



Exploring the Teacher Professional Development in the Fourth Industrial Revolution: In Pursuit of Social Justice

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Abstract: *The emergence of technology in various sectors of life has transformed the global world. Thus, making things easy. Technology acceptance in the education system has impacted and transformed the education system. This qualitative study explored the need for professional development of teachers in developing African countries to promote the adoption and use of ICT in classrooms for instructional delivery. Ten subject teachers from selected ten schools were engaged in a semi-structured interview to collect data. Interviews were conducted after all necessary ethical conditions had been fulfilled. The interviews were audio-recorded with the permission of the participants. The recorded interviews were transcribed, coded to generate themes for the presentation and discussion of findings. Findings revealed that the concept of the Fourth Industrial Revolution was clearly understood by the teachers, however, they were hindered from embracing it in their teaching due to some factors such as lack of computer knowledge and skills, inadequate resources, and other barriers. The study, therefore, recommends regular and adequate training for teachers on the effective use of ICT in teaching and learning. Stakeholders are encouraged to provide adequate technical resources to all schools regardless of the school locations.*

Keywords: *ICT, Adoption, 4IR, Technical know-how, Rural, Professional development, Teaching and learning*

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1. Introduction

The 21st century is characterized by technological advancement driven by the Fourth Industrial revolution. Thus, the recent years have been structured by a rapid acceptance of technology and the creation of new interest, and tools in every area of the educational domain. There have been several studies in the literature acknowledging different education-related technology for instructional purposes. In particular, the use of wireless technology, web-based, mobile technology, digital platforms, computer projection systems, active gaming devices, use of Moodle, and software that provide new opportunities

for teachers and learners (Adelore & Itasanmi, 2016; Semiz & Ince, 2012).

Technology is increasingly becoming part of education with every passing day. Therefore, the role a teacher can play in the successful integration of technology into education is very crucial (So & Kim, 2009). However, authors like Lee and Tsai (2008) have suggested that many teachers seem uncertain on how to enhance student learning using technology in-class lessons. While some teachers use the internet to attract learners' attention, they do not know how to use it to facilitate the teaching and learning process. In light of this, the training of pre-service teachers with the use of technology has become an important component of teacher training programmes to

certify that aspiring teachers are well prepared to use technology in their teaching (Gulbahar, 2008; Batane & Ngwako, 2017).

It is therefore important to establish whether or not the teacher professional development capacitate teachers with the technological skills during various workshops/training. Teaching is a noble profession that requires continuing development of teachers through various in-service training to support their practice (Ajani, 2020). The process supports the teachers' entry knowledge and skills into the profession. Batane and Ngwako (2017) stated that the changing learning landscape is becoming more technology-oriented, thus, it is worth finding out if technology forms part of the teachers' professional development. Extant literature posits that teachers were reluctant to adopt the use of technology for classroom lessons which was neither part of their original training, nor part of their in-service training (Habibu, Abdullahi & CheKum, 2012).

This study probe further to investigate how teachers use the digital platform in the delivery of their lessons in schools. This study, therefore, aims to investigate the use and adoption of ICT by teachers, to encourage ICT based professional development for teachers in South African schools.

Theoretical Framework

Unified Theory of Acceptance and Use of Technology (UTAUT), UTUAT as a technology adoption model was introduced by Venkatesh, Morris, Michael, and Davis in 2003. The theory adopts constructs and moderators from the other eight theories of technology acceptance and Use of Technology (UTAUT) to investigate the best possible ways to promote the use of technology and user behaviour for teacher professional development. According to Bhatiasevi (2016), UTAUT provides a clearer understanding of behaviour acceptance and the use of technologies compared to other acceptance theories. The

richness and high descriptive capability of the UTUAT model when compared to the other theories of technology acceptance and use has made it very relevant for this study to inform the use of ICT/E-learning among teachers for their professional development as well as their classroom usage. Venkatesh *et al.* (2003) aver that previous technology acceptance models were able to describe approximately 40 per cent of technology acceptance, and on the other hand, while UTAUT has been able to explain 70 per cent of the intention to use technology.

