information. However, e-learning has remained a slowly growing phenomenon in South Africa as well as other African societies. According to Uleanya and Gamede (2019), the slow growth of e-learning in South Africa like other developing and underdeveloped nations is hinged on various factors such as the high rate of poverty, ignorance, low level of exposure, low acceptability rate, amongst others. Therefore, the need to explore some of the factors mitigating against South African universities in equipping their students for e-learning arises. Hence, the following sub-heading identifies and explains some of the factors hindering universities from equipping their students for e-learning in South Africa.

2.22.1 Mitigating Factors Hindering Universities from Equipping Students for E-Learning in South Africa

In the context of South Africa as is the case with many underdeveloped and developing nations across the globe which is predominantly African nations, even with the e-education policy on the implementation of ICTs in schools across the country, there are still gaps in the policy and challenges in their implementation (Mdlongwa, 2012). According to the report from PanAf (2008-2011); Nkula & Krauss, (2014) indicate that despite the significance of e-learning in education, many institutions in South Africa still have challenges in acquiring adequate e-learning facilities. The study conducted by scholars in South Africa on e-learning revealed that the main problem is not as a result of lack of ICT resources but many instructors are not competent to implement and maximise the possibilities of ICT resources for teaching purposes. Instead, it is being used for administrative purposes such as tying lecture notes, conducting tests and entering marks (Howie and Blignaut, 2009; PanAf, 2008-2011; Mofokeng & Mji, 2010; Ndlovu & Lawrence, 2012; Makgato, 2012). Olasina (2018) conducted a study on the effect of human and social factors on affecting the decision of students to accept e-learning at KwaZulu-Natal University. The findings of the study revealed that attitude, social influence, perceived usefulness, and perceived satisfaction are essential to students' behavioural intention to accept e-learning.

Almaiah *et al.* (2020) identified several factors or challenges related to the integration and implementation of e-learning and are been classified into four categories namely: individual, course, technological, and cultural factors. Furthermore, in their explanation, these factors or challenges vary from one country to another due to readiness to accept e-learning, diverse cultural beliefs and environment. For instance, Aung and Khaing (2015) observed that the poor network facility, poor content development and lack of digital learning and skills are the major challenges in the adoption of e-learning in many developed countries. Suffice to say that there are quite a lot of challenges that influence the implementation of e-learning.

In brief, the reviewed literature shows that South Africa, like other developing nations across the globe, also experience challenges in attempting to equip students for eLearning in the nation. This

is due to various factors which cut across individual students, institution related, as well as nation-based.

2.23 Conclusion

The chapter focused on reviewing relevant literature for the objectives guiding the study. Thus, literature on digital learning in education, factors hindering institutions of learning, especially universities from equipping students for e-learning, an overview of e-learning, definitions of e-learning, history of e-learning, classification of e-learning: asynchronous e-learning, synchronous e-learning and blended e-learning. e-learning, factors promoting and those hindering e-learning, amongst other relevant issues, were reviewed. The chapter also explored some of the benefits of e-learning, advantages and disadvantages of e-learning, factors hindering universities from equipping students for e-learning. Also, considering the focus of the study, e-learning in South Africa, as well as factors hindering universities from equipping students for e-learning in South Africa was also discussed in this chapter following reviews of relevant literature. The next chapter is focused on the conceptual model of the study.

CHAPTER 3

CONCEPTUAL MODEL FOR POLICYMAKERS

3.1 Introduction

In the preceding chapters, digital learning, factors promoting students' level of awareness on digital learning and the factors hindering students' level of awareness on digital learning was discussed. Also, the role of curriculum transformation in education in preparing digital learners as well as the 4IR and the need for curriculum redesign by policymakers was discussed. Furthermore, in the last chapter, E-learning and the factors hindering its use in South African institutions of learning was also discussed.

In response to these discussions, this chapter presents an argument on two communication models which are adopted in the conceptualisation of a model to guide the investigation in the two selected institutions (DUT and UNIZULU) involved in this study. The model is designed to serve as a guideline for the two institutions regarding their role in preparing and equipping digital learners. Also, this model will provide a guideline that South African government policymakers may adopt for effective restructuring of the curriculum. This chapter aims to ensure to the design of a conceptual model by using scientific models which will assist and guide the final recommendations after the results of the research has been analysed. The model is designed to assist in scientifically giving a clearer understanding of the causes of low acceptance and preparation rate for the 4IR by South Africans and their institutions of learning using a selected comprehensive university (objective 5). In brief, this scientific model is expected to inform the final recommendation(s).

According to Grove *et al.* (2013), Concepts are terms given to an idea which is often considered as the building blocks of a theory. Saunders *et al*. (2015) opine that the term ‘concept’ refers to a mental image or cogitation of a phenomenon Gerrit van der Waldt (2020) supports this assertion that concepts as a process that outlines the purpose of a mental image regarding a phenomenon. Nilsen (2015) defines a “conceptual model” as a conscious adaptation of a phenomenon. Shields and Tajali (2006) explain that the conceptual model performs as a guide or map that gives

consistency to experimental review. Grove *et al. (*2013) state that conceptual model assists in the explanation of a phenomenon and also reflects a philosophical stance. Elangovan and Rajendran (2015) describe a conceptual model as a framework that is used for outlining ideas or thought in research. Elangovan and Rajendran (2015) add that "conceptual models" as the representation of real-world phenomenon which is portrayed in the form of illustration. Premkumar *et al*. (2017) argue that conceptual models give structure to a study.

This implies that a conceptual model can be described as a process or phenomenon which can be adapted in the outlining of a mental picture regarding a subject. The conceptual model is adopted for this study to assist in scientifically giving a clearer understanding of how selected South African institutions of learning have embraced the transformation brought about by the fourth industrial revolution.

3.2 Communication Model

Communication is the process of transferring information from one person to another. To support this assertion, Kelvin-Iloafu (2017) views communication as a means of distributing information, ideas and feelings from one person in order with the motive of receiving it accordingly. Nevertheless, diverse communication scholars have endeavoured to interpret the essence of communication by making use of models. Evagorou *et al* (2015) see models as a visual representation involved in the act of communication. Kapur (2020) describes communication models as an essential concept that assists in the interpretation of the processes involved in communication. Ashman (2018) argues that models of communication help in simplifying the communication process through visual representation. Popescu *et al*. (2015) view models as a system that permits the interpretation of phenomena using specific structures which are linking both the elements and relationships involved amidst these elements. Kapur (2020) refers to a model as a graphic representation designed with the motive of giving information regarding how the variable works. Bajracharya (2018) indicates that communication models are structured representations involved in the process of communication which enhances comprehension of how the process works. Bajracharya (2018) adds that models are communicated in a metaphorical

manner as well as the use of symbols. Suffice to state that models are a graphical or visual representation of a communication process.

3.3 Importance of Communication Models

Tutorialspoint (2021) identifies some significance of the use of models involved in the communication process. The importance of communication models includes the following:

- Communication models assist in connecting and understanding the various components involved in the act of communication.
- Models present new goals and thoughts regarding the various features of communication that guide in planning for effective communication.
- Models are significant because they are illustrative representations of the communication process.
- Models are important because they are being used for scrutiny in the sphere of communication.
- Models assist in predicting the success or failure which is being encountered by a specific communication process.
- Communication models can be used in analysing real-life situations and to assist in preventing future recurrence.

This suggests that communication models are very significant to ensure effective communication. Furthermore, models assist in giving a clear understanding of the various aspects involved in the flow of communication. Elangovan and Rajendran (2015) note that when models are developed through the use of standard conventions, this enables logical and sequential arguments which create clear and common understanding.

Nevertheless, in this chapter, two communication models which are AIDA as well as Shannon and Weaver models are used and applied to this study.

3.4 AIDA Model

The AIDA model is a communication model developed for marketing purposes. In this study, the AIDA model is adopted to examine how the university community communicates to the students into embracing the 4IR educational transformation (digital learning). Insight tycoon (2020) explains that the AIDA model is an advertising model used for marketing. Ghirwu (2013) asserts that the AIDA model can be traced to the theory of communication which was introduced by Elias St. Elmo Lewis in 1898. Furthermore, Ghirwu explains the idea for the model is for consumers to be driven through a set of purchasing processes which are attention, interest, conviction, and action published in 1910 in The Printer's Ink. Ghirwu (2013) adds that the model was later called the AIDA model. Páramoa *et al*. (2021) explain that the AIDA model existed from the late 19th century after the development of instructions for business people by E.St. Elmo Lewis. Montazeribarforoushi *et al*. (2017) add that the AIDA model was developed by an American Advertising Advocate named E. St. Elmo Lewis in 1898. The model was originally developed for structuring sales negotiation but has been adapted to every aspect of advertising.

According to Páramoa *et al*. (2021), the first model which is known as the hierarchy of effects model was proposed in the late 1800s and included only three stages namely: attention, interest, and desire. In the early 1900s, the model was later developed by Strong (1925) with the addition of action. Gurung (2012) states that the hierarchy of effects model entails the stages involved in the changes of customers' behaviour and the action taken into purchasing a product. This model informs that there are four stages that consumers go through after they are informed about a product. Mabry (2010) argues that the existence of the hierarchy of effects based models is guided by the cognitive, affective, and cognitive psychology model. Furthermore, Mabry explains that the psychology model describes the behavioural aspects involved in decision-making, which suggests that humans think first, followed by feel and lastly act when influenced by stimuli.

Sunuantari (2017) as well as Enjolras *et al*. (2015); explains that the AIDA model assists in marketing and has been used in the business sector for years. Hadiyati (2016) states that the AIDA model is a marketing model which is developed to organize how advertising should operate based

on the perceptions of customers. Hanlon (2021) opines that the AIDA model is a communication model which identifies the various stages which people go through during the process of buying a particular product or service. Insight tycoon (2020) opines that the AIDA model provides essential information which is needed for the analysis of advertising information. Hadiyati (2016) asserts that modern marketing can be described in the AIDA model. Páramoa *et al*. (2021) observe that the AIDA model which means (Attention, Interest, Desire, Action) is one of the most popular hierarchy-of-effects-based models. Strong (1925 cited by Páramoa *et al*. 2021) explains that the AIDA model identifies attention, interest and desire as the consecutive stages that a potential customer or consumer goes through when purchasing a particular product, and the final stage which is the action reflecting the period of purchase. Suffice to say that the AIDA model is a well-informed model which is adapted into diverse sectors including the educational sectors. Furthermore, the AIDA model is a communication model which is used in transmitting information from the advertiser regarding a product to its consumer. Hence, in this study, the four stages of AIDA which are "Attention, Interest, Desire, Action" are discussed by the researcher following various identified headings below.

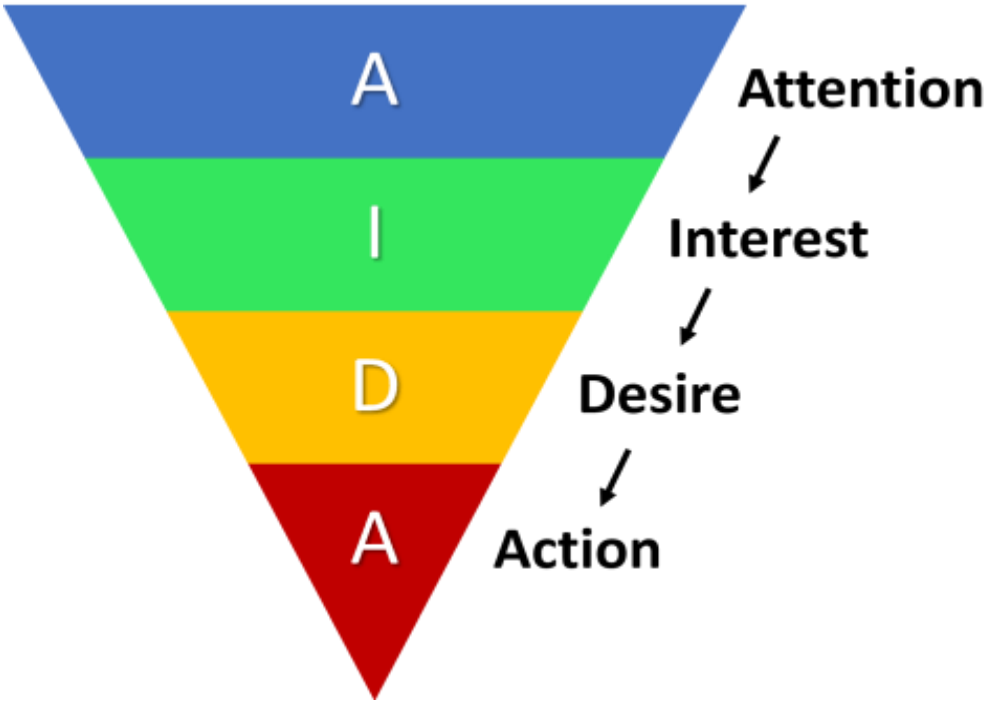

Figure 1: AIDA Model

Source: adapted from (Strong, 1925)

3.4.1 Attention

Páramoa *et al*. (2021) opine that attention is an essential element in the study of effective advertising. Insight tycoon (2020) explains that the first stage in the AIDA model is attention. Páramoa *et al*. (2021) add that attention has become one of the most used resources because the first objective in marketing is attracting the attention of consumers. Pelley *et al*. (2016) refer to attention as a set of emotional and cognitive processes which allows the prioritization of certain events for further actions. According to Hadiyati (2016), attention entails attracting the customers which necessitate the product to be catching enough for customers to purchase the product. Munoz-Leiva (2019) argues that in the context of advertising, attention is the processing stage which is short term and requires immediate responses.

Priyanka (2013) views that the advertiser needs to capture the targeted audience or customers' attention in order not to lose them. Páramoa *et al*. (2021) add that attention should centre on the

earliest moment when the customer(s) interact with the product because if it is not as expected, the flow of communication would have been interrupted and the message(s) may not be well processed. In the context of this study, attention with regards to the move from onsite to online following the transformation being brought about by the 4IR should be aimed at being positive to attract and sustain the attention of students. Meanwhile, Hanlon (2021) outlined some tips to be considered when trying to gain the attention of the customer or consumers which are: how to make the customer aware of the product, and the campaign strategy as well as the tools or platforms to be used and what the message entails? In general, the first function in advertising is creating awareness regarding the product, followed by attracting the attention of the intended target market, which later results in an interest in the product (Chang & Wang, 2019). This implies that before a consumer can go ahead to purchase a product, the advertiser needs to create awareness about the product in such a way that will catch the attention of the consumer. In other words, in the context of this study, before students who can be referred to as consumers can go ahead to embrace the transition to e-learning, which is the product in question, the institutions need to create awareness in a manner that will be appealing and catch the attention of the students.

3.4.2 Interest

Insight tycoon (2020) states that once awareness has been made regarding the product, the next thing is to work on increasing the interest of the customers. Wijaya (2015) opines that viewing interest from a psychological perspective, comprises both cognitive and affective elements to the point where the sensory approach starts to operate at attitudinal and levels where opinions are beginning to form. Wigfield and Cambria (2010) had earlier stated that interest is the engagement of individuals in different capacities which include both affective and cognitive processes.

Priyanka (2013) explains that the advertiser uses the interest to persuade the customers into making believe that purchase of the product will ease their daily lifestyle. Hassan *et al*. (2015) view that to reach the interest stage, it is necessary to acquire certain information regarding the benefits of the product. Su *et al*. (2016) add that to gain the interest of the consumers, it is important to acquire sufficient information regarding the products. Páramoa *et al*. (2021) believe that interest entails a

longer interaction to ensure that the message is adequately communicated. According to Renninger and Hidi (2011), interest is developed based on information, advantage, and effective reaction. Hanlon (2021) identifies some points which should be considered in ensuring the interest of the consumer. These are: how to gain the consumers' interest, the content strategy and the availability of the information and location such as the website. Suffice to state that it is important to ensure that the interest of the consumer is gained by acquiring the necessary information needed for the product. Thus, in the context of this study, institutions of learning must ensure that the interest of their students is gained.

3.4.3 Desire

Hassan *et al*. (2015) refer to desire as the reflection of aspiration into the possession of a particular product or service which is being advertised. Priyanka (2013) describes desire as the ability to arouse the customer's desire. This is achieved when the advertiser can persuade the customers into desiring the product by providing a clear understanding the product. Insight tycoon (2020) asserts that desire is arousing the customer's or consumers' eagerness regarding the product. Meanwhile, Wijaya (2015) believes that desire involves an emotional state whereby the consumer or customer believes the truth in the promotional message or advertised product. Mihart (2012) notes that the stronger the feeling of desire, the higher will be the purchasing goal, hence, the higher the chances of consumer or customer moving to the next level.

Wu *et al*. (2019), as well as Han (2017), maintain that desire plays a vital role in influencing and motivating consumer loyalty. Jan *et al*. (2019) observe that to make advertising more effective, it needs to create a desire in the heart of the consumers or listeners. Anand and Shachar, (2011) as well as Terui *et al*. (2011) adds that the provision of sufficient information by the advertiser on the features and quality of the product or services can help in fulfilling the desire of the consumer. Furthermore, Hanlon (2021) pointed out that answers are to be proffered to certain questions to arouse the desire of the customers. The questions needing answers in this instance include: 1. what are the things that make the advertisers' product desirable? 2. How to interact personally in ensuring emotional connection? In summary, advertisement has a great possibility of building the

desire of the customers which results in acting (Fortenberry & McGoldrick, 2019). It can be implied that it is of great importance to be able to arouse the desire of the targeted consumer to secure purchase.

3.4.4 Action

Priyanka (2013) explains that action is the last step of the stage where the advertiser convinces the customer into making the purchase. Insight tycoon (2020) states that action deals with the purchase of the product. In every marketing campaign according to Rehman *et al*. (2014a), the main aim is selling the product as a result action is linked with the acquisition of the product. Wilson *et al*. (2015) assert that expressing the benefits of the product to the consumers or customer and the reduction in the effort required in completing the process is essential in the facilitation of the transition to action.

Having seen the AIDA model and its possible applicability to this present study, there is a need to consider the second model considered relevant for this study as well as possible ways by which it can be applied. Hence, the next section is used to explain the Shannon and Weaver model briefly and its possible application to this study under consideration.

3.5 Shannon and Weaver Model of Communication

Drew (2019) describes the Shannon and Weaver Model of Communication as the mother of all communication models based on its popularity. Communication theory (2010) explains that in 1948, Shannon who was an American mathematician as well as an electronic engineer and Weaver an American Scientist worked at Bell Telephone Laboratories and came together to write an article in “Bell System Technical Journal” which is called “A Mathematical Theory of Communication” also known as “Shannon-Weaver model of communication”. On the other hand, Steinberg (2007) reports that Shannon and Weaver were both workers at Bell Telephone Laboratory in the United States of America whose motive was to provide a way through which the channels of communication can be effectively utilized. For instance, how to send a maximum amount of

information along a given channel and measure the capacity of the channel. Communication Theory (2010) adds that Shannon and Weaver's model was designed for improving the technical aspect of communication which however has been applied to various aspects of communication. Drew (2019) states that the main aim of the model explains how communication can be processed and received.

3.6 Elements of a Communication Model

In the line of the discussion above, Pearhtres (2016) explains that a proper or structured communication model should adopt the following elements:

- The source: the sender of the message also known as an encoder
- Message: The information sent to the receiver by the sender
- Encoder: The message is transmitted into spoken language
- Channel: The medium of communication
- Receiver/Decoder: The extractor or decoder of the information
- Feedback: A response regarding the comprehension of the message
- Noise: Interference

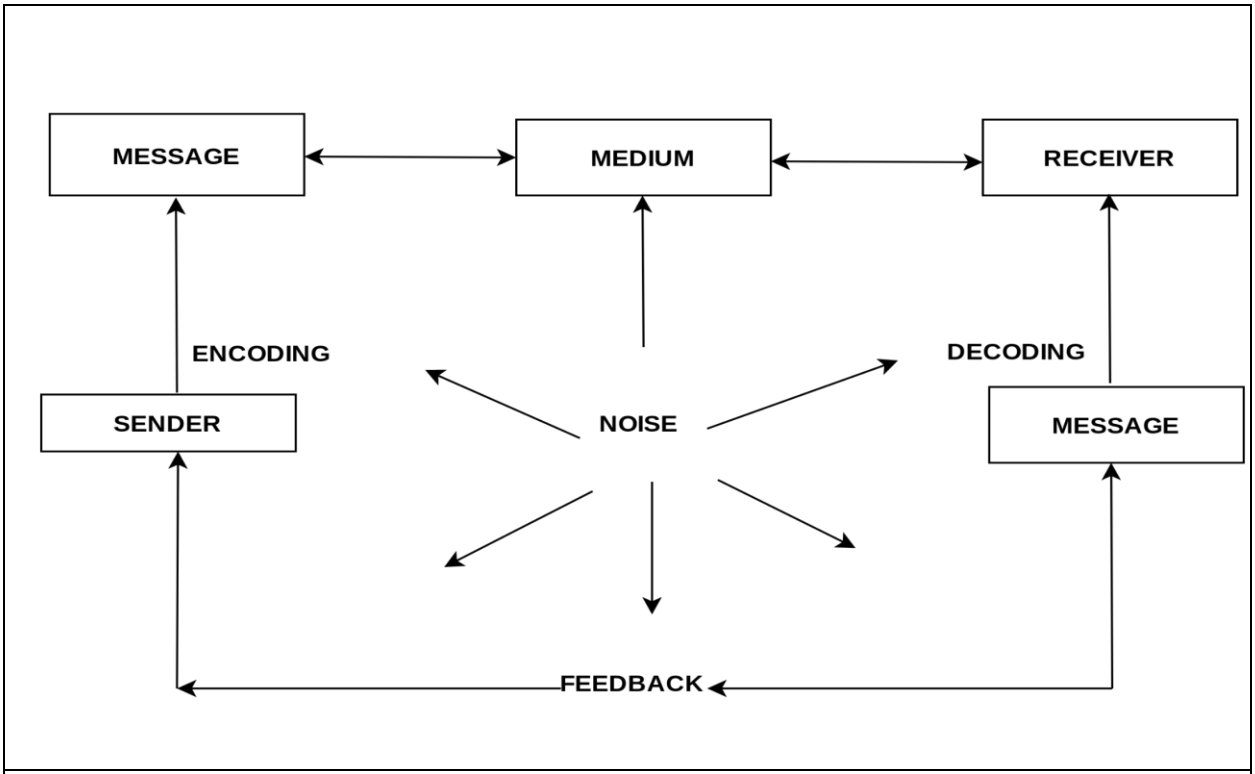

Figure 2: Shannon and Weaver's model of communication
Source: Adapted from Hartley & Bruckmann (2002:12)

3.7 Analysis of Shannon and Weaver Model of Communication to the study

To successfully analyse the Shannon and Weaver model, there is a need to consider each of the various components. Thus, each component of the model is briefly explained concerning the present study.

3.7.1 Source

Eke (2020) explains that the originator of the message is the sender. Eunson (2012) states that the Shannon and Weaver model starts with the sender known as the source of information. Furthermore, Eunson (2012) adds that the sender sends out information while the receiver responds to the information. According to Hybels and Weaver (2001) opines that for effective communication, the sender needs to encode the message in a way that the receiver will be able to understand easily. Kapur (2020) notes that in the process of communication, the sender is regarded

as the most significant person in initiating communication. Nordquist (2019) indicates that in the process of communication when the sender initiates communication, it needs to be in a friendly manner. Suffice to state that the sender is the initiator of the communication process. In this study, the sender can be the university community.

3.7.2 Message

Hybels and Weaver (2001) note that the message consists of ideas and feelings that the sender wants to share with the receiver. Kapur (2020) refers to a message as information that is transmitted from the sender to the receiver. Furthermore, Kapur (2020) explains that messages are related to various subjects and concepts which are embedded in oral, non-verbal, and written forms. Wrench and Punyanunt-Carter (2012) had earlier stated that a message in the context of the Shannon and Weaver model can be seen as the idea that the sender is transmitting to the receiver. This means that the message in communication is the central point, idea or focus for which a sender and a receiver meet. In the context of this study, the message can be classified as the idea (adoption of digital learning) being transmitted from the university community to the students.

3.7.3 Channel

Steinberg (2007) explains a channel as the physical means through which signal or information is transmitted. Eke (2020) refers to channels as a means through which message or information is delivered**.** Weihrich (2010) states that an appropriate channel is used to transmit the message which can be delivered orally or in writing. Furthermore, Weihrich (2010) believes that a proper consideration of the choice of channel to be used is important to ensure proper communication. Umeozor (2020) notes that when messages are to be sent, the sender considers the appropriate channel of communication to disperse the messages to the receiver. Umeozor (2020) adds that the channel of communication could be oral, electronic, the use of public address systems, mobile technology, and video conferencing. This implies that in communication, the medium of communication is important, and the sender needs to choose an appropriate medium. In the context

of this study, the channel can be the use of technology. For instance, the adoption of technology by lecturers in teaching and learning activities.

3.7.4 Receiver

Eke (2020) opines that the receiver of the message is to encode the message and interpret it in a way he or she can understand. Eke (2020) further adds that the ability of a message to be properly decoded relies on the receiver's ability to interpret it correctly. Umeozor (2020) refers to the receiver as the recipient of the information who decodes the message for it to be understood. Umeozor (2020) further explains that the act of interpreting messages is called decoding. Suffice to state that the recipient of the information sent across from the sender is the receiver. In this study, the recipients serve as the students in the selected institutions of learning.

3.7.5 Feedback

Steinberg (2007) refers to feedback as the receiver's reaction which is transmitted back to the sender. Eke (2020) holds the view that feedback is the reaction received from the receiver which shows whether the message is understood or not. Eke (2020) adds that feedback occurs in two-way communication. Weihrich (2010) states that feedback controls and stimulates the process of communication from the sender to the receiver. Eunson (2012) observes that feedback allows interaction between the sender and the receiver of the information. Umeozor (2020) argues that feedback assists the sender to know how the receiver interprets the message. Furthermore, Umeozor (2020) states that feedback is essential in the flow of communication because such messages can be modified to enhance clarity and comprehension. From the foregoing, it can therefore be stated that feedback is a vital element in the communication process. In this study, the feedback can be considered as the reactions and responses from students to lecturers and the university community at large with regards to the transformation being experienced following the experiences in the fourth industrial revolution (4IR), especially with regards to the transition from onsite to online learning.

3.7.6 Noise

Weihrich (2010) refers to noise as any unwanted thing in the process of communication. Weihrich (2010) adds that noise is anything that interferes with the free flow of communication. Umeozor (2020) refers to noise as any obstacles or interference which distort the flow of information from reaching its destination. Furthermore, Umeozor (2020) explains that noise can proceed from any of the elements in the communication process either from the sender, message, channel, and receiver. Steinberg (2007) regards noise as anything which is added to the signal in between its transmission and reception which is not intended by the sender. Suffice to state that noise results in failure in the communication process. In this study, factors hampering the flow of communication from the university community to the students are classified as noise.

As sequel to the analyses of both the AIDA as well as the Shannon and Weaver communication models, the researcher dimmed it fit to design a different model to be adapted for this study. This designed model is a blend of the AIDA and the Shannon and Weaver models. This is as presented and explained below.

3.8 Conceptualized model by the researcher for the study

For institutions to embrace transformation brought about by 4IR, the researcher proposes a model to assist in this regard to ensure effective communication from the institution to the students and feedback from the students to the institution.

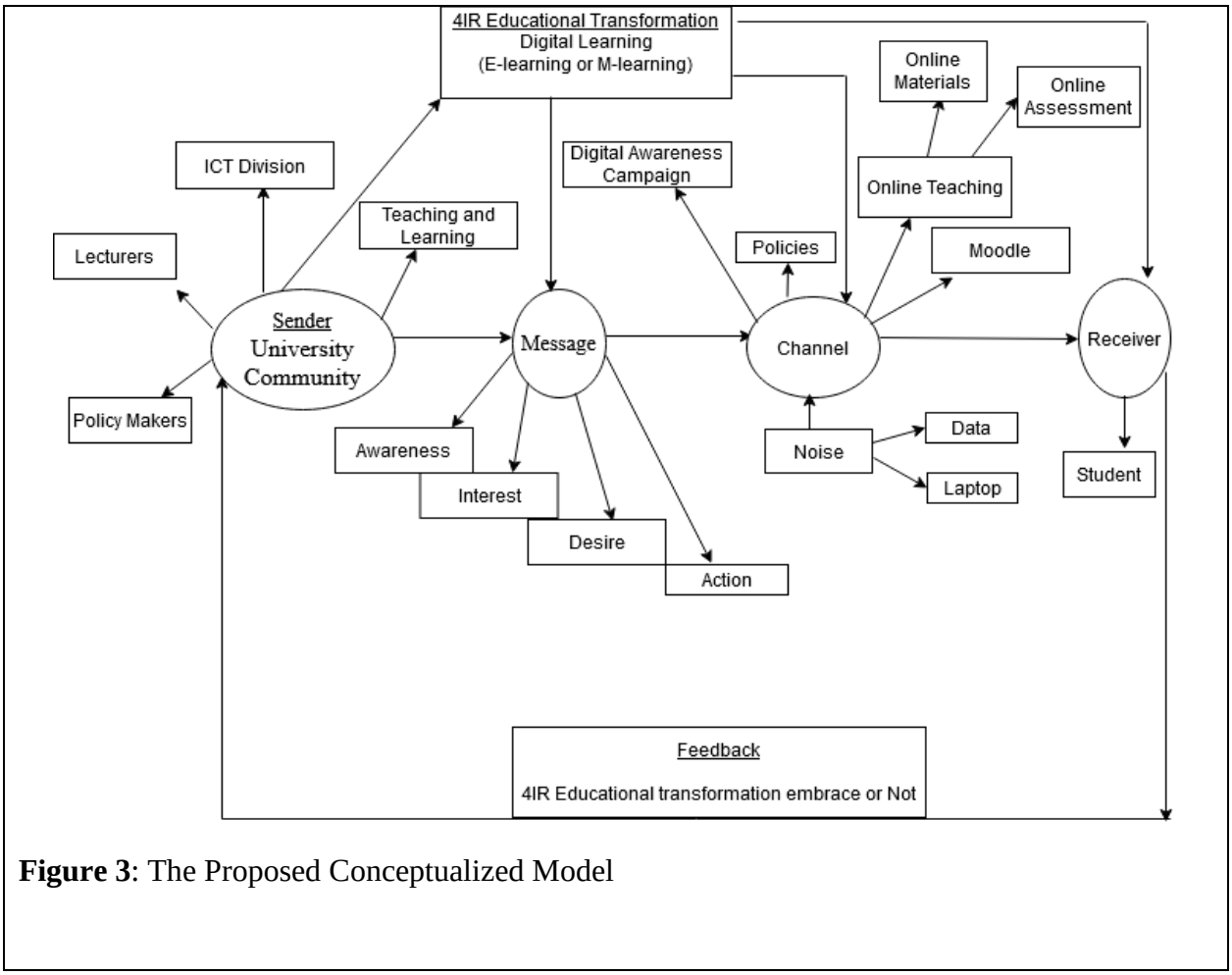

Figure 3: The Proposed Conceptualized Model

3.9 Explanation and Application of the Conceptualized model

The researcher used both the AIDA model and Shannon and Weaver model to conceptualize this model. In this section, the researcher explains how the conceptualized model applies to the study. In the diagram above (figure 3), the main source from which all other branches come is the 4IR educational transformation which refers to the adoption of digital learning through which other forms of learning come from such as E-learning and M-learning. This 4IR educational transformation serves as a mediator between the sender and the receiver. Also, this 4IR educational transformation which is the adoption of digital learning reveals that it has a positive influence on the message to be communicated, the channel of communication to be used as well as the receiver. All the components are explained and highlighted below.

3.9.1 Sender

The sender in the conceptualized model refers to the university community which are policymakers, lecturers, ICT division and the teaching and learning department. From the above diagram, the sender influences the message as well as the 4IR educational transformation. The sender transmits information on the significance of the 4IR education transformation (digital learning) to the receiver. The motive of the sender to the receiver is to ensure that the receiver gets adequate information needed for the 4IR educational transformation (digital learning). Furthermore, the aim of the university community is for students to embrace the information and adopt the idea. Liu (2015) views education as a type of activity that involves the educator (university community, the sender) selecting quality information and transmitting the information or idea to the receivers (students). Furthermore, Liu (2015) notes that the transmission of information can be seen as a marketing process (AIDA) because the university community is the seller or advertiser of information while the students are the consumer of the information. Li *et al*. (2010) note that the transmission of information to students is not an easy job because students receiving the information are not equal to accepting the information. Liu (2007) opines that the role of the university community is to acquire new information needed for the development of the students because they serve as the representative and mouthpiece of the society. Liu (2007) adds that the university has become a high-tech breeding place for the promotion of information. Thus, in the 4IR era, the university is expected to breed high-tech individuals using all possible avenues. Meanwhile, following the outbreak of the COVID-19 pandemic and as desired in the 4IR era, high-tech individuals are to be bred using various technologies, transitioning from onsite to online learning as well as blended learning. This implies that the university community which is the sender in this study is expected to promote the use of technologies in breeding high-tech individuals during the fourth industrial revolution era which is being experienced.

3.9.2 Message

The information transmitted from the sender to the receiver should enclose an awareness of the significance of 4IR educational transformation which is digital learning. For instance, e-learning or m-learning. Furthermore, in the message, the sender should be able to catch the attention of the

receiver into understanding the importance of 4IR educational transformation (digital learning, such as e-learning or m-learning) on their education as well as get them interested in its use. Also, the message regarding the 4IR educational transformation (digital learning, such as e-learning or m-learning) on education is envisaged to cause the receiver to desire using technologies of the 4IR as well as aligning with the transition from onsite to online: whether e-learning or m-learning. Thereafter the message should motivate the receiver into intending to embrace 4IR educational transformation (digital learning) either e-learning or m-learning. Liu (2015) explains that in the use of the AIDA model, the university community must ensure to attract the attention of the students to the use of digital learning. Furthermore, Liu (2015) maintains that the message from the university community should be able to arouse students' interest as well as motivate the students' learning desires and lastly encourage the students into acting by participating in the online class. The above model, it shows that the message positively influences the channel of communication to be used.

3.9.3 Channel

The channel of communication refers to the medium used in disseminating information to the receiver. In the above model, the channel of communication includes the adoption of online teaching. This entails the use of online materials and online assessment, Moodle, digital awareness campaign, curriculum and policies. Arrosagaray *et al*. (2019) note that information communication technology (ICT) tools are means of communication that are gradually incorporated into teaching and learning environments. Arrosagaray *et al*. (2019) further explain that students from the modern generations of higher education have developed in an environment that is dominated by the Internet and digital technologies. Cordero-Gutiérrez and Lahuerta-Otero (2020) argue that higher education of institutions should find diverse digital means such as online medium on how information can be transmitted effectively to students to attract and motivate them. Liu (2015) adds that in the marketing process, the university community can sell their products perfectly through proficient use of marketing skills such as communication skills which can serve as a channel through which information is communicated to the receiver (students). Suffice to state that, the channel of communication influences the receiver. Thus, in this study, the extent to which

the use of Moodle and other online teaching platforms, materials, amongst others are embraced by the students and university community as well as how much influence the communication flow, explains and reflects the subject of the channel.

3.9.4 Noise

This refers to anything that hinders the encoding and decoding of messages. This can be considered from a psychological or social point of view. Umeozor (2020) refers to noise as any obstacles or interference which distort the flow of information from reaching its destination. Coman (2020) observes that in the 21st century and 4IR era, lack of data, poor internet connection, lack of laptops/computers are referred to as technical problems in noise that can affect the free flow of communication. İşman and Altinay (2005) indicate that technical problems hinder effective communication. On the other hand, Karal, *et al.* (2011) adds that freezing screen, sound disturbances, and echoes are some other technical barriers (noise) in communication. The above diagram, it shows that noise has a positive influence on the channel of communication. Noise in this study, therefore, refers to a lack of data and laptops which can distort the free flow of communication from the sender to the receiver. Lack of data or laptop can cause noise because the necessary information is envisaged not to be received or encoded by the receiver.

3.9.5 Receiver

Umeozor (2020) refers to the receiver as the recipient of the information who decodes the message for it to be understood. The receiver in the above model refers to students. Students are the recipient of the information which is communicated from the sender (university community) on the use of 4IR educational transformation (digital learning). Meanwhile, Li *et al* (2010) explain that students receiving information from the university community do not amount to them accepting the information because receiving information is a passive activity while accepting information is an active activity. Buarqoub (2019) notes that the receiver first gets the information, decodes it, and interprets it based on his or her understanding, thereafter, responds to the message by giving feedback to the sender. Hence, the need for the next heading: feedback.

3.9.6 Feedback

In the proposed model, there is feedback from the students to the university community. This feedback is expected to assist the university to know whether the students have embraced the educational transformation brought about by 4IR or not. Mamula *et al*. (2020) maintain that feedback is a two-way process of communication that should be operated consistently because it increases the process of developing people and promotes good relations. London and Smither (2002) add that the goal of feedback is to improve performance as well as valued outcomes. On the other hand, Baker (2013) explains that feedback serves as an instrument used in measuring effective communication and also for evaluation and review purposes. Thus, in testing whether universities are embracing the transformation brought about by 4IR, there is a need to investigate the feedback from the reactions and responses of the students who are the receivers.

Sequel to the proposed conceptualized model by the researcher, it is envisaged that the responses about students (who represent the receivers in the proposed model) from both the selected students and the staff members of the institutions of learning would help the researcher know the extent to which universities in KwaZulu-Natal are embracing the transformation brought about by the 4IR. The researcher, therefore, aims at investigating whether the technologies of the 4IR are used in the selected institutions of higher learning. Where they are used, how, and when? Where are they not used why? These in focus, while attempting to proffer answers to the research questions guiding this study, is expected to help the researcher successfully trace the extent to which the selected universities of this study are embracing the transformation brought about by the 4IR. Moreover, the model is also considered useful for institutions of higher learning to embrace the transformation brought about by the 4IR.

3.10 Conclusion

In this chapter, based on the notion that communication scholars use models to recognize the essential elements involved in the process of communication and to present a real picture of the relationship which exists when real communication takes place explored the applicability of the same to this study. In this study, two communication models were discussed in detail which are

AIDA and Shannon and Weaver models. Also, the researcher used the combination of both the AIDA model and the Shannon and Weaver model to conceptualize a model which can help in testing the extent to which the selected universities embrace the transformation brought about by the 4IR. The same model is also envisaged to be useful to institutions of learning in embracing the transformation brought about by the 4IR. In the next chapter, the research method used for this study is presented and discussed.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

The earlier chapter presented a conceptual model which may assist policymakers to embrace eLearning on an ongoing basis at higher institutions of learning. This section presents the philosophical paradigm for this study. The chapter includes the research methods, a short explanation of the study area and the population of the study area. Also, the sample size, the sampling procedure, instrument of the study and method adopted in gathering information or data for this study are presented. In the final section ethical of the chapter, consideration and the process involved in carrying out the data is discussed.

Quinlan *et al.* (2019) state that research methodology is used to denote research methodologies such as case studies or surveys, and data collection method(s) such as observation, interviews, focus groups and questionnaires. The methodological framework includes data collection methods. Turnbull *et al.* (2020) inform us that research methodology is regarded as a technique on how a researcher scientifically designs a study to confirm the trustworthiness of outcomes that addresses the aims and objectives of the research. Bounchrika (2021) explains research methodology as a systematic method in solving research problems by gathering data through diverse means, analysing data and making conclusions on the findings. Thus, research methodology has two prime functions which are: dictate and control data acquisition and, to analyse and make meanings from the data. This process according to Leedy and Ormrod (2021) can be considered as data interpretation.

Various authors (Bazeley, 2018; Creswell, 2017; Eller *et al.* 2018; Johnson and Christensen, 2020; Kumar, 2019; Maree, 2021; Saunders *et al.* 2019; Sefotho, 2021) reveal how researchers usually adopt a qualitative, a quantitative or a mixed methods/multimethod mode of inquiry. Just as qualitative and quantitative research steps are available, steps in mixed methods research approach

(MMR) are also available from various authors (Cohen *et al.* 2018; Delport and Fouché, 2018; Johnson and Christensen, 2017; Creswell, 2015).

While various authors (Creswell, 2017; Creswell & Plano Clark, 2018; Kumar, 2019; Leedy & Ormrod, 2021; Nardi, 2018; Perry, 2018; Seabi, 2018) mention that the mixed methods research (MMR) approach combines both qualitative and quantitative research approaches in the same study, Fouché (2021) avers that MMR builds on both quantitative and qualitative approaches. This is because when using an MMR approach according to Fouché (2021), the qualitative and quantitative methods complement each other. Both methods allow a more in-depth and/or complete analysis and understanding of research problems, including those that are complex (Fouché, 2021). Given this, an MMR approach was used in this study to combine quantitative and qualitative research in a single study (Perry, 2018; Seabi, 2018).

4.2 Research Paradigm

A research paradigm represents a particular worldview that defines, for the researchers who hold this view, what is acceptable to research and how this should be done (Bertram and Christiansen, 2020). According to Saunders *et al*. (2019), a research philosophy is a system of beliefs regarding the increase in knowledge This implies that paradigms serve as the lens or organising principles by which reality is interpreted (Nieuwenhuis, 2021). Kumar (2019) posits two main research paradigms which are positivism and interpretivism. These paradigms can be referred to as quantitative and qualitative respectively. These are explained below.

Erciyes (2020) views positivism and post-positivism paradigm as an indication of relationships that exist between concrete ideas with empirical observations that can be identified through valid tests. On the other hand, Fard (2012) and Fazliogullari (2012) explain that interpretivism, which is also called the constructivist paradigm, is a kind of paradigm that seeks to understand people and social phenomena.

Since the researcher used an MMR approach by combining both qualitative and quantitative research methods, a pragmatic paradigm was used as a foundation to guide the study (Bazeley,

2018; Creswell and Plano Clark, 2018; Ferreira, 2018). The researcher intended to maintain balance in some aspects of quantification (positivism) as well as to incorporate interpretivist concerns around subjectivity and meaning (Bougie and Sekaran, 2020). A brief on both paradigms follows hereunder.

In the qualitative phase, the researcher used interpretivism. One of the reasons for using interpretivism was to depend heavily on information from participants to gain an in-depth understanding of multiple realities. Using an inductive method such as interviews using value-laden data, the researcher sought meaningful relationships and the consequences of the interactions of educators which included analysis of language and a search for dynamics with a multitude of values (Walliman, 2018).

Interpretivists often address the process of interaction among individuals and focus on specific contexts in which people live and work to understand the settings of the participants (Creswell, 2017; Saunders *et al.* 2019). Since the researcher used interpretivism to understand and interpret the views of participants, this affirmed that human life can be understood by focusing on people's subjective experiences by sharing meanings (Bryman *et al.* 2018; Saunders, *et al*. 2019; Nieuwenhuis, 2021).

In the quantitative phase, the researcher was interested in rigour and the generalisability of findings. The study was informed by the ontological position of objectivism: that reality is out there to be studied, captured and understood. To do this, the researcher was detached, neutral, value-free and assumed a non-interactive position (Merriam and Tisdell, 2016). The researcher used positivism to carry out deductive research by putting forward theories she could test using a fixed, predetermined research design and objective measures (Bryman, et al., 2018; Bless, et al., 2020; Leedy and Ormrod, 2020).

Positivism allowed the researcher to derive knowledge scientifically through comparative analysis (Walliman, 2018). Thus, by using positivism, the researcher assumed the role of being an objective observer by searching for facts through comparisons and association variables (Walliman, 2018;

Bezuidenhot and Davis, 2019) and used scientific methods to study human action through proven facts (Govender, 2018; Li, *et al.* 2018; Sefotho, 2021).

4.3 Characteristics of Research

Pandey and Pandey (2015) identified the following as characteristics of research:

- ❖ Research is aimed at problem-solving
- ❖ Research necessitates proficiency
- ❖ Research requires patience and courage
- ❖ Research strengthens the development of generalizations and principles which will assist in determining future situations.
- ❖ Research is positioned around observable experience and description
- ❖ Research involves the collection of data or the use of existing data
- ❖ Research allows thorough recording and designed procedures for analyses
- ❖ Research ensures objectivity and logicality through the application of diverse tests in achieving a concrete conclusion.

Furthermore, Bhome *et. al.* (2015) also mentioned some characteristics of research:

- ❖ Research makes use of scientific methods in discovering information needed to provide solutions to problems.
- ❖ Research is a continuous process because it studies existing information and also develops new ones.
- ❖ Research is multipurpose by creating connections between variables, predicting the future and the development of new theories or concepts.
- ❖ Research maintains objectivity and excludes impartiality
- ❖ The research employs empirical evidence
- ❖ Conclusion and generalization are arrived at in research

For this study, the researcher ensured to follow the principles involved in data collection as well as recording the data and analysing the findings of the study.

4.4 Research Design and Methods

This segment explains the research design and method employed for the study.

4.4.1 Research Design

Pandey and Pandey (2015) define research design as the blueprint or plan which is used as a guide in the process of research and procedures required for gathering information. Haradhan (2017) defines research design as a conceptual structure or blueprint by which research is collected and analysed. Griffee (2012) views research design as a model or blueprint guiding the researcher on how to conduct the research. Creswell (2014) argues that research design is a structured way of gathering data using proper procedures and analysis. Neelam (2020) states that research design provides a solid foundation for the research to reduce cost and give notable control regarding the consistency of the results achieved. Mohajan (2017) refers to research design as a conceptual structure that creates the plan involved in the process of collection, analysis and interpretation of data. Neuman (2014) notes that research design centres on designing a study and developing a method to assist and guide the research process.

In this study, the researcher adopted the mixed methods research design (a quantitative approach using the survey method and a qualitative approach using interviews for data collection). According to Kumar (2014), the mixed methods design allows the adoption of two methods commonly described as quantitative and qualitative in collecting data for a study. Maree (2020) opines mixed methods as the combination of qualitative and quantitative methods within a study, by employing both the use of numeric (numbers) and thematic illustrations.

4.4.2 Research methods

This study adopted a mixed-methods approach for data collection. According to Kumar (2019), the quantitative paradigm can be used to gather information from a large sample size, while the qualitative paradigm can be adopted in the collection of in-depth quality information from a small sample size. Leedy and Ormrod (2019) and Mishra and Alok (2011) explain that qualitative methods make use of verbal facts, visual and non-numeric information for the study.

Creswell and Plano Clark (2011) assert that mixed methods involve a strategy for the collection, analysing and "mixing" of both quantitative and qualitative methods in a single study with the motive of understanding the research problem. Bazeley (2015) observes that mixed methods are an essential and efficient way of generating more exact results to provide a comprehensive perspective to the research problem. Poth and Munce (2020) add that mixed methods design is significant because it can combine multiple data which can assist in studying complex problems. The mixed method is done to enhance triangulation and validation of data (Brink *et al.* 2018). Furthermore, Bounchrika (2021) explains that mixed methods entail triangulation in a study. Haq (2014) had earlier stated that triangulation avails researchers the possibility of presenting diverse findings regarding a single phenomenon using quantitative and qualitative methods.

In the context of this study, large quantitative data were collected by the researcher from randomly selected student respondents through the use of a questionnaire. Meanwhile, in-depth qualitative data was collected from selected staff members who functioned as participants in this study through the use of semi-structured interviews. The adoption of a mixed-method approach in this study enabled triangulation and validation of the sets of collected data from both students and staff members. The two approaches were used to collect data that helped in proffering answers to the four identified research questions stated above.