Conversely, the UTUAT model comprises eight different theories and making UTAUT one of the most comprehensive and essential theories for explaining information technology adoption and use (Quigfei, Shaobo & Gang 2008). The UTAUT model applies to users irrespective of gender, extents of information technology competence, culture, as well as to a large variety of available technologies; therefore, proving its richness and reliability (Bhatiasevi 2019). UTUAT model has four constructs and all of them will be used in this study to examine the factors influencing the behavioural intention of academics to use Moodle. UTUAT's constructs are performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating condition (FC). Evans (2013) notes that UTUAT's constructs are moderated by gender, age, experience. According to Ventakatesh *et al.*, (2003), performance expectancy as users believe that using a particular system to perform job function will enhance their performance, effort expectancy is referred to as the level of ease of use of a system. In addition, social influence is a user's perception that a person who is important to him or her should use the new system while facilitating condition is defined as the degree to which a user believes that organizational and technological infrastructure is available to support the use of technology. UTAUT's richness, reliability and suitability explain why ICT/E-learning should be embraced in teacher professional development for enhanced classroom practices.

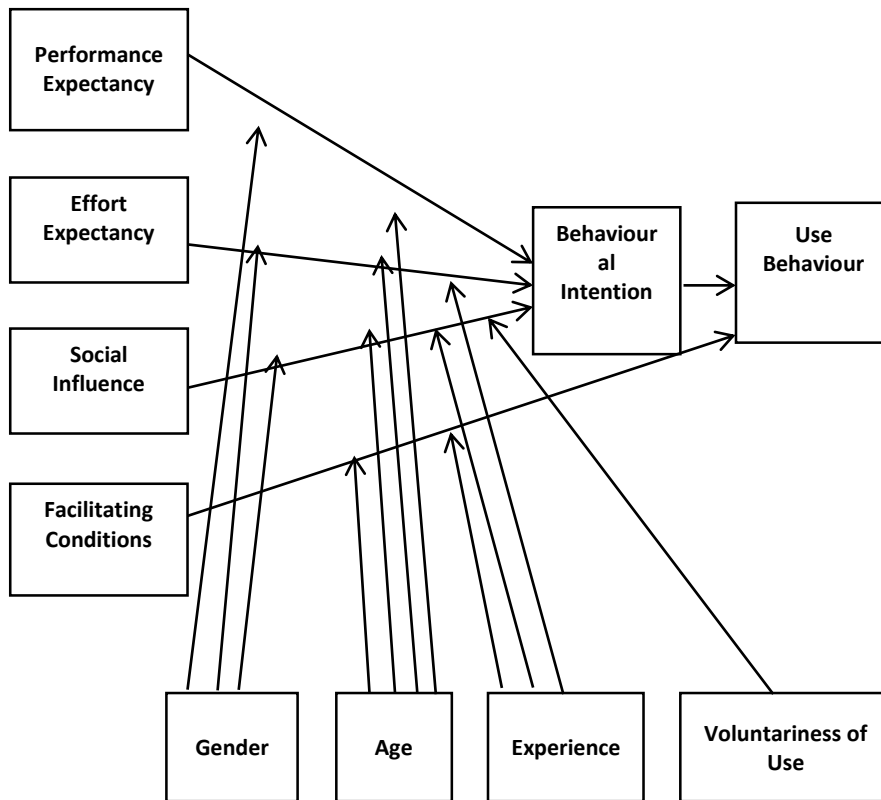


Fig.1: UTAUT Model (Venkatesh et al. 2003).

The rationale for use of UTAUT in this chapter is for this well-established theoretical framework to explore how ICT/E-learning can be integrated for teacher professional development and to investigate the factors that influence behavioural intention to use technology. The following constructs in the UTAUT theory are operationalized below concerning the use of ICT/E-learning in teacher professional development.

1. **Performance Expectancy:** this is operationalized as “the degree to which a teacher believes that using ICT/E-learning will enhance his teaching and learning process”.
2. **Effort Expectancy:** this is “the degree to which teacher believes that ICT/E-learning will be easy to use for his / her teaching process.
3. **Social Influence:** this is defined as “a teacher’s perception that other teachers should use ICT/E-learning for their teaching process”.
4. **Facilitating Condition:** this is “the degree to which a teacher believes that organizational and technical infrastructures exist to use ICT/E-learning for teaching and learning”.

2. Literature Review

The impact of Information and Communication Technology (ICT) on teaching and learning globally

necessitates its integration in the classroom. In South Africa, the Independent Project Trust (IPT) (1998) recognizes the winds of change blowing through the global education system and this needs to be accommodated in developing the African education system. The global change is good and requires the implementation of the learning technologies in teaching and learning to enhance learners’ performance, as well as effective curriculum delivery in schools and classrooms. Seemingly, schools should be provided with functional, appropriate and adequate resources to support teaching and learning. This implies that adequate provision of learning resources in schools will enhance the effective delivery of the curriculum. The support also includes the provision of appropriate and regular ICT workshops as well as follow-up to support teaching and learning. Developing African countries must embrace the wind of the Fourth Industrial Revolution that has engulfed every sector, hence schools should be encouraged to implement the adoption of learning technologies. Accordingly, planning and designing of the subject curriculum should not be only in theory but practical implementation, which adequately translates the theory into practice.

The use and adoption of ICT in classroom teaching and learning are capable of improving learners' performance and their abilities to explore learning at their own pace (Mjwara, 2017). This study, therefore, explores the impact of teacher education in the preparation of learners for

sustainable development goals through 4IR. Almekhlafi and Almeqdadi (2010) posit that some challenges hinder the implementation of technology in developing nation' schools. These access to gadgets, support on competencies, inadequate resources and lack of ICT training to teachers. Munje and Jita (2020) opine that integration of ICT in African schools are hindered based on the geographical lack of ICT resources in many schools, especially rural schools where the education of rural learners are compromised.

The government's drive to provide ICT opportunities to schools is usually noted through various policies on the implementation of ICT in schools. However, implementation of ICT in schools is weak due to a lack of connection between the policies and practice. Poor internet connectivity, lack of technical support are some of the notable challenges to ICT implementation in most schools in developing countries. ICT integration is a far-fetched theory that discourages some teachers who are interested in adopting ICT into their teaching and learning. In other words, these challenges are greatly influenced by a lack of adequate fund.

The absence of adequate fund to implement ICT in developing countries is an indication of a lack of priority to join the Global Information Infrastructure, which further exacerbates the digital gap between rich and poor. Sustainability of growth development needs ICT to create opportunities and capacity building for learners, to ensure their beneficial responsiveness and absorption into dynamic national economies). The picture in developing Africa reflect the disparity between the richer of the developing countries and the poorer as portrayed by the rural-urban divide in most African countries. South African teachers are becoming increasingly interested in the use of learning technologies such as open-source learning and e-learning in their classroom practices. Thus, the advent of the internet has made a world of information available to all.

In South Africa, societal issues such as inequality and wealth distribution are prevalent. Social difficulties such as a high crime rate, gender violence, and unemployment are more frequent in unequal societies. Inequality in South Africa's education sector is a contentious issue, and new technological breakthroughs have the potential to bolster this view. The human condition and social fairness must be taken into account. It's important to think about how technology innovation and shifting economic power affect society at different socioeconomic levels. Threats in an increasingly interconnected globe should be recognized, and intercultural understanding, unwavering respect for freedom, and human rights should be emphasized. As a result, interpersonal and intercultural skills should be cultivated. The lack of funds is one of the most significant obstacles to the successful implementation of the 4IR in South African education. Although education funding has increased in recent years, it is still insufficient to allow educational institutions to function fully. It has resulted in,

among other things, increased university tuition and diminished research funding. The difficulty for educational institutions is to invest more in new technological breakthroughs while also prioritizing where the money should go. Significant financial support is required for new technology to thrive in educational institutions.

Another problem in the education sector that will have an impact on the 4IR's effectiveness is the exclusion of certain socioeconomic groups from participating in the 4IR. Badat (2010) claims that, notwithstanding an increase in black student enrolment since 1994, the gross participation rate of black South Africans, particularly African and coloured South Africans, remains much lower than that of white South Africans. Universities are considered as having a responsibility for social justice and developing an equitable and equitable environment to reverse apartheid's negative impacts.

3. Research methodology

The study adopted the qualitative research approach to obtain first-hand information from the participants with the use of the in-depth interview. Denzin and Lincoln (2011) opine that qualitative research is a situated activity that locates the observer in the world. Qualitative research consists of set interpretive, material practices that make the world visible. The use of qualitative data tends to be open-ended without any predetermined responses. In order word, qualitative research involves the study of things in their natural settings. The interpretive paradigm was adopted to interpret findings for the study. Creswell (2013) affirms that the qualitative research approach begins with assumptions and the use of interpretive paradigm that inform the study of the research problem and objectives addressing the meaning individuals or groups ascribe to a social or human problem. In this study, the use of interpretive paradigm is to investigate the use of technology in teaching and learning. Denzin and Lincoln (2011) stress that qualitative research involves an interpretive approach, it presents the approach to the world in its natural form. Ten subject teachers were randomly selected from ten rural-urban schools in King Cetshwayo District of KwaZulu-Natal province. Gravetter and Forzano (2011) opine that a simple random sampling is a method that attempts to give equal chances to each member of the population to be chosen as part of the sample. Each participant was selected by chance and had equal opportunity to be selected for the study.