Additionally, following the ongoing pandemic, the researcher had to collect quantitative data using a survey monkey approach. In other words, the quantitative data for this study was collected using google Forms. The qualitative data on the other hand was collected online via emails, zoom and telephone conversations following the preference of the interviewees. Archibald *et al*. (2019), as well as Daniels et al. (2019), refers to zoom as a video conferencing platform that is used extensively for research purposes. In other words, the researcher used social media platforms to conduct the semi-structured interviews used in collecting qualitative data for the study. Chen & Hinton, (1999) cited by Lobe *et al*. (2020) explains that online qualitative research methods, such as online interviews and online focus groups, are a type of traditional methods using internet avenues instead of face-to-face interaction.

4.5 The study Area

This study was conducted at the University of Zululand and Durban the University of Technology in KwaZulu-Natal province of South Africa. The researcher made use of these two different institutions to establish the role of universities in embracing transformation brought about by 4IR.

4.5.1 University of Zululand

In 1960, the University College of Zululand was established as a constituent college academically affiliated with the University of South Africa. However, the university has drastically developed to a fully-fledged university, equal to its contemporaries in higher institutions in South Africa. The University of Zululand is a comprehensive tertiary institution which is located within UMhlathuze Municipality, a fast-growing industrial hub in the north of Uthukela River in Kwazulu-Natal, South Africa. The University of Zululand has two campuses, KwaDlangezwa campus which is the oldest campus and Richards Bay Campus which was completed in 2009. The University of Zululand offers approximately 257 accredited degrees and certificate courses across faculties in Arts, Education, Science and Agriculture including Commerce, Administration and Law at KwaDlangezwa and Richards Bay campuses. The University of Zululand has approximately 16 118 students currently (UNIZULU, 2021).

4.5.2 Durban University of Technology

The Durban University of Technology came into existence in April 2002 due to the merger of two reputable Technikons, ML Sultan and Technikon Natal. Before its existence, it was named the Durban Institute of Technology which later became the Durban University of Technology following the rest of the universities of technology. The Durban University of Technology is in the cities of Durban and Pietermaritzburg (PMB) in KwaZulu-Natal Province. The institution has approximately 33,000 students. DUT is a multi-campus tertiary institution that provides 47 academic programmes at six faculties which are: Accounting and informatics, Applied Sciences, Management Sciences, Engineering and Built Environment, Health Science and lastly Arts and Design (DUT 2021).

4.6 Sampling and Sampling Procedure

In the context of this study, sampling is described as a technique adaptable for selecting a small group to determine the characteristics of a large group or a population (Brynard, Hanekom & Brynard, 2021). The researcher used some sampling steps from Zikmund, Babin Carr and Griffin (2019), as seen below.

4.6.1 Target Population

A population can be described as a single group of individuals, institutions, objects, etc. with general characteristics that are of interest to researchers. The general characteristics of groups distinguish them from other people, institutions, objects, etc. (Bertram & Christiansen, 2020). It is used to mean the total number of people, groups or organisations that could be included in a study (Bertram & Christiansen, 2020). This group of elements or cases, whether individuals' objects or events, must possess the characteristics the researcher aims to investigate (Leedy & Ormrod, 2021) and conform to specific criteria (Johnson & Christensen, 2020). They are people from which researchers' sampling elements are drawn and to which researchers want to generalise findings (Du Plooy, 2017). These individuals also consist of all the sampling units relevant to the research question (Pietersen & Maree, 2021). The population of this study was drawn from undergraduate students, teaching, and learning as well as ICT staff and lecturers of two selected universities in KwaZulu-Natal (KZN) Province of South Africa. The focus was to explore the level of preparedness for digital learning in the 4IR in the selected universities. It was impossible to involve all the undergraduate students in the two selected South African based universities. The target population for the study were undergraduate students, teaching and learning as well as ICT staff and lecturers of two selected universities in KwaZulu-Natal (KZN) Province of South Africa. These universities are UNIZULU and DUT.

4.6.2 Sampling frame

A sample is a subset of the population that is selected because although it is much smaller than the actual population, it is usually intended to be representative of the original population group (Mooi, Sarstedt & Mooi-Reci, 2018). For a study to make inferences about a particular population, sample

size is an important feature (Taherdoost, 2020). According to Patten and Newhart (2018), it is usually impractical to study an entire population, so researchers draw a sample, study it, and infer that what is true of the sample is probably also true of the population. To do this, the researcher employed a sampling technique to select a small group to determine the characteristics of a large group or a population (Morgan & Sklar, 2018).

4.6.3 Sampling technique

Sampling methods for obtaining representative samples are divided into two broad categories, namely probability and non-probability sampling methods (Bertram & Christensen, 2020). McEwan (2020) defines non-probability sampling as a sampling method employed whereby the researcher conducts sampling based on subjective judgement rather than random selection. The researcher employed a purposive sampling technique. Purposive sampling refers to a type of non-probability sampling in which people are selected because of their relevant knowledge, interest and experience about the case (Rule & John, 2017). Sampling, then, was being aimed at unearthing insights about this study's topic (Johnson & Christensen, 2020)

The researcher adopted both probability and non-probability sampling methods. Also, the researcher adopted random and purposive sampling techniques in this study, the undergraduate students who were respondents in this study were selected using a simple random sampling technique. This helped the researcher to avoid all forms of bias, thereby giving all undergraduate students in the selected universities who qualified to participate in the study the opportunity of taking part. In addition, the undergraduate students who were selected as respondents for this study included second and third years. This was to ensure uniformity across all faculties in the two selected universities as well as their stay and level of experiences in the institutions. First and fourth years were excluded from the study because while first years are unaware of the previous practices in the universities, not all faculties and departments in the two selected universities have fourth years.

The purposive sampling technique is adopted in choosing this study's universities. This was done to ensure that the right institutions which suit the setting of the study, the relevant lecturers, and

students who were able to give the needed information were selected. The institutions are based in the KwaZulu-Natal Province of South Africa. Convenient sampling was used to select the representative of teaching and learning, ICT and academic staff lecturing second- and third-years undergraduate modules who participated in the qualitative study. The use of convenient sampling in selecting participants of the qualitative study was based on their schedule, availability, and interest to participate in the study. Thus, such sampling allowed the researcher to involve relevant participants in the study based on their willingness and availability to take part in the study. Lecturers lecturing 2nd and 3rd year undergraduate students were selected because they are involved in teaching the students and they work with the designed syllabi. Representative of the ICT unit was selected because the unit is responsible for assisting lecturers in ensuring e-Learning activities. Meanwhile, Teaching and Learning staff members were selected to participate in the study following their contributions in enhancing eLearning activities, training academic staff members, and assisting students in different ways such as academic writing, tutorial sessions, among others. The selection of the identified participants enabled the researcher to proffer answers to the identified research questions stated above while triangulating the responses from students.

4.6.4 Sample Size

Salkind (2019) explains that the qualitative method allows for the collection of in-depth information. Thus, in the qualitative phase of this study, the researcher relied on a small sample of participants who were purposively selected to document the study in-depth. For the quantitative part of this study, considering the large size of the total population of students in the selected universities, Du Plooy's 2009 sample model was adopted. Hence, following the online information provided by the ICT Unit of the Durban University of Technology, the number of students currently enrolled stands at an estimate of 33,000. However, the exact number of registered undergraduate students is not stated. On the other hand, the number of currently enrolled undergraduate students at the University of Zululand following an online release stands at 16, 118. Hence, for this study, the sample size of 400 randomly selected undergraduate students from the second year and above: 200 from each of the selected universities were selected. For different levels to be involved in the study, 100 undergraduate students were selected from levels 2 and 3

from the two universities respectively. Meanwhile, level 1 was excluded from the study following the fact that they are a novice and ignorant of previous happenings and operations of the institutions. Also, level 4 was excluded from the study since not all faculties have such.

4.6.5 Sampling Units

The selection of a sample size of 400 for this study was a sequel to Du Plooy's sample model which states that 370 sample size is sufficient for a population between 10000 and 49999.

The table is as shown below:

Population Size	Sample Size
Infinity	384
500 000	384
100 000	384
50 000	381
10 000	370
5000	357
3000	341
2000	322
1000	278

Table 1: Population and sample size

Source: adapted from Du Plooy (2009:119)

Sample Size breakdown

Institution	Level 2 Students	Level 3 Students	Total
DUT	100	100	200
UNIZULU	100	100	200
Total	200	200	400

Table 2: Sample Size of Respondents for Quantitative Study

Additionally, for the qualitative study, six (6) participants were selected. The following was identified in the table 3:

Institution	Representative of T&L	Lecturer	Manager of ICT	Total
DUT	1	1	1	3
UNIZULU	1	1	1	3
Total	2	2	2	6

Table 3: Sample Size of Participants for Qualitative Study

4.7 Data Collection and Methods

Mixed Methods Research (MMR) has several advantages as suggested by different scholars such as (Bless *et al.* 2020; Creswell & Plano Clark, 2018; Creswell, 2015; Denscombe, 2017; Devlin, 2018; Dörnyei, 2018; Elias & Theron, 2018; Eller *et al.*, 2018; Greene *et al.* (1989 cited by Johnson and Onwuegbuzie, 2004); Hesse-Biber & Leavy, 2011; Ile *et al.* 2019; Johnson & Christensen, 2020; Jonson *et al.* 2007; Kumar, 2019; Li *et al.* 2018. It is noted that only one kind of data, one methodology, one way of looking at the research may not do justice to the issue in question (Johnson & Christensen, 2020; Li *et al.* 2018; Perry, 2018). Kumar (2019) takes this further by stating that several sub-objectives, not all of which lend themselves to be extensively and

accurately explored by the methods of a single paradigm. Some sub-objectives, according to Kumar (2019:27), "*are better explored through quantitative methods while others through quantitative methods".* Since qualitative research processes are claimed to lack transparency in terms of participants' selection and data analysis (Bryman, 2016), MMR is usually used to obtain generalisation which is offered by the quantitative side of MMR (Bryman, 2016; Kumar, 2019).

Mixed methods entail triangulation in a study Bounchrika (2021) and this is done to enhance triangulation and validation of data (Brink *et al.* 2018). Thus, this study followed a mixed methods research (MMR) approach through **triangulation of methods** (Bazeley, 2018; McNabb, 2018). This involved mixing quantitative and qualitative research approaches (Devlin, 2018, Johnson & Christensen, 2020; Nardi, 2018) whereby the researcher made use of information gained from both the quantitative and the qualitative methods to get rich and comprehensive data as well as multiple perspectives of the study's key issues to answer the study's research questions, with a view of improving accuracy (Creswell and Plano Clark, 2018). As a strategy, triangulation was significant in this study because it combined multiple data which assisted in studying complex problems (Poth and Munce, 2020) and this eventually enabled the researcher to achieve credibility, validity and accuracy of research findings (Santos, *et al.* 2015).

4.7.1 Qualitative data collection

Creswell (2014) asserts that qualitative data involves direct communication with individuals on a one-to-one basis or group setting. Du Plooy-Cilliers, *et al*. (2014) explain that using the qualitative data collection method allows the researcher to obtain the richness and in-depths of the data. Leedy and Ormrod (2019) mentioned that in qualitative data collection, multiple methods can be used to collect data in a single study, such as interviews, observations, objects, written documents, audiovisual material and electronic material. Sekaran and Bougie (2016) support Leedy and Ormrod's view and state that these methods allow the researcher to collect a wide range of information from the participants. Kumar (2019) identified the types of interviews in qualitative research methods which are structured interview and unstructured interview

Creswell (2014) asserts that qualitative data involves direct communication with individuals on a one-to-one basis or group setting. Leedy and Ormrod (2020) mention that in qualitative data collection, multiple methods can be used to collect data in a single study, such as interviews, observations, objects, written documents, audio-visual material and electronic material. Bougie and Sekaran (2020) support Leedy and Ormrod's (2020) view by stating that these methods allow the researcher to collect a wide range of detailed information from the participants. Hence, for this study, a qualitative method was employed as one of the data collection methods. Also, the qualitative method uncovers the significance and seriousness of human behaviour, it looks at the deep meaning of actions (Bryman *et al,* 2018; Denzin & Lincoln, 2018; Li et al., 2018) to understand the experiences of those involved (Chase, 2018; Dane, 2018; Nardi, 2018), it follows an inquiry approach in which the researcher enters real-world settings to observe, interact and understand what emerges in a naturalistic way, it collects data subjectively (Cohen et al., 2018; Creswell & Plano Clark, 2018; Dane, 2018) and, as such, relies primarily on different methods of collecting information such as focus groups discussions (Li et al., 2018; Nardi, 2018), interviews (Denzin & Lincoln, 2018; Nardi, 2018; Li et al., 2018), field notes (Nardi, 2018), observations, conversations, photographs, recordings, and memos to the self (Denzin & Lincoln, 2018) whereby the researcher's stance is an engaged one, reflexive and value-laden. Qualitative research uses purposeful sampling of rich information for in-depth study to document the diversity and looks for themes and patterns across case studies (Dane, 2018; Patton, 2015; Salkind, 2018), using an inductive analysis (Patton, 2015).

Kumar (2019) identified the types of interviews in qualitative research methods which are structured and unstructured. The researcher adopted semi-structured interviews (SSIs) in line with the objectives of this study.

SSIs in this study not only provided the advantage of the ability to ask questions and to listen (Torre *et al.* 2018), they allowed room for probes (Bougie & Sekaran, 2020; Leedy & Ormrod, 2020; Saunders *et al.* 2019h) and for questions to be explained (Kumar, 2019). Probes were *"detail-oriented probes, elaboration probes and clarification probes"* (Nieuwenhuis, 2021:109).

Interviews consist of accounts given to the researcher about the issues in which they are interested. Therefore, by using interviews, the researcher in this study got to hear of participants' subjective experiences and attitudes that would otherwise remain inaccessible. The interviews proved to be a very convenient way of overcoming distances both in space and in time (Peräkylä & Ruusuvuori, 2018).

An Interview Protocol provided the researcher with a set of predetermined questions to engage the participant and designate the narrative terrain (Monette *et al.* 2014). Since the Interview Protocol was produced beforehand, it forced the researcher to think explicitly about what he wanted to cover during the interview (Monette *et al.* 2014). Eventually, rich descriptive data from the interviews helped the researcher to understand the respondent's construction of knowledge and reality (Nieuwenhuis, 2021).

The interviews were conducted for conveniently selected staff members to ascertain and enhance the triangulation of data retrieved from the student respondents. The staff were conveniently selected based on the following: their schedule, availability, readiness and interest to take part in the study. They were asked questions related to their training/retraining, changes they are implementing, amongst others. University management from the ICT Division was interviewed. Questions on ICT infrastructure trained personnel, technicians amongst others were asked to know the latest update with regards to the subject matter in their institutions. Also, staff of the Teaching and Learning Centres were interviewed. They were asked questions on curriculum development, qualification changes concerning the subject matter.

4.7.2 Quantitative data collection

The researcher in this study adopted a quantitative research approach because the quantitative research approach is largely researcher driven, is structured (Cohen *et al.* 2018; Kumar, 2019; Polit & Beck, 2020), pre-determined (Cohen *et al.* 2018; Creswell & Plano Clark, 2018; Salkind, 2019), unbiased and objective (Creswell & Plano Clark, 2018; Leedy & Ormrod, 2021; Kumar, 2019) research approach and does not record the words of participants (Bryman, 2016) instead concepts are converted into operational definitions for results appear in numeric form and are eventually

reported in numbers (Bless *et al.* 2020; Bryman *et al.* 2018; Leedy & Ormrod, 2020; Salkind, 2019) as well as in aggregated, statistical language (Bless *et al.*, 2020; Cohen *et al.*, 2018; Salkind, 2019) and summarisation (Wild & Diggines, 2015).

With epistemological roots in positivism (Creswell & Plano Clark, 2018; De Vos *et al.* 2018; Fouché & Delport, 2018), a quantitative approach is used in an empirical study that is context-free and uses reliable and valid measurement tools (Bryman, 2016). It tends to be a rigid (Bless *et al.*, 2020) design in which hard, reliable (Salkind, 2019) numeric data (Creswell & Plano Clark, 2018; Bartley & Hashemi, 2021; Leedy & Ormrod, 2020) are obtained systematically and in a fixed and standardised manner to seek to control phenomena.

The quantitative research approach tests and verifies theories or explanations (Bless *et al.*, 2020; Bryman *et al.*, 2018; Leedy & Ormond, 2020) and uses standards validity and reliability (Creswell & Plano Clark, 2018). It is deductive hence it relies on large because it seeks to generate findings and generalise from the sample (Bertram & Christiansen, 2020; Fouche & Roestenburg, 2021; Leedy & Ormrod, 2020).

Questionnaires were used in this study to collect data because they were easier and quicker for respondents to answer (Debois, 2019; Johnson & Christensen, 2020; Neuman, 2014), respondents had time to think about the answers, the answers of different respondents were easier to compare, the answers were easier to code and to analyse statistically and there were no irrelevant or confusing answers to questions (Neuman, 2014).

Questionnaires allowed the researcher to obtain opinions (Li *et al.* 2018; McMillan & Schumacher, 2016; McNabb, 2018) and feelings about the study's matters, to have the same information from respondents and to score easily (McMillan & Schumacher, 2014).

The following objectives were mentioned in the questionnaire

- To explore the level of awareness that students at the selected South African universities have on digital learning.

- To determine plans which policymakers at the selected South African universities have put in place to transform the curriculum for digital learners.
- To investigate the restructuring of the syllabi of the selected South African universities for relevance in the 4IR
- To identify factors hindering the selected South African universities from equipping students for eLearning.
- To develop a framework to assist policymakers at the selected South African universities to embrace eLearning on an ongoing basis

The questionnaire for students consisted of five parts which were in line with the objectives of the study.

- The first part contains the demographic data of the students
- The second part focuses on the level of awareness that students at the university have on digital learning.
- The third part concentrated on factors hindering the university from equipping learners for eLearning
- The fourth part dealt with how students at the university can be fast-tracked into embracing eLearning because of the unexpected COVID-19 lockdown.
- The fifth part focuses framework to assist policymakers at the university to embrace eLearning on an ongoing basis

In addition, the questions for this study were developed and designed based on prior research works to evaluate the role of universities in embracing transformation brought about by 4IR.

The researcher used questionnaires to collect data from selected students participating in the study to enhance the generalization of findings. The student respondents are current undergraduate students that are undergoing higher education training. The questions that were asked looked at their awareness and views about 4IR and whether digital transformation in their views are taking place at the campus. Due to the COVID-19 pandemic and restriction measures at the time of data collection for this study, the researcher attempted to administer the questionnaire using google

form. The link was sent, and follow-up was made but the responses from students were limited. Hence, the researcher resolved to administer the questionnaire by hand when students were allowed to return to campus and nearby hostels. The researcher was able to administer 250 questionnaires to undergraduate 2nd and 3rd-year students at the University of Zululand. Of the administered 250 questionnaires, 200 duly completed were selected by the researcher for analysis. For the respondents from the Durban University of Technology (DUT), the researcher could not administer the questionnaire by hand as the students were not allowed to resume back to campus for contact face-face learning. The researcher contacted the students through different links such as academic and non-academic staff members to whom the link of the survey was sent. Following the email addresses that were received from the university administrative office, the link to the survey was sent to students, after which different follow-ups were made. Eventually, 200 undergraduate students from the 2nd and 3rd years were able to complete the survey online using the link that was sent to them. Meanwhile, the items of the questionnaire were prepared based on information from literature and prior studies on the role of universities in embracing transformation brought about by 4IR.

4.7.2.1 Reliability

Reliability refers to the stability of the measuring instrument used in data collection, and this includes its ability to be consistent throughout, it should be able to give the same results when applied at different times (Bertram & Christensen, 2020; Pietersen & Maree, 2021; Sürücü and Maslakci, 2020). Positivists put more emphasis on reliability as the most characteristic of scientific methods of research (Hasan, 2016) because it is argued that research methods used in any piece of research should be able to be repeated by other researchers to verify and check its scientific accuracy (Mauthner, 2020). To ensure the reliability of the study, a pilot study was conducted.

According to Roestenberg (2021), pilot tests should be conducted on newly constructed questionnaires before these are used for collecting actual survey data. Pilot tests help to further refine items, test data collection methods, check whether respondents can complete questionnaires

and the time it takes to complete them. Data collected during a pilot test should be analysed to try out the planned analysis techniques

Quinlan et al. (2019) explain that a pilot study, as explained, is carried out using a small number of respondents. These respondents should be like the actual respondents in the study, but they should not be respondents in the study. Usually, pilot studies are carried out with five to 15 respondents, depending on the size of the study. In piloting a questionnaire, the researcher wants to establish how respondents will respond to the questionnaire and if they will they clearly understand each item and question in the questionnaire and will the responses they give be the responses required.

In this regard, the instruments were piloted using students and staff members from the selected institutions. This was to check the extent to which the contents of the instruments were understood. Meanwhile, participants who were engaged during the pilot were not involved in the actual study.

4.7.2.2 Validity

The validity of an instrument is the degree to which it measures what it claims to measure, and therefore all dimensions of validity will be explored in this research to ensure the validity of the instrument (Shah & Brown, 2020). For this study, face and content validity were applied.

Beck (2020) advises that as a way of ensuring content validity, the researcher must make use of the expertise of the professionals in that specific field of study. Taherdoost (2016) states that face validity assesses things which are about language clarity, readability, feasibility, formatting and consistency of style. Thus, the researcher, after designing the instruments for both the qualitative and quantitative parts of the study, consulted with experts in the field and other related fields. Their comments regarding the structure and contents of the instruments about the objectives of the study to be achieved were taken into consideration and duly implemented.

4.8 Ethical Consideration

Research ethics is built on the concepts of confidentiality, anonymity, and informed consent, all of which are derived from the basic human rights to privacy (Tiidenberg, 2018). Thus, during the entire research process, the researcher kept in mind the most ethical considerations as seen below.

The University of Zululand, just like any other university, has its guidelines to research ethics from the research ethics committee (Canella & Lincoln, 2018; Devlin, 2018; Durdella, 2019; Elias & Theron, 2018; Gaudet & Robert, 2018; Leedy & Ormrod, 2020; Nardi, 2018; Pretorius & Morgan, 2018; Salkind, 2019; Saunders *et al.*, 2019a). Based on the fact that the study involved human beings, the need for ethical approval and collection of the ethical certificate was crucial before the commencement of the research. This is following the report of scholars such as Salkind (2019), Devlin (2018), Nardi (2018), amongst others. Thus, the researcher applied for ethical clearance at the University of Zululand. Following the collection of the ethical clearance certificate from the University of Zululand, another application for ethical clearance was made to the Durban University of Technology. Consequently, an ethical clearance certificate was obtained from the Durban University of Technology. Once the ethical clearances were collected by the researcher, the data collection process commenced.

4.8.1 Informed consent

Explanation of the process of obtaining informed consent is pivotal. Thus, informed consent was obtained from respondents by the researcher following the suggestions of scholars such as Bartley & Hashemi, 2021; Bertram & Christiansen, 2020; Cohen *et al.*, 2018; Dane, 2018; Devlin, 2018; Elias & Theron, 2018; Eller *et al.* 2018; Gaudet & Robert, 2018; Josephson & Smale, 2020; Kumar, 2019; Louw, 2019; Nardi, 2018; Pajo, 2018; Patten & Newhart, 2018; Saunders & Lewis, 2018; Saunders *et al.*, 2019d; Tiidenbur, 2018; Walliman, 2018). As a major standard with research ethics, prospective respondents in this study were given much-needed information about the research to enable them to decide whether to participate in the study or decline. This was following the suggestion of Bryman (2016). Also, respondents were informed by the researcher that they

could at any time terminate their participation in the study without any penalty (Patten and Newhart, 2018; Strydom and Roestenberg, 2021).

4.8.2 Principle of beneficence

Various authors (Bertram & Christiansen, 2020; Christians, 2018; Cohen *et al.*, 2018; Dane, 2018; Elias & Theron, 2018; Nardi, 2018; Patten & Newhart, 2018; Polit & Beck, 2020) inform us that the researcher needs to ensure that the study is of benefit to respondents. Since collaborative institutions were involved in this study, findings will eventually be shared with them. The aim is to promote collaborative efforts so that information is not withheld as if it is classified and therefore could endanger the study (Cloete & Thornhill, 2018).