The collected data were transcribed and analysed with the thematic analysis process where transcripts were coded to generate interpretive themes, for presentation and discussion of findings (Vaismoradi, Turunen & Bondas, 2013). Thematic analysis as an independent qualitative descriptive approach is mainly described as a method for identifying, analysing and reporting patterns (themes) within data (Braun & Clarke, 2006). All ethical procedures

for this scientific study were strictly adhered to with voluntary participation of the participants.

4. Results and Discussion

Discussion of the themes from the semi-structured interviews are presented below. Themes were first presented, with findings from each theme offered, interpreted, related to the study and extant literature. Extractions of the verbatim quotations from the data were indicated with pseudonyms to protect the identity of the participants: teachers 1-10 (T1, T2, T3, T4, T5, T6, T7, T8, T9, and T10).

4.1 The concept of ICT in the education system

The participants expressed their views on what ICT meant to them. Though, some indicated they were not using ICT for some reasons. Participant T1 expressed: *“ICT is to inculcate skills and to communicate with others in the teaching of the subjects. It is also useful for education research. We must move in that direction of the Fourth Industrial Revolution to prepare our learners for the future. It is very important to integrate ICT into classrooms.”* (T1)

While another participant declared ICT irreplaceable in teaching and learning: *“ICT adoption means that in teaching and learning, ICT plays an irreplaceable role that teachers cannot play”*. (T2). ICT is to teach learners to understand clearly, as expressed by Participant T4: *“I understand it as a way of teaching kids to understand technology or the way to use technology in teaching. The government should endeavour to buy those gadgets such as computer, cell phones and others. So that they understand the use of ICT”*. (T4). Other expressions by the participants asserted that they understood ICT in teaching and learning as they used it in teaching: *“It makes our learners more in line with the system that is being introduced. The learners are being introduced to the new world they are grown into. Now, we are in the Fourth Industrial Revolution”*. (T9). Another Participant, T10 agreed that it is to make teaching easy: *“Yes, we are using it. Most things are done with computers now. So, it's easy using the computer to teach. We are adapting to the new technology”*.

Dube, Nhamo & Magonde (2018) establish that it is important to integrate ICT into teaching and learning in schools, according to Naidoo (2020) will provide learners with the opportunities to access information extensively on any subject, and will expose them to the Fourth Industrial Revolution where everything is done with technologies. Oke and Fernandes (2020) justify the use of ICT in the school system as a global norm. Simon and Ngololo (2018) suggest that more learning technologies should be integrated and made available in curriculum delivery.

The adoption of ICT into teaching requires frequent and appropriate ICT training for the teachers through their professional development (Dlamini & Mbatha, 2018; Chisango et al, 2020). Chisango and Lesame (2019) opine that teachers need to be provided with a frequent update on expertise, knowledge and necessary specialized ICT skills that can facilitate effective integration of ICT into teaching and learning and can improve on the adoption through continuous and frequent training. Furthermore, Ojo and Adu (2018), Madoda and Chigona (2019) advocates for the provision of ICT resources to all schools and frequent and necessary professional development of teachers for effective utilization of ICT resources in teaching and learning. From these findings, participants understood that ICT is significant in teaching and learning. This supports both DOI and TPACK theories that teachers need to understand the need for ICT in teaching and learning clearly, for them to adopt and use ICT effectively in their classroom practices regularly and appropriately (Rogers, 1962, 2003; Mishra & Koehler, 2006).

4.2 Adoption and integration of ICT into teaching/learning

It was revealed that teachers' integration of ICT into classroom practices are influenced by many reasons.

Participant T9 highlighted in his views that he used ICT for his classroom practices: *“Yes, I use it in my school. It makes my work a lot easier. I use it to make learnings easier for my learners. Learners also use the social network to communicate with me for more clarity”*. Participant T1 concurred that the 21st century necessitates teachers to blend learning: *“Yes, I use ICT in class. We are in the 21st century. It is important because it makes teaching easier. Because I believe it makes the learners visualize learning”*. Similarly, participant T5 echoed the same on the use of ICT in school: *“Yes, it makes teaching more easier. It reduces the time. It makes teaching more positive. Learners are happy using it”*. Another participant affirmed that she used ICT in teaching to adapt to technology: *“Yes, we are using it. Most things are done with computers now, so, it's easy using the computer to teach. We are adapting to the new technology”* (T10).

Findings revealed that most rural schools are not using ICT to teach for several reasons. Using ICT in teaching and learning is beneficial to both schools and learners (Adarkwah, 2020). According to Mwapwele, Marais, Dlamini and Van Biljon (2019), the adoption of ICT into teaching and learning in schools enables concrete learning and arouses learners' interest to learn. This implies that the adoption of ICT into teaching and learning is capable of enhancing learners' academic performance and also make curriculum delivery less stressful. However, Dlamini and Mbatha (2018) affirm that only teachers who possess ICT knowledge and skills can in a real sense integrate ICT successfully into their classroom practices. A similar opinion was shared by Ruxwama and Msibi (2018) that possession of the right ICT skills enables adequate and

appropriate use of various ICT resources to deliver learning experiences to the learners. Hence, Naidoo asserts that teachers need to be grounded in computer knowledge and skills to impact teaching and learning. The DOI theory stipulates that computer users must have the needed know-how of the innovation to appropriately integrate it into teaching and learning (Migro & Ocholla, 2005). Conversely, Munyengabe, Yiyi, Haiyan and Hitimana (2017) encourage all teachers to be trained on existing learning technologies that can be used to enhance teaching and learning of all subjects. Therefore, Aydin and Gurol (2019) argue that in-service training/workshops for teachers should be designed to provide them with opportunities to integrate ICT into their lesson delivery.

4.3 Teachers' competencies

Participants' views on ICT skills they possessed for teaching and learning in their schools were sought. Some of these participants mentioned in their views what as much as they wanted to use the ICT, they lacked the appropriate skills. While some who possessed the skills could not use the skills to teach because their schools lacked the ICT resources. Participant T9 responded: *"As a teacher, I do have skills. I have been trained to use ICT. I know how to use a smartboard, presentation for teaching and learning, Zoom for a meeting, use social media for teaching and learning. Also, I have equipped some of my colleagues and some of my learners so that we can all use ICT. So, those who are willing are empowered. So, I will say I possess adequate skills I can use in teaching"* (T9). Participant T3' views concurred with the above expressions: *"Yes, I have those skills. I have the skills of browsing the internet to access information for my learners. I can use any application that is useful for teaching and learning my subject. I can use many programs in ICT. I can use any design available in my school. I can install or uninstall any software application on any device. I can use MS Word, PowerPoint, Excel and even CorelDraw"* (T3).

The theory of Diffusion of Innovation posits that users of innovation such as the integration of ICT into teaching and learning need to have a good mastery of the appropriate skills. This concurs with Messina and Tabone (2015) that regular update of knowledge and skills of ICT is necessary to effectively integrate ICT into classroom practices. Dlamini, Meyer, Maraisa and Ford (2017) aver that technical know-how of ICT is necessary for its adoption and use in teaching and learning. Similarly, Vadachalam and Chimbo (2017) concur that the effective use of ICT in teaching and learning is determined or influenced by the level of ICT skills possessed by the teachers. Jian (2015) following Jita and Mokhele, (2014) suggest that a well-structured training or workshop on the ICT skills is necessary to support subject-contents delivery through the use of ICT, which can promote effective teaching skills, improve learners' academic performance and encourage good mastery of the subject content.

4.4 Factors influencing adoption and integration of ICT into classroom practices

Views of the teachers were sought to corroborate the factors that influence the integration of ICT into teaching and learning in their schools. Participant T2 agreed that so many factors influenced the integration of ICT in his classroom instructional delivery: *"The factors in my school include available space for the gadgets, the community around the school. The computer knowledge of the teachers. Teachers must have ICT knowledge so that they won't discourage learners"* (T2). Participant T4 also corroborated that many factors influenced teachers' use of ICT in teaching activities: *"The factors that influence ICT in my school is the fact that today, we are in the world of technology. Most of the things come from technology. Even the meeting or the information from the department come through technology. So, we need to adapt to ICT"* (T4). The expression of T6 indicated that lack of resources hinders the integration of ICT: *"I think the lack of resources is one. We do not have practical materials, even we don't have enough classrooms in my school. Some of the teachers are old fashioned. They will have to be taught first, computer skills for them to use ICT in teaching"* (T6). Availability of resources remained one of the critical influence on the integration of ICT in teaching and learning. A participant T8 had this to say: *"Technological, infrastructures like computers, network and community violence"* (T8).