4.8.3 Principle of non-maleficence

Through the principle of non-maleficence, the researcher did not harm the respondents physically or otherwise (Bartley & Hashemi, 2021; Hammersley, 2021; Leedy & Ormrod, 2020).

4.8.4 Confidentiality and anonymity

This forms part of the non-maleficence principle (Bertram & Christiansen, 2020; Carter, 2018; Tiidenberg, 2018). Thus, the researcher assured the respondents of confidentiality and anonymity. The researcher had a responsibility to keep the participants' identities a secret regarding their participation in the research study (Mostafa, 2016; Nardi, 2018; Saunders & Lewis, 2018). Participants were assured that neither their names nor any information revealing their identities would be exposed. It is for this reason that they agreed to participate in the study.

4.9 Data Analysis

The actual processing, analysis and interpretation of data took place at this stage. Here, the researcher processed the data sets and analysed them according to the selected data analysis strategy indicated in this chapter. The results were verified against the literature by embedding them in larger theoretical perspectives or paradigms. The researcher ensured that findings were grounded in the data that inferences were logical and that strategies for increased credibility were used appropriately (Fouché, 2021).

The researcher adopted descriptive statistics for the quantitative data. Mishra *et al.* (2019) explain descriptive statistics as important because they are employed to describe the attribute of the data in the study. Pyzdex (2021) notes descriptive statistics as data summaries that describe the method distribution in terms of numbers. The quantitative data was captured using Statistical Package for Social Sciences (SPSS) version 25 and Chi-Square. The quantitative data were further analysed and presented using tables, graphs, charts, frequencies, and central tendency. Conversely, the qualitative data were coded into themes and analysed following the responses of the participants with regards to each identified theme. Uwe Flick (2018) explains that coding and categorizing are not the only ways of analyzing qualitative data; rather they are prominent if data were collected from interviews, focus groups and observations. Solveig (2016) argues that no computer-based programme can analyze data such as NVivo and CAQDAS which are data management tools to support the researcher in the process of analysing data rather than only the human mind can do that. Solveig (2016) further asserts that rather than making use of powerful, complex and sophisticated programmes which require full mastery of their use, it may be useful for emerging researchers to use an easier method for coding and interview data based on basic functions in Word and Excel. Thus, the researcher was guided in this regard.

4.10 Report on findings

Reporting the research process and findings is a very important aspect of the research. As this is the only way in which the entire project will be communicated to other role players, this task should not be underestimated. The researcher bore in mind that the dissemination of information might determine the impact of the research results. The researcher had to develop a narrative and relevant mechanisms for dissemination to appropriate audiences that accurately reflect the core findings or themes of the research.

In brief, the table below shows the steps suggested by Fouché (2021) which was followed in this study.

Phase 1: Frame the proposed study (Pre-design phase)
Step 1: Identify a researchable topic
Step 2: Formulate the research question or problem statement
Step 3: Assess the suitability of the research approach
Step 4: Develop the research proposal
Step 5: Consider the place of literature and theory in the research
Step 6: Consider the ethical implications of the study
Step 7: Consider the implications for dissemination and impact
Phase 2: Plan the project (Design phase)
Step 8: Select a research design or strategy
Step 9: Select method(s) of data collection and analysis
Step 10: Select a sampling plan and consider the value of a pilot study
Phase 3: Implement the project (Implementation phase)
Step 11: Conduct the research. Consider entry and access in implementing the design; collect and record material
Phase 4: Analyse, interpret and report the data (Analysis and dissemination phase)
Step 12: Process, analyse data, verify and interpret the results. Select additional criteria for judging adequacy and undertake a literature review as appropriate
Step 13: Plan narratives and report on findings

Table 4: A proposed research process for this study

Source: Fouché (2021)

4.11 Conclusion

This chapter explored the diverse strategies and steps which were adopted by the researcher in an attempt to proffer answers to the research questions guiding the study. The steps followed were discussed in detail. This study applied a mixed-method which directed the approach to be used in the research design. The population of this study were students from two selected institutions in KwaZulu-Natal Province. This study adopted a sample size of 400 which was outlined by Du Plooy. The instruments for this study were questionnaires and semi-interview in line with the objectives. A pilot study was conducted to test the reliability and validity of the instruments used. Ethical considerations which are involved in the process of data collection were adhered to in this study. The next chapter discusses the data analysis and interpretation of findings.

CHAPTER 5

PRESENTATION OF QUANTITATIVE DATA

5.1 Introduction

In the prior chapter, a detailed explanation of the research methodology which was used in conducting mixed-method research for the study. In this chapter, the researcher presents the analysis of the quantitative data collected for the study. As outlined in the previous chapter (chapter 4), the study employed both quantitative and qualitative data collection techniques. Hence, this chapter presented the quantitative data which were collected through questionnaires, interpretation of findings which speaks to the research objectives set for this study. Also, as regards this chapter further discussion will be found in chapter nine

5.2 Demographic Characteristics of Students

VARIABLE	LEVEL	FREQUENCY	PERCENTAGE
Name Of Institution			
	University of Zululand	200	50.0
	Durban University of Technology	200	50.0
	Total	400	100.0
Gender			
	Male	172	43.0
	Female	228	57.0
	Total	400	100.0
Year of Study			
	Year 2	248	62.0
	Year 3	152	38.0
	Total	400	100.0

Table 5: Demographic Characteristics of Students

Table 5 shows the demographic information of the respondents from the University of Zululand and Durban University of Technology. The analysis shows that 43.0% of the respondents were males while 57.0% were females. Moreover, 62.0% were second-year students while 38.0 were third-year students.

5.3 Research Question One

What is the level of awareness of students at the selected South African universities on digital learning?

S/N	Variable	N	X	SD	Decision
1.	There are digital awareness programme(s) in our institution which increases digital learning	400	1.60	.844	High
2.	There are digital awareness campaign(s) in our institution which increases knowledge of digital learning	400	1.76	.857	High
3.	Lecturer(s) are conversant with digital learning	400	1.37	.681	Low
4.	The ICT division displays a good knowledge of digital learning through their programmes and practice	400	1.69	.875	High
5.	The Teaching and Learning Centre display good knowledge of digital learning through their programmes and practice	400	1.52	.791	Moderate

Table 6: Statistics showing the mean and standard deviation of students from the University of Zululand and from Durban University of Technology (Normative mean = 1.5)

Table 6 showed that students for this research study have a high level of awareness of the following variables:

- There is digital awareness campaign(s) in our institution which increases knowledge of digital learning
- There are digital awareness campaign(s) in our institution which increases knowledge of digital learning
- The ICT division displays a good knowledge of digital learning through their programmes and practice.

Also, their level of awareness is low on whether lecturer(s) are conversant with digital learning while their perception of the Teaching and Learning Centre thus displaying good knowledge of digital learning through their programmes and practice is moderate. Conclusively, out of the above-listed variable, it can be said that their level of awareness is high on digital learning.

5.4 Research Question Two

What plans have policymakers in the selected South African universities put in place to transform the curricula for digital learners?

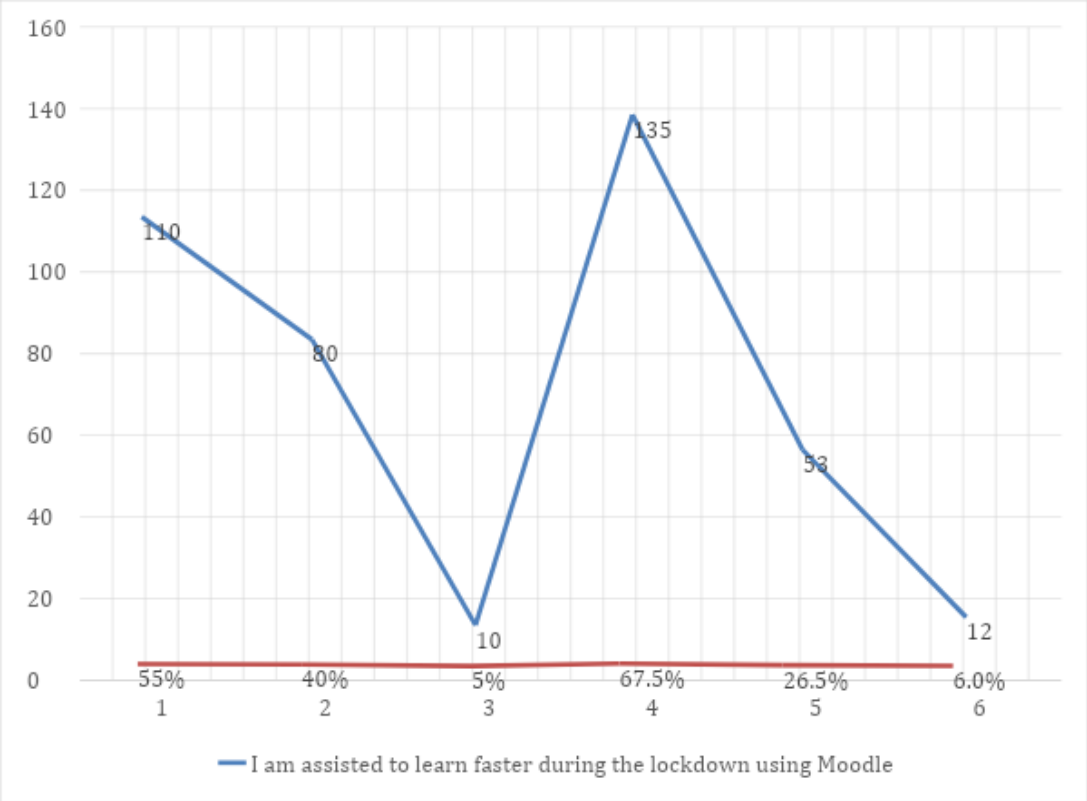

Figure 4: Responses of respondents on better learning through online teaching

Figure 4 indicates the students' responses to the policymakers' plans in the University of Zululand and Durban University of Technology in transforming the curriculum for digital learners. That I am assisted to learn faster during the lockdown using Moodle received the support of 55% of the

students from the University of Zululand and 67.5% from the Durban University of Technology. 40% of the students disagreed from the University of Zululand while 26.5% of them were found in the Durban University of Technology. Other 5% and 6% respectively remained unaware.

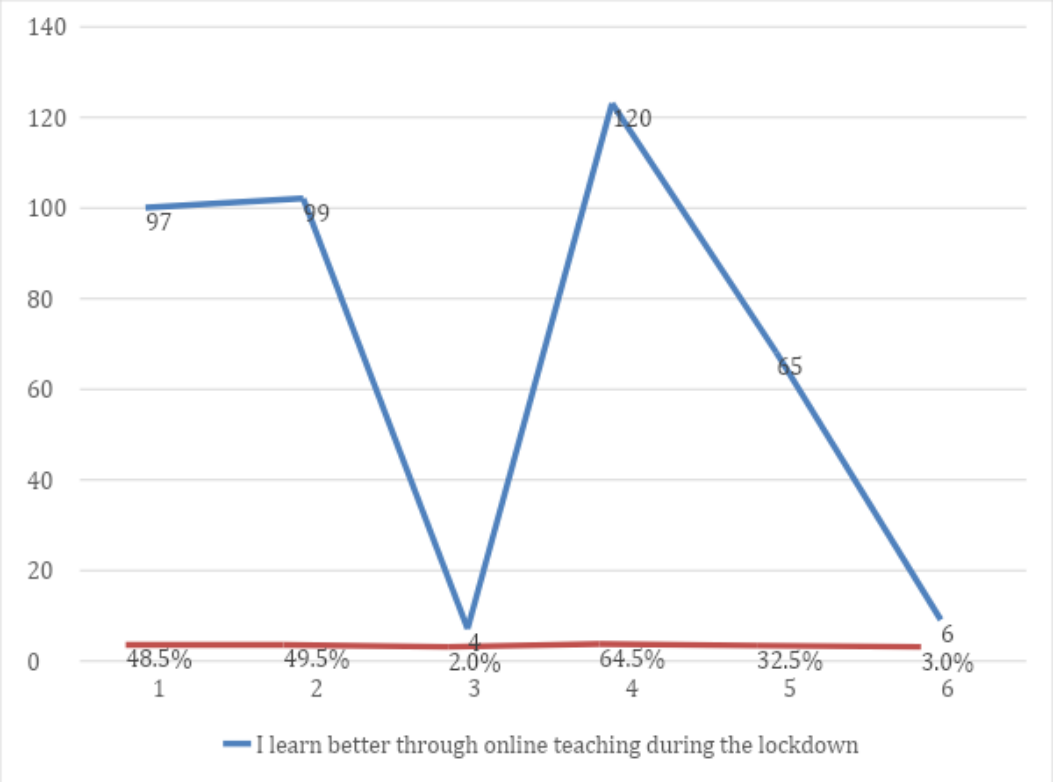

Figure 5: Respondent responses on learning better through online teaching

Figure 5 talks on the issue of whether students learn better through online teaching during the lockdown gained 48.5% support of students from the University of Zululand but from Durban University of Technology (DUT), 64.5% of the students were in agreement. While 45.5% disapproved of the claim from the University of Zululand (UNIZULU), just 32.5% of the students signified their disagreement. 2% and 3% of them from UNIZULU and DUT alongside did not know at all.

Figure 6: Respondent responses on learning faster through online materials

Figure 6 discusses in terms of whether students were aided to learn faster through the provision of online materials such as e-books got the approval of 53% of them were from UNIZULU and 67% from DUT. While 42% disapproved of UNIZULU, only 28.5% of them were in DUT. For those who did not know remained 5% from UNIZULU and 4.5% from DUT.

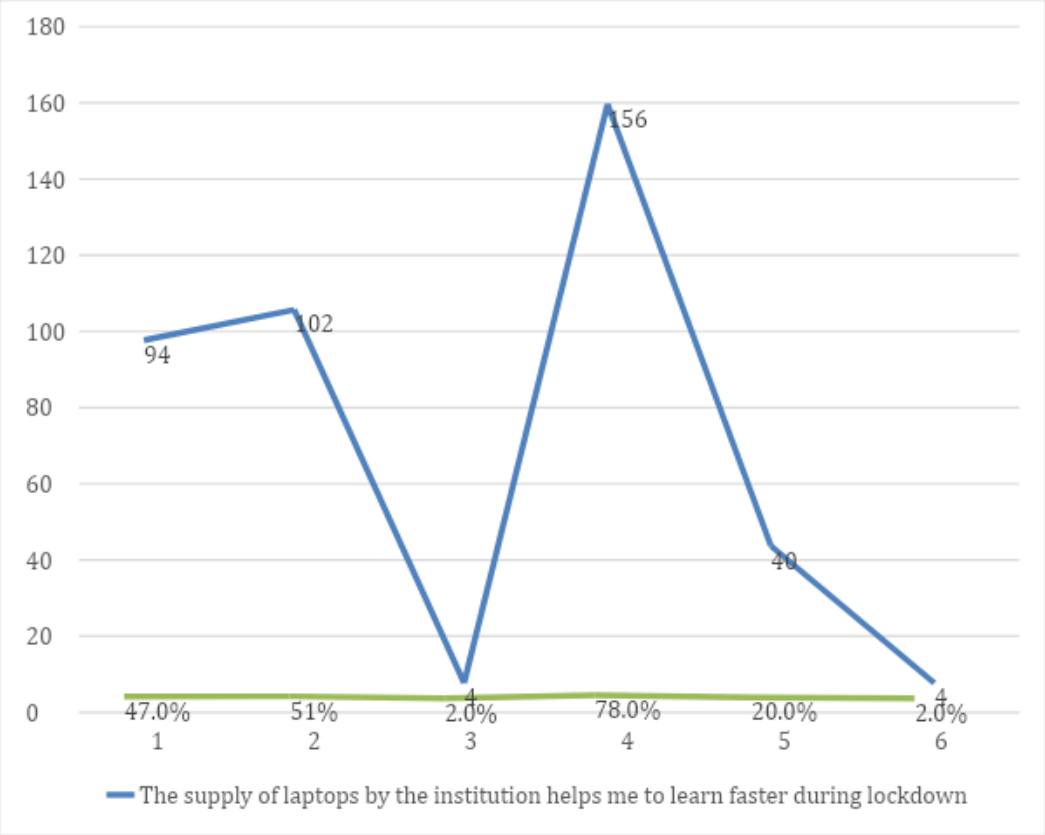

Figure 7: Respondent responses on learning faster through online assignments

In figure 7, another variable that students learned faster during lockdown through the online assignments given by lecturers received solemn support of 59% of them from UNIZULU and 70.5% from DUT. 39.% and 24% from UNIZUU and DUT disagreed while 4% and 11% did not know at all.

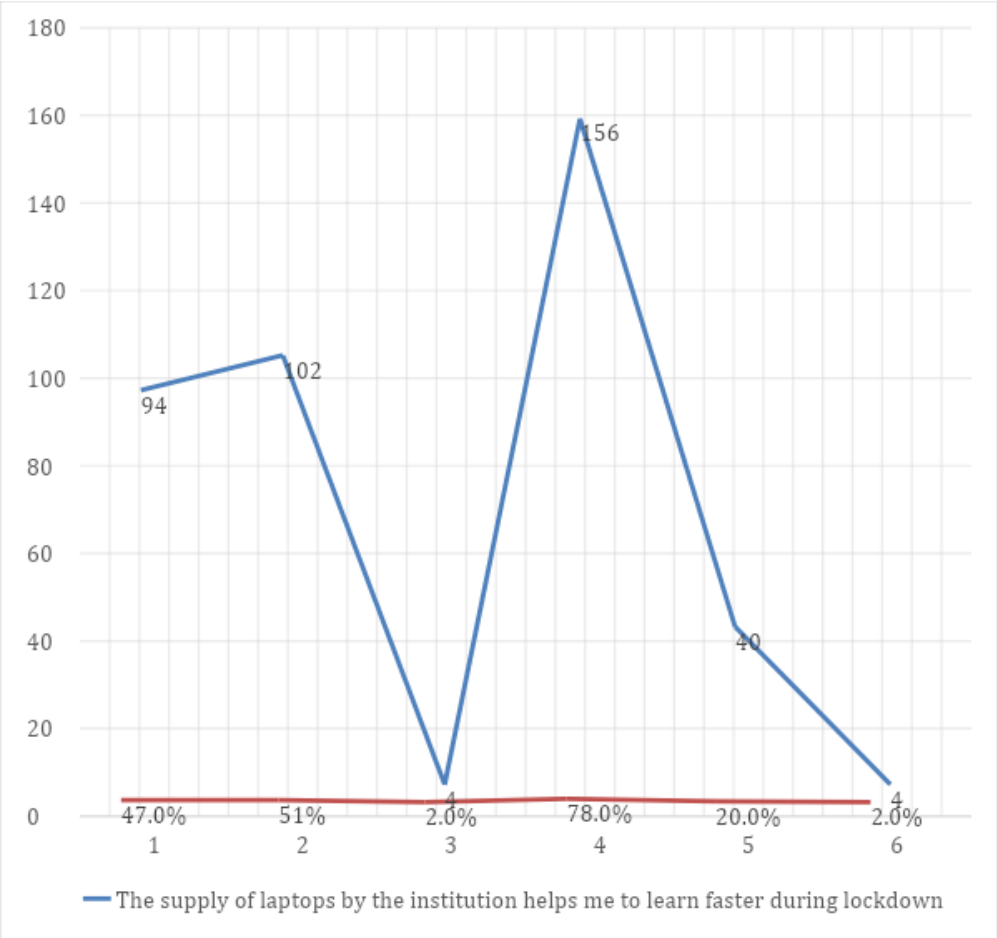

Figure 8: Respondent responses on the provision of internet data

Figure 8 discusses whether the internet data provided by the university helped students to learn faster during lockdown was supported by 59% of them from UNIZULU and 70.5% from DUT. 39% and 24% were on the disagreement side while 4% and 11% did not know.

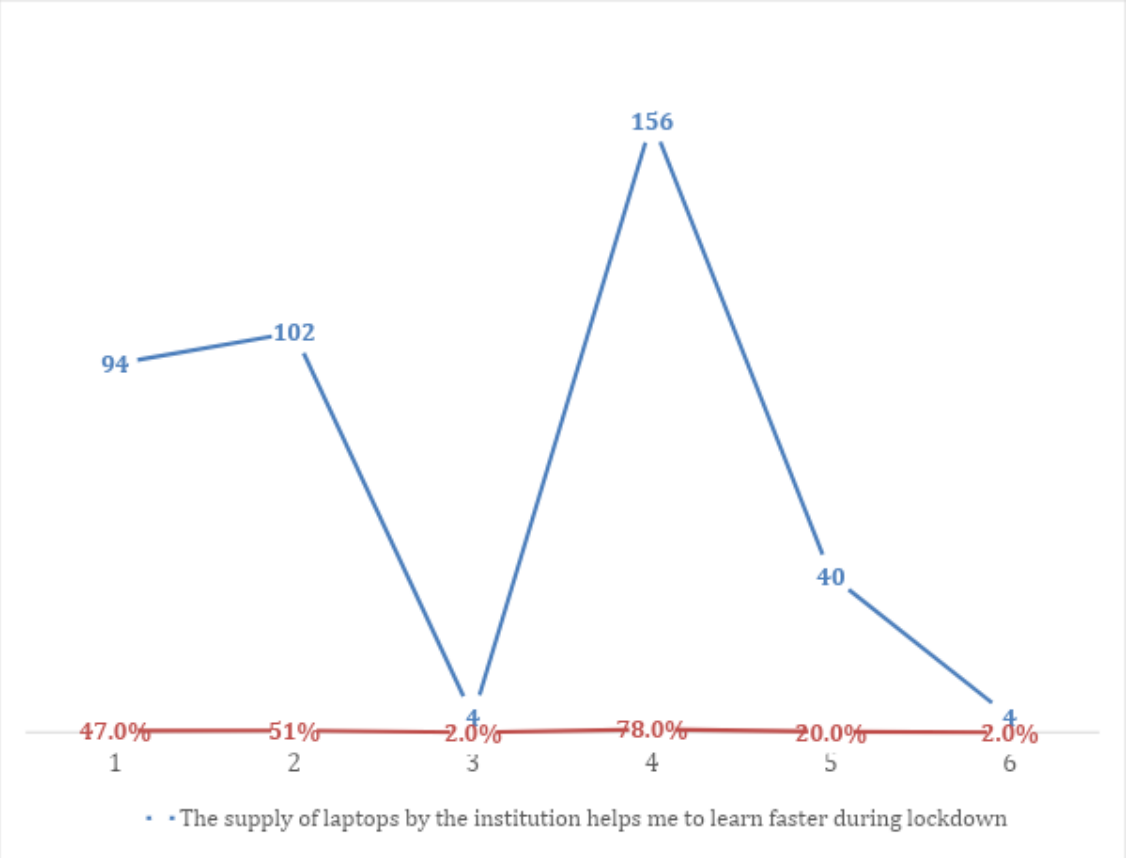

Figure 9: Respondent responses on the provision of laptop

Figure 9 indicates whether the supply of laptops by the institution helped students to learn faster during lockdown; only 47% of students supported it from UNIZULU while 78% of them were found from DUT. 51% and 20% of students disagreed while 4% on either side did not know.

5.5 Research Question 3

How are the syllabi of the selected South African universities restructured for relevance in the 4IR?

5.5.1 There are digital awareness programme(s) in our institution which increases digital learning

Programmes		Institutions		
		UNIZULU	DUT	Total
Yes	Count	88	167	255
	Expected Count	127.5	127.5	255.0
	% within Programmes	34.5%	65.5%	100%
	% within institution	44.0%	83.5%	63.7%
	% 0f Total	22.0%	41.8%	63.7%
No	Count	40	11	51
	Expected Count	25.5	25.5	51.0
	% within Programmes	78.4%	21.6%	100.0%
	% within institution	20.0%	5.5%	12.8%
	% 0f Total	10.0%	2.8%	12.8%
Not sure	Count	72	22	94
	Expected Count	47.0	47.0	94.0
	% within Programmes	76.6%	23.4%	100.0%
	% within institution	36.0%	11.0%	23.5%
	% of Total	18.0%	5.5%	23.5%
Total	Count	200	200	400
	Expected Count	200.0	200.0	400.0
	% within Programmes	550.0%	50.0%	100.0%
	% within institution	100.0%	100.0%	100.0%
	% of Total	50.0%	50.0%	100.0%

Table 7: Contingency table for digital awareness programmes in University of Zululand and Durban University of Technology to increase digital learning.

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	67.560[a]	2	.000
Likelihood Ratio	70.419	2	.000
Linear-by-Linear Association	58.408	1	.000
N of Valid Cases	400		

Table 8: Chi-Square Tests for digital awareness programmes in the University of Zululand and Durban University to increase digital learning.

0 cells (0.0%) have an expected count less than 5. The minimum expected count is 25.50.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells has expected count of less than 5. The minimum expected count in this table is 25.50. In another table, the minimum expected count (value) will change. Tables 7 and 8 showed that there was a significant relationship between digital awareness programme(s) in the University of Zululand and Durban University of Technology to increase digital learning: $X^2(2, N =400) = 67.560$, $p = .000$.

5.5.2 Digital awareness campaign(s) in our institution which increases knowledge of digital learning.

Campaign	Institutions		
	UNIZULU	**DUT**	**Total**
Yes Count	73	133	206
Expected Count	103.0	103.0	206.0
% within Campaign	35.4%	64.6%	100.0%
% within institution	36.5%	66.5%	51.5%
% 0f Total	18.3%	33.3%	51.5%
No Count	59	25	84
Expected Count	42.0	42.0	84.0
% within Campaign	70.2%	29.8%	100.0%
% within institution	29.5%	12.5%	21.0%
% of Total	14.8%	6.3%	21.0%
Not sure Count	68	42	110
Expected Count	55.0	55.0	110.0
% within Campaign	61.8%	38.2%	100.0%
% within institution	34.0%	21.0%	27.5%
% of Total	17.0%	10.5%	27.5%
Total Count	200	200	400
Expected Count	200.0	200.0	400.0
% within Campaign	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% of Total	50.0%	50.0%	100.0%

Table 9: Contingency table for a digital awareness campaign in the university of Zululand and Durban University of Technology

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	37.383[a]	2	000
Likelihood Ratio	38.100	2	.000
Linear-by-Linear Association	25.183	1	.000
N of Valid Cases	400		

Table 10: Chi-Square Tests showing digital awareness campaigns in the University of Zululand and Durban University of Technology to increase digital learning.

0 cells (0.0%) have an expected count less than 5. The minimum expected count is 42.00.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells has expected count less than 5. The minimum expected count in this table is 42.00. In another table, the minimum expected count (value) will change. Tables 9 and 10 showed that there was a significant relationship between digital awareness campaigns in the University of Zululand and Durban University of Technology to increase digital learning: X2(2, N =400) = 37.383, p = .000.

5.5.3 Lecturer(s) are conversant with digital learning

Lecturers	Institutions		
	UNIZULU	DUT	Total
Yes Count	130	168	298
Expected Count	149.0	149.0	298.0
% within lecturers	43.6%	56.4%	100.0%
% within institution	65.0%	84.0%	74.5%
% 0f Total	32.5%	42.0%	74.5%
No Count	37	19	56
Expected Count	28.0	28.0	56.0
% within lecturers	66.1%	33.9%	100.0%
% within institution	18.5%	9.5%	14.0%
% 0f Total	9.3%	4.8%	14.0%
Not sure Count	33	13	46
Expected Count	23.0	23.0	46.0
% within lecturers	71.7%	28.3%	100.0%
% within institution	16.5%	6.5%	11.5%
% 0f Total	8.3%	3.3%	11.5%
Total Count	200	200	400
Expected Count	200.0	200.0	400.0

% within lecturers	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% 0f Total	50.0%	50.0%	100.0%

Table 11: Contingency table for lecturers' efficiency in the University of Zululand and Durban University towards digital learning

	Value	**Df**	**Asymptotic Significance (2-sided)**
Pearson Chi-quare	19.327[a]	2	000
Likelihood Ratio	19.741	2	. 000
Linear-by-Linear Association	18.115	1	. 000
N of Valid Cases	400		

Table 12: Chi-Square Tests showing lecturers' efficiency in the University of Zululand and Durban University of Technology towards digital learning.

0 cells (0.0%) have an expected count less than 5. The minimum expected count is 23.00.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells has expected count of less than 5. The minimum expected count in this table is 23.00. In another table, the minimum expected count (value) will change.

Tables 11 and 12 revealed that there was a significant relationship between lecturers' efficiency in the University of Zululand and Durban University of Technology towards digital learning: X2(2, N =400) = 19.327, p = .000.

5.5.4 The ICT division displays a good knowledge of digital learning through their programmes and practice.

ICT Division	**Institutions**		
	UNIZULU	**DUT**	**Total**
Yes Count	93	140	233
Expected Count	116.5	116.5	233.0
% within digital learning	39.9%	60.1%	100.0%
% within institution	46.5%	70.0%	58.3%
% 0f Total	23.3%	35.0%	58.3%
No Count	37	20	57
Expected Count	28.5	28.5	57.0
% within digital learning	64.9%	35.1%	100.0%

% within institution	18.5%	10.0%	14.2%
% 0f Total	9.3%	5.0%	14.2%
Not sure Count	70	40	110
Expected Count	55.0	55.0	110.0
% within digital learning	63.6%	36.4%	100.0%
% within institution	35.0%	20.0%	27.5%
% 0f Total	17.5%	10.0%	27.5%
Total Count	200	200	400
Expected Count	200.0	200.0	400.0
% within digital learning	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% 0f Total	50.0%	50.0%	100.0%

Table 13: Contingency table for ICT division displaying good knowledge of digital learning through their programmes and practice in the University of Zululand and Durban University of Technology

	Value	**Df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	22.733[a]	2	.000
Likelihood Ratio	22.981	2	.000
Linear-by-Linear Association	19.379	1	.000
N of Valid Cases	400		

Table 14: Chi-Square Tests for ICT division in displaying good knowledge of digital learning through their programmes and practice in the University of Zululand and Durban University of Technology

0 cells (0.0%) have an expected count less than 5. The minimum expected count is 28.00.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells has expected count of less than 5. The minimum expected count in this table is 28.00. In another table, the minimum expected count (value) will change.

Tables 13 and 14 display the fact that there was a significant relationship between the ICT division in the University of Zululand and Durban University of Technology for displaying good knowledge of digital learning through their programmes and practice: $X2(2, N =400) = 22.733$, $p = .000$.

5.5.5 The Teaching and Learning Centre displays a good knowledge of digital learning through its programmes and practice

TLC Centre	Institutions		
	UNIZULU	DUT	Total
Yes Count	112	155	267
Expected Count	133.5	133.5	267.0
% within TLC centre	41.9%	58.1%	100.0%
% within institution	56.0%	77.5%	66.8%
% 0f Total	28.0%	38.8%	66.8%
No Count	38	20	58
Expected Count	29.0	29.0	58.0
% within TLC centre	65.5%	34.5%	100.0%
% within institution	19.0%	10.0%	14.5%
% 0f Total	9.5%	5.0%	14.5%
Not sure Count	50	25	75
Expected Count	37.5	37.5	75.0
% within TLC centre	66.7%	33.3%	100.0%
% within institution	25.0%	12.5%	18.8%
% 0f Total	12.5%	6.3%	18.8%
Total Count	200	200	400
Expected Count	200.0	200.0	400.0
% within TLC centre	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% 0f Total	50.0%	50.0%	100.0%

Table 15: Contingency table for the teaching and learning centre displays a good knowledge of digital learning through their programmes and practice in the University of Zululand and Durban University of Technology

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20.845[a]	2	.000
Likelihood Ratio	21.130	2	.000
Linear-by-Linear Association	18.462	1	.000
No of Valid Cases	400		

Table 16: Chi-Square Tests for the teaching and learning centre that displays a good knowledge of digital learning through their programmes and practice in the University of Zululand and Durban University of Technology

0 cells (0.0%) have an expected count less than 5. The minimum expected count is 29.00.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells shas an expected count of less than 5. The minimum expected count in this table is 29.00. In another table, the minimum expected count (value) will change.

Tables 15 and 16 declared a significant relationship between teaching and learning centres in the University of Zululand and Durban University of Technology towards digital learning: X2(2, N =400) = 20.845, p = .000.

5.5.6 I am assisted to learn faster during the lockdown using Moodle

Lockdown	**Institutions**		
	UNIZULU	**DUT**	**Total**
True Count	110	135	245
Expected Count	122.5	122.5	245.0
% within lockdown	44.9%	55.1%	100.0%
% within institution	55.0%	67.5%	61.3%
% 0f Total	27.5%	33.8%	61.3%
False Count	80	53	133
Expected Count	66.5	66.5	133.0
% within TLC centre	60.2%	39.8%	100.0%
% within institution	40.0%	26.5%	33.3%
% 0f Total	20.0%	13.3%	33.3%
I don't know Count	10	12	22
Expected Count	11.0	11.0	22.0
% within TLC centre	45.5%	54.5%	100.0%
% within institution	5.0%	6.0%	5.5%
% 0f Total	2.5%	3.0%	5.5%
Total Count	200	200	400
Expected Count	200.0	200.0	400.0
% within TLC centre	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% 0f Total	50.0%	50.0%	100.0%

Table 17: Contingency table for assisting students to learn faster during the lockdown using Moodle in the University of Zululand and Durban University of Technology.

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.214[a]	2	016
Likelihood Ratio	8.257	2	016
Linear-by-Linear Association	3.698	1	.054
N of Valid Cases	400		

Table 18: Chi-Square Tests for assisting students to learn faster during the lockdown using Moodle in the University of Zululand and Durban University of Technology.

0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 11.00.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells shas an expected count of less than 5. The minimum expected count in this table is 11.00. In another table, the minimum expected count (value) will change.

From table 17 and 18, it can be observed that there was a significant relationship between the University of Zululand and Durban University of Technology in assisting students to learn faster during the lockdown using Moodle: $X^2(2, N =400) = 8.214$, $p = .016$

5.5.7 I learn better through online teaching during the lockdown

Lockdown	Institutions		
	UNIZULU	DUT	Total
True Count	97	129	226
Expected Count	113.0	113.0	226.0
% within lockdown	42.9%	57.1%	100.0%
% within institution	48.5%	64.5%	56.5%
% 0f Total	24.3%	32.3%	56.5%
False Count	99	65	164
Expected Count	82.0	82.0	164.0
% within lockdown	60.4%	39.6%	100.0%
% within institution	49.5%	32.5%	41.0%
% 0f Total	24.8%	16.3%	\41.0%
I don't know Count	4	6	10
Expected Count	5.0	5.0	10.0
% within lockdown	40.0%	60.0%	100.0%
% within institution	2.0%	3.0%	2.5%
% 0f Total	1.0%	1.5%	2.5%

Total Count	200	200	400
Expected Count	200.0	200.0	400.0
% within lockdown	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% 0f Total	50.0%	50.0%	100.0%

Table 19: Contingency table showing students' responses to online teaching during the lockdown in the University of Zululand and Durban University of Technology

	Value	**Df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	11.980[a]	2	.003
Likelihood Ratio	12.049	2	.002
Linear-by-Linear Association	7.521	1	.006
N of Valid Cases	400		

Table 20: Chi-Square Tests online teaching during the lockdown in the University of Zululand and Durban University of Technology

0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 5.00.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells shas expected count of less than 5. The minimum expected count in this table is 5.00. In another table, the minimum expected count (value) will change.

Tables 19 and 20 depicted that there was a significant relationship between the University of Zululand and Durban University of Technology as regards online teaching during the lockdown: $X^2(2, N = 400) = 11.980, p = .003$

5.5.8 I am aided to learn faster during lockdown through the provision of online materials such as an e-book, etc

Online Material	**Institutions**		
	UNIZULU	**DUT**	**Total**
True Count	106	134	240
Expected Count	120.0	120.0	240.0
% within online material	44.2%	55.8%	100.0%
% within institution	53.0%	67.0%	60.0%
% 0f Total	26.5%	33.5%	60.0%
False Count	84	57	141

Expected Count	70.5	70.5	141.0
% within online material	59.6%	40.4%	100.0%
% within institution	42.0%	28.5%	35.3%
% 0f Total	21.0%	14.2%	35.3%
I don't know Count	10	9	19
Expected Count	9.5	9.5	19.0
% within online material	52.6%	47.4%	100.0%
% within institution	5.0%	4.5%	4.8%
% of Total	2.5%	2.3%	4.8%
Total Count	200	200	400
Expected Count	200.0	200.0	400.0
% within online material	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% of Total	50.0%	50.0%	100.0%

Table 21: Contingency table showing students' responses to online materials such as an e-book that aided learning during the lockdown in the University of Zululand and Durban University of Technology.

	Value	**Df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	8.490[a]	2	.014
Likelihood Ratio	8.529	2	014
Linear-by-Linear Association	6.128	1	.013
N of Valid Cases	400		

Table 22: Chi-Square Tests showing students' responses to online materials such as an e-book that aided learning during the lockdown in the University of Zululand and Durban University of Technology

0 cells (0.0%) have an expected count less than 5. The minimum expected count is 9.50.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells has expected count of less than 5. The minimum expected count in this table is 9.50. In another table, the minimum expected count (value) will change.

Tables 21 and 22 established that there was a significant relationship between the University of Zululand and Durban University of Technology as regards online materials such as an e-book that aided learning during the lockdown $X^2(2, N = 400) = 8.490$, $p = .016$

5.5.9 I learn faster during lockdown through the online assignments given by lecturers

Online Assignment	Institutions		
	UNIZULU	DUT	Total
True Count	118	141	259
Expected Count	129.5	129.5	259.0
% Within online assignment	45.6%	54.4%	100.0%
% Within institution	59.0%	70.5%	64.8%
% of Total	29.5%	35.3%	64.8%
True Count	78	48	126
Expected Count	63.0	63.0	126.0
% Within online assignment	61.9%	38.1%	100.0%
% Within institution	39.0%	24.0%	31.5%
% of Total	19.5%	12.0%	31.5%
True Count	4	11	15
Expected Count	7.5	7.5	15.0
% Within online assignment	26.7%	73.3%	100.0%
% Within institution	2.0%	5.5%	3.8%
% of Total	1.0%	2.8%	3.8%
True Count	200	200	400
Expected Count	200.0	200.0	400.0
% Within online assignment	50.0%	50.0%	100.0%
% Within institution	100.0%	100.0%	100.0%
% of Total	50.0%	50.0%	100.0%

Table 23: Contingency table showing students' responses to online assignments given by teachers to aid fast learning during the lockdown in the University of Zululand and Durban University of Technology

	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.452[a]	2	002
Likelihood Ratio	12.654	2	.002
Linear-by-Linear Association	2.040	1	.153
N of Valid Cases	400		

Table 24: Chi-Square Tests showing students' responses to online assignments given by teachers to aid fast learning during the lockdown in the University of Zululand and Durban University of Technology

0 cells (0.0%) have an expected count less than 5. The minimum expected count is 7.50.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells has expected count of less than 5. The minimum expected count in this table is 7.50. In another table, the minimum expected count (value) will change.

Tables 23 and 24 affirmed that there was a significant relationship between the University of Zululand and Durban University of Technology as regards online assignments given by teachers to aid fast learning during the lockdown $X2(2, N =400) = 12.452$, $p = .002$.

5.5.10 The internet data provided by the university to me helps me to learn faster during lockdown

Internet Data Provided	Institutions		
	UNIZULU	**DUT**	**Total**
True Count	94	156	250
Expected Count	125.0	125.0	250.0
% within data provided	37.6%	62.4%	100.0%
% within institution	47.0%	78.0%	62.5%
% of Total	23.5%	39.0%	62.5%
True Count	102	40	142
Expected Count	71.0	71.0	142.0
% within data provided	71.8%	28.2%	100.0%
% within institution	51.0%	20.0%	35.5%
% of Total	25.5%	10.0%	35.5%
True Count	4	4	8
Expected Count	4.0	4.0	8.0
% within data provided	50.0%	50.0%	100.0%
% within institution	2.0%	2.0%	2.0%
% of Total	1.0%	1.0%	2.0%
True Count	200	200	400
Expected Count	200.0	200.0	400.0
% within data provided	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% of Total	**50.0%**	**50.0%**	**100.0%**

Table 25: Contingency table showing students' responses to internet data provided by the University that aided fast learning during the lockdown in the University of Zululand and Durban University of Technology.

	Value	Df	Asymptotic Significance (2-sided)	Exact sig (2 sided)	Exact sig (1Point Probability sided)
Pearson Chi-Square	42.446[a]	2	.000	.000	
Likelihood Ratio	43,54	2	.000	.000	
Fisher's exact test	43.334	1			
Linear-by-Linear Association	34.361 [b]	1	.000	.000	.000
N of Valid Cases	400				

Table 26: Chi-Square Tests showing students' responses to internet data provided by the University to aid fast learning during the lockdown in the University of Zululand and Durban University of Technology

2 cells (33.3%) have an expected count of less than 5. The minimum expected count is 4.00. The standardised statistic is – 5.862

Using exact in this table because SPSS has complained that 2 cells with 3.3% have expected count less than 5. The implication is that the Pearson chi-square is not valid. You will see that the minimum expected count in this table is 4.

The analysis in Table 26 showed that 2 cells had an expected count of less than 5. Therefore, an exact significance test was adopted in respect of the Pearson chi-square. Hence, Tables 25 and 26 attested to the fact that there was a significant relationship between the University of Zululand and Durban University of Technology as regards internet data provided by the university to aid fast learning during the lockdown .X2(2, N =400) = 42.446, p = .000.

5.5.11 Supply of laptops by the institution helps me to learn faster during lockdown

Laptop Supplied	**Institutions**		
	UNIZULU	**DUT**	**Total**
True Count	66	80	\146
Expected Count	73.0	73.0	146.0
% within data provided	45.2%	54.8%	100.0%
% within institution	33.0%	40.0%	36.5%

% of Total	16.5%	20.0%	36.5%
False Count	109	77	186
Expected Count	93.0	93.0	186.0
% within data provided	58.6%	41.4%	100.0%
% within institution	54.5%	38.5%	46.5%
% of Total	27.3%	19.3%	46.5%
I don't know Count	25	43	68
Expected Count	34.0	34.0	68.0
% within data provided	36.8%	63.2%	100.0%
% within institution	12.5%	21.5%	17.0%
% of Total	6.3%	10.8%	17.0%
Total Count	200	200	400
Expected Count	200.0	200.0	400.0
% within laptop	50.0%	50.0%	100.0%
% within institution	100.0%	100.0%	100.0%
% 0f Total	50.0%	50.0%	100.0%

Table 27: Contingency table showing students' responses to the supply of laptops by the institution to aid fast learning during the lockdown in the University of Zululand and Durban University of Technology

	Value	**Df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	11.613[a]		.003
Likelihood Ratio	11.699	2	.003
Linear-by-Linear Association	.080	1	.777
N of Valid Cases	400		

Table 28: Chi-Square Tests showing students' responses to the supply of laptops by the institution to aid fast learning during the lockdown in the University of Zululand and Durban University of Technology

0 cells (0.0%) have an expected count less than 5. The minimum expected count is 34.00.

The above statement is always shown by SPSS as a rule of thumb to show that chi-square is valid because none of the cells has expected count of less than 5. The minimum expected count in this table is 34.00. In another table, the minimum expected count (value) will change.

Tables 27 and 28 showed that there was a significant relationship between the University of Zululand and Durban University of Technology as regards the supply of laptops by the institution to aid fast learning during the lockdown $X^2(2, N = 400) = 11.613$, $p = .003$

5.6 Research Question Four

What are the factors hindering the selected South African universities from equipping students for eLearning?

S/N	Variable	University of Zululand			Durban University of Technology		
		True	False	I do not know	True	False	I do not know
1.	The curriculum hinders me from preparing for digital learning	101 50.5%	44 22.0 %	55 27.5%	137 68.5 %	38 19.0 %	25 612.5 %
2.	Lack of exposure hinders me from preparing for digital learning	113 56.5%	60 30.0 %	27 13.5%	139 69.5 %	43 21.5 %	18 9.0%
3.	The modules that I do hinders me from preparing for digital learning	122 61%	50 25.0 %	28 14.0%	143 71.5 %	43 21.5 %	14 7.0%
4.	Relationship with my lecturers hinders me from preparing for digital learning	106 53.0%	64 32.0 %	30 15.0%	118 59.0 %	55 27.5 %	27 13.5%
5.	Policies on campus does not promote digital learning	87 43.5%	49 24.5 %	64 32.0%	116 58.0 %	42 21.0 %	42 21.0%

Table 29: Statistics showing factors hindering the University of Zululand and Durban University of Technology in equipping students for eLearning

Table 29 depicted the plans that militated against equipping students for eLearning. The first factor was whether the curriculum hindered students from preparing for digital learning; 50.5% from UNIZULU and 68.5% came from DUT to support the assertion. 22% and 19% of the students disagreed while 27.5% and 12.5% from UNIZULU and DUT were on the side of "I don't know." In terms of whether lack of exposure hinders students from preparing for digital learning; 56.5% of students from UNIZULU and 69.5% from DUT chorously supported this claim. 30% from UNIZULU and 21.5% from DUT were not in support while 13.5% from UNIZULU and 9% from DUT fell flatly to the side of "I do not know." On the issue of whether the modules that students

did hinder them from preparing for digital learning received the wholesome agreement of 61% of the students from UNIZULU and 71.5% from DUT. In another factor, 53% of students from UNIZULU and 59% from DUT affirmed that their relationship with the lecturers hindered students from preparing for digital learning. 32% from UNIZULU and 27.5% from DUT did not agree with the statement. Also, 15% from UNIZULU and 13.5% from DUT did not know what to say. Furthermore, whether policies on campus did not promote digital learning received the support of 43.5% of the respondents from UNIZULU and 58% of them from DUT. 24.5% from UNIZULU and 21% from DUT disapproved of the assertion while 32% from UNIZULU and 21% from DUT were not aware of the claim.

5.7 Conclusion

In this chapter, the results of the analysed data from students' responses were presented. The next chapter (Chapter 8) presents the findings of the analysed data from the conducted interviews with both academic and non-academic staff members of the two selected South African universities.

CHAPTER 6

PRESENTATION OF QUALITATIVE DATA

6.1 Introduction

The objective of this chapter is to present the results of the interview which provides further answers regarding the research questions 1,2,3, 4 and 5. This is done to enhance triangulation about Ngulube (2015), who thinks that this is of great significance to both quantitative and qualitative research to enhance the trustworthiness, reliability and validity of quantitative research. Hence, this study employed triangulation as a method of gathering information which could be of great importance in authenticating the findings collected in Chapter 5 which presented the result of the quantitative data through the use of questionnaires.

One (1) Academic staff and two Non-academic staff (2) were purposively selected each from the two selected institutions of learning, making the total number of selected academic staff two (2) and four (4) non-academic staff. Lecturers lecturing 2nd and 3rd year undergraduate students were selected because they are involved in teaching the students and they work with the designed syllabi. The representative of the ICT unit was selected because the unit is responsible for assisting lecturers in ensuring eLearning activities. Meanwhile, Teaching and Learning staff members were selected to participate in the study following their contributions in enhancing eLearning activities, training academic staff members, and assisting students in different ways such as academic writing, tutorial sessions, among others. As stated earlier, the interview centered on the five (5) research questions of the study. The sequence of the research question with the interview questions are displayed below in Table 30

S/N	Research Questions	Interview Questions
RQ1	What is the level of awareness of students at the selected South African universities on digital learning?	1. Do you think students in your institution are aware of digital learning? Yes/No 1b. If yes, what do you think is their level of awareness of digital learning?
RQ2	What plans have policymakers in the selected South African universities put in place to transform the curricula for digital learners?	(2) What are the various steps taken or plans put in place by the institution and your department to transform the curriculum for digital learners?
RQ3	How are the syllabi of the selected South African universities restructured for relevance in the 4IR?	(3) Does the syllabus of your institution cater for students' relevance in the 4IR? If YES, how? If NO, what measures is the institution taking towards ensuring that it is restructured for relevance?
RQ4	What are the factors hindering the selected South African universities from equipping students for eLearning?	(4) What are the factors hindering the institution from preparing students for digital learning?
RQ5	What is the most suitable framework that can assist policymakers at the selected South African universities to embrace eLearning on an ongoing basis?	(5) How are students in your institution fast-tracked into embracing eLearning especially because of the unexpected COVID-19 lockdown? (6) What do you think can be done to enhance universities in preparation for digital learning?