Rogers (2003) in his Diffusion of Innovation theory, explains that the use of technologies in teaching and learning is enhanced by the attitudes of the teachers to use the innovation, as well as their computer knowledge and skills of the appropriate gadgets for classroom teaching. Similarly, Mishra and Koehler (2006) assert technical know-how as a driving force for TPACK in using ICT for teaching. Teachers, according to the participants needed to be trained on the adoption and use of appropriate ICT resources to teach in schools. Lack of computer knowledge as indicated by some of the participants explains why many schools may not be able to use ICT in teaching and learning.

Findings also established that some schools lack ICT resources, this implies that with the presence of computer literate teachers in such schools, integration of ICT into their classroom practices is hindered. TPACK, one of the theoretical frameworks for this study, asserts that teachers should not only be empowered with the technological pedagogy of ICT but should be adequately provided with the technological resources needed for teaching and learning. Migiro and Ocholla (2005) aver that the capacity building of teachers is necessary to effectively use ICT in teaching and learning. Naidoo (2020) in his longitudinal study, recommends a well-designed training on computer skills should be situated within teacher professional development to support ICT integration in schools.

Graham, Stols and Kapp (2020) argue that the use of ICT in teaching and learning is a gateway to the Fourth Industrial Revolution. Simon and Ngololo (2018) agree that the use of ICT in teaching and learning is to prepare and expose the learners to the global world of ICT. Conversely, Oke and Ferdinades (2020) in their opinions, encourage schools to be provided with ICT resources and teachers to be trained on how to use these facilities. Aydin and Gurol (2019) opine that factors that negatively influence the integration of ICT into teaching and learning should be addressed.

4.5 Challenges to ICT's integration in schools

With regards to barriers against the adoption of ICT in teaching in schools, the participants highlighted some barriers against ICT in schools. Participant T2 was of opinion that teachers' attitude: *"Teachers' attitude towards teaching using ICT. The layout of the school, but also the availability of fund to repair when the materials are faulty. The learners' exposure to computers. If a learner comes from a home where there is no such gadget or electronic, it takes a long time"* (T2). Participant T1 responded that contents of IPD activities seemed inadequate: *"As I said, I think the content is not adequately covered, and also the marking of the scripts is not also adequately covered which leave us a gap after attending those IPD, we come back sometimes, with the same problem. It's like at the beginning of the year, our IPD takes two days, but the first day is when we are analyzing things maybe that are not interesting because we already have those results we need to improve now but we take a long time discussing the previous results for the whole day"* (SAT1). Participant T4 identified a poor network for internet at rural schools: *"I told you earlier on that I am at a rural school, the network is poor. The community vandalizes anything that has to do with the signal or the technology. Even what will benefit the learners, they steal or vandalise. There is no knowledge to use ICT, so it's a barrier"* (T4). Participant T5 also upheld learners' background as a serious challenge to ICT: *"Poor backgrounds of the learners and the environment of the school. The environment of the school must determine if the school is smart enough to accommodate all the learners"* (T5).

Several barriers have been identified as impediments to ICT integration into the teaching in schools. The barriers affect or hinder the adoption of ICT into teaching and learning. Rambrij (2018) suggests that several barriers limit the effective usage of ICT in teaching and learning. These problems are inadequate or lack of serviceable computers, network problem and lack of teachers' computer literacy (Mlanga, 2015; Dlamini & Mbatha, 2018; Murire & Cillies, 2019). According to Rogers (1962), effective implementation of DOI is based on the absence of barriers that can affect or challenge the acceptance of innovation. While TPACK enjoins the provision of all necessary resources as well as possession

of adequate ICT skills to drive teachers' attitude to use ICT in classroom teaching. Ojo and Adu (2018) report that learners' inability to use computers is based on the unavailability of computers in schools and the lack of ICT on the part of their teachers. Ajani (2020) recommends ICT-based training for teachers to encourage the use of learning technologies in curriculum delivery. The DoE (2007) provides insight into the Teacher Development Framework as an approach to drive the adoption and use of ICT in teaching and learning. Naidoo (2020) calls for appropriate workshops to support teachers' adoption of ICT into the teaching and learning of all subject contents.

4.6 Strategies to promote ICT's adoption in classroom practices

Findings indicated that many things can still be done to enhance the integration of ICT into teaching and learning. The participants came up with suggestions that can enhance the adoption of ICT into their classroom practices. Participant T3 had this to say: *"No 1 is the provision of training and support to all teachers. It will be of no use if teachers can't use the available ICT in schools. To encourage learners in using modern technology. The parents have to support learners in using these. Some parents need to be addressed on these, as some believe ICT is not good for learners"* (T3). While participant T6 had this to say: *"I think maybe if the school can have laptops, overhead projector. That will assist the teachers in teaching. It will also make the learners interested in learning. Using ICT can make things better"* (T6). Some participants wanted the Department to provide learners with smartphones: *"ICT creates a positive environment in the class. It makes learners enjoy the classroom. The DBE should assist the learners by providing smartphones for the learners. If the DBE can provide these, teaching will be made easy"* (T5). *"Since our school is a rural school, our learners cannot afford smartphones. I think if the Department can provide us with adequate resources, it will help"* (T9). Another participant declared: *"Every desk must have a computer, every child must have the computer to keep on learning new things. Don't do the same thing over and over"* (T10).

Findings revealed that there are many things to be done to enhance the adoption of ICT into teaching and learning. The participants identified and agreed that these strategies will enhance the integration of ICT into teaching in schools. This supports DoE's (2007) assertion that the components of the Teacher Development Framework theory can successfully drive the adoption and use of ICT in classroom practices. The components: Entry, Adoption, Adaptation, Appropriation, and Innovation enjoin adequate provision of all resources and computer literacy competency should be ensured in schools to integrate ICT into teaching and learning. Similarly, Rogers (2003) posits that the availability of adequate resources is a good motivation for teachers' adoption of ICT as an innovation in teaching and learning. This implies why the Diffusion

of Innovation (DOI) is integrated into this study as it explains how innovation like ICT can easily be diffused into the education system.

Conversely, the knowledge of the extent to which teacher can use, manipulate and operate technology to influence learning goals is referred to as Technological Content Knowledge in TPACK (Koehler & Mishra, 2009). Chisange and Lesame (2019) affirm that diverse approaches can be employed to encourage the adoption of ICT into teaching. While Graham, Stols and Kapp (2020) assert that the use of ICT in the education system is a vogue that prepares learners for the Fourth Industrial Revolution (4IR). Ogundile et al (2019) recommend that teachers should be capacitated in this new direction so that their learners should be prepared for the modern world of technology. Learners should be exposed to the reality of technology in our various facets of life (Simon & Ngololo, 2018). Gikenye (2012) notes that ICT is an innovation that shows the integration of technological techniques into teaching and learning as a social system.

5. Conclusion and Recommendations

This study explored the drive for the adoption of ICT in teaching and learning in sampled schools. Emerged themes from the data analysis were presented accordingly and were extensively analysed to discuss the research questions for the study. The findings revealed that the adoption of ICT in teaching and learning varied from one teacher/school to another, and are influenced by several factors. Given the widespread acceptance of ICT in our different facets of life, teachers must be given adequate support to integrate ICT into their teaching in all schools. The study established that teacher professional development is necessary to workshop teachers into the

adoption of ICT into their classroom practices. Some participants indicated that inadequate ICT resources in their schools affected their readiness to integrate ICT into their teaching. The findings also highlighted the critical need for professional development of teachers specifically on the use of ICT appropriately in schools. The teachers clamoured for the provision of computers and laptops for every learner in rural schools, as their parents cannot afford them. Conclusively, the integration of ICT into teaching and learning is established as a global trend to drive 4IR into learners across the globe. The study established that stakeholders in the education system should support schools with the training of teachers on ICT skills as well as provision of necessary ICT gadgets in schools across South Africa to forestall the digital divide between the rural learners and the urban learners, the rural teachers and the urban teachers to enhance the curriculum delivery.

The study, therefore, recommends among others:

- Teachers should be provided with regular ICT training to integrate teaching and assessments into various learning technologies.
- Schools should be provided with adequate and functional teaching and learning technologies.
- Adequate capacity building for teachers will promote their learners' competencies in ICT and relevance to 4IR.
- Adequate technological support should be provided to teachers by the Department of Basic Education to support teachers' use and adoption of technological devices in the teaching and learning of all subjects. This includes the provision and upgrading of all learning software for teaching and learning.

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