Table 30: Sequence between research questions and interview questions

6.2 Themes from the Analysed Interviews

As sequel to the analysed data from the conducted interviews, the following identified themes are generated and explained.

Theme 1: Students' awareness level on digital learning

The analysis of the interviewee's reports showed that the awareness level of students from the two selected South African universities on digital learning is high. For instance, an interviewee from DUT reported saying "Yes, students have awareness of digital learning, and their level of awareness is advanced which improved drastically due to remote learning currently used because of the pandemic." Similarly, an interviewee from UNIZULU reported that: "students in our institution are aware of digital learning and their level of awareness is intermediate." The participant from UNIZULU however, attributed the high awareness level of students on digital learning to their exposure to computer literacy programmes. The participant reported saying: "…. this is because of the use of various platforms. From the onset of their study, students are made to take modules such as Computer Literacy/Studies" This finding of the study somewhat corroborates the projection of the conceptualised model which advocates that the institution of learning which in this case is the marketer (sender) of the product (digital learning) is to create awareness for the students who are the buyers (receiver).

Theme 2: Plans by institutions for curriculum transformation

Findings from theme 2 suggest that institutions have plans in place for curriculum transformation with regards to digital learning. For instance, a participant from UNIZULU reported with regards to the identified theme that: "The plan put in place by the institution is the use of Moodle for classwork and Microsoft Teams for Workshops", Another participant from the same institution when speaking specifically with regards to department reported that: "The steps to the transformation of curriculum as employed in my department started with the use of blended learning approach which involves the use of a combination of online interaction now traditional face to face classroom interactions to now almost a full-fledged online content delivery where

almost all that needs to happen within teaching and learning take place online though this is not appropriately backed up by relevant procedures/policy." Similarly, from DUT, a participant reported on the same subject: "The department has made it their duty to educate learners about the new digital curriculum which includes, marking online, comment, online, holding classes online, uploading work, conducting tests online, etc." The foregoing suggests the plans put in place and followed by the selected institutions with regards to curriculum transformation as it applies to digital learning. This finding of the study aligns with the designed model. In the context of this study, the universities are the marketers transmitting information (knowledge/learning) through the use of channels (digital platforms such as Moodle, Microsoft teams, etc) to the receiver (students).

Theme 3: Institutions catering for students' relevance in the 4IR through the syllabus

Theme 3 showed that while one of the selected institutions is making attempts to cater for students' relevance in the 4IR through the use of syllabi, the other seems not to. For instance, a participant from DUT reported on this subject saying: "Yes. The relevance and application of 4IR vary in each discipline. However, in terms of teaching and learning, each subject/module lecturer is expected to utilize LMS in teaching and learning activities. The curriculum is also reviewed yearly in the department to ensure that students are exposed to up-to-date discipline-specific applications and technologies." Conversely, a participant from UNIZULU reported that: "Not yet, the digital learning space in the institution is still evolving and the university is putting policies and even a place to check whether a student is learning and engaging the provided content, even attendance registers for classes taught online." This finding indicates that UNIZULU still has work to do in this area while DUT perhaps needs to maintain or improve on that which has been put in place.

Theme 4: Factors hindering digital learning

The analysed data from conducted interviews showed that several factors tend to be hampering digital learning in the two selected South African universities. This is based on the reports from participants. For instance, a participant from UNIZULU reported saying: "As much as the university wants to ensure digital learning, certain factors hinder this mission. 1. Only students

with bursaries are supplied laptops by the institutions. 2. Some students do not get data bundles regularly. 3. The location of some students deprives them of access to good internet connectivity. 4. Inadequate computer knowledge and skills of some students. 5. Inability to buy laptops for some students without a bursary. Also, the poor economic situation of some students to purchase data bundles for the internet or smartphones…." In the same vein, a participant from DUT reported that "One of the major factors is extreme inequality, which results in varying levels of exposure and financial capabilities. While the institution is doing its best to provide necessary facilities, students also need to have their devices to effectively participate in digital learning. Unfortunately, not all students can afford most of these devices. Hence, pushing the idea of digital learning sometimes seems like excluding some groups of students in the learning process. Another factor hindering digital learning is that many academic staff members are reluctant in embracing the new mode of teaching" This suggests that the selected universities are experiencing some forms of hindrances on digital learning due to various factors.

Theme 5: Fast-tracking students' embracing of eLearning

This theme showed that the selected universities are making attempts to fast-track how well their students embrace eLearning. For example, a participant from UNIZULU said that "The university has tried to provide laptops for students, and also provide data-free access to the Learning Management System and has even provided data to enable students to access online content. Also, the university has provided sensitization programs aimed at introducing students to the digital possibilities to their learning needs, especially with the new students." In the same vein, a participant from DUT said "The institution provided training and technical support for students during the process of migrating to remote learning." However, another participant from DUT reporting on the same issue reported that "It's very poor considering the above-mentioned factors and also their unwillingness (excuses) of embracing eLearning." This suggests that while institutions may be taking steps to fast-track students' acceptance and embracing of eLearning, certain factors earlier identified hamper such.

Theme 5: Preparation for digital learning

Theme 5 showed that different education stakeholders have different roles to play in ensuring that institutions of learning and students are prepared for digital learning. For instance, a participant from DUT reported that "Institutions still have a long way to go to get digital learning right. Students should be given more responsibility for their learning and not be allowed to have excuses as though they don't know they have to do digital learning. The lack of policies and guidelines for digital learning also needs much consideration." Meanwhile, another participant from UNIZULU has this to say on the same issue: "The university with the stakeholders, NGO, big conglomerates and others, need to provide the necessary support to all students. This implies that all students must be provided with personal laptops, data bundles, smartphones with which they can regularly access learning. Technical know-how should be provided to the students by computer-related companies and NGO to enable them to maximize the learning technologies." In the same vein, another participant from DUT said: "Academic staff should be encouraged to embrace digital learning, and ongoing training should be organized for lecturers." These comments show that in the preparation for digital learning, various stakeholders have different roles to perform.

The findings on the identified themes from the conducted interviews are further explained and presented in detail in tables 31, 32, 33, 34, 35, and 36 below following each identified research question.

6.2 Do students in your institution have awareness of digital learning and their level of awareness?

This question aimed to find out whether the students from the selected institution are aware of digital learning and their level of awareness regarding digital learning

UNIZULU	DUT	Remark
*Yes, students in our institution are aware of digital learning and their level of awareness is intermediate. This is because of the use of various platforms. From the onset of their study, students are made to take modules such as Computer Literacy/Studies. Students are also introduced to blended learning through Moodle, one of the various types of Learning Management systems. Students explore learning through their smartphones or tablets as well. All these are avenues for them to be aware that education is digital nowadays. With the emergence of COVID-19, students are limited to online learning, which is the alternative to face-to-face and blended learning before the COVID-19 pandemic. *Yes, students in our institution are aware of digital learning and their level of awareness of digital learning is quite high. *Yes, students are aware of digital learning in our institution and their level of awareness is medium	* Yes, students have awareness of digital learning, and their level of awareness is advanced which improved drastically due to remote learning currently used because of the pandemic. *Yes, students have awareness of digital learning, and their level of awareness is high. However, as much as students are aware of digital learning, they do not put enough effort to learn how to use digital tools. *Yes, students are aware of digital learning although their level of awareness is poor. However, I believe that the students are not playing their part to be more informed and aware of digital learning, but rather they use excuses and do not take any responsibility.	*From the analysis of the interview question, the researcher finds out that the six (6) selected interviewees agree that students are aware of digital learning. *This is in line with Puentedura (2018) that many higher institutions of learning have recognized digital learning as an essential tool in their teaching and learning activities. *The responses of the participants further revealed that the level of students' awareness of digital learning from the two selected institutions differs from each other. *Saubari and Baharuddin (2016) supported this position by stating that the level of awareness on digital learning in this modern-day era needs to be given more attention and promoted amongst students of all levels.

Table 31: Level of awareness of digital learning (N=6)

Note: N=6 means 6 participants were interviewed for this question

The information in table 31 represents the transcribed interview responses by the staff of the two selected institutions of learning.

6.3 What are the various plans by the institution to transform the curriculum for digital learners?

This question was designed to find out what the various steps are or plans that the selected institutions of learning or departments have provided in transforming the curriculum for digital learners.

UNIZULU	DUT	Remark
*The step put in place by the institution to transform the curriculum is that students are compelled to adapt to online learning, especially with the pandemic. The students are provided with laptops and data bundles for them to access learning. Teachers also communicate or deliver instructions through WhatsApp, audio-recorded voicemail, Zoom meetings. Learning materials are made available on Moodle. *The steps to the transformation of curriculum as employed in my department started with the use of blended learning approach which involves the use of a combination of online interaction now traditional face to face classroom interactions to now almost a full-fledged online content delivery where almost all that needs to happen within teaching and learning take place online though this is not appropriately backed up by	*The university has taken several steps to support digital learning such as enhancing facilities (internet connectivity, computer labs etc.), prioritizing e-resources (e-library) as well as providing LMS to support e-learning. During the lockdown, the department also recirculated modules to accommodate digital/remote learning and assessment. *There are several webinars that have been organized by the institution, faculty, and department, but the participation of students is very bad because digital learning is a thing of today and the future. *The department has made it their duty to educate learners about the new digital	*All the interviewees in the two institutions responded to this question regarding the plans that the institution has provided for curriculum transformation. *The interview participants acknowledged the use of online learning platforms in the delivery of teaching and learning to students as a strategy provided by the institution to transform the curriculum for digital learners. *This corroborates with the findings of Pirapuraj et al., (2019) which states that online learning has become

relevant procedures/policy. There might be a mismatch with regard to consistency in the adoption of digital learning. *The plan put in place by the institution is the use of Moodle for classwork and Microsoft Teams for Workshops	curriculum which includes, marking online, commenting, online, holding classes online, uploading work, conducting tests online, etc.	more popular in education with an increase in its users as well as a rise in the use of Internet facilities. *Also, The World Bank (2020) explains that online learning has become a major concept in the educational sector by converting the traditional form of learning into a virtual approach to learning. Furthermore, some of the tools used include Moodle, Zoom, Google Classroom, YouTube.

Table 32: Plans by institutions for curriculum transformation (N=6)

Note: N=6 means 6 participants were interviewed for this question

6.4 Does the syllabus of your institution cater for students' relevance in the 4IR?

This question was asked to find out if the syllabus of the selected institution of learning caters for their students' relevance in the 4IR and how this has been achieved.

UNIZULU	DUT	Remark
* Yes, the institution is aware of the need to prepare the students for 4IR, this is ensured through the provision of all learning contents for all Modules/courses on the Moodle. The students are also introduced to computer knowledge and skills during their first year of study/admission. Provision of laptops to students in the first year is also a measure by the institution. *Yes, the institution caters for students' relevance in the 4IR through the distribution of laptops for students even though not all of them have received them. *Not yet, the digital learning space in the institution is still evolving and the university is putting policies and even places to check whether a student is learning and engaging the provided content, even attendance registers for classes taught online	* Yes, the teaching and learning are done digitally and also the assessments are done digitally. Also, the institution provides the minimum required resources needed to make sure that students can cover the syllabus that requires the use of 4IR. * Yes. The relevance and application of 4IR vary in each discipline. However, in terms of teaching and learning, each subject/module lecturer is expected to utilize LMS in teaching and learning activities. The curriculum is also reviewed yearly in the department to ensure that students are exposed to up-to-date discipline-specific applications and technologies. *Yes it does, it has changed instantly to 4IR and made means for the	*The six (6) selected interviewees were asked this question on if the syllabus of the selected institution caters for students' relevance in 4IR. *The summary of the responses from 5 of the participants from both UNIZULU and DUT are similar to each other. *However, one of the participants disagrees with the response that the institution is yet to cater for students' relevance in the 4IR because the digital learning space in the institution is still evolving.

	students to be accommodated. Students have their accounts on Moodle, Microsoft teams, they're able to register online and submit online.	

Table 33: Syllabus of the institution to cater for students' relevance in the 4IR (N=6)

Note: N =6 means six (6) participants were interviewed for this question

6.5 What are the factors hindering digital learning?

This is aimed to find out the factors which areare hindering the selected institution in preparing the students for digital learning

UNIZULU	DUT	Remark
*First and foremost is the digital divide which means that most students do not have equal access to technology. This goes beyond just the use of computers and the internet to the availability of necessary infrastructure and amenities that affect education and lives in general. *As much as the university wants to ensure digital learning, certain factors hinder this mission. 1. Only students with bursary are supplied laptops by the institutions. 2. Some students do not get data bundles regularly. 3. The location of some students deprives them of access to good internet connectivity. 4. Inadequate computer knowledge and skills of some students. 5. Inability to buy laptops for some students without a bursary. Also, the poor economic situation of some students to purchase data bundles for the internet or smartphones. 6. Load shedding or absence of electricity in some rural areas.	*I would say the network connectivity of the country is the major factor. Another factor I would say is the availability of devices. Digital learning requires proper working devices and considering that most of the students are using mobile phones (cell phones), digital learning on a computer (laptop and desktop) can never be the same as compared to mobile phones (cell phones). *One of the major factors is extreme inequality, which results in varying levels of exposure and financial capabilities. While the institution is doing its best to provide necessary facilities, students also need to have their devices to effectively participate in digital learning. Unfortunately, not all students can afford most of these devices. Hence, pushing the idea of digital learning sometimes seems like excluding some groups of students in the learning process. Another factor hindering digital learning is	*The question on the factors hindering digital learning was posed to six (6) academic and non-academic staff members that participated in the interview. *The responses of the interviewed participants establishedthe digital divide as factor hindering digital learning. *This is in line with Van Deursen and van Dijk (2019) that note that the digital divide has become a limiting factor in the use of educational technology globally including South Africa in enhancing digital learning. Dlamini and Nkambule (2019) supported this position by adding that the majority of students in higher institutions in South Africa are victims of the digital divide which as result, hinders their access to digital learning.

*Shortage of resources from either DHET or funding organizations	that many academic staff members are reluctant in embracing the new mode of teaching. *Proactive students are somehow delayed of data; the data is loaded late for students and that does cause a delay in teaching and learning	

Table 34: Factors hindering digital learning (N=6)

Note: N =6 means six (6) participants were interviewed for this question

6.6 How are students in your institution fast-tracked into embracing eLearning?

This question was asked purposely to find out how students in the selected institution of learning are fast-tracked into embracing eLearning due to the unexpected pandemic COVID-19 lockdown.

UNIZULU	DUT	Remark
* The university has tried to provide laptops for students, and also provide data-free access to the Learning Management System and has even provided data to enable students to access online content. Also, the university has provided sensitization programs aimed at introducing students to the digital possibilities to their learning needs, especially with the new students. * It is difficult to fast track students who are in disadvantaged locations. However, the provision of laptops and data packages is done by the university, to make students adapt to the e-learning approach. *The campuses are open for students to make use of facilities while observing all COVID-19 protocols.	* It's very poor considering the above-mentioned factors and also their unwillingness (excuses) of embracing eLearning. *The institution provided training and technical support for students during the process of migrating to remote learning. *COVID-9: it would have been easier if students were dto prepare for online learning before the country lockdown because some of them did not know how to use some of the tools.	*This question was directed at both the academic and non-academic staff members in the selected institution (6 in number) interviewed for this study. *The summary of the responses from the participants in UNIZULU indicated that provision of laptops for students, data, awareness programmes and the use of school facilities are ways the institution of learning is fast-tracking students into embracing eLearning *The way identified by DUT participants was quite similar to those of UNIZULU, except the identification of the unpreparedness and unwillingness (excuses) of the student to embrace e-learning.

Table 35: How students are fast-tracked into embracing e-learning

Note: N =6 means six (6) participants were interviewed for this question

6.7 How can universities be enhanced in the preparation for digital learning?

This question was asked purposely to find out the possible solutions to enhance the selected universities in the preparation for digital learning.

UNIZULU	DUT	Remark
*The university with the stakeholders, NGO, big conglomerates and others, need to provide the necessary support to all students. This implies that all students must be provided with personal laptops, data bundles, smartphones with which they can regularly access learning. Technical know-how should be provided to the students by computer-related companies and NGOs to enable them to maximize the learning technologies. *The provision of equal opportunities to all students as an example is in the provision of laptops; this can be done across the board irrespective of whether a student is under a loan system or not. The other one is that the university must provide a proper structure or even a monitoring mechanism that can ensure that their impartation of learning is taking place through digital learning. * Provision of resources including internet data or unlimited Wi-Fi whether on campus or at home, workshops on	*Institutions still have a long way to go to get digital learning right. Students should be given more responsibility for their learning and not be allowed to have excuses as though they don't know they have to do digital learning. The lack of policies and guidelines for digital learning also need much consideration *Academic staff should be encouraged to embrace digital learning, and ongoing training should be organized for lecturers. *By far universities have done what is adequate to enhance online learning since students and lecturers can do everything.	*As a follow up to the previous question, the participants were asked to provide suggestions on how to enhance universities in preparation for digital learning. *In UNIZULU, the participants suggest stakeholders, NGOs, big conglomerates and others provide necessary support like laptops, data bundles and smartphones to all students. Workshops and proper structure or monitoring mechanism. *Similarly in DUT, students should be given more responsibility for their learning. Policies and guidelines should be provided for digital learning. Also, ongoing training should be given to lecturers.

digital learning tools and operations thereof.		

Table 36: Preparation for digital learning (N=6)

Note: N =6 means six (6) participants were interviewed for this question

6.8 Chapter Summary

This chapter brings out the findings obtained from the interviews with academic and non-academic staff of the selected institution on the role of universities in embracing transformation brought about by 4IR. Six (6) academic and non-academic staff in the two selected institutions participated in the interviews: (1) academic staff and two (2) non-academic staff (Staff in ICT and teaching and learning) in UNIZULU and (1) academic staff and two (2) non-academic staff (Staff in ICT and teaching and learning) in DUT. The responses gathered from the interview are highlighted from table 6.2 to 6.7, revealing significant similarities in the role of universities embracing transformation brought about by 4IR in the two selected institutions of the study. Moreover, in UNIZULU, it was discovered that stakeholders, NGOs and big conglomerates should provide necessary support like laptops, Internet data bundles and smartphones to all students to enhance universities in preparation for digital learning. In DUT, however, the responses from the interviews revealed that students should be given more responsibility for their learning, as well as policies and guidelines should be provided for digital learning. Furthermore, results obtained from the data through the use of questionnaires and interviews are discussed in the next chapter which shows the major findings of this study.

CHAPTER 7

DISCUSSION OF MAJOR FINDINGS

7.1 Introduction

In the last two chapters (Chapters 5 and 6), the analysed data from students and staff members of the selected universities were presented. In this chapter, the discussion focuses on the major findings following the analysed data. Hence reference would be made to the last two chapters (chapters 5 and 6) in alignment or contrast with the literature of previous scholarly works with regards to the subject matter. The major findings from the analysed data are discussed following various headings and sub-headings which capture the objectives of the study. The headings include demography of respondents; the level of awareness of students at the selected South African universities on digital learning; Plans by policymakers to transform the curricula for digital learners; Syllabi Restructuring for Relevance in 4IR, and Factors Hindering Universities from Equipping Students for E-Learning, followed by the conclusion of the chapter.

7.2 Demography of Respondents

This section describes the demographic information of the respondents. Data of 200 (two hundred) respondents were selected and analysed from each of the two institutions meaning 400 (four hundred) in total. Data obtained from table 5 shows that the gender of the males in this study which comprises the two selected institutions are 43.0% while that of females are 57.0%. With regards to their year of study, the respondents from second-year students consist of 62.0% while those of third-year students are 38.0%. This implies that the majority of the respondents are females and they were from the second-year level.

7.3 The level of awareness of students at the selected South African universities on digital learning

Table 6 shows that the respondents from the two institutions have awareness of digital learning. The findings obtained from the respondents in this study revealed that the respondents have a high level of awareness on digital learning and the use of digital awareness campaigns in their institution has assisted them to increase their knowledge of digital learning. Furthermore, the use of ICT

divisions also contributed to the respondents' awareness of digital learning through programmes and practice. However, the respondent's level of awareness is low on whether lecturer(s) are conversant with digital learning while their perception of the Teaching and Learning Centre thus displaying good knowledge of digital learning through their programmes and practice is moderate. This result concurs with the responses from the interview conducted on 2 academic staff and 4 non-academic staff participants. Five of the interviewed participants said that students are aware of digital learning and their level of awareness is high. For instance, one of the responses from the participants state that:

> Yes, students have awareness of digital learning, and their level of awareness is advanced which improved drastically due to remote learning currently used as a result of the pandemic.

This finding is in line with Puentedura (2018) that many higher institutions of learning have recognized digital learning as an essential tool in their teaching and learning activities. Additionally, this aligns with the AIDA model propounded by Lewis (1898) and supported by a scholar like Hanlon (2021) which supports the need for the creation of awareness for a product in the context of this study is digital learning to be appreciated and purchased. This finding shows that the selected institutions of learning are aware of the impact that the creation of digital awareness can have on students embracing the use of technology. Consequently, the institutions are making attempts to create the needed awareness.

7.4 Plans by policymakers to transform the curricula for digital learners

The study examined the plans put in place in the selected universities to transform the curricula for digital learners. The survey result from figure 4 showed the students' responses to the policymakers' plans in the selected universities in transforming the curricula for digital learners. In the University of Zululand, 55% of the students agreed with the claim that they learn faster during the lockdown using Moodle while 40% disagreed. In the view of the students at the Durban University of Technology, 67.5% agreed that they learn faster during the lockdown using Moodle while 26.5% disagreed. Nevertheless, the remaining 5% and 6% respectively remained unaware. The findings corroborate with the response from one of the interviewed participants stating that:

> The plan put in place by the institution is the use of Moodle for classwork and Microsoft Teams for Workshops.

In a similar vein, a participant explains that:

> The step put in place by the institution to transform the curriculum is that students are compelled to adapt to online learning especially with the pandemic by making learning materials available on the Moodle.

This finding of the study coincides with the findings of the work of Patel and Patel (2017) who conducted a similar study on the comparison of various learner management systems which includes Moodle, ATutor, Eliademy, and Forma LMS. The results of the study show that compared to the other three LMSs, Moodle was the most effective learner management system. Meanwhile, Herayanti *et al.* (2018) opine that the use of Moodle for learning purposes can assist and improve students' level of understanding regarding certain concepts. Gunawan (2019) agrees that Moodle is a learning platform used by lecturers to communicate information, lectures, assignments, and other learning materials to students. However, in contrast, the work of Mpungose (2020) suggests that Moodle alone cannot offer online lectures but should be linked with other online software which provides educational videos. Surmise to state that following this finding, the selected institutions are to consider the use of other learning platforms in addition to the use of Moodle.

The findings in figure 5 revealed that 48.5% of the students at the University of Zululand were in agreement with the issue of whether students learn better through online teaching during the lockdown while 45.5% disapproved of the claim. Also, 64.5% of the students from the Durban University of Technology approved this claim while 32.5% signified their disapproval of the claim. Meanwhile, 2% and 3% of the respondents respectively from UNIZULU and DUT did not know at all. The findings from the interviewed participants concur with the above findings which indicate students learned better through online teaching during the lockdown. For instance, an interviewee reported that:

> The steps to the transformation of curriculum as employed in my department started with the use of blended learning approach which involves the use of a combination of online

> interaction now traditional face to face classroom interactions to now almost a full-fledged online content delivery where almost all that needs to happen within teaching and learning take place online though this is not appropriately backed up by relevant procedures/policy.

This finding of the study corroborates the work of Sadiku *et al.* (2018) who state that online teaching provides opportunities for students to learn and also to expand their learning environment. Oyedotun (2020) agrees that online teaching provides opportunities for not only teaching but live recording, meetings as well as interactions among lecturers and students. This implies that online platforms create better opportunities for many to learn though it still poses some forms of a challenge for other students.

Figure 6 in terms of whether students were aided to learn faster through the provision of online materials such as e-books got the approval of 53% of them from UNIZULU and 67% from DUT. While 42% disapproved of UNIZULU, only 28.5% of them were in DUT. For those who did not know remained 5% from UNIZULU and 4.5% from DUT. One of the interviewed participants' statements aligns with the above finding stating that:

> The university has taken several steps to support digital learning such as enhancing facilities (internet connectivity, computer labs, etc.), prioritizing e-resources (e-library) as well as providing LMS to support e-learning. During the lockdown, the department also recirculated modules to accommodate digital/remote learning and assessment.

The finding corroborates the submission of Mpungose (2019) as well as Selwyn and Stirling (2016) who state that access to online resources can enhance efficient teaching and learning methods. Oyedotun (2020) believes that the use of online resources such as online blogs, websites, etc provides lecturers and students with the opportunity to access information or materials which will enhance their teaching and learning. Goudeau *et al.* (2021) argue that the recent pandemic outbreak has provided students to gain access to online resources to enhance their learning. Unfortunately, many of the students from remote areas have no access to internet connectivity bringing a challenge to access the online materials.

Another variable in figure 7 that students learned faster during lockdown through the online assignments given by lecturers received solemn support of 59% of them from UNIZULU and 70.5% from DUT. 39.% and 24% from UNIZULU and DUT disagreed while 4% and 11% did not know at all. This finding aligns with the response of one of the interviewed participants who reported that:

> The department has made it their duty to educate learners about the new digital curriculum which includes, marking online, commenting online, holding classes online, uploading work, conducting tests online as well as assignments.

This finding is in line with Koing *et al*. (2020) who states that online platforms create students with an opportunity to learn through online assignments.

Figure 8 shows whether the data provided by the university helped students to learn faster during lockdown was supported by 59% of them from UNIZULU and 70.5% from DUT. 39% and 24% were on the disagreement side while 4% and 11% did not know. This finding aligns with the response of one of the interviewed participants who states that:

> The plan put in place by the university is to provide data bundles for students to access and enhance learning.

The finding agrees with the work of Rodrigues *et al.* (2019) which shows that the university helped students to learn better through the provision of data bundles. However, Mpungose (2020) argues that in the South African context, students should be provided with a free monthly Wi-Fi data bundle to assist them to have access to online learning. The finding of Mpungose (2020) suggests that shortage or lack of Wi-Fi data bundles for South African students from their institutions of learning.

Additionally, in figure 9 on whether the supply of laptops by the institution helped students to learn faster during lockdown; only 47% of students supported it from UNIZULU while 78% of them were found from the DUT. The respondents who disagreed with the statement were 51% and

20% respectively from UNIZULU and DUT. Meanwhile, 4% on either side did not know. This is in line with comments from the interviewed participants who state that:

> The university has put in place plans to provide laptops for students to enhance their teaching and learning.

This finding aligns with the study of Rodrigues *et al.* (2019) who state that universities have put in place programmes to assist students such as the provision of laptops and data bundles to assist students with teaching and learning. Goudeau *et al.* (2021) argue that although many students are provided with free laptops there is still a digital divide because some of the students do not have access to laptops while some have sold theirs for personal benefits. This suggests that while the institutions of learning may be making efforts to assist students in certain instances, students may be taking advantage of such thought to their detriment.

Also, this finding coincides with the responses from the interviewed participant which acknowledged the use of online learning platforms in the delivery of teaching and learning to students is a strategy provided by the institution to transform the curriculum for digital learners. One of the participants responded that:

> There are several webinars that have been organized by the institution, faculty, and department, but the participation of students is very bad because digital learning is a thing of today and the future.

Pirapuraj *et al.*, (2019) state that online learning has become more popular in education with an increase in its users as well as a rise in the use of Internet facilities. Similarly, The World Bank (2020) agrees that online learning has become a major concept in the educational sector by converting the traditional form of learning into a virtual approach to learning. Furthermore, some of the tools used include Moodle, Zoom, Google Classroom, YouTube. Suffice to state that online learning platforms have become a useful channel of communication through which teaching and learning take place, regardless of the disadvantages that it may pose.

7.4 Syllabi Restructuring for Relevance in 4IR

The analysis of data collected on the subject of syllabi restructuring for 4IR relevance in the selected institutions of higher learning was done using Chi-Square. As sequel to the findings, it was deduced that the restructuring of syllabi for relevance in 4IR is being done majorly through digital awareness. Details of the analysis are as presented and explained below

Tables 7 and 8 showed that there was a significant relationship between digital awareness programme(s) in the University of Zululand and Durban University of Technology to increase digital learning. This suggests that digital awareness programmes are ongoing in the selected institutions. This aligns with the AIDA model (Hanlon, 2021) which promotes the subject of awareness in ensuring the purchase of a product. In the context of this study, digital awareness promotes students' acceptance of digital learning. In congruence Mashau and Nyawo (2021) state that the recent events in educational technology have led most higher institutions of learning into the utilization of digital learning for teaching and learning purposes. Abbas *et al.* (2019) add that digital awareness programmes equip basic digital skills which provide both the students and lecturers access to online resources to enhance teaching and learning.

Tables 9 and 10 indicate that there was a significant relationship between digital awareness campaigns in the University of Zululand and Durban University of Technology to increase digital learning. This shows that digital awareness campaigns are ongoing in both selected institutions. This aligns with the Shannon and Weaver model (Eke, 2020) which promotes the use of proper channels to communicate a particular product. In this study, digital awareness campaigns are used in communicating digital learning to the students. In alignment, the works of Uleanya and Rugbeer (2019), Muhuro and Kang'ethe (2016), explains that digital campaigns assist students by creating awareness on digital tools which helps to eradicate ignorance for students. Fazil (2016) adds that digital awareness campaigns assist students to be made aware of the reliability, benefits and risks involved in online activities inclusive of digital learning.

Tables 11 and 12 revealed that there was a significant relationship between lecturers' efficiency in the University of Zululand and Durban University of Technology towards digital learning. This

explains that lecturers' efficiency is in place in the selected universities. This aligns with the findings of one of the interviewed participants who explains that:

> Yes. The relevance and application of 4IR vary in each discipline. However, in terms of teaching and learning, each subject/module lecturer is expected to utilize LMS in teaching and learning activities.

Lemma *et al.* (2018) as well as Blair and Noel (2014) explains that a lecturer's efficiency has a huge effect on the quality of education which is provided by the lecturer as well as improvement in students' academic skills. This finding agrees with the view of Van Schalkwyk (2021) who suggest that the institution of learning, as well as the lecturers, still need to learn more about the efficiencies and effectiveness of their delivery in their teaching approach as well as assessing students.

Tables 13 and 14 displayed the fact that there was a significant relationship between the ICT division in the University of Zululand and Durban University of Technology for displaying good knowledge of digital learning through their programmes and practice. This shows that the display of good knowledge of digital learning by the ICT division is ongoing in both the selected institutions. One of the interviewed participants mention that:

> The students are also introduced to computer knowledge and skills during their first year of study/admission.

This agrees with the findings of Haji *et al.* (2017) stating that ICT division enhances education by providing students with the required digital skills in this 21st century to enable them to compete with other students or people in this informative world. Hong (2016) adds that ICT has the potential of enhancing teaching and learning by making a course more appealing, facilitating communication as well as the decision-making process. Anti *et al.* (2018) think that the introduction of digital learning in many educational systems in developing countries is still relatively at an early stage.

Tables 15 and 16 declared a significant relationship between teaching and learning centres in the University of Zululand and Durban University of Technology towards digital learning. The

findings revealed that the use of the teaching and learning centres is ongoing in the selected institutions. This aligns with the finding of Schlesselman (2020) who explains that the teaching and learning centres are assisting the students with their academic performance by providing workshops to students, giving one-on-one consultation as well as improving their writing skills.

Table 17 and 18, it can be observed that there was a significant relationship between the University of Zululand and Durban University of Technology in assisting students to learn faster during the lockdown using Moodle. This revealed that the use of Moodle is ongoing in the selected institution. This corroborates with the findings of one of the interviewed participants which explain that:

> Yes, the institution is aware of the need to prepare the students for 4IR, this is ensured through the provision of all learning contents for all Modules/courses on Moodle.

Another participant expressed the view that:

> Yes, the institution of learning caters for their students' relevance in the 4IR and makes means for the students to be accommodated. Students have their accounts on Moodle, Microsoft teams, they're able to register online and submit online.

This is in alignment with the findings of Mpungose and Khoza (2020) who stated that the advancement in technology due to 4IR has led many higher institutions of learning to adopt the use of Moodle or Microsoft teams. Bates (2018) and Khoza (2019) opine that Moodle is being used by lecturers in this digital age to ensure effective learning to engage students in sharing ideas. Bsharat and Behak (2021) argue that Moodle is an online learning platform that allows educational support, course management and distribution of course content to students to enhance their academic performance as well as allow interaction between the lecturers and students.

Tables 19 and 20 depicted that there was a significant relationship between the University of Zululand and Durban University of Technology as regards online teaching during the lockdown.

This aligns with the view of one of the interviewed participants which explain that:

> One of the ways in restructuring the syllabi is that the teaching and learning are done digitally.

This corroborates with the findings of Cole (2019); Chase and Laufenberg (2011) who explain that online teaching platforms assist students to learn anywhere, anytime as well as independently. Lederman (2020) explains that the recent outbreak of COVID-19 has compelled both the lecturer and students into a situation whereby teaching and learning activities take place through online mediums. Eickelmann and Gerick (2020) opine that the COVID-19 situation prompted many higher institutions of learning to change their style of teaching and learning to online through which diverse digital tools are explored to solve problems and integrate new teaching methods.

Tables 21 and 22 established that there was a significant relationship between the University of Zululand and Durban University of Technology as regards online materials such as an e-book that aided learning during the lockdown. The findings concur with one of the responses from the interviewed participants stating that:

> Also, the institution provides the minimum required resources needed to make sure that students can cover the syllabus that requires the use of 4IR**.**

This corroborates with the findings of Bardi and Jailani (2015); Surjono (2016) who state that the use of online materials assists both students and lecturers gain access to information easily regarding a subject matter. The study conducted by Garad *et al.* (2021) as well as Mamluah and Maulidi (2021) indicates that the use of online materials creates opportunities to access reading materials which serve as a means of enhancing the students' learning process.

Tables 23 and 24 affirmed that there was a significant relationship between the University of Zululand and Durban University of Technology as regards online assignments given by teachers to aid fast learning during the lockdown. This suggests that giving online assignments to students by lecturers is ongoing in the selected institution. This aligns with the Shannon and Weaver model which support the use of appropriate mediums of communication to transmit information to the receiver. In this study, online assignment is the medium while the receiver is the students. This is in alignment with the findings of Johannes König *et al.* (2020) which state that the recent closure

of institutions due to COVID-19 has enhanced the use of the online platform for teaching and learning the facilitation of online class assignments as well.

Tables 25 and 26 showed that there was a significant relationship between the University of Zululand and Durban University of Technology as regards data provided by the university to aid fast learning during the lockdown. This revealed that the provision of data to students to enhance their learning is ongoing in two selected institutions. This agrees with the study of Hedding *et al.* (2020); the University of South Africa (2020) which views that the recent incidence of COVID-19 has made some universities make data available to their students to enhance teaching and learning. The study conducted by Van Schalkwyk (2021) shows that due to the cost of data which has become a barrier to online learning to students, an agreement between the mobile network provider and the government were entered into to make zero-rated websites available to students thereby accessing university websites and online learning resources without incurring any cost.

Tables 27 and 28 showed that there was a significant relationship between the University of Zululand and Durban University of Technology as regards the supply of laptops by the institution to aid fast learning during the lockdown. This suggests that the supply of laptops to students is ongoing in the selected institutions. This corroborates the findings from the interviewed participants which state that:

> Yes, the institution caters for students' relevance in the 4IR through the distribution of laptops for students even though not all of them have received them.

Another interviewed participant reported that:

> In the process of restructuring the syllabi, the provision of laptops to students in the first year is also a measure by the institution.

This is in line with Hedding *et al.* (2020) who indicated that most universities now provide laptops to their students to assist their learning process, especially with this recent COVID-19 outbreak. Vuk'uzenzele (2020) supports the view of Hedding *et al.* stating that some students at the higher institution of learning received assistance through the provision of laptops from their institution. The study conducted by Jordaan (2020) disagrees with this above assertion explaining that 46%

of students face challenges in completing their assignments or taking part in online learning due to lack of computers or access to internet connectivity.

7.5 Factors Hindering Universities from Equipping Students for E-Learning

Table 29 depicted the plans that militated against equipping students for eLearning. The first factor was whether the curriculum hindered students from preparing for e-learning; 50.5% from UNIZULU and 68.5% came from DUT to support the assertion. 22% and 19% of the students disagreed while 27.5% and 12.5% from UNIZULU and DUT were neutral. This finding aligns with the study of Eze *et al.* (2020) and Otuka (2010) who explains that most curricula in higher institutions of learning are inadequate because it lacks the development and design of how to use e-learning embedded into it. Elumalai *et al.* (2020) add that a lack of alignment between curriculum and e-learning can hinder students from being equipped with e-learning. Holmes and Prieto-Rodriguez (2018) mention that lack of adequate curriculum content can affect the use of e-learning in teaching and learning Eze *et al.* (2020) suggest that the curriculum needs to be designed for both the lecturers and students on how to improve on their digital skills. Also, the government should assist in developing a strategy through which e-learning is embedded into the curriculum so that the quality of teaching and learning is improved. Van Nuland *et al.* (2020) argues that the curriculum in terms of course components need to be designed and aligned with e-learning.

In terms of whether lack of exposure hinders students from preparing for e-learning; 56.5% of students from UNIZULU and 69.5% from DUT supported this claim. Meanwhile, 30% from UNIZULU and 21.5% from DUT were not in support and 13.5% from UNIZULU and 9% from DUT remained undecided. This finding shows that lack of exposure hinders students in this regard from learning. The finding agrees with the work of Sino Cruz *et al.* (2019) which suggests that proper exposure to the use of e-learning tools can assist its users as well as increase the use of these tools. Longhurst *et al.* (2020) add that lack of exposure to technological tools can hinder students from preparing for e-learning.

On the issue of whether the modules that students did hinder them from preparing for e-learning received the wholesome agreement of 61% of the students from UNIZULU and 71.5% from DUT. These findings align with Bovil (2020); Bovil and Woolmer (2018) who state that lack of adequate

module content preparation or design can hinder the students from accessing the modules or not understanding the module content.

Additionally, considering the factor of student-lecturer relationship, 53% of students from UNIZULU and 59% from DUT affirmed that their relationship with the lecturers hindered them from preparing for e-learning. Meanwhile, 32% from UNIZULU and 27.5% from DUT did not agree with the statement, and 15% from UNIZULU and 13.5% from DUT were undecided. This finding aligns with the study of Dhawan (2020) who notes that it may be impossible for lecturers to relate with and help their students in their learning activities especially when the students fail to come forth to seek help. Zhong (2020) adds that the lack of a proper relationship between the lecturer and students is another major concern associated with e-learning. Uleanya (2019) argues that the relationship that exists between students and lecturers contributes to their learning abilities, self-esteem, consequently a possible increase in their level of socialization. The foregoing explains that the student-lecturer relationship is crucial for students to be assisted and successfully adopt e-learning.

Furthermore, with regards to whether policies on campus promoted e-learning, the findings showed that 43.5% of the respondents from UNIZULU and 58% from DUT believed it did not, 24.5% from UNIZULU and 21% from DUT agreed that it did, while 32% from UNIZULU and 21% from DUT were neutral. This suggests that policies affect the adoption and use of online learning platforms in universities. This implies that more of the respondents hold the opinion that policies on campus did not promote e-learning. In other words, institutions are expected to look into making policies that promote e-learning in the selected institutions of higher learning, otherwise, disruption is inevitable. This finding agrees with the work of Aung and Khaing (2016) who state that policies can disrupt the promotion of e-learning. Also, the findings of Saeed Al-Maroof *et al.* (2021) show that a lack of proper policies and strategic plans can hinder the adoption and promotion of e-learning. In addition, Khalil Awan *et al.* (2021) suggest that adequate strategic plans and policies need to be put in place to enhance the successful promotion and implementation of the e-learning system in higher education. Suffice to state that the policies put in place and

implemented by the institutions of learning have the capability of making students embrace or neglect the use of digital platforms in learning.

7.6 Conclusion

This chapter discussed the major findings from both the quantitative and qualitative data collected for this study through the use of questionnaires and interviews. The discussion of finding helped to establish the similarities and differences between the two selected institutions of learning in terms of their level of awareness on digital learning plans made by policymakers, restructuring of the syllabi as well as factors hindering the use of e-learning. The findings show that the adoption of digital learning is already in progress. However, following the percentage of respondents and participants which show that some are still unprepared, thus, more awareness needs to be created for students to assist them in acquiring the necessary digital skills. The next chapter highlights the summary, deductions and recommendations following the findings of the study.

CHAPTER 8

SUMMARY DEDUCTIONS AND RECOMMENDATIONS

8.1 Introduction

In the previous chapter, the major findings from the analysed data were discussed in examining the role of universities in embracing transformation brought about by 4IR. This chapter presents the summary of the study, points out its recommendations and limitations, and suggests future studies as regards this study.

8.2 Research Objectives

The core of this study was to investigate the role of universities in embracing transformation brought about by 4IR. The specific objective of this study as outlined in chapter 1 includes:

1. To explore the level of awareness that students at the selected South African universities have on digital learning.
2. To determine plans that policymakers at the selected South African universities have put in place to transform the curriculum for digital learners.
3. To investigate the restructuring of the syllabi of the selected South African universities for relevance in the 4IR.
4. To identify factors hindering the selected South African universities from equipping students for e-learning.
5. To develop a framework to assist policymakers at the selected South African universities to embrace e-learning on an ongoing basis.

8.3 Identified Research Gap

Based on the findings of the study from analysed data, there seem to be policy issues, factors such as limited available resources, student, lecturer and institutional factors, amongst others remain subject of further interests. This is especially as it concerns rural and semi-urban areas.

8.4 Deductions from the Study

First and foremost, in the sequel to the analysis of collected data, all objectives were achieved. In this section, the deductions following each objective of the study are presented and further explained where necessary.

The findings from this study based on objective 1 of the study established that the majority of the respondents and participants from the two selected universities have a high level of awareness of digital learning. However, some of the respondents and participants lack awareness of digital learning. Also, from the finding, the university makes use of some platforms to communicate digital learning awareness to the respondents which include, a digital awareness campaign, ICT division of the institution, lecturers and a teaching and learning centre. This finding corroborates with the findings of the work of Puentedura (2018) who states that many higher institutions of learning have recognized the role of digital learning which serves as an essential tool in their teaching and learning activities. Thus, it can be deduced that the selected institutions of higher learning have acknowledged and accepted the roles of digital learning as an essential tool adaptable for teaching and learning exercises.

The findings of this study also revealed the plans put in place by policymakers to transform the curriculum for digital learning which is following objective 2. Some of these plans include the use of Moodle, online teaching, online materials, online assignments, provision of data and supply of laptops. The measures put in place were tested during the COVID-19 outbreak. This enabled the researcher to make certain enquiries in this direction. The findings following objective 2 shows that digital platforms such as Moodle, online teaching, online materials, online assignment, provision of data and supply of laptops are adopted by the selected institution of learning to transform the curriculum for digital learning. For instance, the findings show that the majority of the respondents from the two selected institutions agreed that they learnt faster with the use of Moodle during the lockdown. Similarly, the majority also agreed that they learn better through online teaching during the lockdown. In addition to this, the majority of respondents agreed that they are aided to learn faster through the provision of online materials such as an e-book. Based on the finding, more of the respondents stated that they learned faster during lockdown through

the online assignments given by lecturers. Moreover, the findings also showed that the majority of the respondents from the two selected institutions were aided to learn faster during lockdown through the provision of data. Meanwhile, with regards to the supply of laptops, the findings showed that the majority of the respondents from the selected institutions revealed that the supply of laptops by their institutions of higher learning helped them to learn faster during the lockdown. This shows that efforts are being made by the selected institutions of learning to embrace practices of the Fourth Industrial Revolution (4IR) and assist their students to acclimatize to such as well.

Additionally, it is important to note that in all the digital platforms, more of the respondents from DUT agreed that they learnt faster using the online platforms compared to their counterparts from UNIZULU. Perhaps this could be because DUT is semi-urban while UNIZULU is rural.

The result of the findings in objective 3 shows the subject of syllabi restructuring for 4IR relevance in the selected institutions of higher learning. The selected institution of learning employed the following methods in the restructuring of the syllabi for 4IR relevance which includes digital awareness programmes, digital awareness campaigns, lecturers' efficiency, ICT division, teaching and learning centre (TLC), Moodle, online teaching, online material, online assignment, provision of data as well as the supply of laptops. These methods enabled the researcher to make certain enquiries in this direction. The findings in objective 3 revealed that digital awareness programmes, digital awareness campaigns, lecturers' efficiency, ICT division, teaching and learning centre, Moodle, online teaching, online material, online assignment, provision of data as well as the supply of laptops are ongoing in the process of restructuring the syllabi for 4IR relevance. The result of the findings indicates that there was a significant relationship between digital awareness programme(s) at University of Zululand and Durban University of Technology to increase digital learning. This shows that digital learning awareness programmes are ongoing in the two selected institutions, and this serves as a means for restructuring the syllabi for 4IR relevance. This finding aligns with the work of Abbas *et al.* (2019) who state that digital awareness programmes equip with basic digital skills which provide both the students and lecturers access to online resources to enhance teaching and learning.

Similarly, the study findings showed that there was a significant relationship between digital awareness campaigns in the University of Zululand and Durban University of Technology to increase digital learning. These findings also revealed that digital awareness campaigns are ongoing in the two selected institutions. Furthermore, the findings of the study discovered that there was a significant relationship between lecturers' efficiency in the University of Zululand and Durban University of Technology towards digital learning. These findings show that lecturers' efficiency is in place in the two selected universities and with this in place, it helps in the syllabi restructuring for 4IR relevance.

Moreover, the findings of this study indicate that there was a significant relationship between ICT divisions in the University of Zululand and Durban University of Technology displaying good knowledge of digital learning through their programmes and practice. Based on these findings, it can be stated that the display of good knowledge of digital learning by the ICT division is ongoing in the two selected institutions of learning. This method enables the universities to restructure the syllabi in a way that will assist and enhance the students' learning process.

In addition, from the findings of this study, there is a significant relationship between teaching and learning centres in the University of Zululand and Durban University of Technology towards digital learning. From the findings, it is revealed that the use of the teaching and learning centres is ongoing in the selected institutions. This implies that in the process of restructuring the syllabi, the adoption of teaching and learning centres by the institution will assist students in improving their academic performances. This aligns with the finding of the work of Schlesselman (2020) who explains that the teaching and learning centres are assisting the students with their academic performance by providing workshops to students, giving one-on-one consultation as well as improving their writing skills.

Furthermore, the analysed data on the use of Moodle showed that students in the University of Zululand, as well as the Durban University of Technology, are assisted to learn faster, especially during the lockdown using the online platform - Moodle. This finding shows that the use of Moodle is ongoing in the two selected institutions of higher learning. This finding from the respondents was corroborated by the findings of the participants who indicated that the institutions are

preparing the students for syllabi restructuring in this 4IR era through the provision of all learning contents or courses on Moodle. This aligns with the findings of Bsharat and Behak (2021) who state that Moodle is an online learning platform that allows educational support, course management and distribution of course content to students to enhance their academic performances as well as allow interaction between the lecturers and students.

Results from the study on the use of online teaching showed that there was a significant relationship between online teaching in the University of Zululand and the Durban University of Technology, especially during the lockdown. This finding aligns with the view of one of the interviewed participants who explains that online teaching is one of the ways the institution of higher learning is working towards the restructuring of the syllabi. This implies that online teaching is ongoing in the two selected institutions of higher learning.

Furthermore, with regards to the use of online material in the restructuring of the syllabi, the findings from both the respondents and participants established that there was a significant relationship in the findings from the University of Zululand and the Durban University of Technology as regards online materials such as an e-book that aided learning. This was visibly experienced more during the lockdown. From the findings, this implies that the use of online materials by the institution is ongoing in both the selected institutions of learning to enable the students to gain access to relevant materials needed for their learning. Similarly, regarding the issue of online assignment, the findings of the study identified that there was a significant relationship between the findings from the University of Zululand and the Durban University of Technology as regards online assignments given by lecturers to aid fast learning, especially during the lockdown. This suggests that giving online assignments to students by lecturers is in existence in the two selected institutions of higher learning.

The study also found that there was a significant relationship in the findings from the University of Zululand and the Durban University of Technology as regards data provided by the university to aid fast learning, especially during the lockdown. This revealed that the provision of data to students to enhance their learning as a means of restructuring the syllabi for 4IR relevance is ongoing in the two selected institutions of higher learning. Additionally, the findings from both

the respondents and participants attested to the fact that there was a significant relationship between the findings from the University of Zululand and the Durban University of Technology with regards to the supply of laptops by the institutions to aid fast learning, especially during the lockdown. This suggests that the supply of laptops to students is ongoing in the selected institutions of higher learning as a process of restructuring the syllabi by the two selected institutions.

The findings of the study based on objective 4 identified certain factors which hinder the universities from equipping the students with e-learning. Some of these factors include curriculum, lack of exposure, modules, student-lecturer relationship and policies. The findings following the fourth objective of this study show that curriculum, lack of exposure, modules, student-lecturer relationship and policies are some of the factors hindering the selected institution in equipping the students with e-learning. For instance, the result of the findings regarding curriculum showed that the majority of the respondents agreed that the curriculum hinders students from getting equipped with e-learning. This finding corroborates the work of Holmes and Prieto-Rodriguez (2018) who state that lack of adequate curriculum content can affect the use of e-learning in teaching and learning. Similarly, the majority of the respondents also agreed that lack of exposure hinders students from preparing for e-learning. This finding shows that lack of exposure can hinder students from being equipped with relevant digital skills or tools which can enhance their academic performance. In addition to this, many of the respondents stated that the modules offered by students hindered them from preparing for e-learning.

Moreover, the finding also shows that most of the respondents agreed to the assertion that the student-lecturer relationship hindered them from preparing for e-learning. These findings show that the student-lecturer relationship is crucial for students to be assisted and successfully adopt e-learning. Additionally, more of the respondents agreed that policies on campus did not promote e-learning. The findings revealed that institutions are expected to look into making policies that promote e-learning in the selected institutions of higher learning, otherwise disruption is inevitable. This finding aligns with the works of Saeed Al-Maroof *et al.* (2021) who state that lack of proper policies and strategic plans can hinder the adoption and promotion of e-learning. Khalil

Awan *et al.* (2021) suggest that adequate strategic plans and policies need to be put in place to enhance the successful promotion and implementation of the e-learning system in higher education.

8.5 Recommendation of the study

Based on the findings of the study, the following are recommended to different stakeholders:

University and host community

- The university community which includes policymakers, lecturers, ICT division as well as teaching and learning division should create more awareness on digital learning to equip students with relevant digital skills. Awareness can be created through orientation, campaigns and workshops on digital learning as well as educating students about 4IR. Also, the universities can inculcate elements of 4IR transformation in different models across faculties.

- The university needs to employ proper digital platforms such as Moodle, online teaching, online materials, online assignments, provision of data and supply of laptops. These platforms can be used to communicate to the students more in teaching and learning as well as to enhance their academic performances.

- In this present era of 4IR, institutions of learning are required to create exposure to students by equipping them with the necessary skills due to the advancement in technologies, which will assist them to be able to compete in the world at large and withstand the diverse changes occurring around the world.

- Exposure should be created for lecturers by the university as regards e-learning by promoting the use of technologies in breeding high-tech individuals during the fourth industrial revolution era.

Policymakers

- Policies should be reviewed to promote digital learning and implemented by the institutions of learning by making students embrace or neglect the use of digital platforms in learning.

- It is essential for policymakers and the government to transform the curricula to be flexible to accommodate digital learning and other areas such as e-learning as well as preparing the students for the demands and challenges of the Fourth Industrial Revolution (4IR).

- The conceptualized model may be linked to a learning theory (Constructivism theory). This is because constructivism theory entails how students construct their knowledge, in the context of this study using technology. Thus, the model in alignment with constructivism theory may be adopted by the policymakers in making policies that will enhance teaching and learning within the scope of the available technological equipment. In this regard, testing the extent to which higher education institutions can embrace the transformation brought about by the digital revolution will become possible.

Students

- The students should have an open mind towards occurring changes in the era of the Fourth Industrial Revolution and endeavour to flow with the occurrences. This would enable them to easily accept and imbibe practices of the 4IR

8.6 Limitations and Suggestions for Further Study

This section presents limitations and suggestions for further study:

- The demographic information of the respondents was included in this study such as gender, institution and class of study, although the study did not analyse the findings in accordance with the demographic information. Therefore, it is recommended that further studies should be conducted to examine how gender, race, class of study affect the role of digital transformation brought about by 4IR.
- A study should be conducted to examine the impact of digital learning on students, lecturers, institutions, and the community at large.

- This study was limited to the KwaZulu-Natal province in South Africa, the researcher recommends that further study should be conducted across other provinces in South Africa. Also, two or more African institutions of learning can be compared to know the extent to which awareness of digital learning exists among university students.
- The research was limited to students from semi-urban and rural institutions of higher learning. The researcher, therefore, recommends that a similar study should be conducted between students from urban and semi-urban institutions of higher learning.

8.7 Conclusion

This study examined the role of universities in embracing transformation brought about by 4IR. The study found out that most of the respondents and participants have an awareness of digital learning while some lack awareness of digital learning. Also, the study discovered that the selected institutions of higher learning adopted diverse online platforms to communicate learning to their students in the process of transforming the curriculum for digital learning. However, it is important to note that in all the digital platforms, more of the respondents from DUT agreed that they learnt faster using the online platforms compared to their counterparts from UNIZULU. Perhaps this could be because DUT is a semi-urban institution of higher learning while UNIZULU is rural.

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ADDENDA

ADDENDUM 1: Ethical Clearance for University of Zululand

UNIVERSITY OF ZULULAND
RESEARCH ETHICS COMMITTEE
(Reg No: UZREC 171110-030)

RESEARCH & INNOVATION
Website: http://www.unizulu.ac.za
Private Bag X1001
KwaDlangezwa 3886
Tel: 035 902 6731
Fax: 035 902 6222
Email: LundallN@unizulu.ac.za

ETHICAL CLEARANCE CERTIFICATE

Certificate Number	**UZREC 171110-030 PGD 2020/59**							
Project Title	**The role of Universities in embracing Transformation brought by the fourth industrial revolution: A case study at the university of Zululand and DUT**							
Principal Researcher/ Investigator	M.O Uleanya							
Supervisor and Co-supervisor	Dr G.M Naidoo		Prof H. Rugbeer					
Department	Communication Science							
Faculty	Arts							
Type of Risk	Medium Risk – Data collection from people							
Nature of Project	Honours/4th Year		Master's		**Doctoral**	x	Departmental	

The University of Zululand's Research Ethics Committee (UZREC) hereby gives ethical approval in respect of the undertakings contained in the above-mentioned project. The Researcher may therefore commence with data collection as from the date of this Certificate, using the certificate number indicated above.

Special conditions:

(1) This certificate is valid for 1 year from the date of issue.
(2) Principal researcher must provide an annual report to the UZREC in the prescribed format [due date-10 December 2021]
(3) Principal researcher must submit a report at the end of project in respect of ethical compliance.
(4) The UZREC must be informed immediately of any material change in the conditions or undertakings mentioned in the documents that were presented to the meeting.

The UZREC wishes the researcher well in conducting research.

Professor Mashupye R. Kgaphola
University Research Ethics Committee
Deputy Vice-Chancellor: Research & Innovation

10 December 2020

CHAIRPERSON
UNIVERSITY OF ZULULAND RESEARCH ETHICS COMMITTEE (UZREC)
REG NO: UZREC 171110-30
10 -12- 2020
RESEARCH & INNOVATION OFFICE

ADDENDUM 2: Ethical Clearance for Durban University of Technology

Directorate for Research and Postgraduate Support
Durban University of Technology
Tromso Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7
Fax: 031-3732946

20th January 2021
Ms Mofoluwake O Uleanya
c/o Department of Communication Science
Faculty of Arts
University of Zululand

Dear Ms Uleanya

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Full Permission** for you to conduct your research "The role of Universities in embracing transformation brought about by 4IR: A case study of selected tertiary institutions in KwaZulu-Natal" at the Durban University of Technology.

The DUT may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

DR LINDA ZIKHONA LINGANISO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT DIRECTORATE

ADDENDUM 3: Consent Form Declaration

Annexure A: PARTICIPANT INFORMED CONSENT DECLARATION

INFORMED CONSENT DECLARATION

(Participant)

Project Title: **The Role of Universities in Embracing Transformations Ushered in by the Fourth Industrial Revolution: A Case Study of the Roles Played by UNIZULU and DUT in Transformation**

Mofoluwake Oluwadamilola Uleanya from the Department of the Communication Science University of Zululand has requested my permission to participate in the above-mentioned research project.

The nature and the purpose of the research project and of this informed consent declaration have been explained to me in a language that I understand.

I am aware that:

1. The purpose of the research project is to;

- To explore the level of awareness that policymakers at the selected South African universities have on digital learning.
- To determine plans which policymakers at the selected South African universities have put in place to transform the curriculum for digital learners.
- To investigate the restructuring of the syllabi of the selected South African universities for relevance in the 4IR.
- To identify factors hindering the selected South African universities from equipping students for eLearning.
- To develop a framework to assist policymakers at the selected South African universities to embrace eLearning on an ongoing basis.

2. The University of Zululand has given ethical clearance to this research project and I have seen / may request to see the clearance certificate.

3 By participating in this research project, I will be contributing by enabling policymakers to have an alternative towards considering or incorporating proper strategies to the education sector to assist university students and staff members in preparing for the 4IR.

4 I will participate in the project by completing a voluntary questionnaire on the role of the university in embracing transformations ushered in by the Fourth Industrial Revolution.

5. My participation is entirely voluntary and should I at any stage wish to withdraw from participating further, I may do so without any negative consequences.

6 I will not be compensated for participating in the research.

7 There may be risks associated with my participation in the project. I am aware that

a. The following risks are associated with my participation: No risks are anticipated.
b. The following steps have been taken to prevent the risks: No respondent will be pressurised into participation. Respondents will not be misled into providing specific responses.
c. There is a 0% chance of any risk materialising

8. The researcher intends publishing the research results in the form of a thesis and articles in academic journals and conference presentations. However, confidentiality and anonymity of records will be maintained and that my name and identity will not be revealed to anyone.

9. I will not receive feedback/will receive feedback in the form of a full research report regarding the results obtained during the study.

10. Any further questions that I might have concerning the research or my participation will be answered by:

- Researcher: Mrs M.O Uleanya (0604923301)
- Supervisor: Dr G.M Naidoo (035-9026164)
- Co-supervisor: Prof. H. Rugbeer (035-9026210)

11. By signing this informed consent declaration I am not waiving any legal claims, rights or remedies.
12. A copy of this informed consent declaration will be given to me, and the original will be kept on record.

I……. have read the above information / confirm that the above information has been explained to me in a language that I understand and I am aware of the contents of this document. I have asked all questions that I wished to ask and these have been answered to my satisfaction. I fully understand what is expected of me during the research.

I have not been pressurised in any way and I voluntarily agree to participate in the above-mentioned project.

……. …….

Participant's signature Date

ADDENDUM 4: Letter of Informed Consent

Annexure B: LETTER OF INFORMED CONSENT

The role of Universities in embracing transformation brought about by 4IR: A case study of selected tertiary institutions in KwaZulu-Natal

Department of Communication Science

Researcher: Mofoluwake Uleanya

Supervisor: Dr GM Naidoo

Co-Supervisor: H. Rugbeer

Note to the respondent

My name is Mofoluwake Oluwadamilola Uleanya, I am a doctoral student at the University of Zululand. As part of the requirement to fulfil the requirements for this degree, I am undertaking a research on "*The role of Universities in embracing transformation brought about by 4IR: A case study of selected tertiary institutions in KwaZulu-Natal"*. The purpose of this questionnaire is to gather information on your perception about the preparedness of your university with regards to digital learning in the 4IR. This is envisaged to enable me come up with a conceptual framework that will assist universities in preparing for digital learners.

This study is strictly for academic purposes. Please note that your response would be treated with utmost confidentiality. Thank you in anticipation for your favourable response.

- Please use a pen to mark your responses by placing a tick *(√)* or a cross (X) in the appropriate column.
- The questionnaire will take approximately fifteen (15) minutes to complete.

Your participation is appreciated

Contact details: Mofoluwake Uleanya

Cell: +27-83604923301

ADDENDUM 5: Access Letter

Annexure C: ACCESS LETTER REQUESTING PERMISSION TO CONDUCT RESEARCH

Mofoluwake Oluwadamilola Uleanya
University of Zululand
Private Bag X1001
KwaDlangezwa
3886
Cell: +27604923301
Email:mofoluwaket@gmail.com

Director of Postgraduate Research and Innovation,
The Durban University of Technology,
Durban,
South Africa.

Dear Sir/Ma

PERMISSION TO CONDUCT RESEARCH

I am a registered Doctoral student in the Department of Communication Science at the University of Zululand. My supervisors are Dr G.M Naidoo and Prof. H. Rugbeer.

The proposed topic of my research is: **The role of Universities in embracing transformation brought about by 4IR: A case study of selected tertiary institutions in KwaZulu-Natal**

The objectives of the study are:

1. To explore the level of awareness that students at the selected South African universities have on digital learning.

2. To determine plans which policymakers at the selected South African universities have put in place to transform the curriculum for digital learners.

3. To investigate the restructuring of the syllabi of the selected South African universities for relevance in the 4IR.

4. To identify factors hindering the selected South African universities from equipping students for eLearning.

5. To develop a framework to assist policymakers at the selected South African universities to embrace eLearning on an ongoing basis.

I am hereby seeking your consent to approach selected students and staff members at the Durban University of Technology. To assist you in reaching a decision, I will attach the following document to this letter:

(a) A copy of an ethical clearance certificate issued by the University of Zululand

(b) A copy each of the research instruments which I intend using in my research

Should you require further information, please do not hesitate to contact me or my supervisor. Our contact details are as stated below:

- Researcher Email: mofoluwaket@gmail.com, Cell: +27604923301
- Supervisor Email: NaidooG@UNIZULU.ac.za, Telephone No: 035-9026164

Upon completion of the study, I undertake to provide you with a bound copy of the dissertation.

Your permission to conduct this study will be greatly appreciated.

Yours sincerely,

Mofoluwake Oluwadamilola Uleanya

ADDENDUM 6: Questionnaire for University of Zululand

Annexure D

VOLUNTARY QUESTIONNAIRE FOR SECOND AND THIRD YEAR STUDENTS': UNIVERSITY OF ZULULAND

The role of Universities in embracing transformation brought about by 4IR: A case study of selected tertiary institutions in KwaZulu-Natal

Department of Communication Science

Researcher: Mofoluwake Uleanya

Supervisor: Dr GM Naidoo

Co-Supervisor: H. Rugbeer

Note to the respondent

This study is strictly for academic purposes. Please note that your response would be treated with utmost confidentiality. Thank you in anticipation for your favourable response.

- Please use a pen to mark your responses by placing a tick *(√)* or a cross (X) in the appropriate column.
- The questionnaire will take approximately fifteen (15) minutes to complete.

Your participation is appreciated

Contact details: Mofoluwake Uleanya

Cell: +27-83604923301

E-mail: mofoluwaket@gmail.com

SECTION A: (PERSONAL PROFILE)

Please fill the following information. Your personal identity will **NOT** be revealed when the results of this study are published

1. **YOUR GENDER**

	A tick (√)	Official Use
Male		1
Female		2
Other		3

2. **YEAR OF STUDY**

	A tick (√)	Official Use
2nd		2
3rd		3

SECTION B:

To explore the level of awareness that students at the University of Zululand (UNIZULU) have on digital learning.

Please read each statement carefully and place a tick (√) or a cross (X) on the appropriate block				
NO	**STATEMENT**	**YES**	**NO**	**NOT SURE**
1.	There are digital awareness programme(s) in our institution which increases digital learning	1	2	3

2.	There are digital awareness campaign(s) in our institution which increases knowledge of digital learning	1	2	3
3.	Lecturer(s) are conversant with digital learning	1	2	3
4.	The ICT division displays good knowledge of digital learning through their programmes and practice	1	2	3
5.	The Teaching and Learning Centre display good knowledge of digital learning through their programmes and practice	1	2	3

SECTION C:

To identify factors hindering the University of Zululand (UNIZULU) from equipping learners for eLearning.

Please read each statement carefully and place a tick (√) or a cross (X) on the appropriate block that suit your situation in choosing the correct career.				
NO	**STATEMENT**	**TRUE**	**FALSE**	**I DO NOT KNOW**
6.	The curriculum hinders me from preparing for digital learning	1	2	3
7.	Lack of exposure hinders me from preparing for digital learning	1	2	3
8.	The modules that I do hinders me from preparing for digital learning	1	2	3
9.	Relationship with my lecturers hinders me from preparing for digital learning	1	2	3
10.	Policies on campus does not promote digital learning	1	2	3

SECTION D:

To identify how students at the University of Zululand (UNIZULU) can be fast-tracked into embracing eLearning because of the unexpected COVID-19 lockdown.

Please read each statement carefully and place a tick (√) or a cross (X) on the appropriate block that suit your situation in choosing the correct career.				
NO	**STATEMENT**	**TRUE**	**FALSE**	**I DO NOT KNOW**
11.	I am assisted to learn faster during the lockdown using Moodle	1	2	3
12.	I learn better through online teaching during the lockdown	1	2	3
13.	I am aided to learn faster during lockdown through the provision of online materials such as e-book, etc	1	2	3
14.	I learn faster during lockdown through the online assignments given by lecturers	1	2	3
15.	The data provided by the university to me helps me to learn faster during lockdown	1	2	3
16	Supply of laptop by the institution helps me to learn faster during lockdown	1	2	3

SECTION E:

To develop a framework to assist policymakers at the University of Zululand (UNIZULU) to embrace eLearning on an ongoing basis

How can the university show that it has embraced transformations brought by the Fourth Industrial Revolution (4IR)?

……

……

……

……..

Any other comment

……

……

……

…….

Thank you for your participation

Annexure D

VOLUNTARY QUESTIONNAIRE FOR SECOND AND THIRD YEAR STUDENTS': DURBAN UNIVERSITY OF TECHNOLOGY

The role of Universities in embracing transformation brought about by 4IR: A case study of selected tertiary institutions in KwaZulu-Natal

University of Zululand

Department of Communication Science

Researcher: Mofoluwake Uleanya

Supervisor: Dr GM Naidoo

Co-Supervisor: H. Rugbeer

Note to the respondent

This study is strictly for academic purposes. Please note that your response would be treated with utmost confidentiality. Thank you in anticipation for your favourable response.

- Please use a pen to mark your responses by placing a tick *(√)* or a cross (X) in the appropriate column.
- The questionnaire will take approximately fifteen (15) minutes to complete.

Your participation is appreciated

Contact details: Mofoluwake Uleanya

Cell: +27-83604923301

E-mail: mofoluwaket@gmail.com

SECTION A: (PERSONAL PROFILE)

Please fill the following information. Your personal identity will **NOT** be revealed when the results of this study are published

3. **YOUR GENDER**

	A tick (√)	Official Use
Male		1
Female		2
Other		3

4. **YEAR OF STUDY**

	A tick (√)	Official Use
1st		1
2nd		2
3rd		3
4th		4

SECTION B:

To explore the level of awareness that students at the Durban University of Technology (DUT) have on digital learning.

Please read each statement carefully and place a tick (√) or a cross (X) on the appropriate block				
NO	**STATEMENT**	**YES**	**NO**	**NOT SURE**
1.	There are digital awareness programme(s) in our institution which increases digital learning	1	2	3

2.	There are digital awareness campaign(s) in our institution which increases knowledge of digital learning	1	2	3
3.	Lecturer(s) are conversant with digital learning	1	2	3
4.	The ICT division displays good knowledge of digital learning through their programmes and practice	1	2	3
5.	The Teaching and Learning Centre display good knowledge of digital learning through their programmes and practice	1	2	3

SECTION C:

To identify factors hindering Durban University of Technology (DUT) from equipping learners for eLearning.

Please read each statement carefully and place a tick (√) or a cross (X) on the appropriate block that suit your situation in choosing the correct career.				
NO	**STATEMENT**	**TRUE**	**FALSE**	**I DO NOT KNOW**
6.	The curriculum hinders me from preparing for digital learning	1	2	3
7.	Lack of exposure hinders me from preparing for digital learning	1	2	3
8.	The modules that I do hinders me from preparing for digital learning	1	2	3
9.	Relationship with my lecturers hinders me from preparing for digital learning	1	2	3

10.	Policies on campus does not promote digital learning	1	2	3

SECTION D:

To identify how students at the University of Zululand (UNIZULU) can be fast-tracked into embracing eLearning because of the unexpected COVID-19 lockdown.

Please read each statement carefully and place a tick (√) or a cross (X) on the appropriate block that suit your situation in choosing the correct career.				
NO	**STATEMENT**	**TRUE**	**FALSE**	**I DO NOT KNOW**
11.	I am assisted to learn faster during the lockdown using Moodle	1	2	3
12.	I learn better through online teaching during the lockdown	1	2	3
13.	I am aided to learn faster during lockdown through the provision of online materials such as e-book, etc	1	2	3
14.	I learn faster during lockdown through the online assignments given by lecturers	1	2	3
15.	The data provided by the university to me helps me to learn faster during lockdown	1	2	3
16	Supply of laptop by the institution helps me to learn faster during lockdown	1	2	3

SECTION E:

To develop a framework to assist policymakers at the University of Zululand (UNIZULU) to embrace eLearning on an ongoing basis

How can the university show that it has embraced transformations brought by the Fourth Industrial Revolution (4IR)?

……
……
……
……..

Any other comment

……
……
……
…….

Thank you for your participation

Addendum 7: Interview Schedule

Annexure E: INTERVIEW SCHEDULE FOR LECTURERS AND NON-TEACHING STAFF

1. Do you think students in your institution are aware of digital learning? Yes/No

1b. If yes, what do you think is their level of awareness on digital learning?

2. What are the various steps taken or plans put in place by the institution and your department to transform curriculum for digital learners?

3. Dies the syllabus of your institution cater for students' relevance in the 4IR? If YES, how? If NO, what measures is the institution taking towards ensuring that it is restructured for relevance?

4. What are the factors hindering the institution from preparing students for digital learning?

5. How are students in your institution fast-tracked into embracing eLearning especially because of the unexpected COVID-19 lockdown?

6. What do you think can be done to enhance universities in preparation for digital learning?

7. Any other comment?

Thank you for your participation